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Oriental motor

HL-17082-4

EZ limo
easy linear motion

Linear Motion Controller

ESMC-K2
ESMC-A2
ESMC-C2

OPERATING MANUAL

CE

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

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

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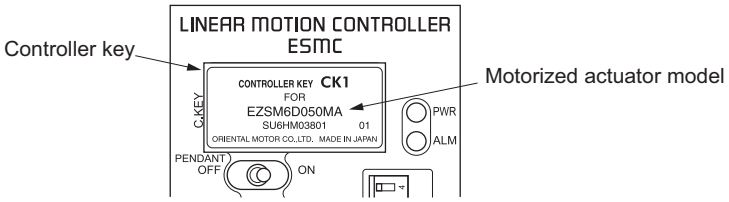
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1 Introduction

1.1 Important note

Be sure to confirm that the motorized actuator model shown on the controller key is the same as the model of the motorized actuator connected to the controller. If the two numbers do not match, the motorized actuator cannot be operated according to the specification. For details, refer to 1.6, “Controller key” on p.7.



1.2 Overview of the product

This linear motion controller (hereinafter referred to as “controller”) is a dedicated controller for motorized actuators.
In the controller, the specification of the combined motorized actuator is set automatically based on the datas stored in the controller key.
You can select desired settings for the following items using the mode switches on the controller.

- Controller mode/driver mode

  Controller mode: The motorized actuator is operated in accordance with the operating data stored in the controller.

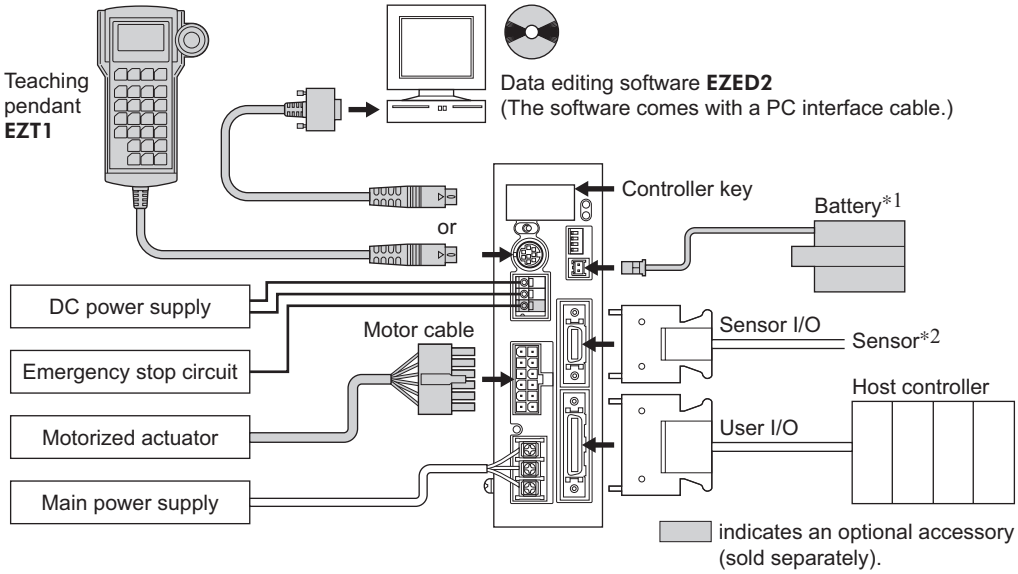
  Driver mode: The motorized actuator is operated by means of externally input pulses.

- Absolute mode/incremental mode

  Absolute mode: An optional battery (sold separately) is used to retain the current position even after the power is turned off.

  Incremental mode: Since the current position is not retained, return-to-home operation must be performed after the power is input.

1.3 System configuration



∗1 Absolute mode only.
∗2 Sensors are optional (sold separately) on the **EZS** Ⅱ series and **ESR** series.

1.4 Compliance with the EC Directives

The controllers bear the CE Marking indicating their compliance with the Low Voltage and EMC Directives, based on combinations with the products specified below.
The controllers do not comply with the EC Directives if combined with other products.

- Installation conditions

Controller, teaching pendant

Controller is to be used as a component within other equipment.

Models	ESMC-K2	ESMC-A2, ESMC-C2	**EZT1**
Overvoltage category	Ⅰ	Ⅱ	–
Pollution degree	2		
Protection against electric shock	ClassⅢ	Class Ⅰ	–
Degree of protection	IP10		IP40

Motorized actuator

Models	EZSM□K* EZCM□K EZAM□K	EZSM□A*, EZSM□C* EZCM□A, EZCM□C EZAM□A, EZAM□C	SPFM□K	SPVM□K	SPRM□K
Overvoltage category	Ⅰ	Ⅱ	Ⅰ		
Pollution degree	2		2		
Protection against electric shock	ClassⅢ	Class Ⅰ	ClassⅢ		
Degree of protection	IP20		–		
Noise level	71 dB		71 dB		

* Excluding the **EZS** Ⅱ Series Clean Room Use motorized linear slides.

- Environmental condition

	Operating environment	Storage environment	Shipping environment
Ambient temperature	0 to +40 °C (+32 to +104 °F) (non-freezing)	–25 to +70 °C (–77 to +158 °F) (non-freezing)	
Ambient humidity	85% or less (non-condensing)		
Altitude	Up to 1000 m (3300 ft.) above sea level		Up to 3000 m (10000 ft.) above sea level
Surrounding atmosphere	• Area that is free from an explosive nature or toxic gas (such as sulfuric gas) or liquid • Area not exposed to direct sun • Area free of excessive amount dust, iron particles or the like • Area not subject to splashing water (storms, water droplets), oil (oil droplets) or other liquids • Area free of excessive salt • Area not subject to continuous vibration or excessive shocks • Area free of excessive electromagnetic noise (from welders, power machinery, etc.) • Area free of radioactive materials, magnetic fields or vacuum		

■ Low Voltage Directive

Model	Applicable Standards
ESMC-K2	Not applicable, because the input power supply voltage is 24 VDC
ESMC-A2, ESMC-C2	EN 50178
EZSM□K*, EZCM□K, EZAM□K	Not applicable, because the input power supply voltage is 24 VDC
EZSM□A*, EZSM□C* EZCM□A, EZCM□C EZAM□A, EZAM□C	EN 60950, EN 60034-1, EN 60034-5, EN 60664-1
EZT1	EN 60950, EN 60204-1

* Excluding the **EZS** Ⅱ Series Clean Room Use motorized linear slides.

■ EMC Directive

Provide EMC measures when installing/wiring the product. Without effective measures to suppress EMI (electromagnetic interference) caused by the motorized actuator, controller or teaching pendant in the surrounding control systems equipment and to address EMS (electromagnetic susceptibility) of the motorized actuator, controller or teaching pendant, the machine's performance may be severely affected.
This product has received EMC measures under the conditions specified in "Example of installation and wiring" on p.11.
Be sure to measure EMC (electromagnetic compatibility) with the product in your equipment, by referring to 2.3, "Installing and wiring in compliance with EMC Directives" on p.10.

Applicable Standards		ESMC-K2	ESMC-A2, ESMC-C2
EMI	Emission Tests	EN 61000-6-4	EN 61000-6-4
	Radiated Emission Test	EN 55011	EN 55011
	Conducted Emission Test	−	EN 55011
EMS	Immunity Tests	EN 61000-6-2	EN 61000-6-2
	Electrostatic Discharge Immunity Test	IEC 61000-4-2*	IEC 61000-4-2*
	Radiation Field Immunity Test	IEC 61000-4-3	IEC 61000-4-3
	Fast transient/Burst Immunity Test	IEC 61000-4-4	IEC 61000-4-4
	Surge Immunity Test	−	IEC 61000-4-5
	Conductive Noise Immunity test	IEC 61000-4-6	IEC 61000-4-6
	Voltage Dip Immunity Test	−	IEC 61000-4-11
	Voltage Interruption Immunity Test	−	IEC 61000-4-11

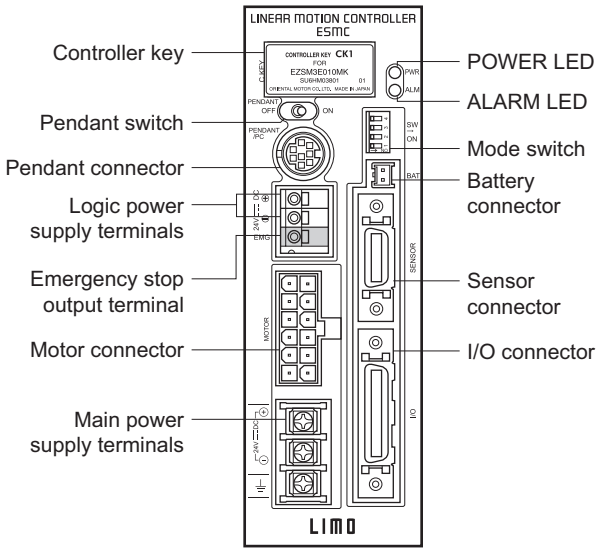
* Teaching pendant: 10 kV both in air and in the contact state

■ Machinery Directive

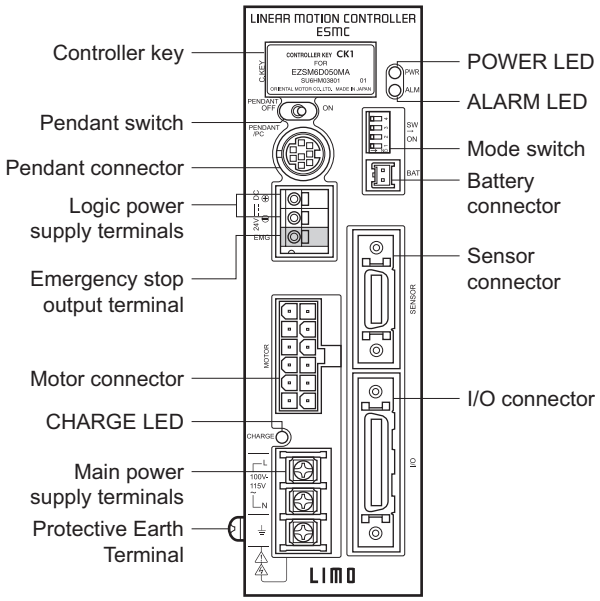
The motorized actuators and controllers are designed and manufactured for use as an internal component for general industrial equipment, and therefore need not comply with the Machinery Directive.
Nonetheless, they are evaluated under the following standards:
Applicable Standards: EN ISO 12100-1, EN ISO 12100-2, EN 1050, EN 60204-1

1.5 Names and functions of front panel

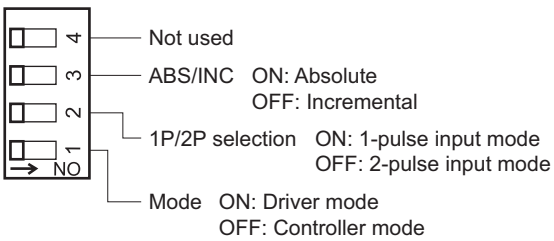
• ESMC-K2



• ESMC-A2, ESMC-C2



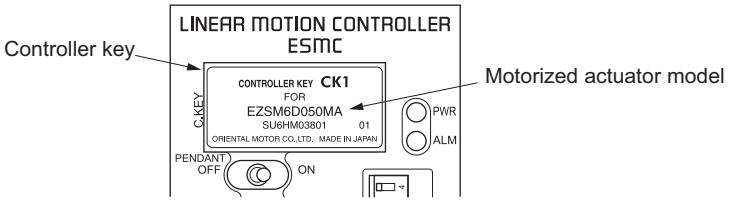
∗ The controllers shown above are equipped with a controller key.

Name	Function
Controller key	The controller key stores parameters relating to motorized actuator control. If you have purchased a controller only, no controller key is supplied. For details, refer to 1.6, “Controller key” on p.7.
Pendant switch	ON: The teaching pendant can be used. OFF: The teaching pendant power is turned off. (The emergency stop button on the teaching pendant is also disabled.)
Pendant connector	This connector is used to connect the pendant connector or PC interface cable.
Logic power supply terminals	This connector is used to connect the logic power supply.
Emergency stop output terminal	This connector is used to connect the Emergency stop circuit.
Motor connector	This connector is used to connect the motor cable of the motorized actuator.
CHARGE LED*	This LED will be lit when the main power supply and logic power supply are input to the controller. It will also be lit when hazardous voltage is still present in the controller. It takes approx. 4 minutes after the power is turned off until the CHARGE LED turns off.
Main power supply terminals	This connector is used to connect the main power supply.
POWER LED	The green LED is lit while voltage is being supplied to the logic power supply terminals.
ALARM LED	The red LED blinks when an alarm is generated (upon activation of the protective function or emergency stop).
Mode switch	Use this switch to set various controller functions. If you have changed any setting, be sure to cycle the logic power supply. The new setting will not become effective until the logic power supply is cycled. 
Battery connector	If your controller is used in the absolute mode, connect an optional battery (sold separately) to this connector.
Sensor connector	This connector is used to connect the sensor input.
I/O connector	This connector is used to connect the user I/O.
Protective Earth Terminal*	The controller’s Protective Earth Terminal

∗ Not available on the ESMC-K2.

1.6 Controller key

A controller key corresponding to the combined motorized actuator is installed on the controller. (If you have purchased a controller only, no controller key is supplied.)



The controller key stores data relating to motorized actuator control.
The controller uses these data to automatically set the following parameters in accordance with the specification of the combined motorized actuator:

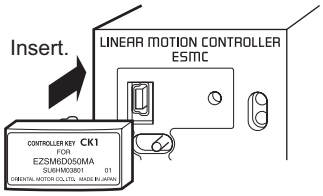
I/O parameter:	LS detection enable/disable
Home parameter:	Return-to-home method
Speed parameters:	Starting speed, acceleration, deceleration, common operating speed
Common parameter:	Upper soft limit
Internal settings (cannot be changed):	Resolution, maximum operating speed, maximum acceleration/ deceleration, motor control settings

Note

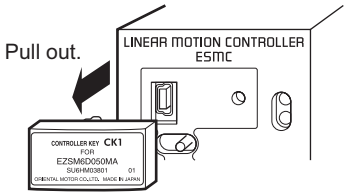
- Be sure to confirm that the motorized actuator model shown on the controller key is the same as the model of the motorized actuator connected to the controller. If the two do not match, the motorized actuator cannot be operated according to the specification.
- If the controller key has been changed to one of a different motorized actuator and the logic power supply is turned on, all data that has been set in the controller will be lost.
- Do not remove the controller key while the controller is receiving power. If the controller key is removed while the controller is receiving power, a motorized actuator communication error alarm (Err2A) will generate.

■ Installing/Removing the controller key

- How to install the controller key



- How to remove the controller key

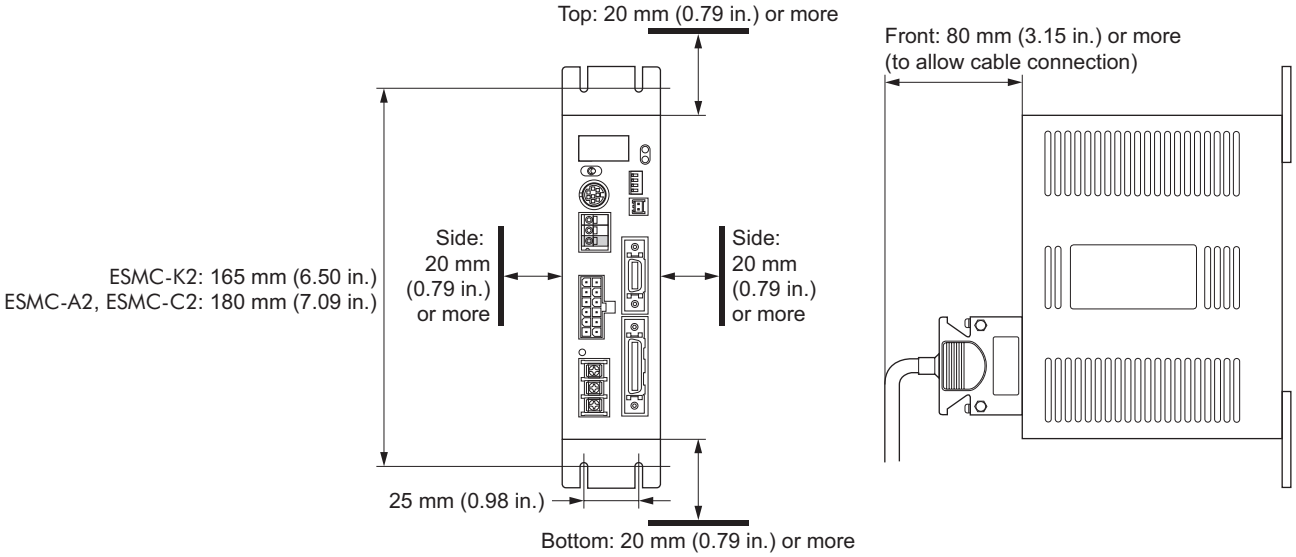


2 Installation

2.1 Controller clearances required at installation

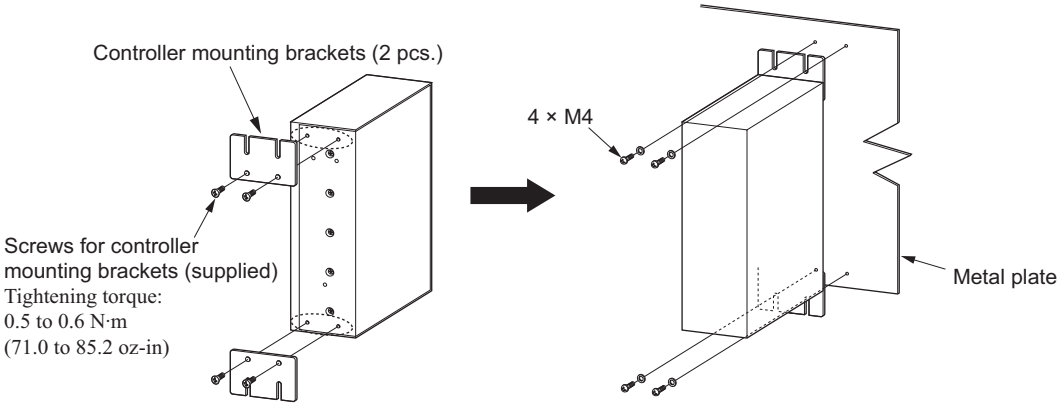
Install the controller on a vertical, flat surface inside an enclosure placed indoors.

Note If the controller is not installed vertically, heat generated from the controller will not be radiated properly and the controller may be damaged due to excessive heat.



2.2 How to install the controller

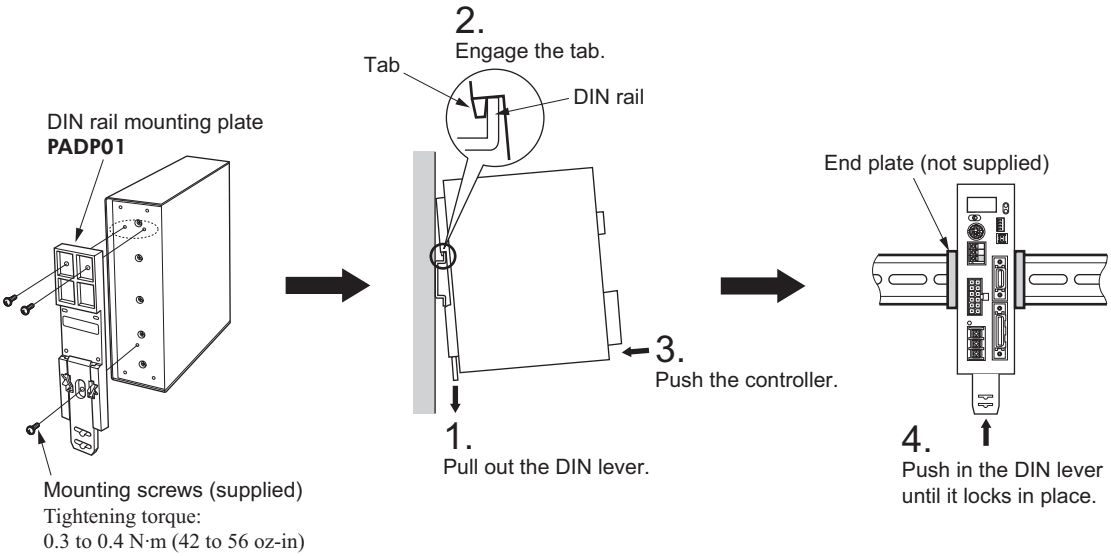
■ Using controller mounting brackets



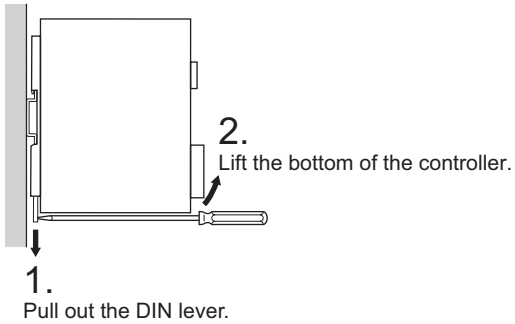
Note
- Do not use the mounting holes for the controller mounting brackets supplied on the back of the controller for any purpose other than securing the mounting brackets.
- Be sure to use the supplied screws when securing the controller mounting brackets.

■ Mounting to DIN rail

Use a DIN rail 35 mm (1.38 in.) wide to mount the driver.



- Removing from DIN rail



Note

- Do not use the mounting holes for the DIN rail mounting plate provided in the back of the controller for any purpose other than securing the DIN rail mounting plate.
- Be sure to use the supplied screws when securing the DIN rail mounting plate. The use of screws that would penetrate 3 mm (0.12 in.) or more through the surface of the controller may cause damage to the controller.
- Use force of about 10 to 20 N (2.2 to 4.5 lb.) to pull out the DIN lever. Excessive force may damage the DIN lever.

2.3 Installing and wiring in compliance with EMC Directives

The basic wiring requirements are explained below.

■ How to ground

When grounding the controller and mains filter, use as thick a cable as possible and connect to the ground point over the shortest possible distance so as not to generate potential difference at the grounded section. Use a wide, thick and uniform conducting surface for the ground point.

■ Mains filter

Connect a mains filter in the AC input line to prevent the noise generated in the controller from propagating externally through the power supply line.
Oriental Motor recommends the mains filters shown in the table right, based on our internal measurement results.

Manufacturer	Model
Schaffner EMC	FN2070-10-06
EPCOS AG	B84113-C-B110

- Install a mains filter at a point as close to the controller as possible.
- Secure the input and output cables with cable clamps or the like so that they won't rise from the surface of the enclosure panel.
- Do not wire the AC input-side cable (AWG16: 1.25 mm^2) and the mains filter's output cable (AWG16: 1.25 mm^2) in parallel. If they are wired in parallel, noise occurring within the enclosure will be transmitted to the power supply cable via stray capacitance, thereby reducing the mains filter's effectiveness.

■ Surge arrester

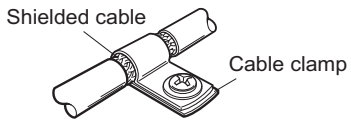
Use a surge arrester or equivalent as below table.

Manufacturer	Single-phase 100-115 V	Single-phase 200-230 V
OKAYA ELECTRIC INDUSTRIES CO., LTD	R·A·V-781BWZ-4 R·C·M-601BQZ-4	
PHOENIX CONTACT GmbH & Co. KG	PT2-PE/S120AC-ST	PT2-PE/S230AC-ST

Note When measuring dielectric strength of the equipment, be sure to remove the surge arrester, or the surge arrester may be damaged.

■ Wiring the I/O cable

Use a shielded cable with a wire of a size ranging between AWG24 to 22 (0.2 to 0.3 mm^2) for the controller I/O cable, and keep it as short as possible. (A shielded cable is available as an option.)
When grounding the I/O cable, use a metal cable clamp and ensure that it contacts the shielded cable along the cable's entire circumference. Install the cable clamp at the end of the shielded cable and secure it to an appropriate grounding point.



■ Notes about installation and wiring

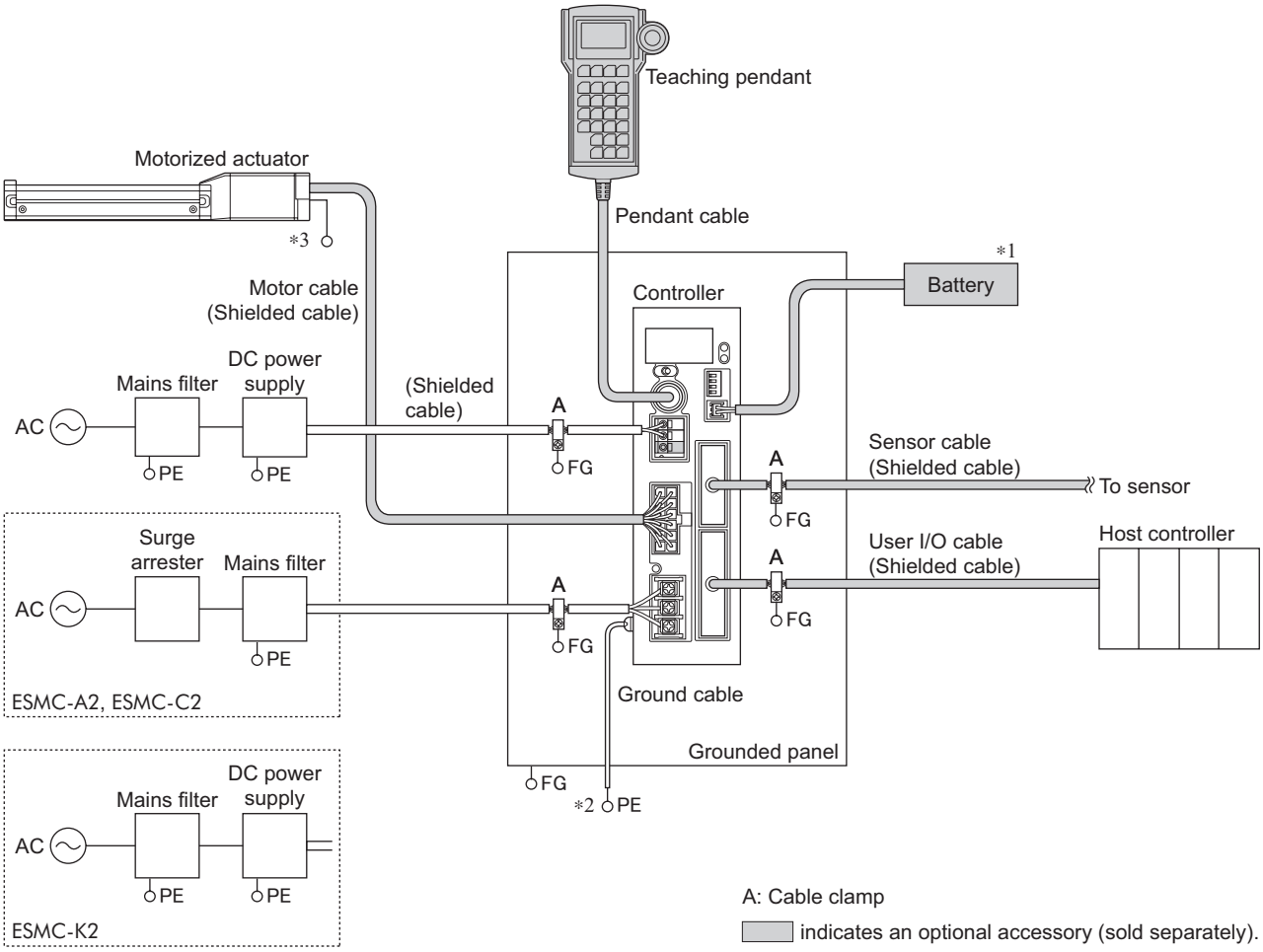
- When relays or electromagnetic switches are used together with the system, use mains filters and CR circuits to suppress surges generated by them.
- Wire the cables along the shortest possible distance, being sure not to wind or bundle excess lengths.
- Separate the signal cables from the power cables such as the motor cable and power supply cable, and wire them so that they're separated by a distance approximately 100 to 200 mm (3.94 to 7.87 in.). If a power cable and signal cable must cross, let them cross at a right angle. Additionally, keep a distance between the mains filter's AC input-side cable and output-side cable.

■ Precautionary note on static electricity

Static electricity may cause the controller to malfunction or sustain damage. Do not touch the controller while power is being supplied. When adjusting the controller's DIP switches while power is being supplied, be sure to use an insulated screwdriver.

■ Example of installation and wiring

The figure below gives an installation/wiring example when connecting an **EZS Ⅱ** series actuator to the controller.



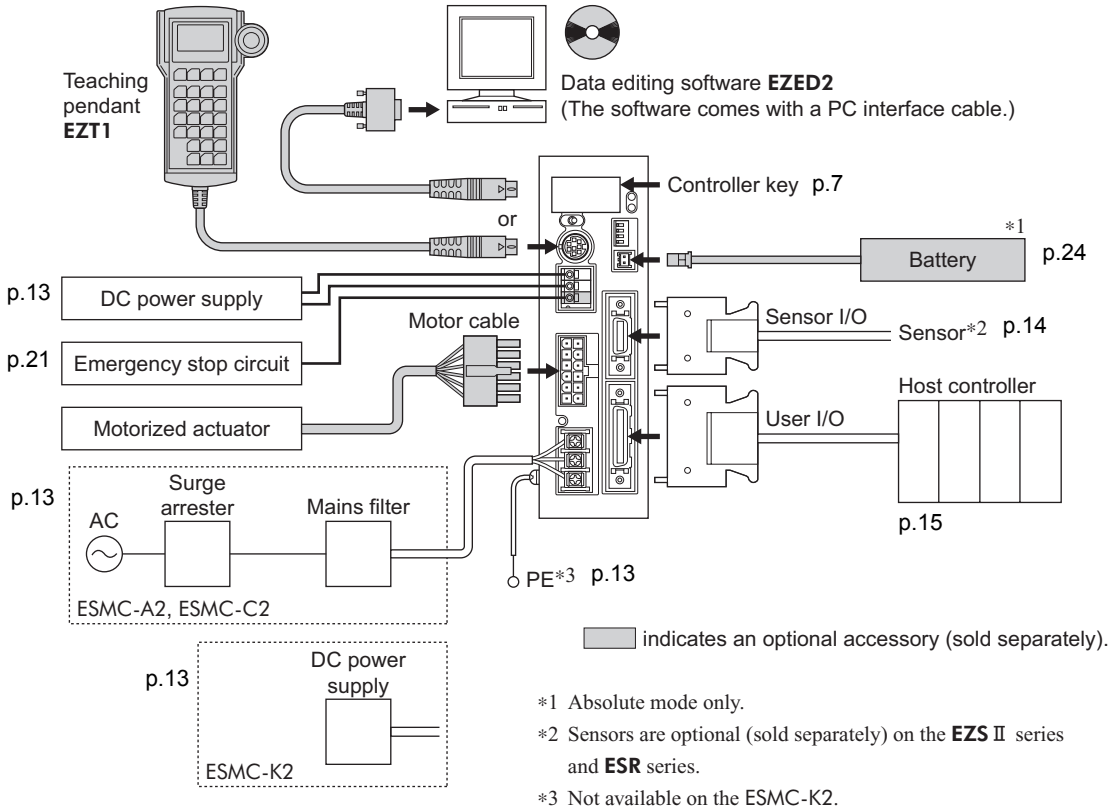
∗1 Absolute mode only.
∗2 Not available on the ESMC-K2.
∗3 Provide Protective Earth (PE) for the ESMC-A2 and ESMC-C2.
Provide Frame Ground (FG) for the ESMC-K2.

Use braided shielded cable to wire the power supply.
Secure each cable clamp at a position as close as possible to the applicable connector.

3 Connection

3.1 General wiring view

Wire the controller by referring to the figure below. For details on the wiring of each component, refer to the Reference page indicated beside the component.

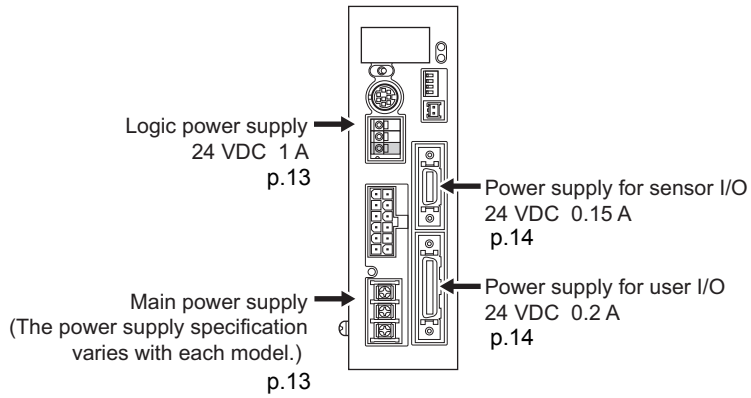


*1 Absolute mode only.

*2 Sensors are optional (sold separately) on the **EZS** Ⅱ series and **ESR** series.

*3 Not available on the ESMC-K2.

■ Where to connect external power input

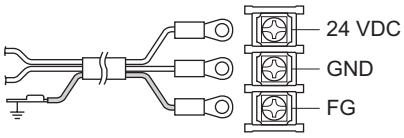


3.2 Connecting to the power supply

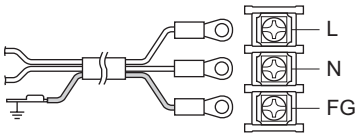
After connection, be sure to install the terminal cover.

Controller model	Applicable lead wire	Tightening torque
ESMC-K2	Solid wire: AWG16 (Ø1.6 mm) Stranded wire: AWG16 (1.25 mm^2)	0.8 to 1.0 N·m (113.6 to 142 oz-in)
ESMC-A2		
ESMC-C2		

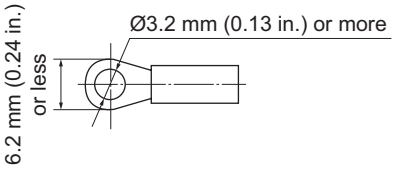
• ESMC-K2



• ESMC-A2, ESMC-C2



• Applicable crimp terminal
Insulated round crimp terminal

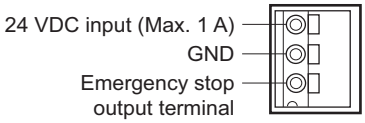


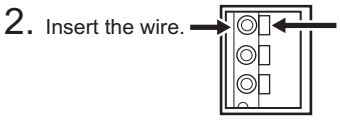
3.3 Connecting to the logic power supply

The logic power supply provides power to the controller CPU, teaching pendant and electromagnetic brake.

Applicable wire	Solid wire: AWG16 (Ø1.6 mm) Stranded wire: AWG16 (1.25 mm^2)
Standard strip length	11 mm (0.43 in.)

• Pin assignments



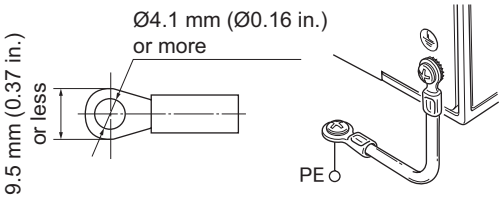


3.4 Grounding the controller

Applicable wire	Solid wire: AWG16 (Ø1.6 mm) Stranded wire: AWG16 (1.25 mm^2)
Protective Earth Terminal	M4 Tightening torque: 1.0 to 1.3 N·m (142 to 185 oz-in)

∗ The ESMC-K2 has no Protective Earth Terminal.

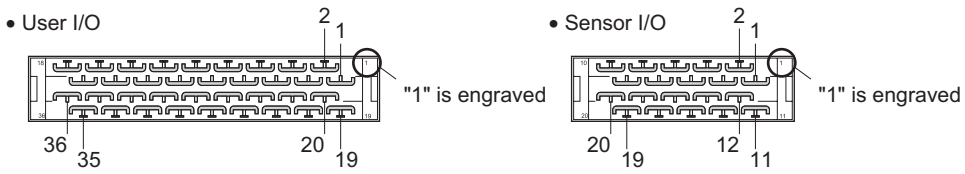
• Applicable crimp terminal
Insulated round crimp terminal



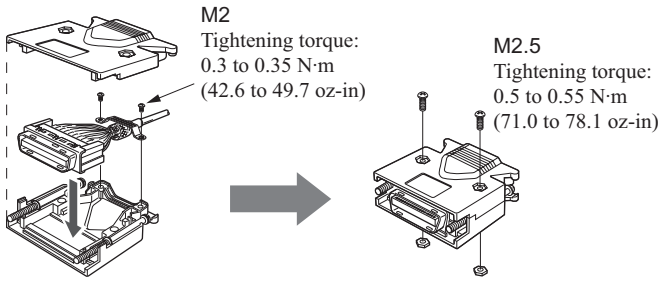
3.5 Connecting the sensor I/O and user I/O

■ Assembly method

1. Solder the lead wires to the supplied I/O connectors (the figure shows pin assignments as viewed from the soldered side).
   Applicable lead wire: AWG28 to 26 (0.08 to 0.14 mm^2)



2. Assembling the connector.



■ Pin assignments of sensor I/O connector

Pin No.	Signal name	Description
1, 11, 19	IN-COM2	Power supply input for sensor
13	+LS	+LS limit sensor input
14	–LS	–LS limit sensor input
15	HOMELS	HOME sensor input

Note

- If a photomicrosensor is used and the sensor wiring length is longer than 2 m, provide an electrolytic capacitor (10 µF, 50 V) at a position within 2 m of the sensor. Refer to the connection examples shown on pp.17 to 20.
- When sensors are used, always set the I/O parameter “LS detection enable/disable” to “Enable.” If it is set to “Disable,” a stop action will not be activated even when a sensor is detected.
- IN-COM2 is insulated from IN-COM1 in the user I/O connector. When using sensors, be sure to connect the power supply.

■ Pin assignments of user I/O connector

• Input signals

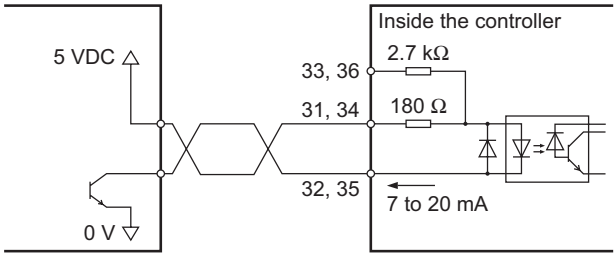
Pin No.	Signal name		Description	Reference
	Controller mode	Driver mode		
7	START	−	Positioning start	p.27
8	ACL/CK*1		ACL: Alarm clear CK: Used to read the current position.	ACL: p.71 CK: p.36
9	FREE		Stops the excitation of the motorized actuator and releases the electromagnetic brake.	p.35
10	STOP	C.OFF	STOP: Operating stop C.OFF: Motor current off	STOP: p.35 C.OFF: p.35
11	M0	HMSTOP	M0 to M5: Selects positioning operating data HMSTOP: Stops return-to-home operation	M0 to M5: p.27 HMSTOP: p.35
12	M1	−		
13	M2	−		
14	M3	−		
15	M4	−		
16	M5	−		
17	HOME/PRESET*2		HOME: Starts return-to-home operation. PRESET: Presets the current position.	HOME: p.25 PRESET: p.27
18	IN-COM1*3*4		Power supply input for input signals	−
19	I/O-GND		Power supply GND for I/O	−
30	REQ		ABS data request	p.36
31	FWD+	FP+	FWD+, FWD−, P24-FWD: Continuous operation in the + coordinate direction FP+, FP−, P24-FP: Pulse input operation in the + coordinate direction	FWD: p.31 FP: p.32
32	FWD−	FP−		
33	P24-FWD	P24-FP		
34	RVS+	RP+	RVS+, RVS−, P24-RVS: Continuous operation in the − coordinate direction RP+, RP−, P24-RP: Pulse input operation in the − coordinate direction	RVS: p.31 RP: p.32
35	RVS−	RP−		
36	P24-RVS	P24-RP		

∗1 If the REQ input is ON, this signal switches to the CK input. If the REQ input is OFF, it switches to the ACL input.
∗2 Switch between the HOME and PRESET using the I/O parameter “HOME/PRESET switching” (factory setting: HOME).
∗3 Connect this signal to 24 VDC if your controller is used in the NPN mode, or connect it to ground if the controller is used in the PNP mode.
∗4 Connect this signal even when only output signals are used.

• Wiring of pins 31 to 36

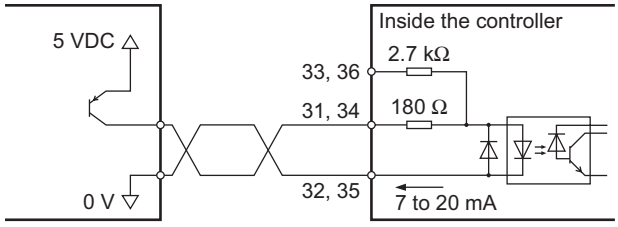
• NPN specification (If used at 5 VDC*)

Sink output circuit connection



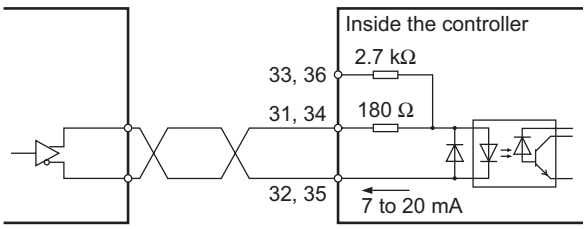
• PNP specification (If used at 5 VDC*)

Source output circuit connection



∗ If 24 VDC is used, use pin No.33 and 36. Refer to the connection examples shown on pp.17 to 20.

• Line driver connection



• Output signals

Pin No.	Signal name		Description	Reference
	Controller mode	Driver mode		
1	OUT-COM*1		Power supply input for output signals	−
2	ALM		Output when an alarm has occurred (Normally close).	−
3	MOVE		Output while the motorized actuator is operating.	−
4	END/OUTR*2		END: Output when the difference between the command position and actual position is within the END signal detection width at the end of operation. OUTR: Used to read the current position.	OUTR: p.36
5	AREA/ OUT0*2	TIM/ OUT0*2	AREA: Output when the moving part has entered the specified area or stopped inside the area. OUT0: Used to read the current position. TIM: Output when the excitation sequence is at step 0.	AREA: p.34 OUT0: p.36 TIM: p.34
6	T-UP/OUT1*2		T-UP: Output when a push-motion operation has been completed. OUT1: Used to read the current position.	T-UP: p.30 OUT1: p.36
20	ASG1		A-phase pulse output (Open collector)	p.33
21	BSG1		B-phase pulse output (Open collector)	
22	ASG2		A-phase pulse output (Line driver)	
23	$\overline{\text{ASG2}}$			
24	BSG2		B-phase pulse output (Line driver)	
25	$\overline{\text{BSG2}}$			

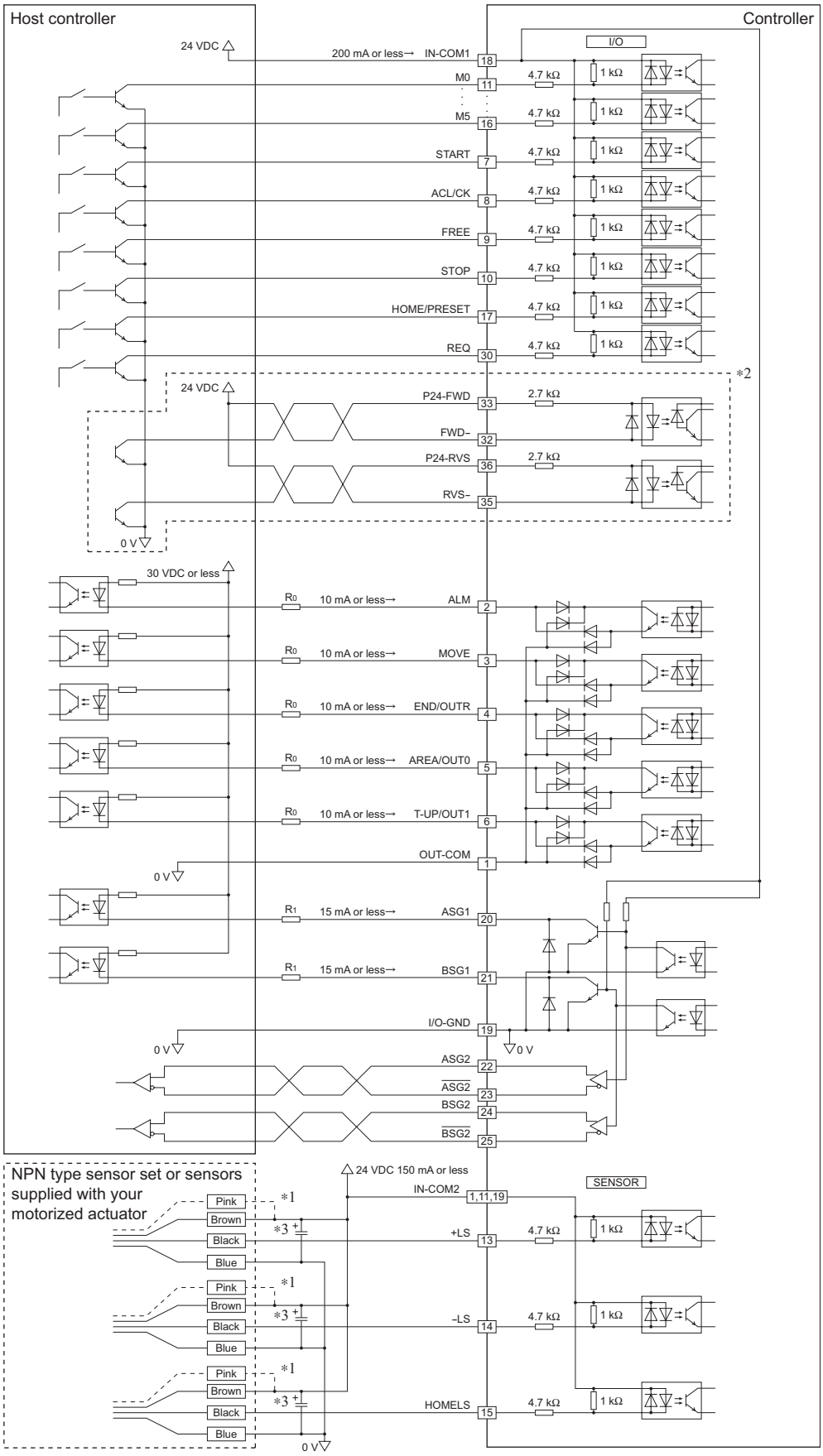
∗1 Connect this signal to ground if your controller is used in the NPN mode, or connect it to 24 VDC if the controller is used in the PNP mode.

∗2 If the REQ input is ON, these signals switch to the OUTR, OUT0 and OUR1 outputs, respectively. If the REQ input is OFF, they switch to the END, AREA and T-UP outputs, respectively.

Note Do not directly connect a host controller adopting TTL circuits. If such controller is connected directly, the output voltage will not drop to 0 V even after an output signal turns ON. As a result, the host controller may not be able to detect the ON status of the output.

■ Connection example for controller mode

Sink logic (NPN specification)



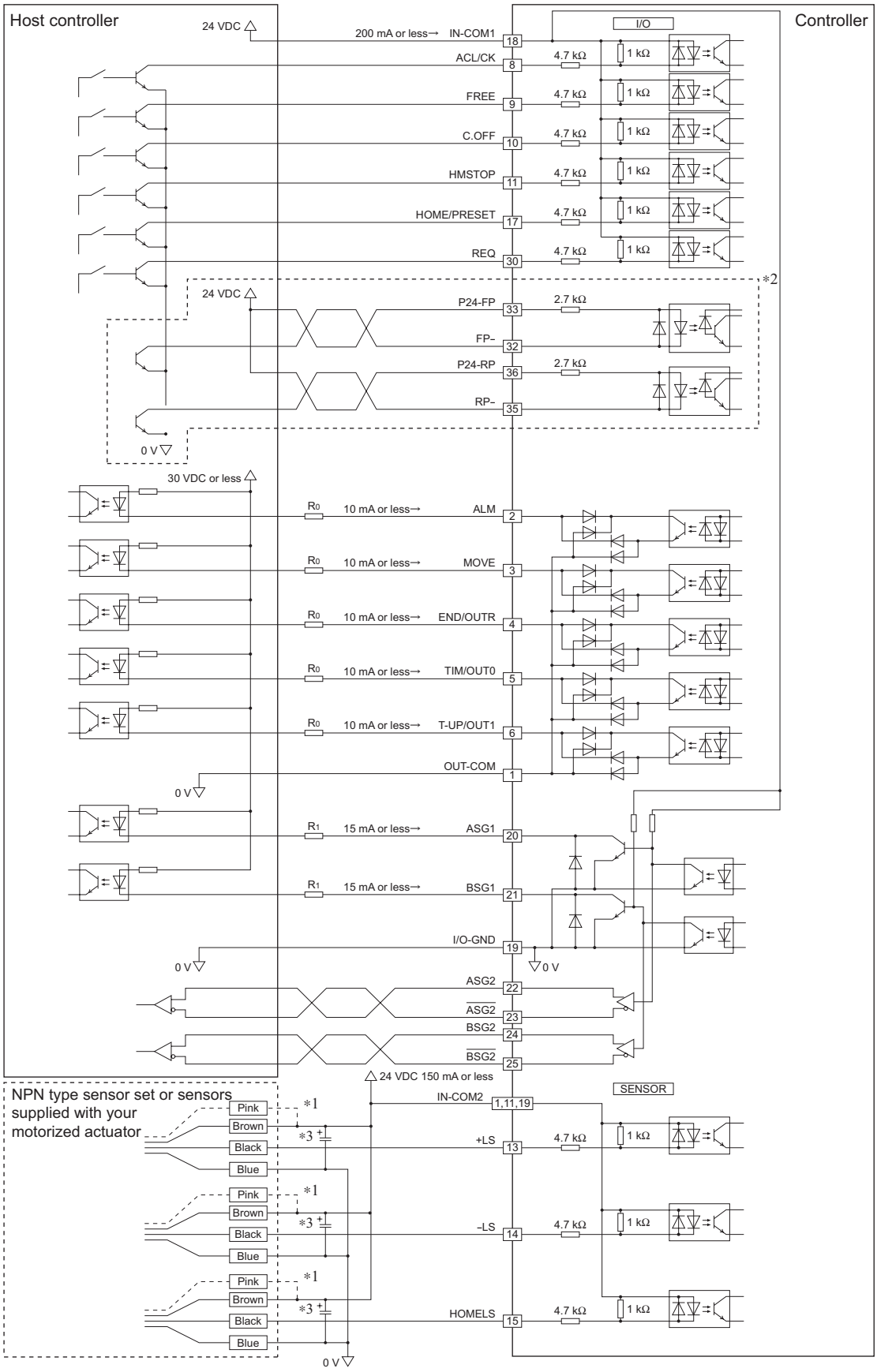
∗1 These connections are required if the sensors are used in the normally closed mode (Photomicrosensor).

∗2 For the wiring of pins 31 to 36, refer to “Wiring of pins 31 to 36” on p.15.

∗3 Refer to 3.5, “Connecting the sensor I/O and user I/O” on p.14.

■ Connection example for driver mode

Sink logic (NPN specification)



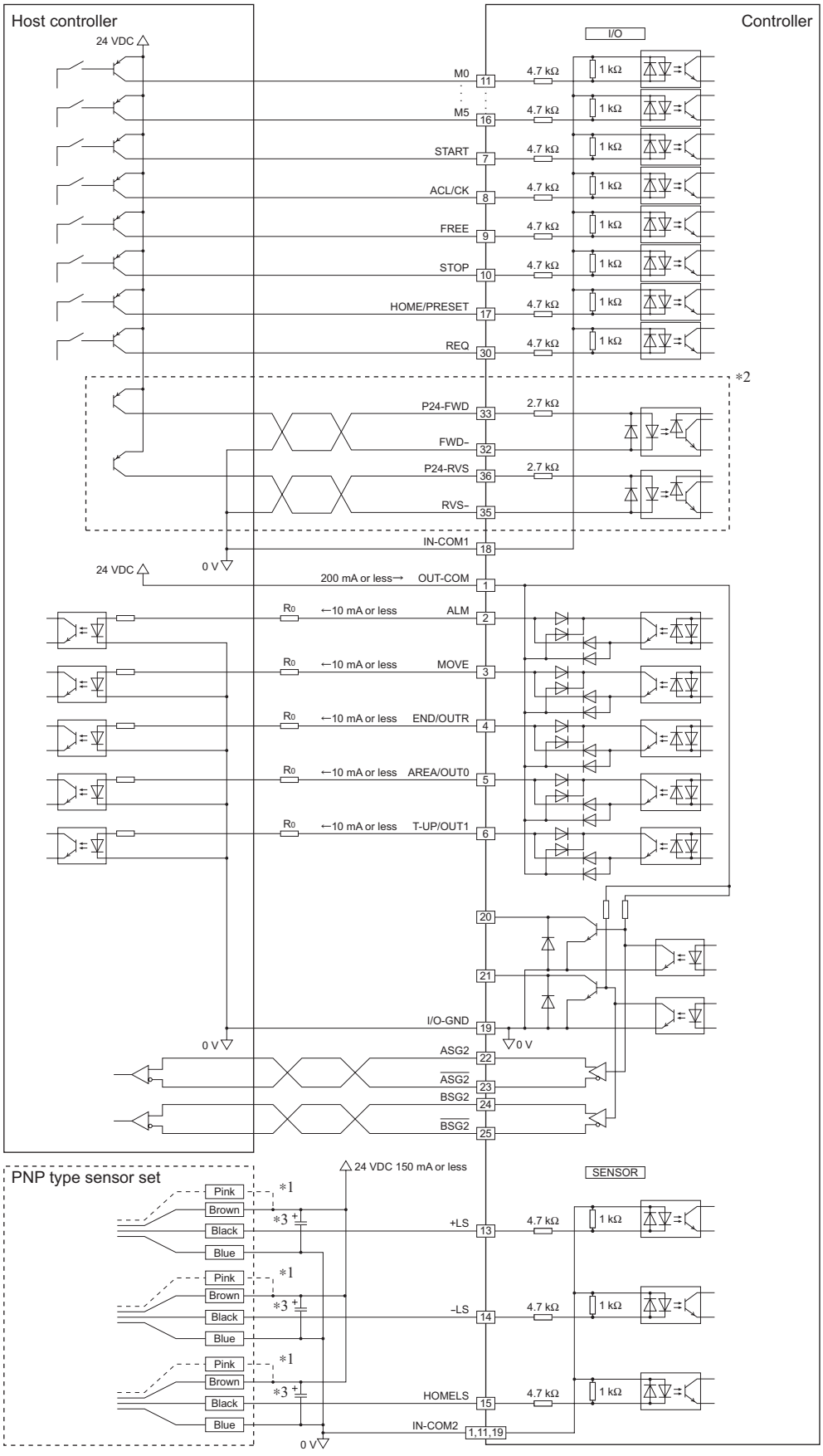
∗1 These connections are required if the sensors are used in the normally closed mode (Photomicrosensor).

∗2 For the wiring of pins 31 to 36, refer to “Wiring of pins 31 to 36” on p.15.

∗3 Refer to 3.5, “Connecting the sensor I/O and user I/O” on p.14.

■ Connection example for controller mode

Source logic (PNP specification)



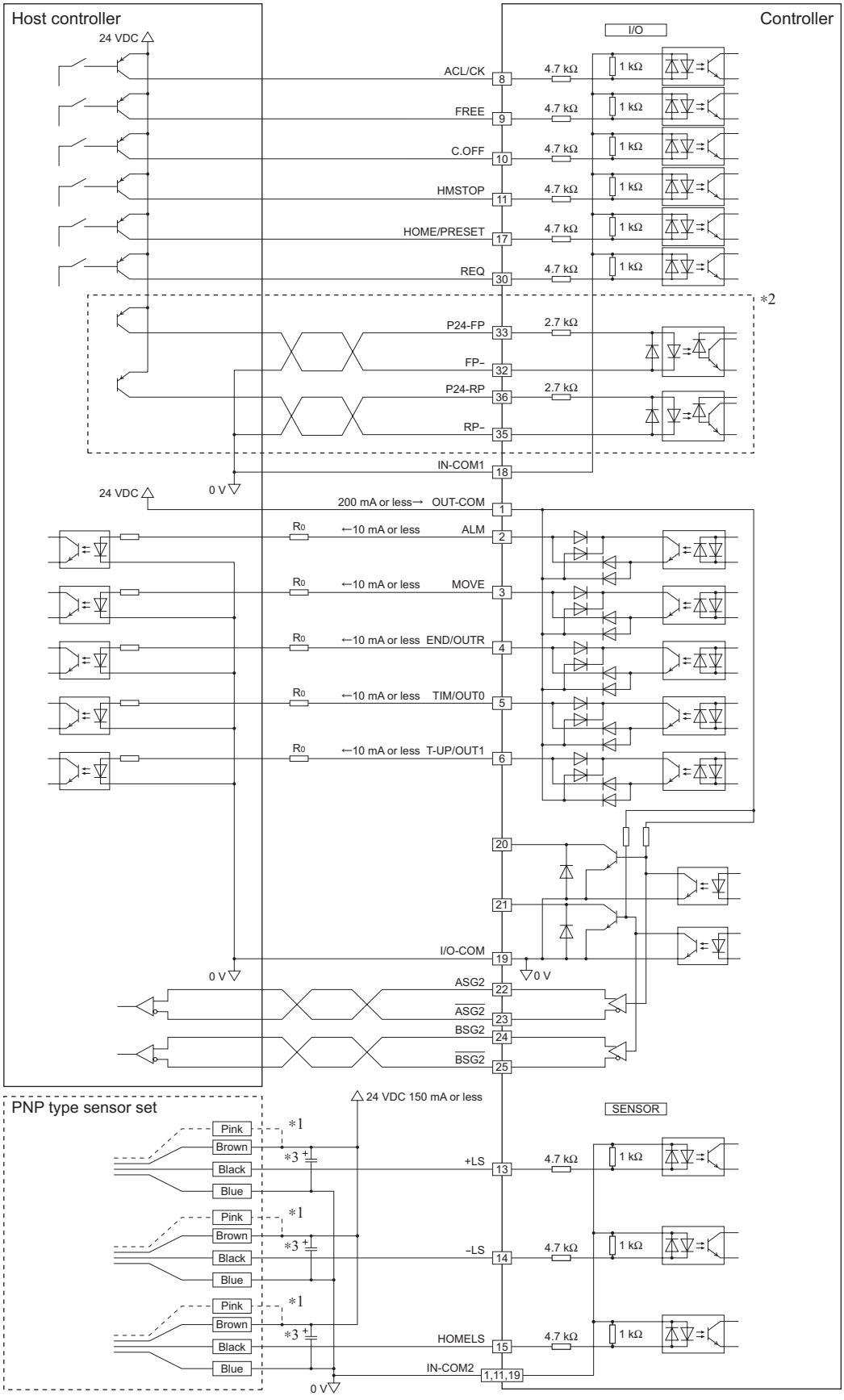
∗1 These connections are required if the sensors are used in the normally closed mode (Photomicrosensor).

∗2 For the wiring of pins 31 to 36, refer to “Wiring of pins 31 to 36” on p.15.

∗3 Refer to 3.5, “Connecting the sensor I/O and user I/O” on p.14.

■ Connection example for driver mode

Source logic (PNP specification)



∗1 These connections are required if the sensors are used in the normally closed mode (Photomicrosensor).

∗2 For the wiring of pins 31 to 36, refer to “Wiring of pins 31 to 36” on p.15.

∗3 Refer to 3.5, “Connecting the sensor I/O and user I/O” on p.14.

3.6 Emergency stop circuit

If an emergency stop function is used, provide a circuit that will cut off the main power supply and logic power supply upon pressing of the emergency stop button.

Note

- Examine the configuration of the emergency stop circuit based on a risk assessment of your manufactured equipment.
- If the result of risk assessment indicates that an emergency stop function is no longer necessary, the circuit configuration shown under “Emergency stop circuit connection example when the emergency stop function is not used” on p.23 can be used.
- Do not connect the emergency stop output terminal directly to the GND terminal (0 V). Doing so may cause the overcurrent protection fuse in the teaching pendant to blow, in which case the emergency stop can no longer be reset.
- Provide a measure on the machine side so that the machine will operate safely when the motorized actuator is stopped.

■ Specification of the emergency stop circuit

The emergency stop function is designed under the following specification:

Emergency stop output terminal (EMG)	A 24 VDC output terminal for driving the relay in the emergency stop circuit. This terminal is connected to the 24 VDC input terminal (+) for logic power supply input inside the controller. When a teaching pendant is used, connection is made via the emergency stop button on the teaching pendant.
Emergency stop button	The emergency stop button of the teaching pendant uses EN Standard recognized parts.

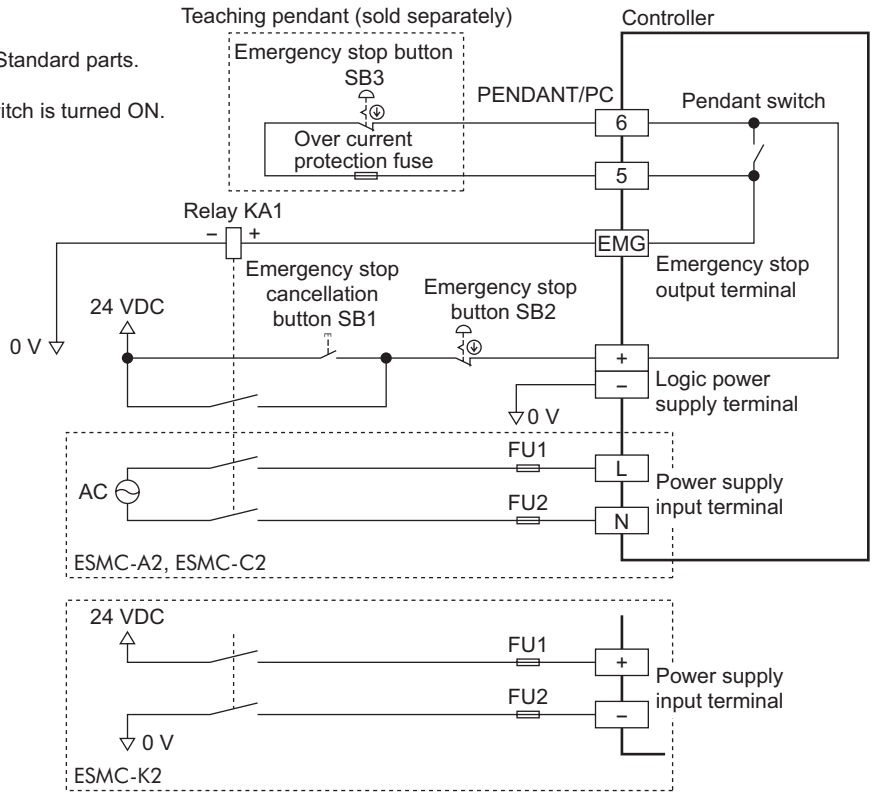
Applicable Standards and categories

EN 954-1, Category 1

■ Emergency stop circuit connection example when the emergency stop function is used

Detection of emergency stop	An emergency stop will be actuated in the following conditions: • The 24 VDC input (+) to the logic power supply has been cut off. • The circuit has been cut off between the emergency stop output terminal and relay. • The emergency stop button on the pendant has been pressed when the pendant is connected. • The overcurrent protection fuse in the pendant has blown.
Stop category (EN 60204-1)	Category 0 (Non-controlled stop)
Action to be taken upon emergency stop	The motor power will be forcibly cut off by a hardware circuit, not by a CPU command, to stop the motorized actuator (= the motor will coast to a stop). If the motorized actuator is equipped with an electromagnetic brake, the electromagnetic brake will be switched to the holding mode.

- KA1 and SB2 must use EN Standard parts.
- KA1: Rating 24 VDC 30 mA
- In the figure, the pendant switch is turned ON.



Note

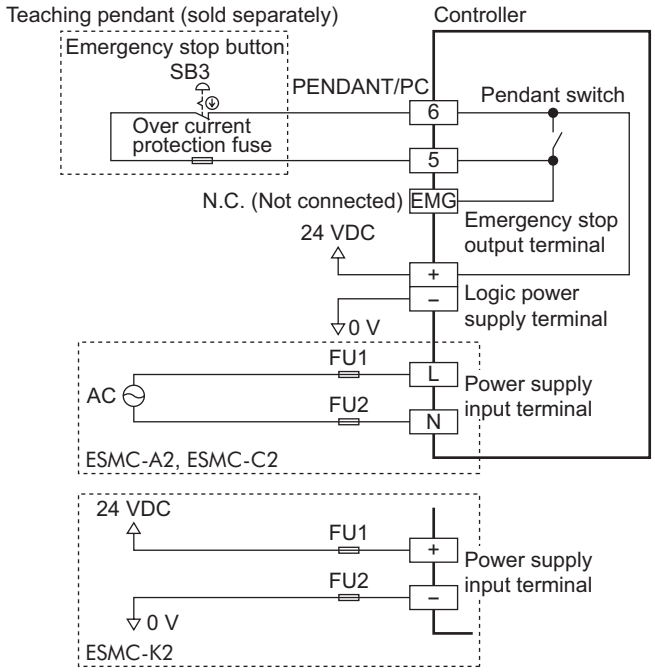
- When using the emergency stop button (SB3) on the teaching pendant, always turn ON the pendant switch on the controller. If the pendant switch is OFF, the emergency stop button (SB3) will not be enabled.
- Set the pendant switch to OFF before disconnecting the teaching pendant. If the pendant is disconnected while the switch is set to ON, the controller will come to an emergency stop.

- Release the emergency stop

To cancel the emergency stop of the controller, follow the steps below:

1. Confirm that safety will be ensured when the motorized actuator resumes operation.
2. Turn the emergency stop button (SB2 or SB3) OFF.
3. Turn the emergency stop cancellation button (SB1) ON.
   The emergency stop of the controller is cancelled.

■ Emergency stop circuit connection example when the emergency stop function is not used



Note When the emergency stop button (SB3) on the teaching pendant is pressed, an emergency stop alarm (Err68) will generate and the motorized actuator will stop operating. This stopping method is based on software control. It does not meet the emergency stop requirements specified in safety standards.

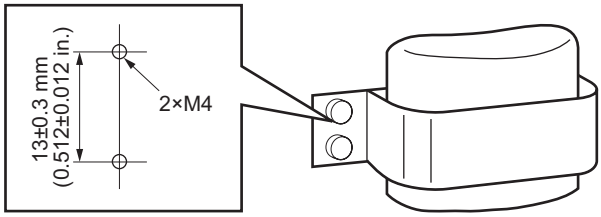
3.7 Connecting the battery

If the controller is used in the absolute mode, be sure to connect an optional battery **PAEZ-BT2** (sold separately).

■ Installing the battery

The battery has a built-in protective circuit. Use the supplied battery holder to secure the battery.

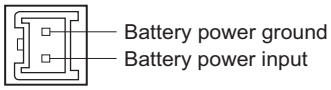
- Battery installation dimensions



■ Connecting and removing the battery

Connect the battery to the controller and input the logic power supply. The battery will start charging. The battery will be fully charged in around 48 hours [assuming an ambient temperature of 20 °C (68 °F)].
Cut off the logic power supply to the controller before removing the battery ESMC-A2 or ESMC-C2 from the controller.

- Pin assignments of battery connector



Note

- The product is shipped with an uncharged battery. Always charge the battery before use.
- When turning off the logic power supply or turning it on again, do not move the moving part of the motorized actuator. It will disable accurate monitoring of the moving part.
- Data is retained for approx. 15 days. If the power will not be supplied to the controller for more than 15 days, remove the battery. If the battery is kept in the controller for a longer period, battery fluid may leak or battery performance may drop.
- Once the battery is removed, the current position is cleared. If you have replaced the battery, be sure to perform a return-to-home operation.

4 Types and functions of operations

4.1 Return-to-home operation (common to the controller and driver modes)

This operation is performed to detect the home used in positioning operation. Return-to-home operation is performed in one of three modes: sensor-less mode, 2-sensor mode and 3-sensor mode. Settings relating to return-to-home operation are performed using the home parameters.

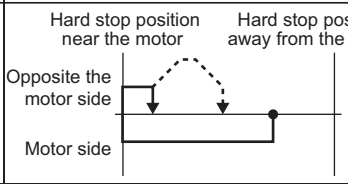
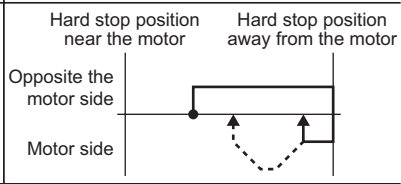
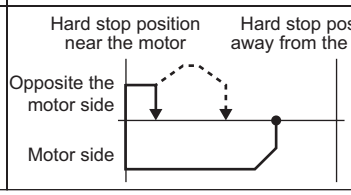
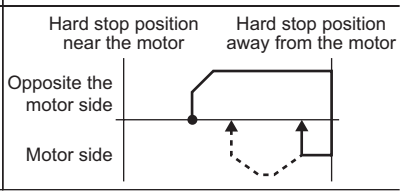
Note

- Performing the return-to-home operation in the absolute mode will write data to the EEPROM. The EEPROM can be rewritten approx. 100,000 times.
- When performing return-to-home operation with any **EZC** Ⅱ series or **EZA** series model, do not change the return direction (from the motor side).

■ Sensor-less mode

This mode is available only when the controller is used in combination with an **EZS** Ⅱ series, **EZC** Ⅱ series and **EZA** series actuator.
In the sensor-less mode, the table will move to the mechanical hard stop position.
Push-motion 1: Sensor-less return-to-home operation is performed at the starting speed of return (HVs).
Push-motion 2 (high speed): Sensor-less return-to-home operation is performed at the operating speed of return (HVr).

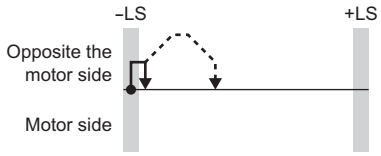
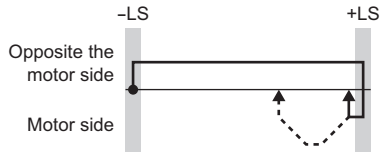
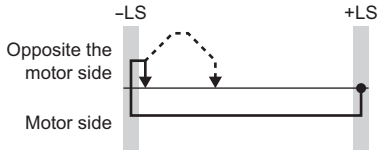
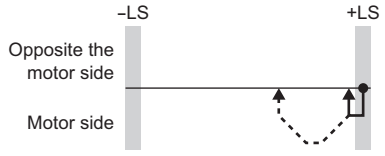
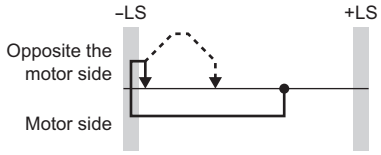
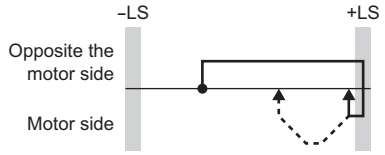
- - - Broken line indicates a home offset.

Sensor-less return-to-home operation type	Starting direction of return-to-home operation: Motor side	Starting direction of return-to-home operation: Opposite the motor side
Push-motion 1		
Push-motion 2 (high speed)		

■ 2-sensor mode

The +LS or –LS becomes the home. Rectangle operation is performed at the starting speed of return (HVs).

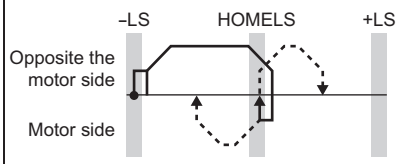
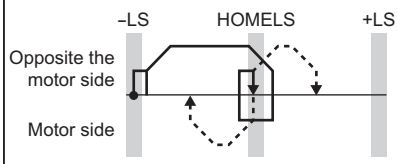
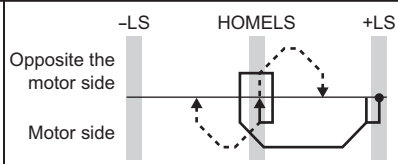
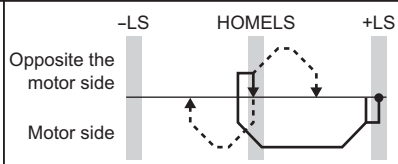
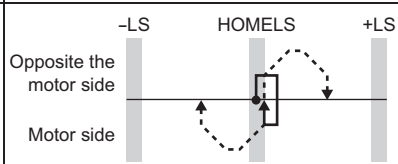
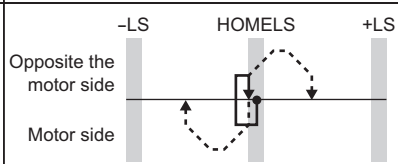
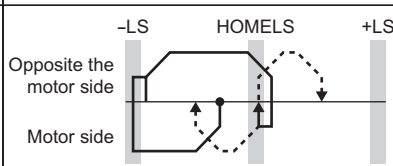
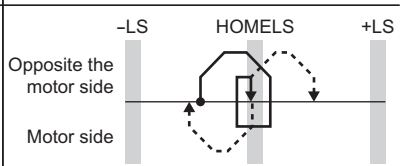
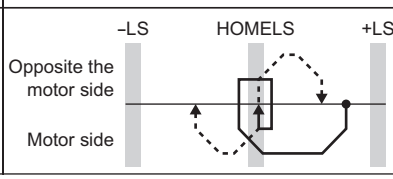
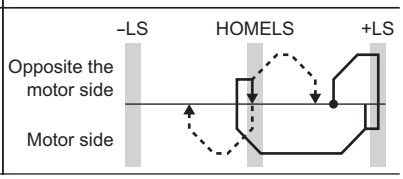
- - - Broken line indicates a home offset.

Starting position of return-to-home operation	Starting direction of return-to-home operation: Motor side	Starting direction of return-to-home operation: Opposite the motor side
–LS		
+LS		
Between –LS and +LS		

■ 3-sensor mode

The HOMELS becomes the home. Acceleration/deceleration operation is performed at the operating speed of return (HVr).

- - - Broken line indicates a home offset.

Starting position of return-to-home operation	Starting direction of return-to-home operation: Motor side	Starting direction of return-to-home operation: Opposite the motor side
–LS		
+LS		
HOMELS		
Between HOMELS and –LS		
Between HOMELS and +LS		

4.2 Preset (common to the controller and driver modes)

Select "PRESET" in the I/O parameter "HOME/PRESET switching" and turn the PRESET input ON at a desired position, and you can set that position as the PRESET position.

Note Turning the PRESET input ON in the absolute mode will write the data to the EEPROM. The EEPROM can be rewritten approx. 100,000 times.

4.3 Positioning operation (controller mode only)

■ Specification of positioning operation

Number of operating data	63
Operating modes	Absolute mode Incremental mode
Operating functions	Single-motion operation: The actuator moves by the distance set in each operating data. Linked-motion operation: Multiple operating data are linked.
Execution methods	Selected positioning method: Operation is performed based on the selected operating data. Sequential positioning method: Operation is performed sequentially using multiple operating data, starting from the selected data.
Setting data	Operating data: Positioning mode, distance/direction, operating speed, operating function, acceleration/deceleration No. Operating data are set individually in operating data No.1 to 63. Speed data: Starting speed Speed data apply commonly to operating data No.1 to 63. Acceleration/Deceleration No.: A desired setting can be selected from four acceleration/deceleration combinations and set individually under operating data No.1 to 63.

■ Resolution

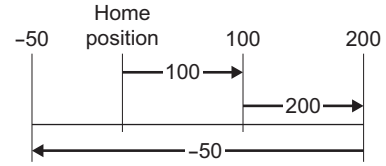
The resolutions in the controller mode are as follows.

Motorized actuator model	Resolution
SPRM4, PWAM8, **ESR** series	0.001 mm (0.00004 in.)
Other	0.01 mm (0.0004 in.)

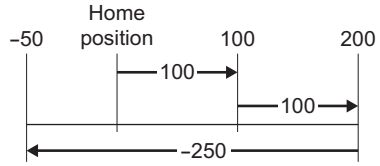
■ Operating modes

Two operating modes of absolute (Abs) and incremental (Inc) are available.
In the absolute mode, you set the distance from the home.
In the incremental mode, the destination of each movement (current position) becomes the starting point of the next movement.

• Absolute mode (Abs)



• Incremental mode (Inc)



■ Single-motion

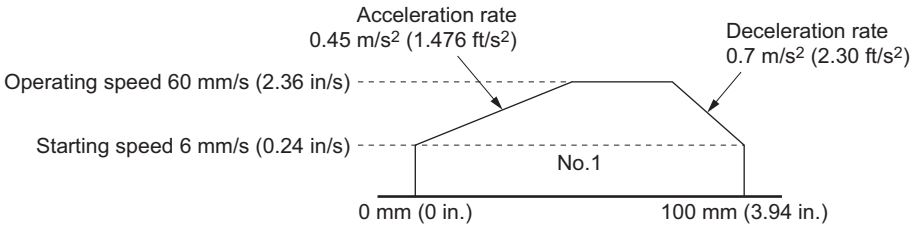
The actuator operates by the distance set in each operating data.

- Example of operating data setting

Data No.	Operating mode	Position	Operating speed	Operating function
1	Abs	100 mm (3.94 in.)	60 mm/s (2.36 in/s)	Single-motion

- Example of speed parameter setting

Starting speed	Acceleration	Deceleration
6 mm/s (0.24 in/s)	0.45 m/s^2 (1.476 ft/s^2)	0.7 m/s^2 (2.30 ft/s^2)



■ Linked-motion

When the START input is turned ON once, up to four sets of operating data in the same direction and consecutive data numbers can be executed.

Note

- If “linked-motion” is specified for operating data No.63, the controller will recognize that single-motion operation has been specified for this data.
- The acceleration/deceleration will conform to the acceleration/deceleration No. set for the first operating data set that has been linked.
- In the fourth line of operation data, set “Single-motion” or “Push-motion” in the operation function field. If “Linked-motion” is set, an operation data error alarm (Err70) will generate.

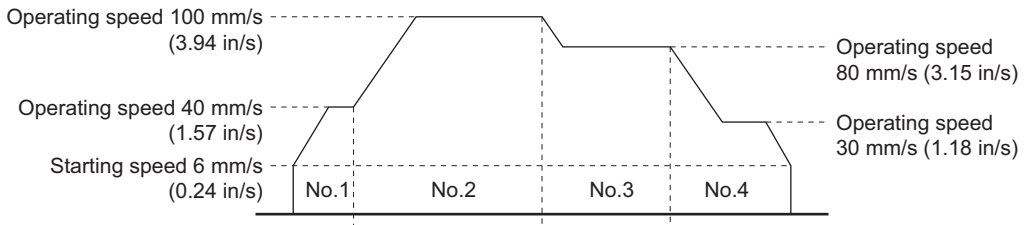
- Example of operating data setting

Data No.	Operating mode	Position	Operating speed	Acceleration/ Deceleration No.	Operating function
1	Abs	10 mm (0.39 in.)	40 mm/s (1.57 in/s)	0	Linked-motion
2	Abs	60 mm (2.36 in.)	100 mm/s (3.94 in/s)	3	Linked-motion
3	Abs	100 mm (3.94 in.)	80 mm/s (3.15 in/s)	1	Linked-motion
4	Abs	120 mm (4.72 in.)	30 mm/s (1.18 in/s)	2	Single-motion

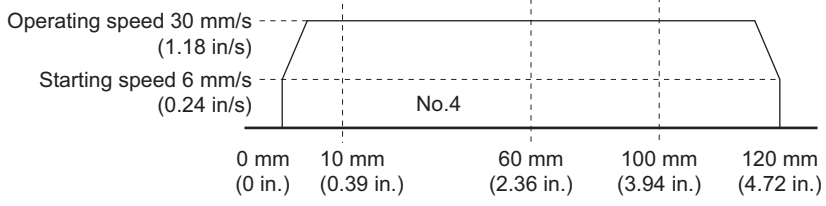
- Example of speed parameter setting

Starting speed	Acceleration	Deceleration
6 mm/s (0.24 in/s)	0.45 m/s^2 (1.476 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)

- When No.1 is executed



- When No.4 is executed



When the last operating data linked is push-motion operation

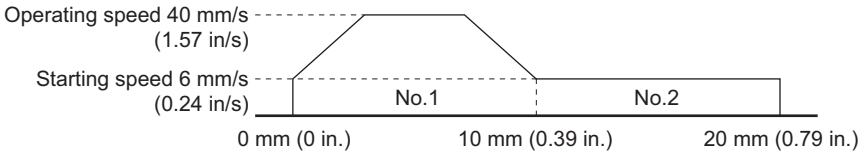
- Example of operating data setting

Data No.	Operating mode	Position	Operating speed	Acceleration/ Deceleration No.	Operating function
1	Abs	10 mm (0.39 in.)	40 mm/s (1.57 in/s)	0	Linked-motion
2	Abs	20 mm (0.79 in.)	6 mm/s (0.24 in/s)	3	Push-motion

- Example of speed parameter setting

Starting speed	Acceleration	Deceleration
3 mm/s (0.12 in/s)	0.45 m/s^2 (1.476 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)

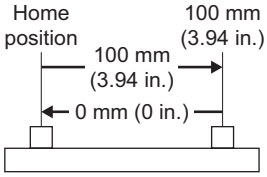
The speed of the push-motion operation becomes the starting speed.



Example of operating data that cannot be linked

- Example of operating data setting

Data No.	Operating mode	Position	Operating speed	Acceleration/ Deceleration No.	Operating function
1	Abs	100 mm (3.94 in.)	60 mm/s (2.36 in/s)	0	Linked-motion
2	Abs	0 mm (0 in.)	60 mm/s (2.36 in/s)	3	Single-motion



The above operating data cannot be linked because the directions are different.

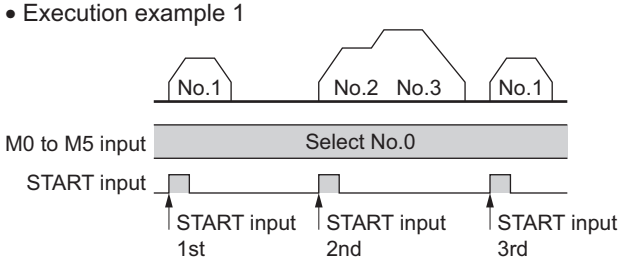
■ Sequential operation

When the M0 to M5 inputs are turned OFF and only operating data No.0 is selected, the controller will enter the sequence-forward positioning mode.
In sequence-forward positioning operation, each operating data is executed sequentially every time the START input is turned ON.

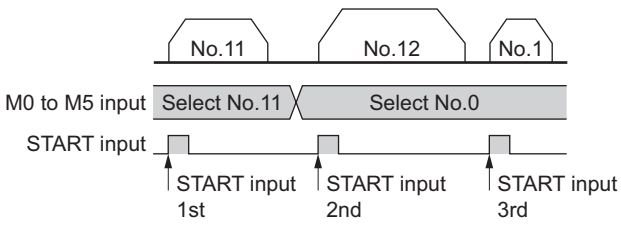
- Example of operating data setting

Data No.	Operating function
1	Single-motion
2	Linked-motion
3	Single-motion
4	Not set
11	Single-motion
12	Single-motion
13	Not set

- Execution example 1



- Execution example 2



If any of the following operations is performed, operating data No.1 will be executed even after selecting No.0 and then turning ON the START input:

- When the power is turned on
- When an alarm is reset
- When return-to-home operation is performed
- When continuous operation is performed
- When the EXT mode is switched to another mode, if the teaching pendant is used.
- When the emergency stop input is cancelled
- When the STOP signal is input.
- When a preset operation is performed
- When the FREE signal is input.

4.4 Push-motion operation (controller mode only)

This operation can be performed only when the controller is used in combination with an **EZS** Ⅱ series, **EZC** Ⅱ series, **EZA** series or **PWA** Ⅱ series. Do not perform push-motion operation with models in any other series.

Note Push-motion operation can be set for products other than those in the **EZS** Ⅱ series, **EZC** Ⅱ series, **EZA** series or **PWA** Ⅱ series. However, such products are not designed to support the push-motion operation. Accordingly, never perform push-motion operation with any of these products, because the product may be damaged.

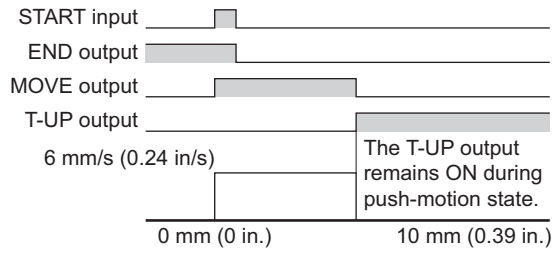
An operation in which the load is continuously subjected to pressure is called “push-motion operation”.
This operation can be performed only when “push-motion” is selected as the operating function.
When the actuator contacts the load during positioning operation, it will automatically switch to push-motion operation.
In push-motion operation, the actuator operates at the constant speed set in the applicable operating data. To perform push-motion operation, set the operating speed to 25 mm/s (0.98 in/s) or below [or 6 mm/s (0.24 in/s) or less for the **PWA** Ⅱ series].
The operating current conforms to the value set as the push-motion current.

Note If push-motion operation is performed at a speed greater than 25 mm/s (0.98 in/s), an abnormal operating data alarm (Err70) will generate [or 6 mm/s (0.24 in/s) or less for the **PWA** Ⅱ series].

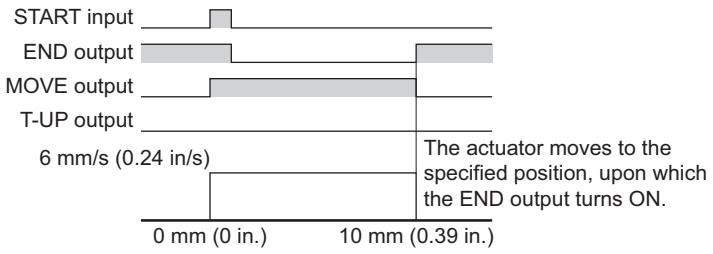
- Example of operating data setting

Data No.	Operating mode	Position	Operating speed	Acceleration/ Deceleration No.	Operating function	Push-motion current
1	Abs	10 mm (0.39 in.)	6 mm/s (0.24 in/s)	0	Push-motion	30%

- Push-motion state occurred



- Push-motion state did not occur



4.5 Continuous operation (controller mode only)

When the FWD input is ON, the actuator moves continuously in the + coordinate direction. When the RVS input is ON, the actuator moves continuously in the – coordinate direction.

Note

- Only the operating speed can be changed during operation by selecting different operation data.
- Even if different operation data is selected while operating, the acceleration/deceleration cannot be changed.

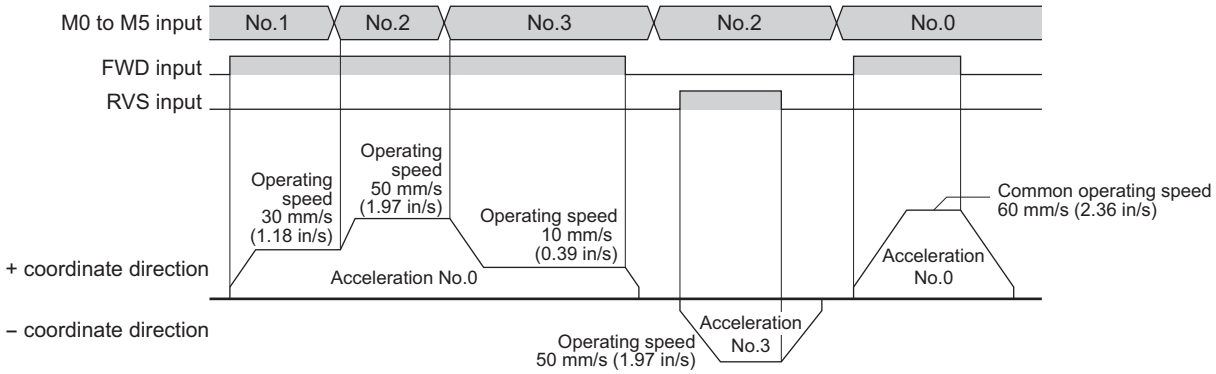
- Example of operating data setting

Data No.	Operating speed	Acceleration/ Deceleration No.
1	30 mm/s (1.18 in/s)	0
2	50 mm/s (1.97 in/s)	3
3	10 mm/s (0.39 in/s)	1
4	Not set	2

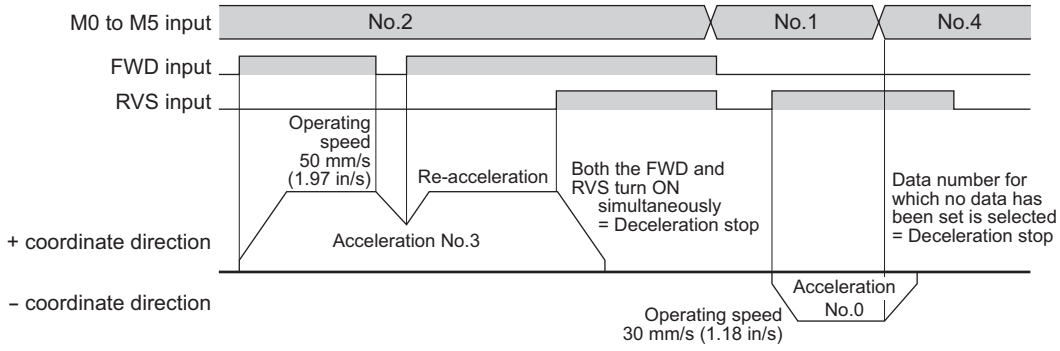
- Example of speed parameter setting

Starting speed	Common operating speed
6 mm/s (0.24 in/s)	60 mm/s (2.36 in/s)

- Execution example 1



- Execution example 2



4.6 Operation by pulse input (driver mode only)

■ Resolution

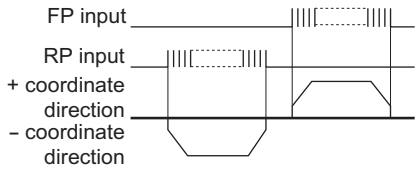
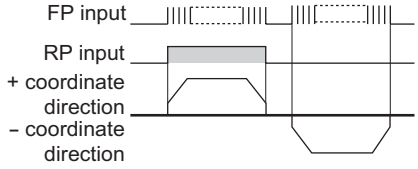
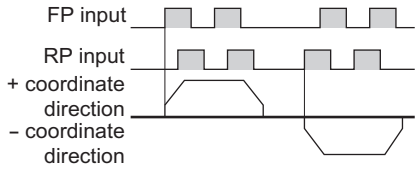
The resolutions in the driver mode are as follows.

Motorized actuator model	Resolution
SPVM6, SPVM8	0.05 mm (0.002 in.)
SPRM4, PWAM8	0.001 mm (0.00004 in.)
ESR series	0.005 mm (0.0002 in.)
Other	0.01 mm (0.0004 in.)

■ Pulse input mode

Select one of the following three-pulse input modes according to the equipment connected to the controller.

Note Pulse input is implemented based on the negative logic.

Pulse input mode	I/O parameters "Pulse input switching"	1P/2P selection	Waveform image
2-pulse input mode (factory setting)	1P/2P	OFF (2-pulse input mode)	
1-pulse input mode	1P/2P	ON (1-pulse input mode)	
Quadrature pulse input mode	Quadrature pulse input	Setting is ignored	

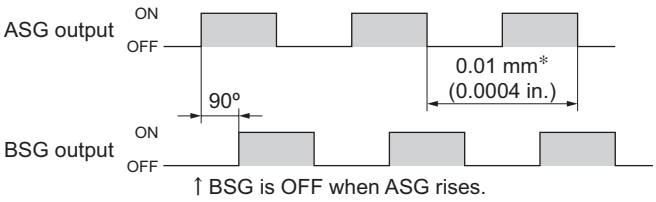
4.7 A-phase pulse output, B-phase pulse output (common to the controller and driver modes)

A-phase pulse output (ASG) and B-phase pulse output (BSG) are available in two types: transistor open collector output and line-driver output. Use either type to suit the input system of the counter unit and other functions of the controller.

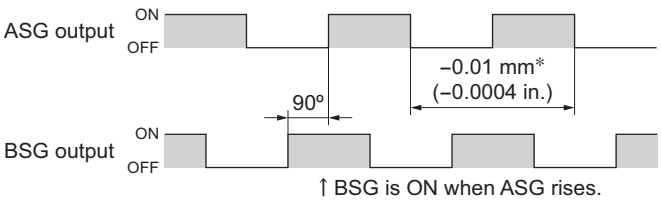
Note

- The pulse output delays behind motorized actuator movement by up to 1 ms. The output may be used to verify the stop position of the motorized actuator.
- Use a frequency counter capable of counting frequencies up to at least twice the frequency corresponding to the maximum speed used by your equipment.
- When using the line driver output, connect a terminating resistance of 150 Ω between the line receiver inputs.
- When using the open collector output, use a cable that is 2 m (6.56 ft.) or shorter. With the open collector output, the output waveform changes according to the resistance and stray capacitance of the cable as well as other factors. Check the behavior depending on the devices used in combination.

Waveform during operation in the + coordinate direction



Waveform during operation in the – coordinate direction



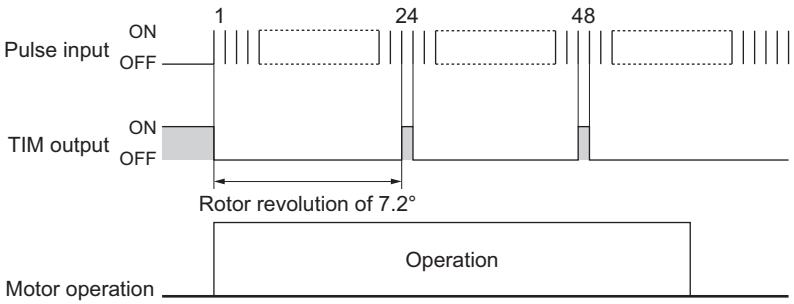
* 0.001 mm (0.00004 in.) for the SPRM4G, PWAM8J and **ESR** series.

4.8 Timing output (driver mode only)

The TIM output turns ON every time the rotor turns 7.2°.
The table below shows the distance of each motorized actuator corresponding to a rotor revolution of 7.2°.

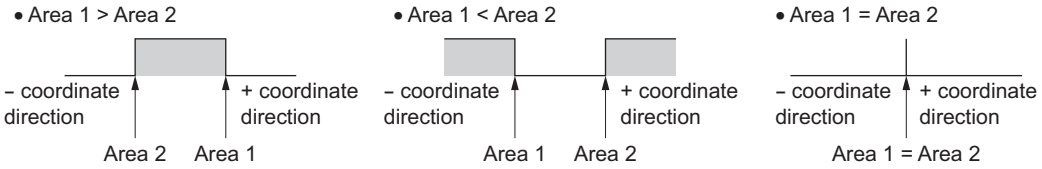
Series	Motorized actuator model	Distance
EZS Ⅱ series **EZC** Ⅱ series **EZA** series	EZSM□E, EZCM□E, EZAM□E	0.12 mm (0.005 in.)
	EZSM□D, EZCM□D, EZAM□D	0.24 mm (0.009 in.)
SPF Ⅱ series	SPFM6C, SPFM8C	0.2 mm (0.008 in.)
	SPFM8B	0.4 mm (0.016 in.)
SPR Ⅱ series	SPRM6C, SPRM8C	0.2 mm (0.008 in.)
	SPRM4G	0.02 mm (0.0008 in.)
ESR series	ESRM3P	0.04 mm (0.0016 in.)
	ESRM4R, ESRM5R	0.12 mm (0.005 in.)
	ESRM6C, ESRM8C	0.2 mm (0.008 in.)
SPV series	SPVM6K	1.5 mm (0.059 in.)
	SPVM8L	1.8 mm (0.071 in.)
PWA Ⅱ series	PWAM6H	0.1 mm (0.004 in.)
	PWAM8J	0.032 mm (0.0013 in.)

Note The TIM output can be used when the operating speed is 5 mm/s (0.2 in/s) or below [or 0.5 mm/s (0.02 in/s) or below if the SPRM4G, PWAM8J and **ESR** series is connected].



4.9 Area output (controller mode only)

The AREA output turns ON when the moving part is inside the area set by the area 1 and area 2 parameters.



Response of area output

- If the same value is set for both area 1 and area 2, operating the actuator at a speed greater than 20 mm/s (0.79 in/s) will not allow the AREA output to turn ON, because the time during which the moving part stays inside the area is too short.
- A maximum delay of 1 ms may occur after the moving part enters the area until the AREA output turns ON.

4.10 Stopping function

The STOP input signal is used to stop operation in the controller mode.
The HMSTOP input signal is used to stop return-to-home operation in the driver mode.
If either of these inputs turns ON, the motorized actuator will stop operating in accordance with the setting of the I/O parameter “Stop action.” Operating stop using the STOP or HMSTOP input is controlled via the CPU.
Select one of the following four stop actions using the I/O parameter “Stop action”:

- Immediate stop
- Deceleration stop
- Immediate stop+current OFF (not excited) +electromagnetic brake actuated (This setting cannot be selected by the HMSTOP input.)
- Deceleration stop+current OFF (not excited) +electromagnetic brake actuated (This setting cannot be selected by the HMSTOP input.)

4.11 Stopping the motor excitation

While the motor is not excited, the moving part can be moved manually.
The motor excitation can be stopped by turning ON the FREE input or C.OFF input. If the motor is operating when the input is turned ON, the motor will stop immediately, after which the motor power will be cut off.

Signal name	Motor	Electromagnetic brake
FREE input (Controller mode, driver mode)	Not excited	Released
C.OFF input (Driver mode)	Not excited	Actuated

4.12 Reading current positioning data and alarm code (common to the controller and driver modes)

This function can be used to read the current position and alarm codes as binary data. It takes 0.5 to 1 second to read data.

Output data format (Total 56 bits)

Current positioning data: 32 bits	+	Status: 8 bits	+	Alarm code: 8 bits	+	Checksum: 8 bits

How to read output data

Example: When the current position is 123.45 mm (4.860 in.), and an emergency stop alarm (Err68) is present

0000 0000 0000 0000 0011 0000 0011 1001	0000 0000	0110 1000	1101 0001
Current positioning data	Status	Alarm	Checksum

- **Current positioning data (32 bits)**

These values indicate the current position of the motorized actuator.
The current position is obtained by converting the current position data to a decimal number, and then dividing the decimal number by 100.
∗ If SPRM4G, PWAM8J and **ESR** series is combined, the decimal number is divided by 1000.

0000 0000 0000 0000 0011 0000 0011 1001 = 12345 (decimal)

$\frac{12345}{100}$ = 123.45 mm (4.860 in.)
(Current positioning data)

- **Status (8 bits)**

These bits indicate the controller status.
Different information is assigned to each bit.

Status =	000	0	0	0	0	0
	⑥	⑤	④	③	②	①

① bit 0: Subsystem overflow
② bit 1: Overspeed during backup
③ bit 2: Absolute position loss
④ bit 3: Insufficient ABS battery voltage
⑤ bit 4: Battery not connected
⑥ bit 5 to 7: Not defined (always 0)

- **Alarm code (8 bits)**

A code corresponding to each alarm is output.
When an alarm occurs, these bits will be displayed on the pendant as an error code.
The bits are displayed as a hexadecimal number on the pendant.

Example: Emergency stop alarm (Err68)
Alarm code = 0110 1000 = 68 (hexadecimal)

- **Checksum (8 bits)**

The checksum provides information based on which the controller checks if the correct data has been read.
The total 48 bits including the current position, status and alarm are divided by eight bits, and the six 8-bit sets are then added up. If the lower eight bits of this sum are the same as the checksum value of output data, the correct data has been read.

Example: 0000 0000 + 0000 0000 + 0011 0000 + 0011 1001 + 0000 0000 + 0110 1000
= 1101 0001

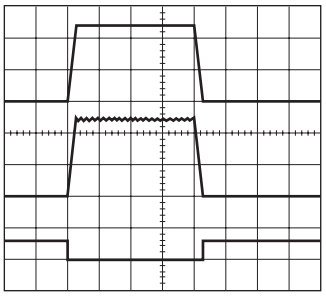
4.13 Softlimit (controller mode only)

This function is available when the “Softlimit” parameter explained in “Common parameters” is set to ON. When the command position exceeds the Lim+ (upper softlimit) position or drops below the Lim– (lower softlimit) position during any operation other than return-to-home operation, the motor decelerates before the specified Lim+/Lim– position and stops at the Lim+/Lim– position.
A softlimit detection error (Err67) generates.

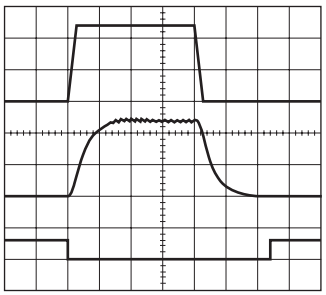
4.14 Speed filter

The speed filter sets a filter time constant that determines the response of the motorized actuator with respect to operating commands.
When the filter time constant is increased, starting/stopping impact will decrease and vibration during low-speed operation will also be reduced, which will consequently allow the motorized actuator to operate smoothly.
However, the greater the filter time constant, the lower the operating command response becomes. Therefore, set an appropriate value in accordance with the purpose and load of your motorized actuator.

• When the speed-filter time constant is set to 1 ms



• When the speed-filter time constant is set to 100 ms



4.15 END signal

Sets the range in which the END signal will be detected.The END output will turn ON if the difference between the command position and actual position is within the END output range when the motorized actuator stops.

$$\text{END output range [mm (in.)]} = \pm \frac{\text{Motor parameter “END signal width”}}{51200} \times \text{Lead [mm (in.)]}$$

Example of END output range

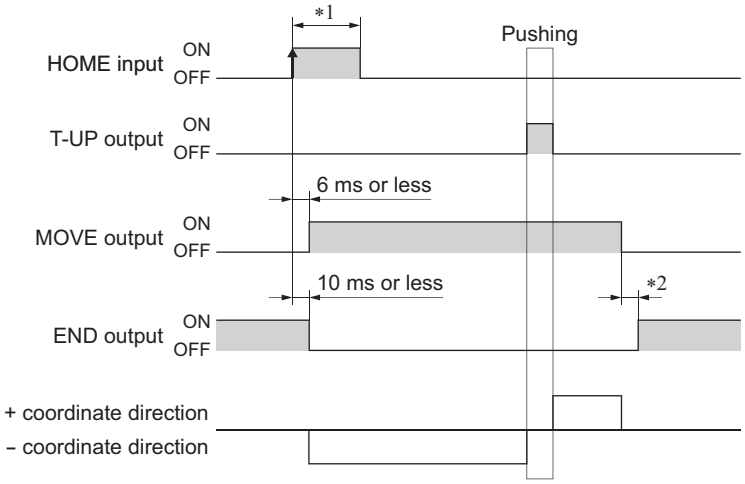
If the END output width is 256 (initial value) and lead is 12 mm (0.47 in.), the END output range becomes 0.06 mm (0.0024 in.).

5 Timing charts

The ON status of a signal indicates that the applicable photocoupler in the controller is carrying current, while the OFF status indicates that the photocoupler is not carrying current.
The up and down arrows in the timing charts indicate edges, while horizontal lines indicate levels.

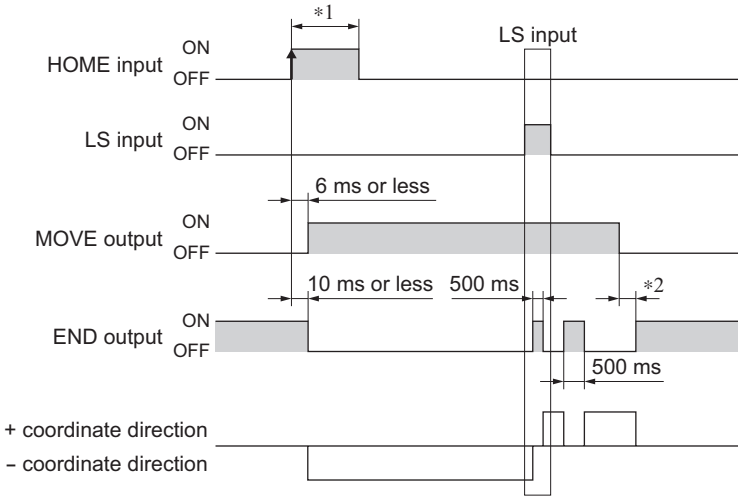
5.1 Return-to-home operation (common to the controller and driver modes)

■ Sensor-less mode



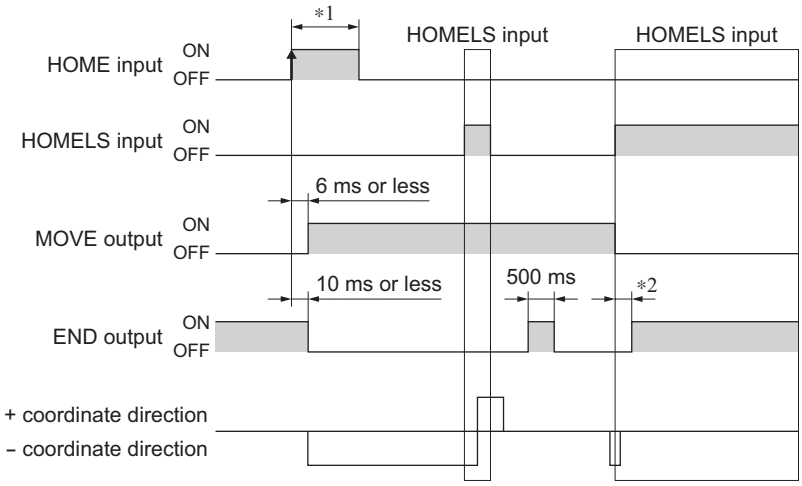
∗1 To perform Return-to-Home operation, use either one of the following two methods to turn on the HOME input. Hold the HOME input in the ON position for more than 4ms or, hold the HOME input in the ON position until the MOVE output turns ON.
∗2 The time after an operation ends until the END output turns ON varies depending on the load and operating speed.

■ 2-sensor Mode



∗1 To perform Return-to-Home operation, use either one of the following two methods to turn on the HOME input. Hold the HOME input in the ON position for more than 4ms or, hold the HOME input in the ON position until the MOVE output turns ON.
∗2 The time after an operation ends until the END output turns ON varies depending on the load and operating speed.

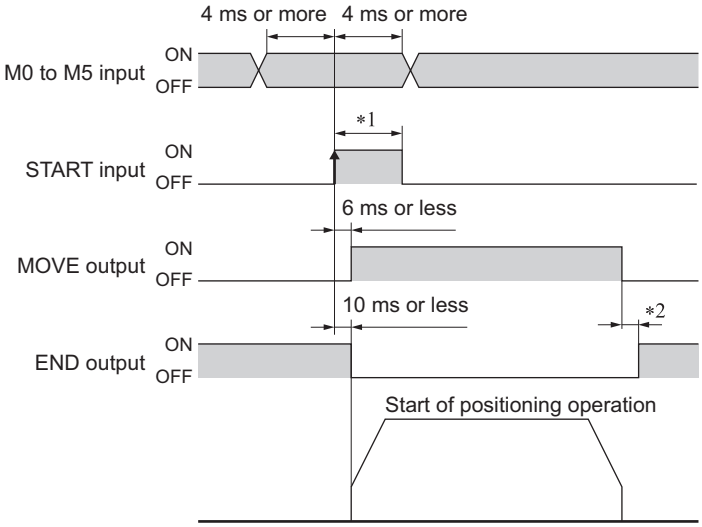
■ 3-sensor Mode



∗1 To perform Return-to-Home operation, use either one of the following two methods to turn on the HOME input. Hold the HOME input in the ON position for more than 4ms or, hold the HOME input in the ON position until the MOVE output turns ON.

∗2 The time after an operation ends until the END output turns ON varies depending on the load and operating speed.

5.2 Positioning operation (controller mode only)



∗1 To positioning operation, use either one of the following two methods to turn on the START input. Hold the START input in the ON position for more than 4ms or, hold the START input in the ON position until the MOVE output turns ON.

∗2 The time after an operation ends until the END output turns ON varies depending on the load and operating speed.

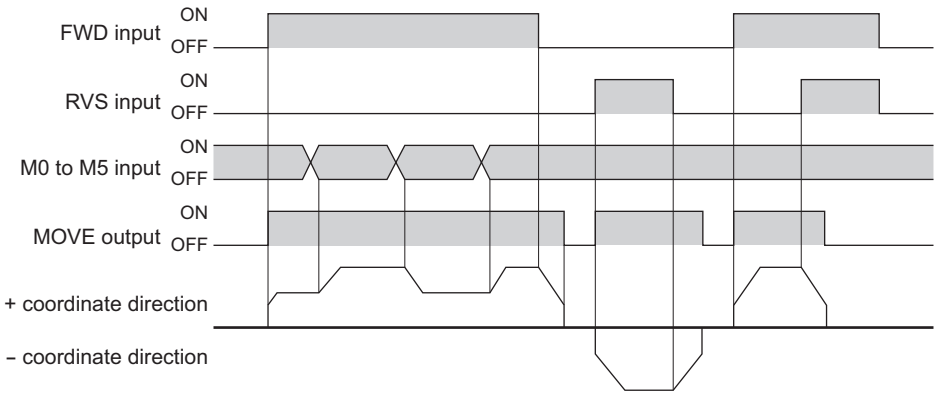
- Combinations of operating data numbers and M0 to M5 inputs

Operating data No.	M5	M4	M3	M2	M1	M0
0*	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	**ON**
2	OFF	OFF	OFF	OFF	**ON**	OFF
3	OFF	OFF	OFF	OFF	**ON**	**ON**
4	OFF	OFF	OFF	**ON**	OFF	OFF
5	OFF	OFF	OFF	**ON**	OFF	**ON**
6	OFF	OFF	OFF	**ON**	**ON**	OFF
7	OFF	OFF	OFF	**ON**	**ON**	**ON**
8	OFF	OFF	**ON**	OFF	OFF	OFF
9	OFF	OFF	**ON**	OFF	OFF	**ON**
10	OFF	OFF	**ON**	OFF	**ON**	OFF
11	OFF	OFF	**ON**	OFF	**ON**	**ON**
12	OFF	OFF	**ON**	**ON**	OFF	OFF
13	OFF	OFF	**ON**	**ON**	OFF	**ON**
14	OFF	OFF	**ON**	**ON**	**ON**	OFF
15	OFF	OFF	**ON**	**ON**	**ON**	**ON**
16	OFF	**ON**	OFF	OFF	OFF	OFF
17	OFF	**ON**	OFF	OFF	OFF	**ON**
18	OFF	**ON**	OFF	OFF	**ON**	OFF
19	OFF	**ON**	OFF	OFF	**ON**	**ON**
20	OFF	**ON**	OFF	**ON**	OFF	OFF
21	OFF	**ON**	OFF	**ON**	OFF	**ON**
22	OFF	**ON**	OFF	**ON**	**ON**	OFF
23	OFF	**ON**	OFF	**ON**	**ON**	**ON**
24	OFF	**ON**	**ON**	OFF	OFF	OFF
25	OFF	**ON**	**ON**	OFF	OFF	**ON**
26	OFF	**ON**	**ON**	OFF	**ON**	OFF
27	OFF	**ON**	**ON**	OFF	**ON**	**ON**
28	OFF	**ON**	**ON**	**ON**	OFF	OFF
29	OFF	**ON**	**ON**	**ON**	OFF	**ON**
30	OFF	**ON**	**ON**	**ON**	**ON**	OFF
31	OFF	**ON**	**ON**	**ON**	**ON**	**ON**

Operating data No.	M5	M4	M3	M2	M1	M0
32	**ON**	OFF	OFF	OFF	OFF	OFF
33	**ON**	OFF	OFF	OFF	OFF	**ON**
34	**ON**	OFF	OFF	OFF	**ON**	OFF
35	**ON**	OFF	OFF	OFF	**ON**	**ON**
36	**ON**	OFF	OFF	**ON**	OFF	OFF
37	**ON**	OFF	OFF	**ON**	OFF	**ON**
38	**ON**	OFF	OFF	**ON**	**ON**	OFF
39	**ON**	OFF	OFF	**ON**	**ON**	**ON**
40	**ON**	OFF	**ON**	OFF	OFF	OFF
41	**ON**	OFF	**ON**	OFF	OFF	**ON**
42	**ON**	OFF	**ON**	OFF	**ON**	OFF
43	**ON**	OFF	**ON**	OFF	**ON**	**ON**
44	**ON**	OFF	**ON**	**ON**	OFF	OFF
45	**ON**	OFF	**ON**	**ON**	OFF	**ON**
46	**ON**	OFF	**ON**	**ON**	**ON**	OFF
47	**ON**	OFF	**ON**	**ON**	**ON**	**ON**
48	**ON**	**ON**	OFF	OFF	OFF	OFF
49	**ON**	**ON**	OFF	OFF	OFF	**ON**
50	**ON**	**ON**	OFF	OFF	**ON**	OFF
51	**ON**	**ON**	OFF	OFF	**ON**	**ON**
52	**ON**	**ON**	OFF	**ON**	OFF	OFF
53	**ON**	**ON**	OFF	**ON**	OFF	**ON**
54	**ON**	**ON**	OFF	**ON**	**ON**	OFF
55	**ON**	**ON**	OFF	**ON**	**ON**	**ON**
56	**ON**	**ON**	**ON**	OFF	OFF	OFF
57	**ON**	**ON**	**ON**	OFF	OFF	**ON**
58	**ON**	**ON**	**ON**	OFF	**ON**	OFF
59	**ON**	**ON**	**ON**	OFF	**ON**	**ON**
60	**ON**	**ON**	**ON**	**ON**	OFF	OFF
61	**ON**	**ON**	**ON**	**ON**	OFF	**ON**
62	**ON**	**ON**	**ON**	**ON**	**ON**	OFF
63	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

∗ Sequential operation is performed with operation data No.0. For details, refer to “Sequential operation” on p.29.

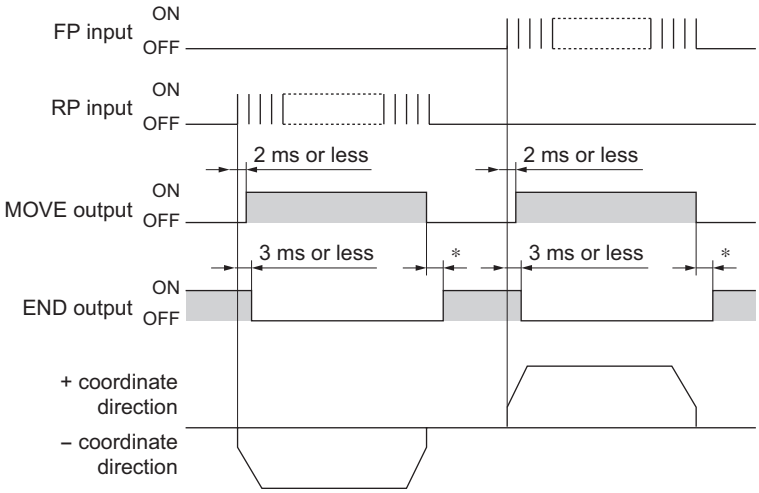
5.3 Continuous operation (controller mode only)



5.4 Operation by pulse input (driver mode only)

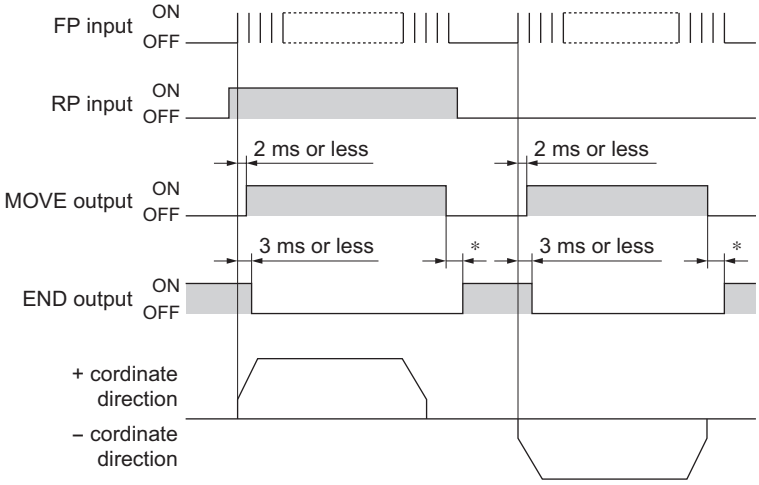
Note Pulse input is implemented based on the negative logic.

■ 2-pulse input mode



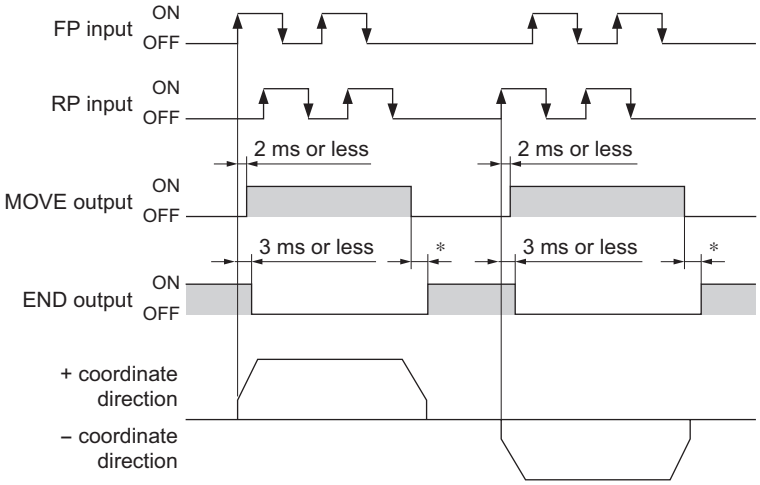
* The time after an operation ends until the END output turns ON varies depending on the load and operating speed.

■ 1-pulse input mode



* The time after an operation ends until the END output turns ON varies depending on the load and operating speed.

■ Quadrature pulse input mode

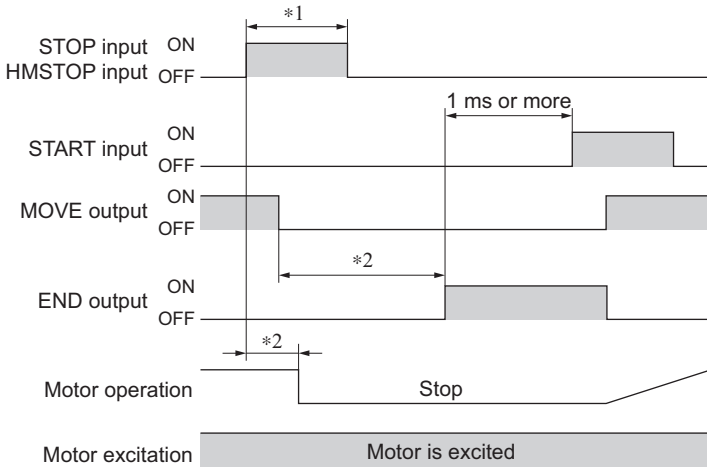


* The time after an operation ends until the END output turns ON varies depending on the load and operating speed.

5.5 Stopping function

Operating stop using the STOP or HMSTOP input is controlled via the CPU.

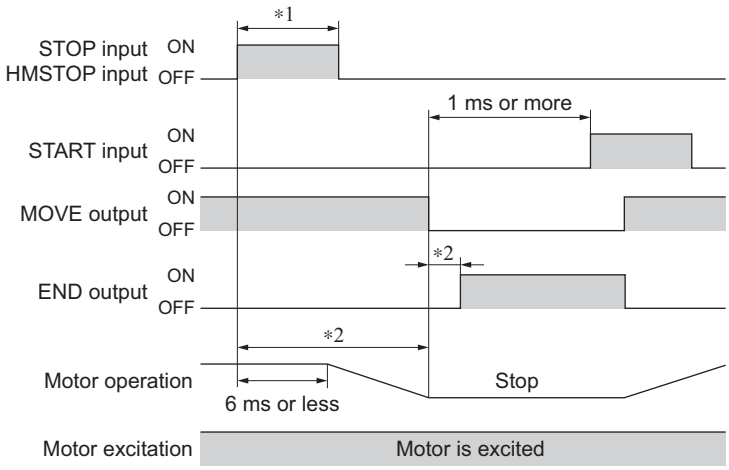
■ Immediate stop



∗1 Select one of the following two methods to turn on the STOP input or HMSTOP input.
Hold the STOP or HMSTOP input in the ON position for more than 4ms or, hold the STOP or HMSTOP input in the ON position until the MOVE output turns OFF.

∗2 The time after the STOP input or HMSTOP input is turned ON until the motor stops, and the time after the MOVE output turns OFF until the END output turns ON, vary depending on the load and operating speed.

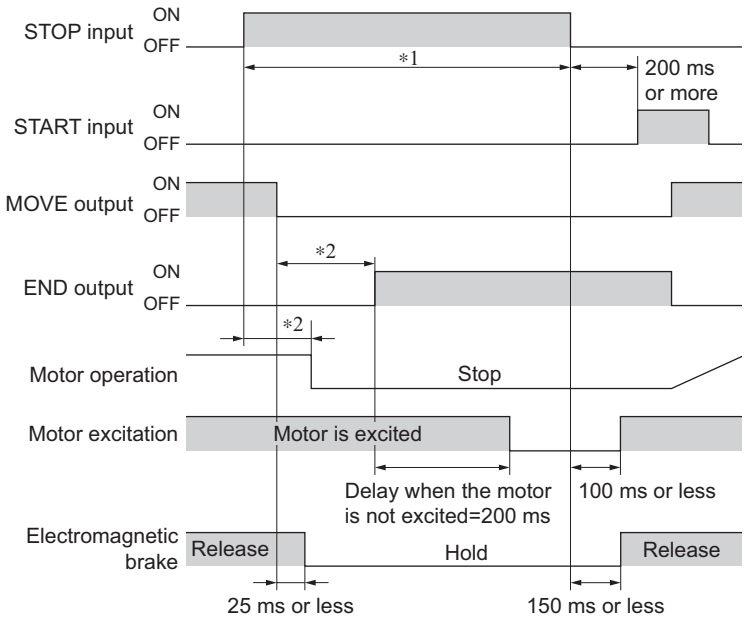
■ Deceleration stop



∗1 Select one of the following two methods to turn on the STOP input or HMSTOP input.
Hold the STOP or HMSTOP input in the ON position for more than 4ms or, hold the STOP or HMSTOP input in the ON position until the MOVE output turns OFF.

∗2 The time after the STOP input or HMSTOP input is turned ON until the motor stops, and the time after the MOVE output turns OFF until the END output turns ON, vary depending on the load and operating speed.

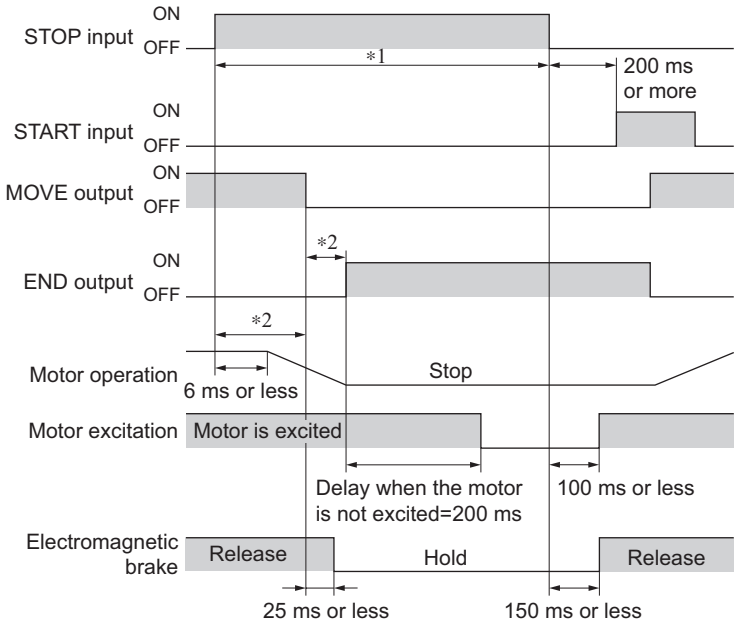
■ Immediate stop +electromagnetic brake actuation



∗1 Select one of the following two methods to turn on the STOP input.
Hold the STOP input in the ON position for more than 4ms or, hold the STOP input in the ON position until the MOVE output turns OFF.

∗2 The time after the STOP input is turned ON until the motor stops, and the time after the MOVE output turns OFF until the END output turns ON, vary depending on the load and operating speed.

■ Deceleration stop +electromagnetic brake actuation



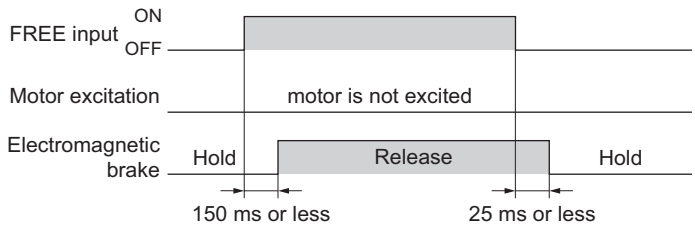
∗1 Select one of the following two methods to turn on the STOP input.
Hold the STOP input in the ON position for more than 4ms or, hold the STOP input in the ON position until the MOVE output turns OFF.

∗2 The time after the STOP input is turned ON until the motor stops, and the time after the MOVE output turns OFF until the END output turns ON, vary depending on the load and operating speed.

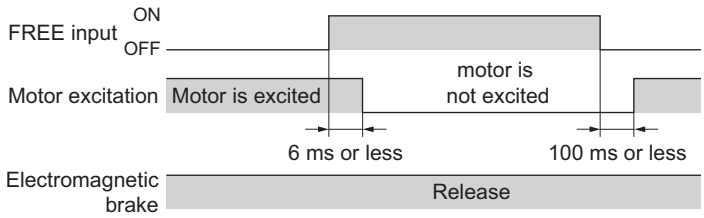
5.6 Stopping the motor excitation

■ FREE Input (common to the controller and driver modes)

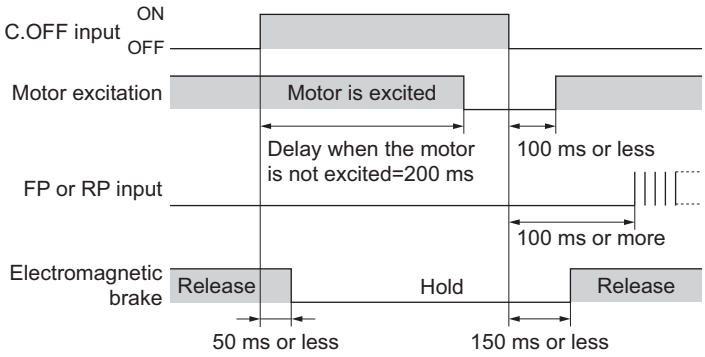
When the STOP or C.OFF is ON



When the STOP or C.OFF is OFF

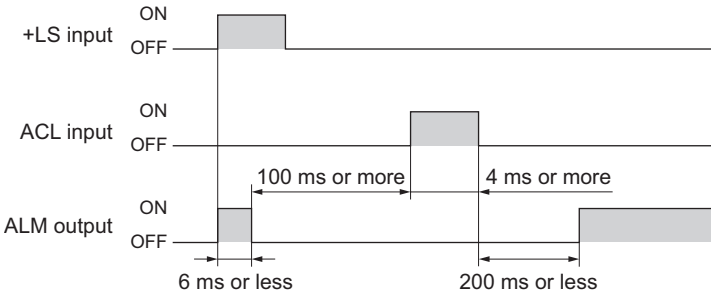


■ C.OFF Input (driver mode only)

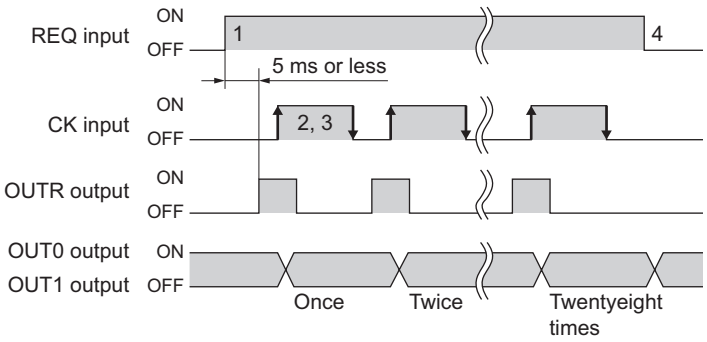


5.7 Alarm clear (common to the controller and driver modes)

The figure below shows an example of how the signals behave when a LS detection error occurs.



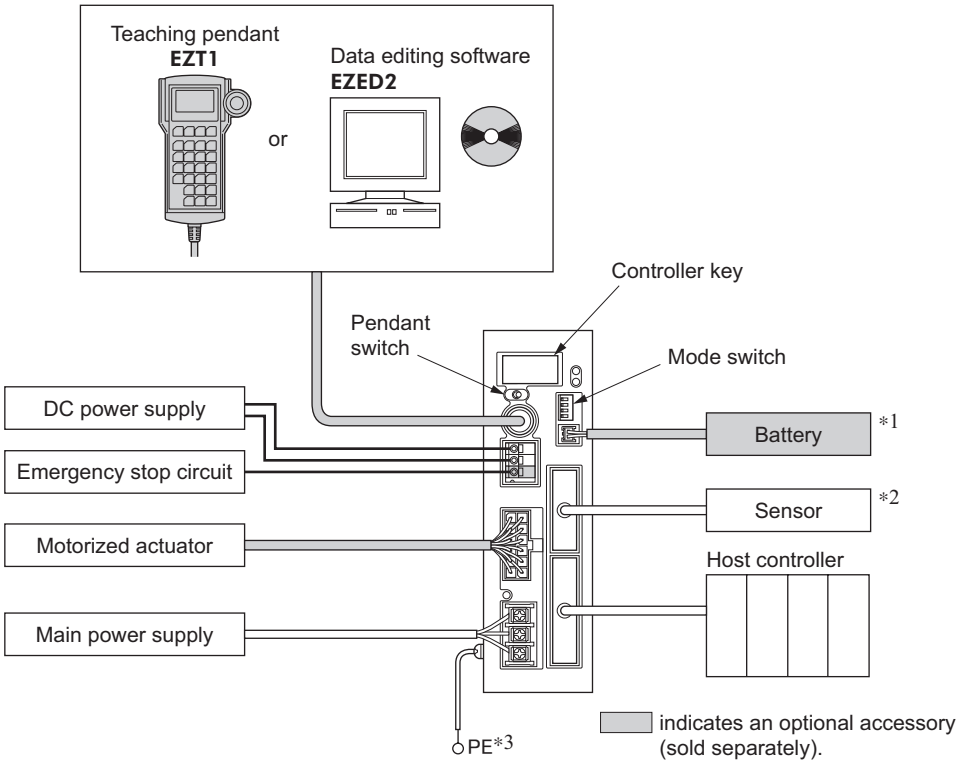
5.8 Reading current positioning data and alarm code (common to the controller and driver modes)



1. Turn the REQ input ON.
2. When the OUTR output turns ON, turn the CK input ON.
   When the OUTR output turns OFF, save the statuses of OUT0 and OUT1 outputs to the host controller.
3. Turn the CK input OFF.
   Repeat steps 2 and 3 above 28 times.
4. Turn the REQ input OFF.
   The information effective at the time the REQ input turned ON is read.
   Turning the REQ input OFF while information is being read will cancel the reading of current positioning data.

6 First time operation

6.1 Starting procedure



∗1 Absolute mode only.
∗2 Sensors are optional (sold separately) on the **EZS** Ⅱ series and **ESR** series.
∗3 Not available on the ESMC-K2.

The following gives a brief explanation of the starting procedure from turning on the controller power to actually operating the actuator.

1. Wire each connector on the controller.
2. Confirm that the motorized actuator model shown on the controller key is the same as the model of the motorized actuator connected to the controller.
3. Set the controller functions using the mode switches.

1	Mode switching	ON: Driver mode OFF: Controller mode
2	Pulse input mode	ON: 1-pulse input mode OFF: 2-pulse input mode
3	ABS/INC switching	ON: Absolute mode OFF: Incremental mode

4. To use a teaching pendant, turn the pendant switch ON.
5. Turn on the main power and logic power supply to the controller.

6. Check the lighting condition of the LED.

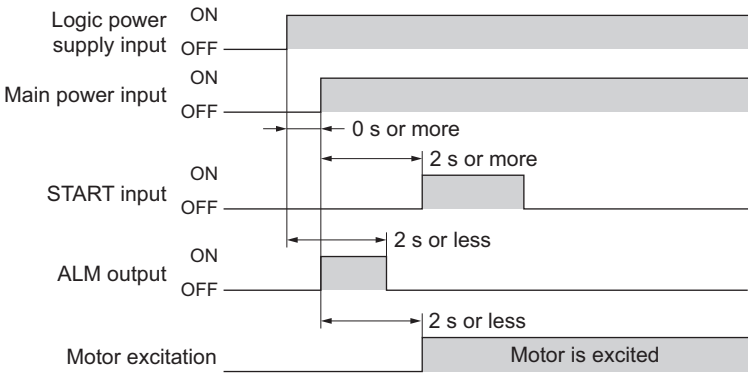
POWER LED	ALARM LED	CHARGE LED	Description
On (green)	Off	On (red)	Normal status
Off	Off	On (red) or Off	See 8.1 “Troubleshooting” on p.70.
On (green)	On (red)	On (red) or Off	
On (green)	Blinking (red)	On (red) or Off	

If you have selected the absolute mode in step 3, an absolute position loss alarm (Err33) generates and the ALARM LED blinks seven times. Press the [F4] key on the teaching pendant or turn the ACL input ON to reset the alarm.
Once the battery is fully charged, the absolute position loss alarm (Err33) should no longer generate.

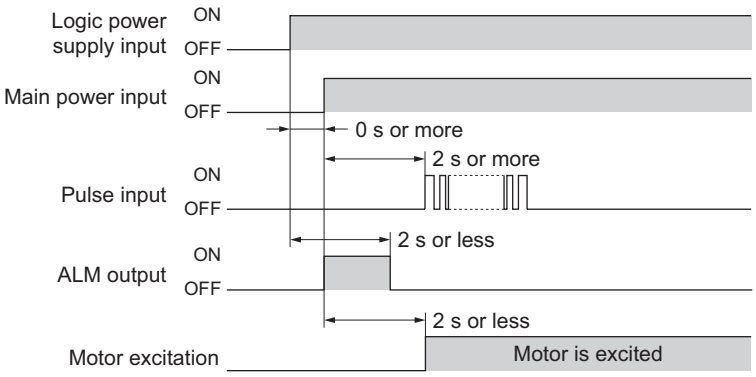
7. Set data using the teaching pendant **EZT1** or data editing software **EZED2**.

8. Perform return-to-home operation.

- Timing chart at power on (controller mode only)



- Timing chart at power on (driver mode only)



Note Do not turn ON the FWD input or RVS input before turning on the logic power supply. It will cause a main power OFF detection alarm (Err23) to generate.

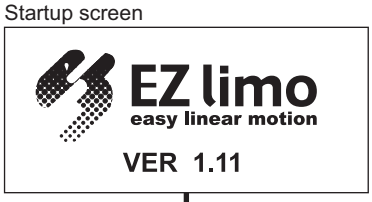
6.2 Trial operation

The following explains the procedure to actually set data using the teaching pendant and move the motorized actuator.
After starting the controller, move the motorized actuator manually to check the wiring and other conditions. Thereafter, set positioning operating data and operate the actuator using the set data.

■ Checking by manual operation

1. Turn on the power to the controller.
   After the controller has started, the language setting screen appears.

Startup screen



language setting screen

```
EXT-Lang        ID00
Language=English
        ←/→ ENT:Set
 ___  ___  ___  ___
```

2. Select “English” or “Japanese” using the [←] and [→] keys, and then press the ENT key.
   Once you have set the language, this screen will no longer appear the next time you start the controller.
   The following screens assume that English has been selected.

First screen of the EXT mode — ENT

```
EXT             ID00
Sel=#00  Act=#00
Pos= 00000.00mm
Mode I/O Alm Data
```

3. Press the [F1] key three times to switch to the TST mode.

First screen of the TST mode — F1 three times

```
TST             ID00
Select
            F2/F3/F4
Mode I/O Mnu Opr
```

4. Press the [F3] key to select manual operation.

F3

```
TST-Mnu Mnu-Opr
Pos= 00000.00mm
          ←/→,F3/F4
Mode      PRE HOME
```

5. Press the [F4] key to perform return-to-home operation.

F1 / F4 — Perform return-to-home operation.

```
EXT             ID00
Sel=#00  Act=#00
Pos= 00000.00mm
Mode I/O Alm Data
```

6. When return-to-home operation has completed, press the [F1] key to switch to the EXT mode.

■ Setting positioning data

Set the following data to operating data No.1:

Positioning method:	Absolute
Position:	45 mm (1.77 in.)
Operating speed:	30 mm/s (1.18 in/s)
Acceleration/Deceleration No.:	1
Operating function:	Single-motion

1. Press the [F1] key to switch to the PRG mode.

First screen of the EXT mode

```
EXT           ID00
Sel=#00  Act=#00
Pos= 00000.00mm
Mode I/O Alm Data
```

F1

First screen of the PRG mode

2. Press the [ENT] key.

```
PRG Data #    ID00
#01   No data
          ENT:Edit
Mode Clr Ins Del
```

ENT

3. Select “Abs” using the [←] [→] keys.

```
PRG-#01 OP Type
Abs/Inc=Inc
      ←/→ ENT:Set
Mode --- --- ---
```

Select using ← →

4. Press the [ENT] key.

```
PRG-#01 OP Type
Abs/Inc=Abs
      ←/→ ENT:Set
Mode --- --- ---
```

ENT

5. Enter “45.00” using the numerical keys.

```
PRG-#01 Pos  Abs
Pos= 00000.00mm
   10keys ENT:Set
Mode --- Rmt Dct
```

Enter using the numerical keys.

6. Press the [ENT] key.

```
PRG-#01 Pos  Abs
Pos= 00045.00mm
   10keys ENT:Set
Mode --- Rmt Dct
```

ENT

7. Enter “30.00” using the numerical keys.

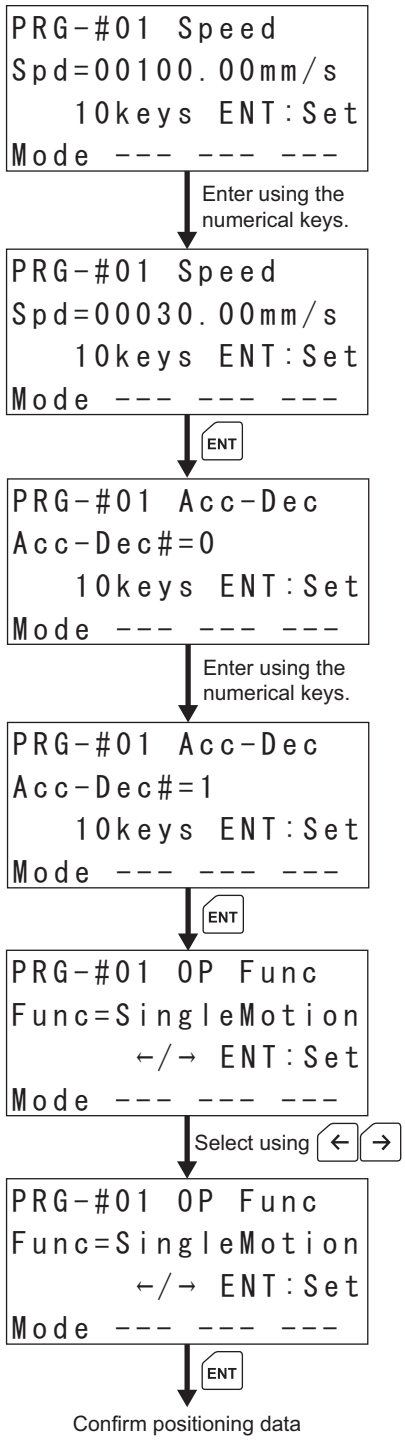
8. Press the [ENT] key.

9. Enter “1” using the numerical keys.

10. Press the [ENT] key.

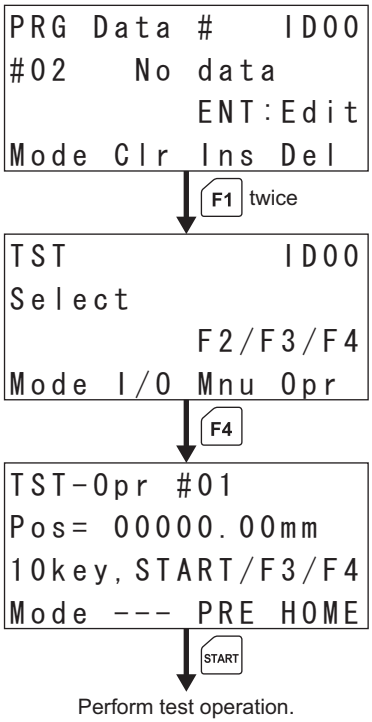
11. Select “SingleMotion” using the [←] [→] keys.

12. Press the [ENT] key to finish setting positioning data.
The operating data is set to operation No.1.



■ Performing test operation

1. Press the [F1] key twice to switch to the TST mode.
2. Press the [F4] key to select test operation.
3. Press the [START] key to execute operating data No.1.
   Press the [STOP] key to stop the operation.



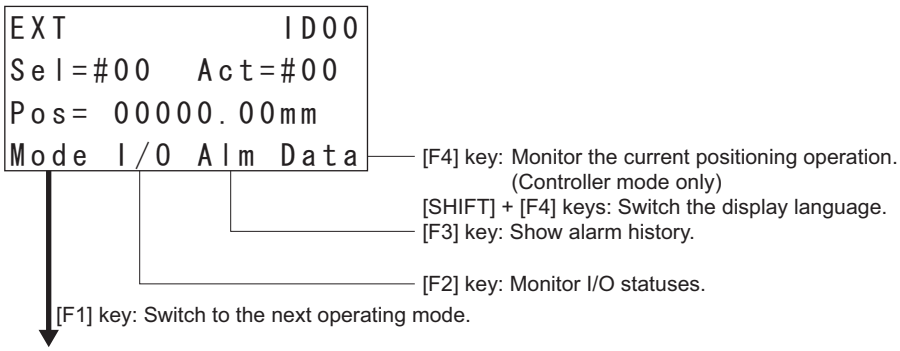
7 Teaching pendant operation

7.1 Operating modes

The teaching pendant provides four operating modes. The first screen of each mode is shown below. Press the [F1] key to switch to the next mode.

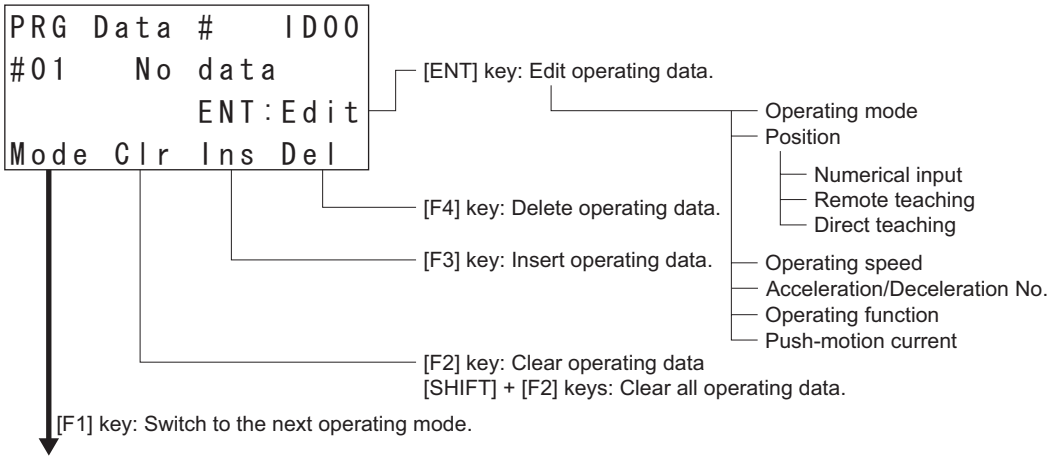
- EXT (external) mode

This mode is used to operate the actuator using external inputs.



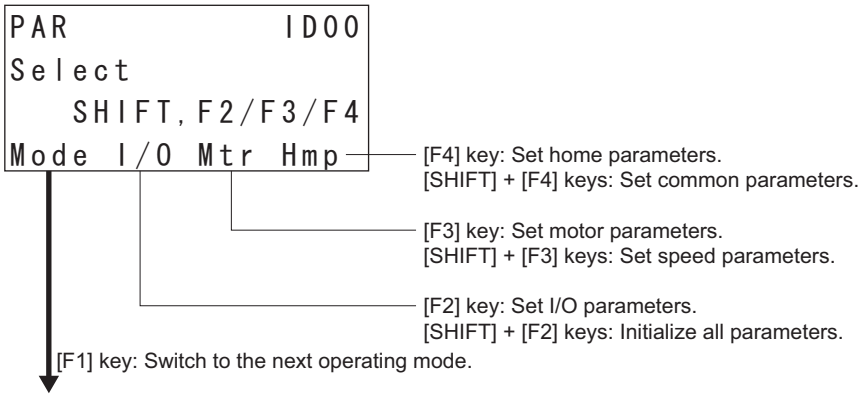
- PRG (program) mode (controller mode only)

This mode is used to set positioning operating data.



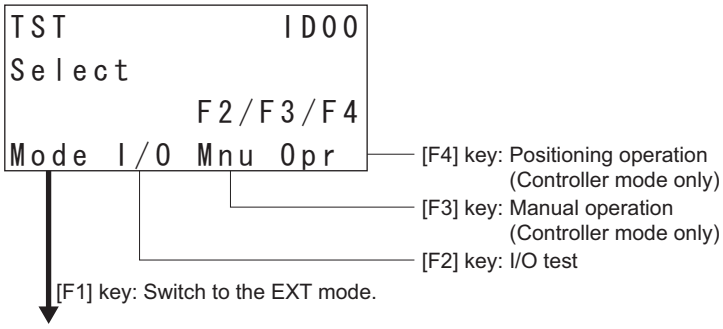
- PAR (parameter) mode

This mode is used to set parameters.



- TST (test) mode

  This mode is used to check the connection statuses of I/Os or perform test operation.

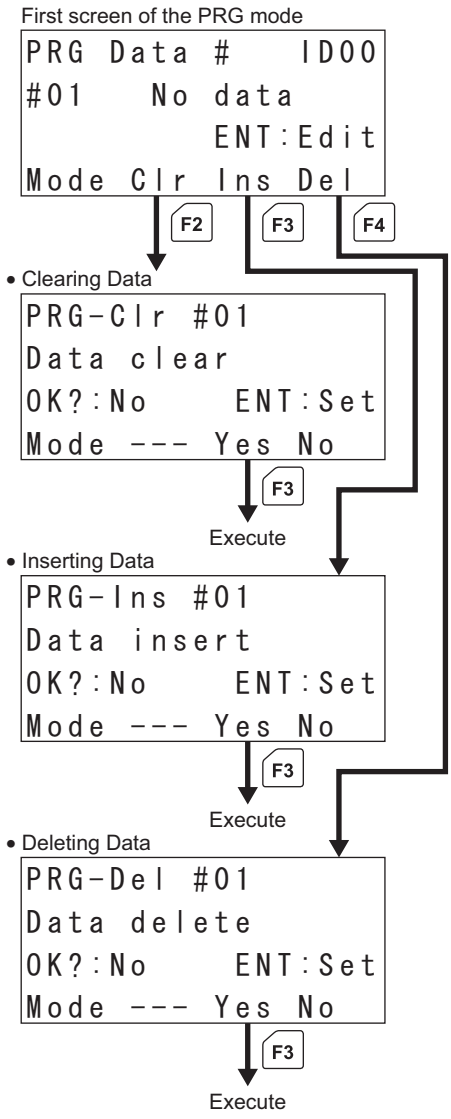


7.2 Clearing, inserting and deleting operating data, and performing all delete

Note Do not disconnect the pendant cable while data is being cleared, inserted or deleted or all delete is being performed. If the cable is disconnected during these operations, a nonvolatile memory error alarm (Err41) will generate.

■ Clearing, inserting and deleting data

1. Press one of [F2] to [F4] keys on the first screen of the PRG mode.
2. Press the [F3] key on each screen to perform the desired operation.



- Clearing data

  "No data" is set for the selected data.

- Inserting data

  "No data" is inserted at the selected data.
  Each subsequent data moves down to the next number.
  The data in data No.63 is deleted.

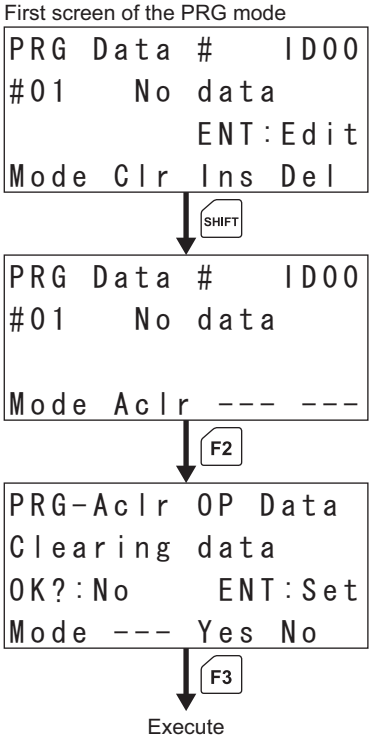
- Deleting data

  The selected data is deleted.
  Each subsequent data moves up to the preceding number.
  "No data" is inserted in data No.63.

■ Deleting all operating data

1. On the first screen of the PRG mode, press the [F2] key while holding down the [SHIFT] key.

First screen of the PRG mode



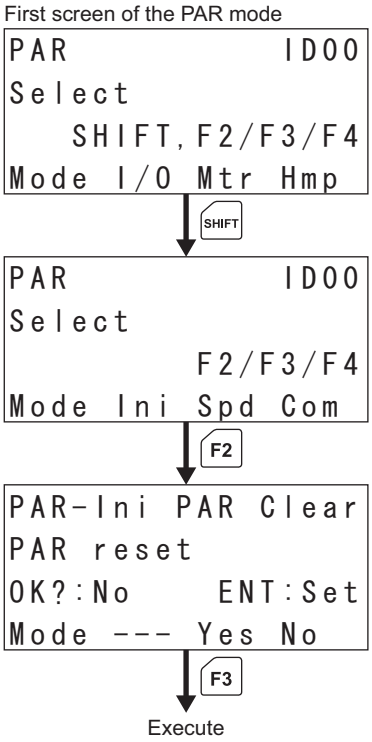
2. Press the [F3] key to delete all data.
"No data" is set for all operating data.

7.3 Initializing the parameters

Reset all parameters to their default values.

1. On the first screen of the PAR mode, press the [F2] key while holding down the [SHIFT] key.

First screen of the PAR mode



2. Press the [F3] key to initialize the parameters.

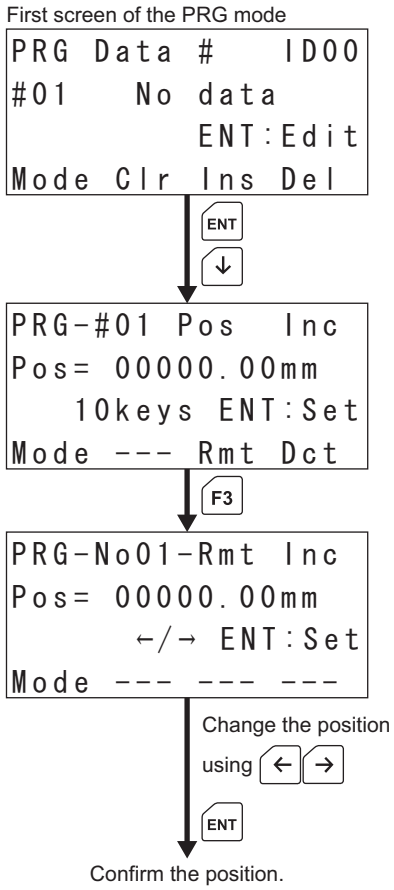
7.4 Teaching (controller mode only)

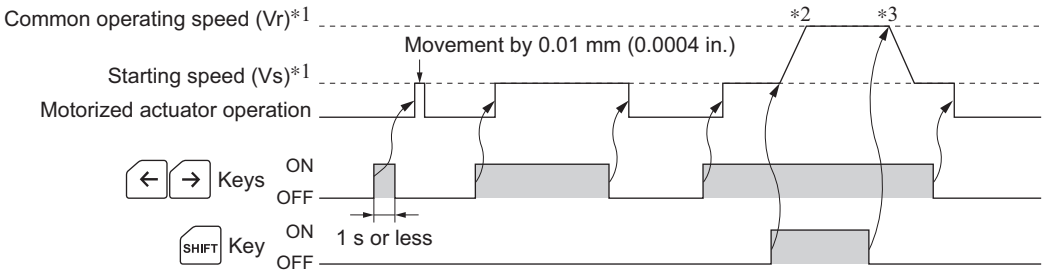
You can physically move the actuator's moving part and set the achieved position as operation data.

■ Remote teaching

Use the [←] [→] keys to operate the motorized actuator and set the stop position.

1. On the first screen of the PRG mode, select the operating data to perform remote teaching.
2. Press the [ENT] key, and then press the [↓] key.
3. Press the [F3] key to select remote teaching.
4. Press the [←] [→] keys to change the position.
   Refer to the timing chart below for the operation of the motorized actuator.
5. After the position has been confirmed, press the [ENT] key.
   The current position is set to the operating data.



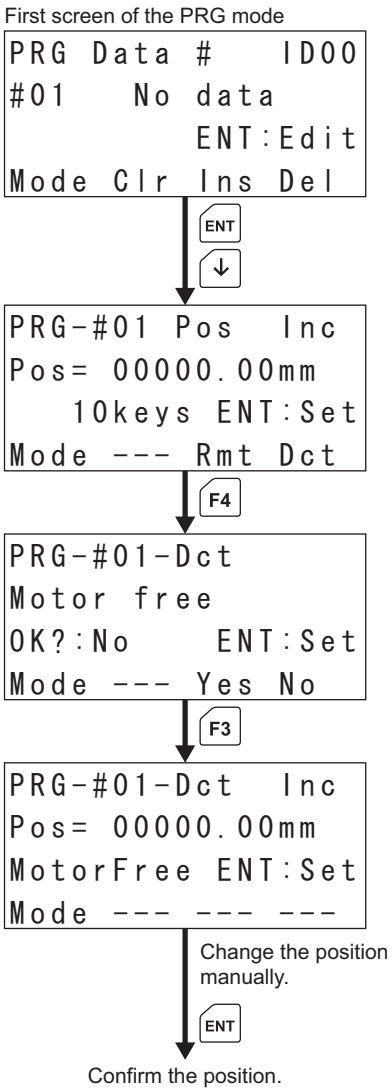


∗1 Set these speeds using the corresponding speed parameters. If Vr ≤ Vs, the actuator operates at a constant speed of Vs.
∗2 The motor accelerates at the acceleration set under acceleration No.0.
∗3 The motor decelerates at the deceleration set under deceleration No.0.

■ Direct teaching

Move the actuator's moving part to setting a stop position.

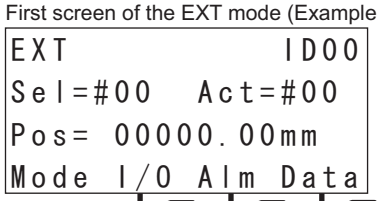
1. Turn off the main power to the controller.
2. On the first screen of the PRG mode, select the operating data to perform direct teaching.
3. Press the [ENT] key, and then press the [↓] key.
4. Press the [F4] key to select direct teaching.
5. Press the [F3] key to turn off the excitation of the motorized actuator.
6. Move the actuator's moving part manually to change the position.
7. After the position has been confirmed, press the [ENT] key.
   The current position is set to the operating data.



7.5 Monitor function

You can monitor I/Os, alarms and operating data in the EXT mode.

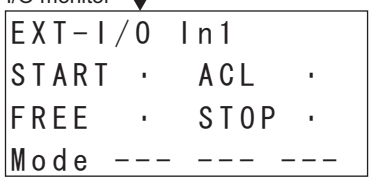
First screen of the EXT mode (Example of controller mode)



F2 F3 F4

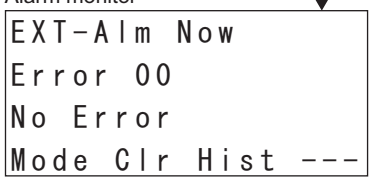
- I/O monitor

  The status of each I/O is shown.
  You can display the statuses of other I/Os by pressing the [↑] and [↓] keys.
  ON: " ∗ "
  OFF: "• "



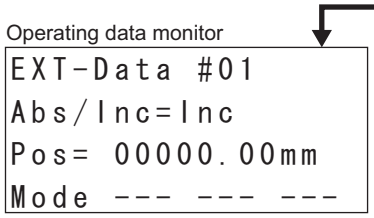
- Alarm monitor

  The current alarm status is shown.

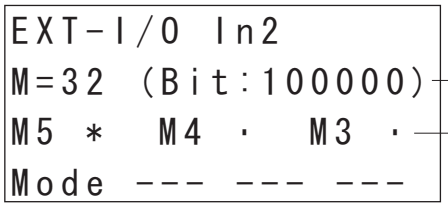


- Operating data monitor

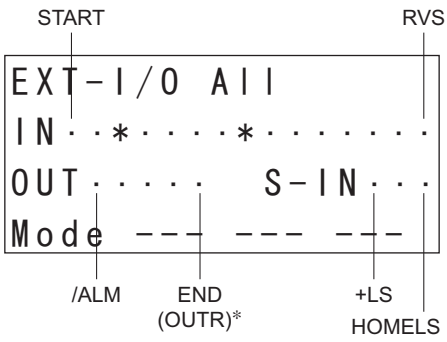
  The positioning operating data currently executed is shown.



■ Description of I/O monitor screen



On the screen for monitoring all I/Os, the symbols (∗ and •) correspond to the respective I/Os (from the far left).



The signals are aligned in the following orders from the left.

- Controller mode

Input signals	START, ACL (CK)*, FREE, STOP, M5, M4, M3, M2, M1, M0, HOME/PRESET, REQ, /EMG, FWD, RVS
Output signals	/ALM, MOVE, T-UP (OUT1)*, AREA (OUT0)*, END (OUTR)*
Sensor	+LS, –LS, HOMELS

∗ When the ABS data is loaded

- Driver mode

Input signals	ACL (CK)*, FREE, C.OFF, HOME/PRESET, REQ, /EMG, FP, RP, HMSTOP
Output signals	/ALM, MOVE, T-UP (OUT1)*, TIM (OUT0)*, END (OUTR)*
Sensor	+LS, –LS, HOMELS

∗ When the ABS data is loaded

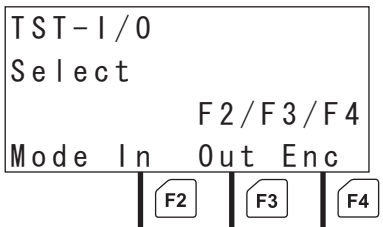
7.6 I/O checking

The I/O check function is used to check input signals from the sensors and host controller or output signals to the host controller for testing purposes.
Perform I/O check to examine the wiring condition after the equipment has been started or during inspection.

Note All I/O functions and operations are disabled during the I/O check. Nothing occurs even after turning ON any I/O signal.

1. On the first screen of the TST mode, press the [F2] key to select I/O check.
2. Press one of [F2] to [F4] keys.
   Use the [↑] [↓] keys to move through the items on the applicable check screen selected by pressing one of [F2] to [F4] keys.

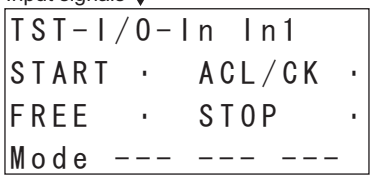
First screen of the TST mode



F2 F3 F4

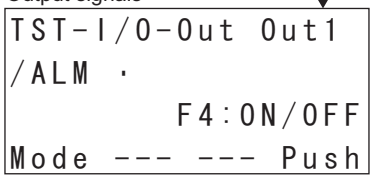
- Input signals

Input signals can be monitored.
ON: “∗”
OFF: “•”



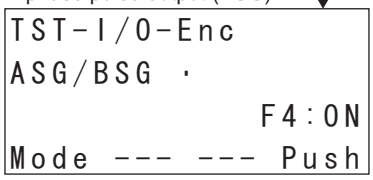
- Output signals

Switch the ON/OFF status of each output signal by pressing the [F4] key.
ON: “∗”
OFF: “•”



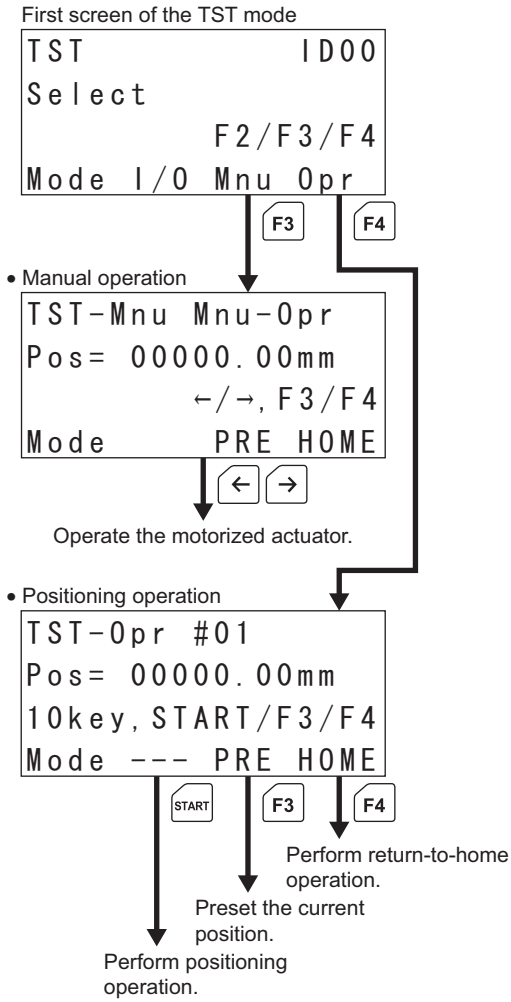
- A-phase pulse output (ASG), B-phase pulse output (BSG)

1000 pulses (1000 Hz) are output every time the [F4] key is pressed.
Pulse is output: “∗”
Pulse is stopped: “•”



7.7 Manual operation (controller mode only)

Manual operation is performed in two ways: by performing positioning operation using set operating data, or by operating the actuator using the [←] [→] keys.
On the first screen of the TST mode, press the [F3] or [F4] key.

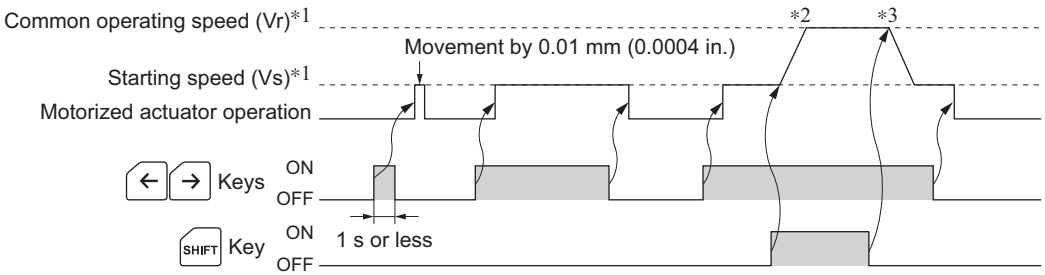


- Manual operation

When the [←] [→] key is pressed, the motorized actuator starts operating.
Refer to the timing chart below for the operation of the motorized actuator.

- Positioning operation

Select the operating data to perform positioning operation, and then press the [START] key.
Positioning operation is performed.
Press the [STOP] key to stop the operation.
Press the [F3] key to preset the current position.
Press the [F4] key to perform return-to-home operation.



∗1 Set these speeds using the corresponding speed parameters. If Vr ≤ Vs, the actuator operates at a constant speed of Vs.
∗2 The motor accelerates at the acceleration set under acceleration No.0.
∗3 The motor decelerates at the deceleration set under deceleration No.0.

7.8 Changing the screen display language

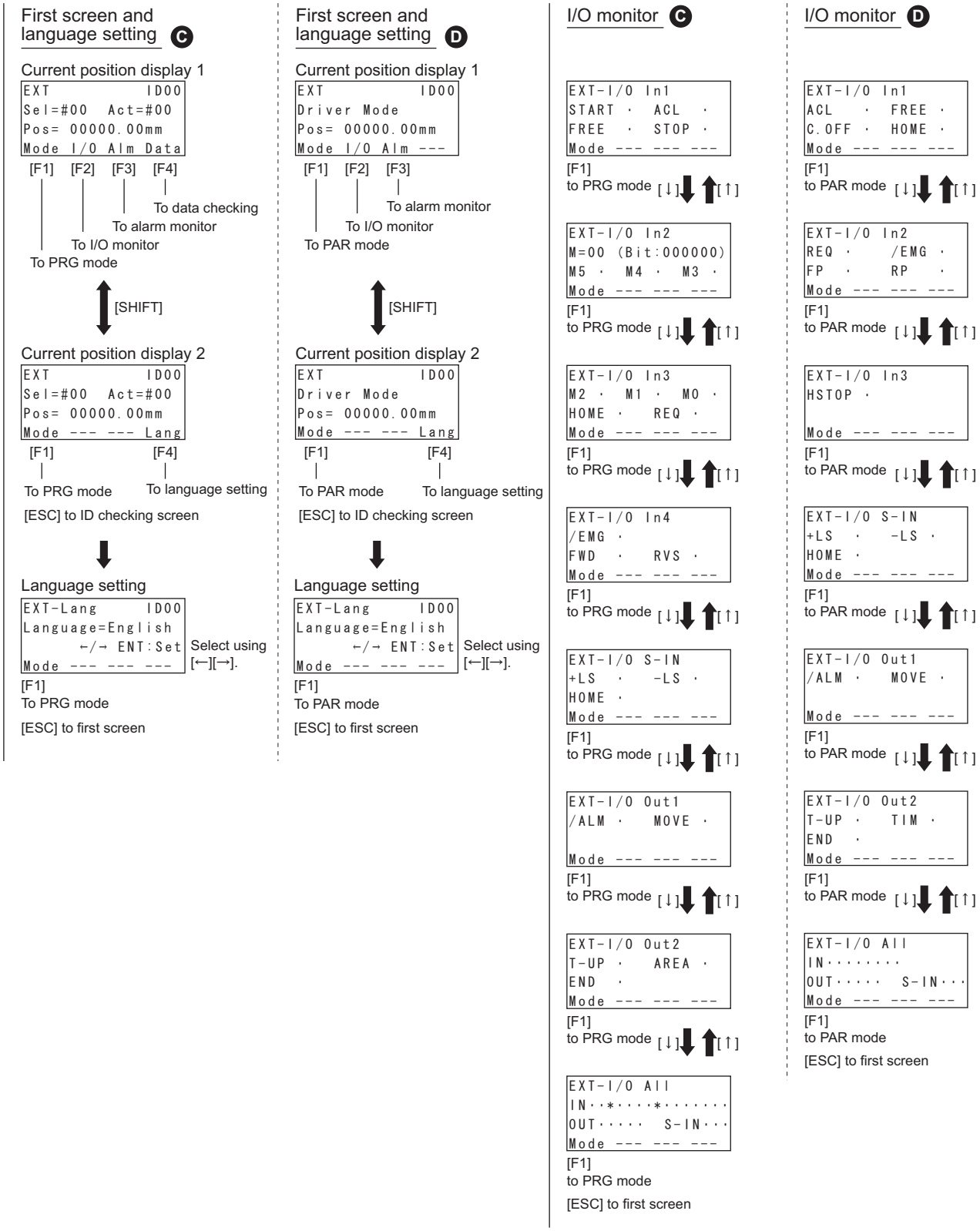
The screen display can be changed between the Japanese and English modes.
For details, refer to 7.9, “Table of operation switching” on p.60.

7.9 Table of operation switching

■ EXT mode

Ⓒ Display or switching in the controller mode

Ⓓ Display or switching in the driver mode



Alarm monitor

Current alarm information

```
EXT-Alm Now
Error 00
No Error
Mode Clr Hist ---
```

[F1] [F2] [F3] [F4]

- [F4]: Clear alarm
- [F3]: To alarm history
- [F2]: To clear alarm history
- [F1]: To PRG mode Ⓒ / To PAR mode Ⓓ

[ESC] to first screen

Clear alarm history

```
EXT-Alm-Clr
Clear alarm hist.
OK?:No    ENT:Set
Mode --- Yes No
```

[F1] [F3] [F4]

- [F4]: To first screen
- [F3]: Clear and go to first screen
- [F1]: To PRG mode Ⓒ / To PAR mode Ⓓ

[ESC] to current alarm information

Alarm history

```
EXT-Alm-Hist0
Error 61
LS Rev Error
Mode --- --- ---
```

[F1]
to PRG mode Ⓒ [↓] [↑]
to PAR mode Ⓓ

```
EXT-Alm-Hist1
Error 68
EMG Error
Mode --- --- ---
```

[F1]
to PRG mode Ⓒ [↓] [↑]
to PAR mode Ⓓ

[↓] [↑]

```
EXT-Alm-Hist9
Error 00
No Error
Mode --- --- ---
```

[F1]
to PRG mode Ⓒ
to PAR mode Ⓓ

[ESC] to first screen

Data checking Ⓒ

```
EXT-Data #01
Abs/Inc=Inc
Pos= 00000.00mm
Mode --- --- ---
```

[F1]
to PRG mode [↓] [↑]

```
EXT-Data #01
Func=SingleMotion
Spd=00060.00mm/s
Mode --- --- ---
```

[F1]
to PRG mode [↓] [↑]

```
EXT-Data #01
Acc=00000.00m/s2
Dec=00000.00m/s2
Mode --- --- ---
```

[F1]
to PRG mode [↓] [↑]

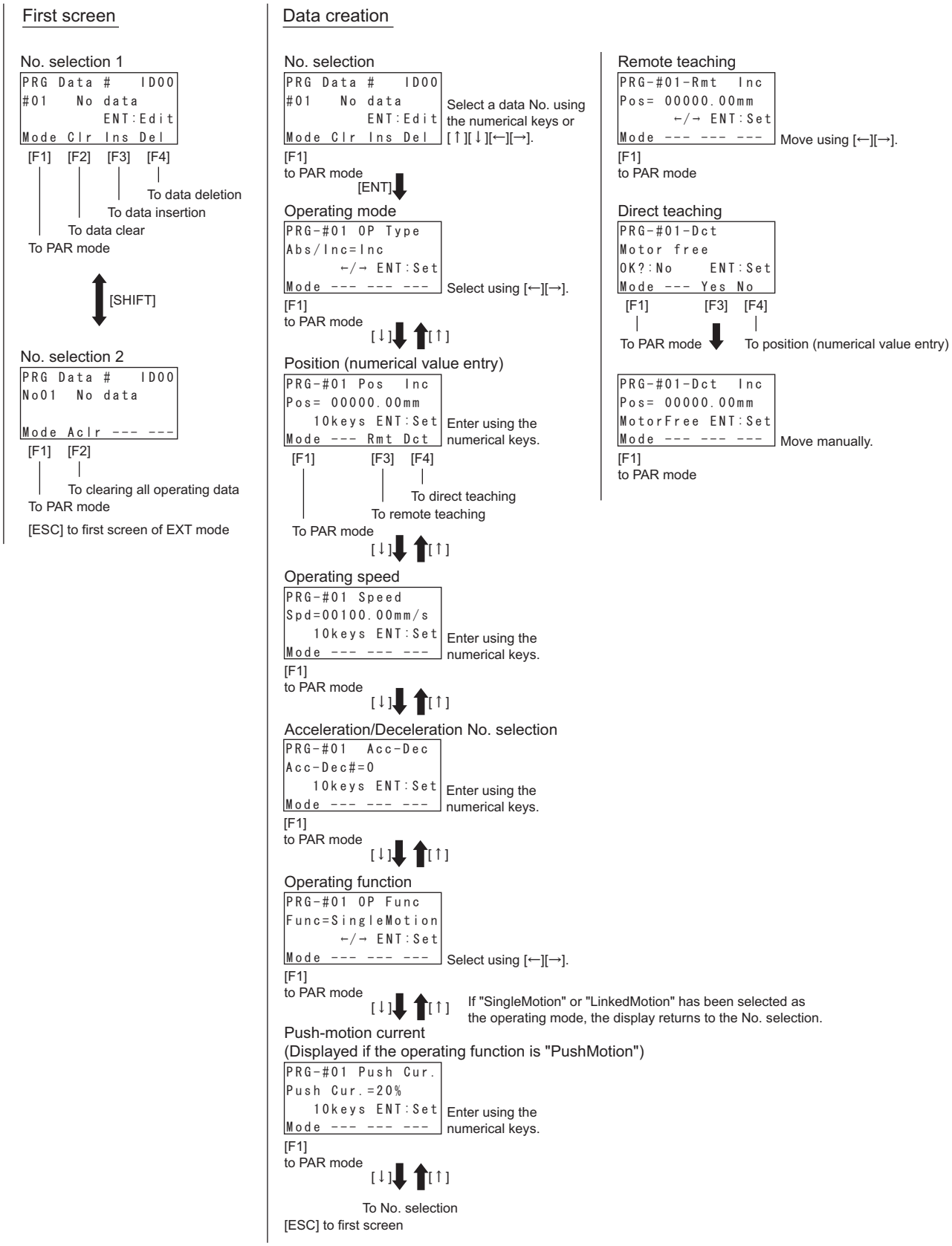
```
EXT-Data #01
Push Cur.=20%

Mode --- --- ---
```

[F1]
to PRG mode

[ESC] to first screen

■ PRG mode (controller mode only)



Data clear, insertion and deletion

Data clear

```
PRG-Clr #01
Data clear
OK?:No     ENT:Set
Mode --- Yes No
```

[F1] To PAR mode
[F3] Clear and move to first screen
[F4] To first screen
[ESC] to first screen

Data insertion

```
PRG-Ins #01
Data insert
OK?:No     ENT:Set
Mode --- Yes No
```

[F1] To PAR mode
[F3] ⬇
[F4] To first screen

Screen displayed during the processing

```
PRG-Ins #01
Inserting data
Wait for a moment
 --- --- --- ---
```

To first screen after completion.

Data deletion

```
PRG-Del #01
Data delete
OK?:No     ENT:Set
Mode --- Yes No
```

[F1] To PAR mode
[F3] ⬇
[F4] To first screen

Screen displayed during the processing

```
PRG-Del #01
Deleting data
Wait for a moment
 --- --- --- ---
```

To first screen after completion.

All operating data clear

All operating data clear

```
PRG-Aclr OP Data
Clearing data
OK?:No     ENT:Set
Mode --- Yes No
```

[F1] To PAR mode
[F3] ⬇
[F4] To first screen

Screen displayed during the processing

```
PRG-Aclr OP Data
Clearing all data
Wait for a moment
 --- --- --- ---
```

To first screen after completion.

■ PAR mode

Ⓒ Display or switching in the controller mode
Ⓓ Display or switching in the driver mode

First screen

No. selection 1

```
PAR              ID00
Select
   SHIFT,F2/F3/F4
Mode I/O Mtr Hmp
```

[F1] [F2] [F3] [F4]

- [F4] To home parameters
- [F3] To motor parameters
- [F2] To I/O parameters
- [F1] To TST mode
- [SHIFT]

No. selection 2

```
PAR              ID00
Select
           F2/F3/F4
Mode Ini Spd Com
```

[F1] [F2] [F3] [F4]

- [F4] To common parameters
- [F3] To speed parameters
- [F2] To initializing parameters
- [F1] To TST mode

[ESC] to first screen of PRG mode Ⓒ
[ESC] to first screen of PAR mode Ⓓ

I/O parameters

Stop action

```
PAR-I/O STOPAct
Act=Dec stop
      ←/→ ENT:Set
Mode --- --- ---
```

Ⓒ Select using [←][→].
[F1] to TST mode [↓][↑]

Stop logic

```
PAR-I/O STOP LGC
STOP LGC=NO set
      ←/→ ENT:Set
Mode --- --- ---
```

Ⓒ Select using [←][→].
[F1] to TST mode [↓][↑]

C.OFF logic

```
PAR-I/O C.OFF LGC
C.OFF LGC=NO set
      ←/→ ENT:Set
Mode --- --- ---
```

Ⓓ Select using [←][→].
[F1] to TST mode [↓][↑]

HMSTOP action

```
PAR-I/O HSTOP Act
Act=Dec stop
      ←/→ ENT:Set
Mode --- --- ---
```

Ⓓ Select using [←][→].
[F1] to TST mode [↓][↑]

HMSTOP logic

```
PAR-I/O HSTOP LGC
HSTOP LGC=NO set
      ←/→ ENT:Set
Mode --- --- ---
```

Ⓓ Select using [←][→].
[F1] to TST mode [↓][↑]

HOME/PRESET switching

```
PAR-I/O HO/PR Sel
HO/PR Sel=HOME
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].
[F1] to TST mode [↓][↑]

PRESET position setting

```
PAR-I/O PRESET
PRES= 00000.00mm
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.
[F1] to TST mode [↓][↑]

To pulse input mode switching

Pulse input switching

```
PAR-I/O Pulse Typ
Pulse Typ=2P/1P
      ←/→ ENT:Set
Mode --- --- ---
```

Ⓓ Select using [←][→].
[F1] to TST mode [↓][↑]

LS detection enable/disable

```
PAR-I/O LS Detect
LS Detect=Off
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].
[F1] to TST mode [↓][↑]

LS logic

```
PAR-I/O LS LGC
LS LGC=NO set
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].
[F1] to TST mode [↓][↑]

HOME logic

```
PAR-I/O HOME LGC
HOME LGC=NO set
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].
[F1] to TST mode [↓][↑]

Overtravel action

```
PAR-I/O LS Action
LS Act=Imd stop
      ←/→ ENT:Set
Mode --- --- ---
```

Ⓒ Select using [←][→].
[F1] to TST mode [↓][↑]

- Ⓒ To stop action
- Ⓓ To C.OFF logic

[ESC] to first screen

Motor parameters

Operating current

```
PAR-Mtr Run Cur.
Run Cur.=100%
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓][↑]

Standstill current

```
PAR-Mtr Stop Cur.
Stop Cur.=50%
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓][↑]

Speed filter

```
PAR-Mtr Filter
Filter=003ms
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓][↑]

END signal detection width

```
PAR-Mtr END Width
END Width=00256
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓][↑]

To operating current

[ESC] to first screen

Home parameters

Return direction

```
PAR-Hmp HomeDir
HomeDir=To Motor
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].

[F1] to TST mode

[↓][↑]

Home offset

```
PAR-Hmp Offset
Pos= 00000.00mm
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓][↑]

Return mode

```
PAR-Hmp Home Type
Home=Push1
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].

[F1] to TST mode

[↓][↑]

Starting speed of return

```
PAR-Hmp Start Spd
HVs=00006.00mm/s
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓][↑]

Operating speed of return

```
PAR-Hmp Run Spd
HVr=00006.00mm/s
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓][↑]

To return direction

[ESC] to first screen

Initialize parameters

Initialize parameters

```
PAR-Ini PAR Clear
PAR reset
OK?:No     ENT:Set
Mode --- Yes No
```

[F1] To TST mode

[F3]

[F4] To first screen

Screen displayed during the processing

```
PAR-Ini PAR Clear
PAR reset
Wait for a moment
 --- --- --- ---
```

To the first screen after completion.

Speed parameters C

Starting speed

```
PAR-Spd Start Spd
Vs =00006.00mm/s
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Acceleration rate No.0

```
PAR-Spd Acc#0
Acc=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Deceleration rate No.0

```
PAR-Spd Dec#0
Dec=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Acceleration rate No.1

```
PAR-Spd Acc#1
Acc=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Deceleration rate No.1

```
PAR-Spd Dec#1
Dec=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Acceleration rate No.2

```
PAR-Spd Acc#2
Acc=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Deceleration rate No.2

```
PAR-Spd Dec#2
Dec=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Acceleration rate No.3

Acceleration rate No.3

```
PAR-Spd Acc#3
Acc=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Deceleration rate No.3

```
PAR-Spd Dec#3
Dec=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Common operating speed

```
PAR-Spd Rmt Spd
Vr =00100.00mm/s
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

To starting speed

[ESC] to first screen

Speed parameters D

Acceleration rate No.0

```
PAR-Spd Acc#0
Acc=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Deceleration rate No.0

```
PAR-Spd Dec#0
Dec=00000.45m/s2
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1] to TST mode

[↓] [↑]

Acceleration rate No.0

[ESC] to first screen

Common parameters C

Softlimit

```
PAR-Com Soft Lim
Soft Lim=On
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].

[F1]
to TST mode

[↓] [↑]

Upper softlimit

```
PAR-Com Soft Lim+
Lim+=00501.00mm
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1]
to TST mode

[↓] [↑]

Lower softlimit

```
PAR-Com Soft Lim-
Lim-=-00001.00mm
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1]
to TST mode

[↓] [↑]

Area 1

```
PAR-Com Area1
Area1=00000.00mm
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1]
to TST mode

[↓] [↑]

Area 2

```
PAR-Com Area2
Area2=00000.00mm
   10keys ENT:Set
Mode --- --- ---
```

Enter using the numerical keys.

[F1]
to TST mode

[↓] [↑]

Coordinate setting

```
PAR-Com Pos Dir
+Dir=Opp Motor
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].

[F1]
to TST mode

[↓] [↑]

[←] key direction

```
PAR-Com ←key Dir
←Dir=To Motor
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].

[F1]
to TST mode

[↓] [↑]

To softlimit

[ESC] to first screen

Common parameters D

Coordinate setting

```
PAR-Com Pos Dir
+Dir=Opp Motor
      ←/→ ENT:Set
Mode --- --- ---
```

Select using [←][→].

[F1]
to TST mode

[ESC] to first screen

■ TST mode

Ⓒ Display or switching in the controller mode
Ⓓ Display or switching in the driver mode

First screen Ⓒ

Item selection

```
TST            ID00
Select
          F2/F3/F4
Mode I/O Mnu Opr
```

[F1] To EXT mode
[F2] To I/O checking
[F3] To manual operation
[F4] To positioning operation

[ESC] to first screen of PAR mode

First screen Ⓓ

Item selection

```
TST            ID00
Select
               F2
Mode I/O --- ---
```

[F1] To EXT mode
[F2] To I/O checking

[ESC] to first screen of PAR mode

I/O checking Ⓒ

I/O selection

```
TST-I/O
Select
          F2/F3/F4
Mode In  Out Enc
```

[F1] To EXT mode
[F2] To input check
[F3] To output check
[F4] To encoder pulse output check

[ESC] to first screen

Input check

```
TST-I/O-In In1
START ・  ACL/CK ・
FREE  ・  STOP   ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In In2
M=00 (Bit:000000)
M5 ・  M4 ・  M3 ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In In3
M2 ・  M1 ・  M0 ・
HOME ・   REQ ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In In4
/EMG ・
FWD  ・   RVS ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In S-IN
+LS  ・   -LS ・
HOME ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In All
IN・・*・・・・*・・・・・・・
              S-IN・・・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑] To In1

[ESC] to I/O selection

Output check

```
TST-I/O-Out Out1
/ALM ・
          F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out2
MOVE ・
          F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out3
T-UP/OUT1 ・
          F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out4
AREA/OUT0 ・
          F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out5
END/OUTR ・
          F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out All
OUT・・・・・
   98765
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑] To Out1

[ESC] to I/O selection

Encoder pulse output check

```
TST-I/O-Enc
ASG/BSG ・
               F4:ON
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[ESC] to I/O selection

I/O checking D

I/O selection

```
TST-I/O
Select
          F2/F3/F4
Mode In  Out Enc
```

[F1] [F2] [F3] [F4]

- [F1]: To EXT mode
- [F2]: To input check
- [F3]: To output check
- [F4]: To encoder pulse output check

[ESC] to first screen

Input check

```
TST-I/O-In In1
ACL/CK ・FREE ・
C.OFF  ・HOME ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In In2
REQ ・   /EMG ・
FP  ・   RP   ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In In3
HSTOP ・

Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In S-IN
+LS  ・  -LS ・
HOME ・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

```
TST-I/O-In All
IN・・・・・・・・・
          S-IN・・・
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

To In1

[ESC] to I/O selection

Output check

```
TST-I/O-Out Out1
/ALM ・
         F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out2
MOVE ・
         F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out3
T-UP/OUT1 ・
         F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out4
TIM/OUT0 ・
         F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out Out5
END/OUTR ・
         F4:ON/OFF
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[↓] [↑]

```
TST-I/O-Out All
OUT・・・・・
   98765
Mode --- --- ---
```

[F1] to EXT mode [↓] [↑]

To Out1

[ESC] to I/O selection

Encoder pulse output check

```
TST-I/O-Enc
ASG/BSG ・
             F4:ON
Mode --- --- Push
```

[F1] to EXT mode [F4] Output ON/OFF

[ESC] to I/O selection

Manual operation C

```
TST-Mnu Mnu-Opr
Pos= 00000.00mm
          ←/→,F3/F4
Mode --- PRE HOME
```

[F1] [F3] [F4]

- [F1]: To EXT mode
- [F3]: Current position preset
- [F4]: Return-to-home operation

Positioning operation C

```
TST-Opr #01
POS= 00000.00mm
10key,START/F3/F4
Mode --- PRE HOME
```

[F1] [F3] [F4]

- [F1]: To EXT mode
- [F3]: Current position preset
- [F4]: Return-to-home operation

8 Error handling

If the motorized actuator or controller does not operate correctly during actuator operation, take the appropriate actions by referring to the information provided in this chapter. If normal operation cannot be restored after following the suggested actions, please call our Technical Support Line.

8.1 Troubleshooting

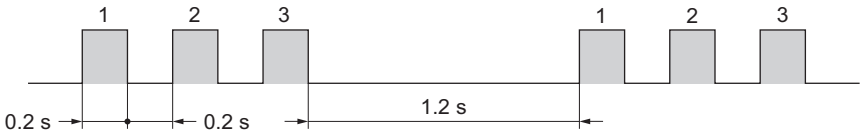
Problem	Cause	Action
The POWER LED does not turn ON.	The logic power supply is not supplied.	Check if the logic power supply is connected correctly. If the POWER LED does not turn on after cycling the logic power supply please call our Technical Support Line.
The CHARGE LED does not turn ON.	The main power is not supplied.	Check if the main power supply is connected correctly. If the CHARGE LED does not turn on after cycling the main power, please call our Technical Support Line.
• A red ALARM LED blinks on the controller. • The teaching pendant screen turns red.	An alarm is present.	Check the number of times the ALARM LED blinks or the error displayed on the teaching pendant, and identify an appropriate action by referring to 8.2, “Causes of alarms and actions” on p.71.
The motorized actuator does not operate.	An alarm is present.	Check the number of times the ALARM LED blinks or the error displayed on the teaching pendant, and identify an appropriate action by referring to 8.2, “Causes of alarms and actions” on p.71.
	The logic power supply is not supplied.	Input the logic power supply confirm that a green POWER LED is on, and then start operation.
	The STOP input is turned ON.	Turn the STOP input OFF.
	An operating data number for which no operating data has been set is selected.	Select an operating data number for which operating data has been set, and then turn the START input ON.
	The operating current is too small.	Increase the setting of the operating current parameter.
The set speed/position differs from the actual speed/position.	The motorized actuator model shown on the controller key is different from the model of the motorized actuator connected to the controller.	Make sure the motorized actuator model shown on the controller key matches the model of the motorized actuator connected to the controller.
The teaching pendant screen is not displayed.	The logic power supply is not supplied.	Input the logic power supply confirm that a green POWER LED is on, and then start operation.
	The pendant switch is turned OFF.	Turn the pendant switch ON.
	The teaching pendant is not connected to the controller.	Connect the teaching pendant to the controller.
Pressing the emergency stop button on the teaching pendant does not actuate an emergency stop.	The pendant switch is turned OFF.	Turn the pendant switch ON. The teaching pendant cannot be used if the pendant switch is OFF.
An optional battery is connected, but the current position cannot be backed up.	The controller is not set to the absolute mode (factory setting: incremental mode).	Set mode switch No.3 to ON, and then cycle the logic power supply.
	A battery alarm is present.	Check the number of times the ALARM LED blinks or the error displayed on the teaching pendant, and identify an appropriate action by referring to 8.2, “Causes of alarms and actions” on p.71.

Problem	Cause	Action
Large vibration noise occurs during low-speed operation.	The rotor position detection sensor of the motorized actuator has not been adjusted in combination with the controller.	Perform constant-speed operation for at least 50 mm (1.97 in.) at a speed of 0.4 to 60 mm/s (0.0157 to 2.36 in/s). This will complete the combined adjustment of the motorized actuator and controller.
The teaching pendant shows the following screen, and the screen turns red. No ID's detected1 F1:Check ID again	The controller is not communicating correctly with the teaching pendant.	Check the connection of the teaching pendant, and then cycle the power.

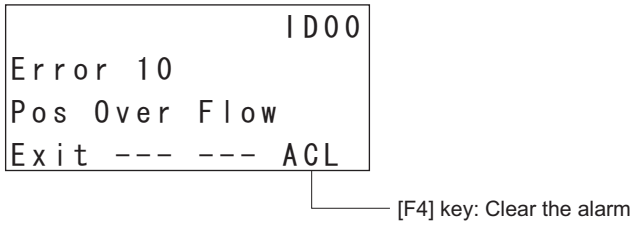
8.2 Causes of alarms and actions

■ How to check and reset an alarm

1. Count the number of times the ALARM LED blinks.
When an alarm occurs, the ALARM LED will repeat a certain blink pattern as shown below (the LED blinks three times in this example).



2. If a teaching pendant is connected, an error message is displayed and the backlight illuminates in red.
Example:
Display when an excessive position deviation alarm (Err10) has occurred



3. Check the cause by referring to “Alarm list” on p.72, and take the appropriate action.
An alarm can be reset in one of the following three ways:
- Cycle the power.
- Input an ACL signal once (one-shot).
- If a teaching pendant is connected, press the [F4] key.

Those alarms for which “Invalid” is shown in the ACL field of the “Alarm list” must be reset by cycling the power.

4. If you cannot remove the cause of the alarm or the alarm cannot be reset even after the cause has been removed, please call our Technical Support Line.

■ Alarm list

When an alarm occurs, the controller will perform one of the following two operations based on software control via the CPU:
Operation 1: Cut off the motor current and actuate the electromagnetic brake.
Operation 2: Stop the motor.

- No. of ALARM LED blinks: 2

Description	Display	Operation	Causes	Action	ACL
Controller overheat	Err21 Over Heat	1	The controller's heat-sink temperature reached approx. 85 °C (185 °F).	Check the operating condition of the motorized actuator and the ventilation condition inside the enclosure.	Valid
Overload	Err30 Over Load	1	A load exceeding the maximum thrust force was applied for five seconds or more.	Reduce the load or decrease the acceleration.	Valid
Overspeed	Err31 Over Speed	1	The motor speed exceeded 5500 r/min.	An unanticipated load may have been applied during operation. Check the load.	Valid

- No. of ALARM LED blinks: 3

Description	Display	Operation	Causes	Action	ACL
Overvoltage	Err22 Over Voltage	1	The DC voltage of the main circuit is too high.	Reduce the load or decrease the acceleration.	Valid
Main power OFF detection	Err23 Main Power Off	1	Main power OFF detection	Check to see if the main power is input correctly.	Valid

- No. of ALARM LED blinks: 4

Description	Display	Operation	Causes	Action	ACL
Excessive position deviation	Err10 Pos Over Flow	1	The deviation between the command position and actual position exceeded three motor shaft revolutions.	Reduce the load or decrease the acceleration.	Valid

- No. of ALARM LED blinks: 5

Description	Display	Operation	Causes	Action	ACL
Overcurrent	Err20 Over Current	1	The motor cable was shorted.	Check the motor cable and its connection to the controller.	Invalid

- No. of ALARM LED blinks: 6

Description	Display	Operation	Causes	Action	ACL
Emergency stop	Err68 EMG Error	1	An emergency stop input was detected.	• Release the emergency stop button on the teaching pendant. • If no teaching pendant is connected, check if the pendant switch is OFF. • The fuse of the teaching pendant has blown. Please call our Technical Support Line or contact your nearest Oriental Motor branch or sales office.	Invalid

- No. of ALARM LED blinks: 7

Description	Display	Operation	Causes	Action	ACL
Insufficient ABS battery voltage	Err27 Low Battery Error	2	The ABS backup battery voltage dropped to, or below, the specified value. (If the absolute position has been lost, then alarm code 33 “Absolute position loss error,” is displayed instead.)	• Charge the battery for 48 hours. • After resetting the alarm, perform a return-to-home operation. • If this alarm generates frequently, the battery may be suffering from memory effect* or may have reached its life. Please call our Technical Support Line or contact your nearest Oriental Motor branch or sales office.	Valid
Absolute position loss	Err33 Position Lost	2	• After the purchase, the power was turned on without charging the battery first. • The battery has reached its life.	Charge the battery for 48 hours.	Valid
			• The battery is not connected or the power was turned on for the first time after connection. • The motor cable was disconnected when the main power was OFF. • The battery cable became open or a fuse in the battery was blown.	After resetting the alarm, perform a return-to-home operation.	
LS logic error	Err60 LS Logic Error	2	The −LS and +LS sensors were detected in the sensor-enable mode.	Reset the alarm, and then check the logic of the installed sensors and the logic setting in the LS logic setting parameter.	Valid
LS reverse connection error	Err61 LS Rev Error	2	The LS sensor opposite to the operating direction was detected during a return-to-home operation. (2-sensor mode, 3-sensor mode)	Reset the alarm, and then check the +LS and −LS wiring.	Valid
Return-to-home error	Err62 Home Sequence Error	2	A return-to-home operation did not complete normally.	• An unanticipated load may have been applied during the return-to-home operation. Check the load. • If the installation positions of +LS, –LS and HOMELS are close to one another, the return-to-home sequence may not end properly, depending on the starting direction of return-to-home operation. Review the sensor installation positions and the starting direction of return-to-home operation. • Return-to-home operation may have been performed in a condition where both +LS and –LS were detected. Check the logic of the installed sensors and the logic setting in the LS logic setting parameter.	Valid
HOMELS non-detection error	Err63 NoHome Detect	2	The HOMELS signal is not output at a position between +LS and –LS during HOME operation (3-sensor mode).	Set a HOME sensor between the limit sensors (+LS, –LS).	Valid

* Memory effect refers to a phenomenon where the apparent battery capacity drops due to repeated partial charges and discharges.

- No. of ALARM LED blinks: 7

Description	Display	Operation	Causes	Action	ACL
LS detection error	Err66 LS Detected	2	The +LS or −LS sensor was detected in the sensor enable mode.	After resetting the alarm, pull the actuator out of the limit sensor via continuous operation or perform return-to-home operation.	Valid
Soft limit detection	Err67 Soft Lim Detected	2	The moving part of the motorized actuator reached a soft limit.	After resetting the alarm, pull the actuator out of the soft limit via continuous operation or perform return-to-home operation.	Valid
HOME offset error	Err6A HOME Offset Error	2	The LS signal was detected during home offset operation.	Reset the alarm, and then check the home offset value.	Valid
Abnormal operating data	Err70 Data Out of Range	2	• Five or more operating data have been linked. • Operating data of different directions have been linked. • Data No.1 is not set in sequence-forward positioning operation. • The operating speed for push-motion operation exceeds 6 mm/s (0.24 in/s).	Check the operating data after resetting the alarm.	Valid

- No. of ALARM LED blinks: 8

Description	Display	Operation	Causes	Action	ACL
Sensor error	Err28 Sensor Error	1	Abnormality was detected in the rotor position detection sensor in the motor while the motor was operating.	Turn off the power and check the motor cable and its connection to the controller, and then cycle the power.	Invalid
Controller key communication error	Err2A Actuator No Connect	1	A communication error with the controller key occurred.	Turn off the power, check the connection with the controller key/controller, and then cycle the power.	Invalid
Sensor error	Err42 Sensor Error	1	The motor cable was not connected when the power was input.	Turn off the power and check the motor cable and its connection to the controller, and then cycle the power. Be sure to perform return-to-home operation after the power is turned on.	Invalid
Rotation at initialization	Err43 Sensor Error	1	Initialization failed because the motor was rotating when the power was turned on.	Check the load. An external load or a load exceeding the specified value has been applied to the moving part of the motorized actuator when the power was turned on.	Invalid
Nonvolatile memory error	Err44 Memory Error	1	Data stored in the controller key was damaged.	Turn off the power and check the controller key and its connection to the controller, and then cycle the power.	Invalid
Motorized actuator combination error	Err45 Actuator Mismatch	1	The supply voltage specification of the controller is different from the supply voltage specification stored in the controller key's motorized actuator information.	Turn off the power, check the connection with the controller key/controller, and then cycle the power.	Invalid

- No. of ALARM LED blinks: 9

Description	Display	Operation	Causes	Action	ACL
Subsystem error	Err29 Sub System Error	1	An error occurred during communication between the main and sub CPUs.	Turn off the power, and then cycle the power.	Invalid
Nonvolatile memory error	Err41 Memory Error	1	• The stored data was damaged. • Rewrite life of the EEPROM (approx. 100,000 times) was reached.	Initialize the operating data and parameters in the controller using the teaching pendant or data editing software.	Invalid

8.3 Teaching pendant errors

If a communication error occurs between the teaching pendant and controller, the corresponding message will be displayed and the screen will turn red.

If this screen is displayed, check the controller connection again and press the [F1] key.

Since this is not a controller error, no alarm code is shown nor the ALARM LED turns on.

The motorized actuator continues to perform the operation it was performing immediately before the error.

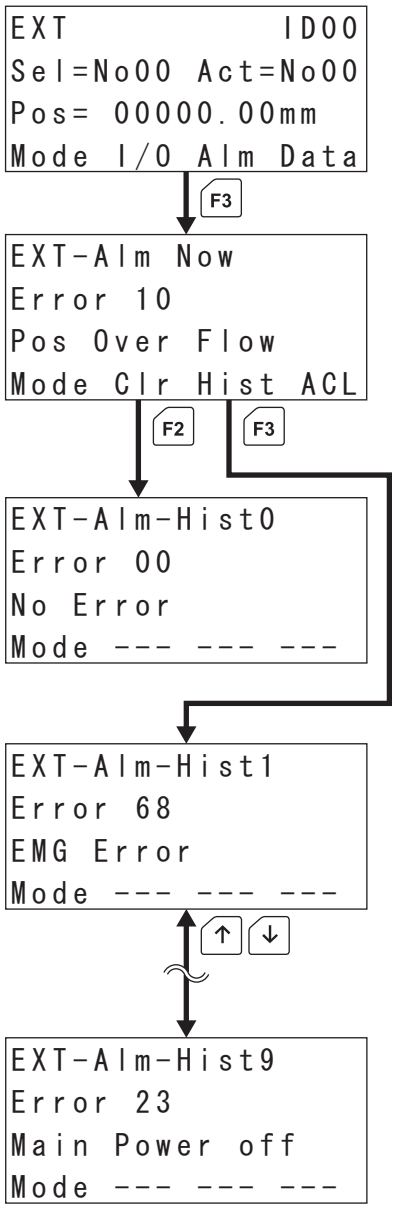
Error	Pendant display
Not connected	No ID's detected1 F1:Check ID again
Communication error	Com Error F1:Check ID again F2:Ignore Err ID
Not recognized	No ID's detected2 F1:Check ID again

8.4 Checking and clearing the alarm history

1. Press the [F3] key on the first screen of the EXT mode.

2. Press the [F2] key to clear the alarm history.
   Press the [F3] key to display the latest alarm history.

3. Press the [↑] [↓] key to display the history of alarms generated to date. Up to ten alarms from the most recent one can be displayed.



9 Specifications of main power supply

■ EZS Ⅱ series

Controller model	Power supply specification	EZSM3 EZSM4	EZSM6
ESMC-K2	24 VDC	1.7 A	4.0 A
ESMC-A2	Single-phase 100-115 V	3.0 A	5.0 A
ESMC-C2	Single-phase 200-230 V	2.1 A	3.0 A

■ SPF Ⅱ series

Controller model	Power supply specification	SPFM6 SPFM8
ESMC-K2	24 VDC	4.0 A
ESMC-A2	Single-phase 100-115 V	5.0 A
ESMC-C2	Single-phase 200-230 V	3.0 A

■ SPR Ⅱ series

Controller model	Power supply specification	SPRM4	SPRM6	SPRM8
ESMC-K2	24 VDC	1.0 A	1.7 A	4.0 A
ESMC-A2	Single-phase 100-115 V	−	3.0 A	5.0 A
ESMC-C2	Single-phase 200-230 V	−	2.1 A	3.0 A

■ ESR series

Controller model	Power supply specification	ESRM3 ESRM4	ESRM5	ESRM6	ESRM8
ESMC-K2	24 VDC	1.0 A	1.1 A	1.7 A	4.0 A
ESMC-A2	Single-phase 100-115 V	−	−	3.0 A	5.0 A
ESMC-C2	Single-phase 200-230 V	−	−	2.1 A	3.0 A

■ SPV series

Controller model	Power supply specification	SPVM6	SPVM8
ESMC-K2	24 VDC	4.0 A	−
ESMC-A2	Single-phase 100-115 V	5.0 A	6.0 A
ESMC-C2	Single-phase 200-230 V	3.0 A	3.5 A

■ PWA Ⅱ series

Controller model	Power supply specification	PWAM6	PWAM8
ESMC-A2	Single-phase 100-115 V	6.4 A	6.0 A
ESMC-C2	Single-phase 200-230 V	3.9 A	3.5 A

■ EZC Ⅱ series

Controller model	Power supply specification	EZCM4	EZCM6
ESMC-K2	24 VDC	1.7 A	4.0 A
ESMC-A2	Single-phase 100-115 V	3.0 A	5.0 A
ESMC-C2	Single-phase 200-230 V	2.1 A	3.0 A

■ EZA series

Controller model	Power supply specification	EZAM4	EZAM6
ESMC-K2	24 VDC	1.7 A	4.0 A
ESMC-A2	Single-phase 100-115 V	3.0 A	5.0 A
ESMC-C2	Single-phase 200-230 V	2.1 A	3.0 A

10 Setting ranges and Initial values by series

10.1 List of setting items

■ Operating data

Parameters	Display	Description	Reference
Operating mode	Abs/Inc	Select either the absolute (Abs) mode in which the target position of positioning operation is set by the distance from the home, or the incremental (Inc) mode in which the target position is set by the distance from the current position or the destination of the previous movement.	p.27
Position	Pos	Set the target position of positioning operation.	p.27
Operating speed (Positioning operation)	Spd	Set the speed at which to move the moving part to the target position. If the starting speed is greater than the operating speed, the moving part will operate at the starting speed.	p.27
Operating speed (Push-motion operation)		Set the operating speed (push-motion operation speed) to be used when “Push motion” is selected in the “Operation function” field. Set the push-motion operation speed to 25 mm/s (0.98 in/s) or less [or 6 mm/s (0.24 in/s) or less for the **PWA**Ⅱ series].	p.30
Acceleration/ Deceleration No.	Acc-Dec#	Select a desired acceleration/deceleration from among No.0 to 3. The acceleration/deceleration number indicates a combination of the acceleration number and deceleration number set by speed parameters. For example, acceleration/deceleration No.0 indicates a combination of acceleration No.0 and deceleration No.0.	p.27
Operating function	Func	Single-motion: Operation is performed based on a selected set of operation data. Linked-motion: Operation is performed by linking up to four sets of operation data. Push-motion: The load or other object installed on the moving part is pushed.	p.27
Push-motion current	Push Cur.	Set the current value to be used when “Push motion” is selected in the “Operation function” field. Set the push force using a percentage [%] of the motor rated current. The push force is roughly proportional to the push current.	p.30

■ I/O parameters

Parameters	Display	Description	Reference
Stop action	Act	Select from the following four options the stop method to be used when the STOP input turns ON: Immediate stop, deceleration stop, immediate stop +electromagnetic brake (MB) +current OFF (C.OFF), deceleration stop+electromagnetic brake (MB) +current OFF (C.OFF)	p.35, p.42
Stop logic	STOP LGC	Set the input logic (normally open or normally closed) of the STOP input.	p.35
C.OFF logic	C.OFF LGC	Set the input logic (normally open or normally closed) of the C.OFF input.	p.35
HMSTOP action	Act	Set the stop method to be used when the HMSTOP input turns ON.	p.35, p.42
HMSTOP logic	HSTOP LGC	Set the input logic (normally open or normally closed) of the HMSTOP input.	p.35
HOME/PRESET switching	HO/PR Sel	Set either “HOME input” or “PRESET input” as the function of the HOME/PRESET input terminal.	p.27

Parameters	Display	Description	Reference
PRESET position	PRES	When the PRESET input is turned ON at a desired position, such position will be set as the PRESET position. The setting will be cancelled when a return-to-home operation is performed.	p.27
Pulse input switching	Pulse Typ	Select the pulse input mode to be used in the driver mode.	p.32, p.41
LS detection enable/disable	LS Detect	Set this parameter to “Enable” if limit sensor inputs are to be used.	p.13
LS logic	LS LGC	Set the input logic (normally open or normally closed) of the limit sensor inputs (+LS and -LS).	–
HOME logic	HOME LGC	Set the input logic (normally open or normally closed) of the HOMELS.	p.27
Overtravel	LS Act	Set the stop method to be used upon detection of a limit sensor signal.	–

■ Motor parameters

Parameters	Display	Description	Reference
Operating current	Run Cur.	Set the motor current during operation (other than push-motion operation) as a percentage [%] of the motor rated current. The thrust force during operation is roughly proportional to the operating current.	–
Standstill current	Stop Cur.	Set the motor current at standstill as a percentage [%] of the rated motor current. The holding torque at standstill is roughly proportional to the standstill current.	–
Speed filter	Filter	Set the motor response to the operation commands. The greater the value set in this parameter, the more gradual the speed change becomes at standstill and consequently the smaller the vibration (damping) becomes at standstill. However, positioning takes a longer time.	p.37
END signal detection width	END Width	Set the range within which an END signal will be output. When the Linear and Rotary Actuator stops, the END output will turn ON if the difference between the command position and the actual position is within the END output range.	p.37

■ Home parameters

Parameters	Display	Description	Reference
Return direction	HomeDir	Set the return direction. If the home is on the opposite-motor side and the motor side of the coordinate system is set as negative, set this parameter to “Opposite-motor side.” For the operating coordinates, refer to the common parameter “Coordinate Setting.”	p.25
Home offset	Pos	The home position detected as a result of return-to-home operation is shifted by the distance set as the home offset, and the resulting position is defined as the home (current position= 0 mm).	p.25
Return method	Home	Select the return-to-home operation method from among “Push motion 1,” “Push motion 2,” “2-sensor mode” and “3-sensor mode.” “Push motion 2” is supported by the **EZS** Ⅱ series, **EZC** Ⅱ series and **EZA** series.	p.25
Starting speed of return	HVs	Set the starting speed of return to home.	p.25
Operating speed of return	HVr	Set the operating speed of return to home. The acceleration and deceleration will correspond to the values set in acceleration No.0 and deceleration No.0, respectively.	p.25

■ Speed parameters

Parameters	Display	Description	Reference
Starting speed	Vs	Specify the speed at the start and end of operation (other than return-to-home operation).	p.27
Acceleration	Acc	Set the accelerations corresponding to acceleration/deceleration No.0 to 3.	p.27
Deceleration	Dec	Set the decelerations corresponding to acceleration/deceleration No.0 to 3.	p.27
Common operating speed	Vr	Set the operating speed to be used in remote teaching, manual operation, or continuous operation where M0 to M5 are OFF. The acceleration and deceleration will correspond to the values set in acceleration No.0 and deceleration No.0, respectively. If the starting speed is greater than the common operating speed, the starting speed will be used in the operation.	p.31 p.55 p.59

■ Common parameters

Parameters	Display	Description	Reference
Softlimit enable/disable	Soft Lim	Set this parameter to “Enable” if soft limits are to be used.	p.37
Upper softlimit	Lim +	Set the upper soft limit in the + direction.	p.37
Lower softlimit	Lim −	Set the upper soft limit in the - direction.	p.37
Area 1	Area 1	If the current position is smaller than the value set for area 1, the AREA output will turn ON. If the current position is greater than the value set for area 1, the AREA output will turn OFF.	p.34
Area 2	Area 2	If the current position is smaller than the value set for area 2, the AREA output will turn ON. If the current position is greater than the value set for area 2, the AREA output will turn OFF.	p.34
Coordinate setting	+ Dir	Set the direction of operation coordinates. Set this parameter to “Opposite motor side” to define the opposite-motor side as the positive direction, or set it to “Motor side” to define the motor side as the positive direction.	−
← key direction	←Dir	Set the direction in which to operate when the left arrow key [←] on the pendant is pressed.	−

10.2 EZS Ⅱ series

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	−83886.08 to 83886.07 mm (–3302.60 to 3302.60 in.)	0.00
	Operating speed	Positioning operation 0.01 mm/s to maximum speed	100.00
		Push-motion operation 0.01 to 25.00 mm/s (0.0004 to 0.98 in/s)	−
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, PushMotion	SingleMotion
	Push-motion current	0 to 100%	20
I/O parameters	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	Off
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	0 to 50% For EZSM3 and EZSM4 200-230 V types: 0 to 65%	50 For EZSM3 and EZSM4 200-230 V types: 65
	Speed filter	1 to 100 ms	15
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Return method	Push1, Push2, 2 (2-sensor mode) , 3 (3-sensor mode)	Push1
	Starting speed of return	• Push1, Push2 0.01 to 25.00 mm/s (0.0004 to 0.98 in/s) • 2-sensor mode, 3-sensor mode 0.01 to 200 mm/s (0.0004 to 7.87 in/s) EZSM6E only: 0.01 to 180 mm/s (0.0004 to 7.09 in/s)	6.00 mm/s (0.24 in/s)
	Operating speed of return	• Push2 EZSM□D: 0.01 to 100 mm/s (0.0004 to 3.94 in/s) EZSM□E: 0.01 to 50 mm/s (0.0004 to 1.97 in/s) • 3-sensor mode 0.01 mm/s to maximum speed	6.00 mm/s (0.24 in/s)
Speed parameters	Starting speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s) EZSM6E only: 0.01 to 180 mm/s (0.0004 to 7.09 in/s)	6.00 mm/s (0.24 in/s)
	Acceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Deceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Common operating speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s) EZSM6E only: 0.01 to 180 mm/s (0.0004 to 7.09 in/s)	100.00 mm/s (3.94 in/s)
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	−1.00 mm (−0.04 in.)
	Area 1	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Area 2	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

10.3 SPFⅡseries

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Operating speed	0.01 mm/s to maximum speed	100.00
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, (PushMotion)	SingleMotion
	Push-motion current	0 to 100%	20
I/O PARAMETERS	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	On
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	0 to 50%	50
	Speed filter	1 to 100 ms	12
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Return method	2 (2-sensor mode) , 3 (3-sensor mode)	3
	Starting speed of return	0.01 to 200 mm/s (0.0004 to 7.87 in/s) For the SPFM8C DC input type: 0.01 to 150 mm/s (0.0004 to 5.91 in/s)	SPFM6, SPFM8C: 5.00 mm/s (0.20 in/s) SPFM8B: 10.00 mm/s (0.39 in/s)
	Operating speed of return	0.01 mm/s to maximum speed	SPFM6, SPFM8C: 5.00 mm/s (0.20 in/s) SPFM8B: 10.00 mm/s (0.39 in/s)
Speed parameters	Starting speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s) For the SPFM8C DC input type: 0.01 to 150 mm/s (0.0004 to 5.91 in/s)	SPFM6, SPFM8C: 5.00 mm/s (0.20 in/s) SPFM8B: 10.00 mm/s (0.39 in/s)
	Acceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Deceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Common operating speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s) For the SPFM8C DC input type: 0.01 to 150 mm/s (0.0004 to 5.91 in/s)	100.00 mm/s (3.94 in/s)
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	−1.00 mm (−0.04 in.)
	Area 1	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Area 2	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

Note Push-motion operation can be set for products in the **SPF**Ⅱseries. However, such products are not designed to support the push-motion operation. Accordingly, never perform push-motion operation with any of these products, because the product may be damaged.

10.4 SPR Ⅱ series

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	SPRM4: −8388.608 to 8388.607 mm (−330.260 to330.260 in.) SPRM6, SPRM8: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	SPRM4: 0.000 SPRM6, SPRM8: 0.00
	Operating speed	SPRM4: 0.001 to 50 mm/s (0.00004 to 1.97 in/s) For the SPRM6 DC input type: 0.01 to 100.00 mm/s (0.0004 to 3.94 in/s) For the SPRM6 AC input type: 0.01 to 500.00 mm/s (0.0004 to 19.69 in/s) For the SPRM8 DC input type: 0.01 to 120.00 mm/s (0.0004 to 4.72 in/s) For the SPRM8 AC input type: 0.01 to 350.00 mm/s (0.0004 to 13.78 in/s)	SPRM4: 30.000 SPRM6, SPRM8: 100.00
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, (PushMotion)	SingleMotion
	Push-motion current	0 to 100%	20
I/O PARAMETERS	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	SPRM4: −8388.608 to 8388.607 mm (−330.260 to330.260 in.) SPRM6, SPRM8: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	SPRM4: 0.000 SPRM6, SPRM8: 0.00
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	On
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	0 to 50% For the SPRM6 200 VAC type: 0 to 65%	50 For the SPRM6 200 VAC type: 65
	Speed filter	1 to 100 ms	12
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	SPRM4: −8388.608 to 8388.607 mm (−330.260 to330.260 in.) SPRM6, SPRM8: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	SPRM4: 0.000 SPRM6, SPRM8: 0.00
	Return method	2 (2-sensor mode) , 3 (3-sensor mode)	SPRM4: 2 SPRM6, SPRM8: 3
	Starting speed of return	SPRM4: 0.001 to 50 mm/s (0.00004 to 1.97 in/s) For the SPRM6 DC input type: 0.01 to 100 mm/s (0.0004 to 3.94 in/s) For the SPRM8 DC input type: 0.01 to 120 mm/s (0.0004 to 4.72 in/s) For SPRM6 and SPRM8 AC input types: 0.01 to 200 mm/s (0.0004 to 7.87 in/s)	SPRM4: 0.500 mm/s (0.02 in/s) SPRM6, SPRM8: 5.00 mm/s (0.20 in/s)

Setting items		Setting range	Initial value
	Operating speed of return	SPRM4: 0.01 to 50 mm/s (0.0004 to 1.97 in/s) For the SPRM6 DC input type: 0.01 to 100.00 mm/s (0.0004 to 3.94 in/s) For the SPRM6 AC input type: 0.01 to 500.00 mm/s (0.0004 to 19.69 in/s) For the SPRM8 DC input type: 0.01 to 120.00 mm/s (0.0004 to 4.72 in/s) For the SPRM8 AC input type: 0.01 to 350.00 mm/s (0.0004 to 13.78 in/s)	SPRM4: 0.500 mm/s (0.02 in/s) SPRM6, SPRM8: 5.00 mm/s (0.20 in/s)
Speed parameters	Starting speed	SPRM4: 0.001 to 50 mm/s (0.00004 to 1.97 in/s) For the SPRM6 DC input type: 0.01 to 100 mm/s (0.0004 to 3.94 in/s) For the SPRM8 DC input type: 0.01 to 120 mm/s (0.0004 to 4.72 in/s) For SPRM6 and SPRM8 AC input types: 0.01 to 200 mm/s (0.0004 to 7.87 in/s)	SPRM4: 0.500 mm/s (0.02 in/s) SPRM6, SPRM8: 5.00 mm/s (0.20 in/s)
	Acceleration	SPRM4: 0.001 to 10.00 m/s^2 (0.00328 to 32.8000 ft/s^2) SPRM6, SPRM8: 0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	SPRM4: 0.100 m/s^2 (0.328 ft/s^2) SPRM6, SPRM8: 0.45 m/s^2 (1.476 ft/s^2)
	Deceleration	SPRM4: 0.001 to 10.00 m/s^2 (0.00328 to 32.8000 ft/s^2) SPRM6, SPRM8: 0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	SPRM4: 0.100 m/s^2 (0.328 ft/s^2) SPRM6, SPRM8: 0.45 m/s^2 (1.476 ft/s^2)
	Common operating speed	SPRM4: 0.001 to 50 mm/s (0.00004 to 1.97 in/s) For the SPRM6 DC input type: 0.01 to 100 mm/s (0.0004 to 3.94 in/s) For the SPRM8 DC input type: 0.01 to 120 mm/s (0.0004 to 4.72 in/s) For SPRM6 and SPRM8 AC input types: 0.01 to 200 mm/s (0.0004 to 7.87 in/s)	SPRM4: 30.000 mm/s (1.18 in/s) SPRM6, SPRM8: 100.00 mm/s (3.94 in/s)
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	SPRM4: −8388.608 to 8388.607 mm (−330.260 to330.260 in.) SPRM6, SPRM8: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	SPRM4: −8388.608 to 8388.607 mm (−330.260 to330.260 in.) SPRM6, SPRM8: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	−1.00 mm (−0.04 in.)
	Area 1	SPRM4: −8388.608 to 8388.607 mm (−330.260 to330.260 in.) SPRM6, SPRM8: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Area 2	SPRM4: −8388.608 to 8388.607 mm (−330.260 to330.260 in.) SPRM6, SPRM8: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

Note Push-motion operation can be set for products in the **SPR Ⅱ** series. However, such products are not designed to support the push-motion operation. Accordingly, never perform push-motion operation with any of these products, because the product may be damaged.

10.5 ESR series

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.000
	Operating speed	0.01 mm/s to maximum speed	100.000
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, (PushMotion)	SingleMotion
	Push-motion current	0 to 100%	20
I/O PARAMETERS	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	−8388.608 to 8388.607 mm (−330.260 to330.260 in.)	0.000
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	On
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	0 to 50% ESRM6 only: 0 to 65%	50 ESRM6 only: 65
	Speed filter	1 to 100 ms	15
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	−8388.608 to 8388.607 mm (−330.260 to330.260 in.)	0.000
	Return method	2 (2-sensor mode) , 3 (3-sensor mode)	3
	Starting speed of return	0.001 to 200 mm/s (0.00004 to 7.87 in/s) ESRM3 only: 0.001 to 100 mm/s (0.00004 to 3.94 in/s)	6.000 mm/s (0.24 in/s) ESRM3 only: 2.500 mm/s (0.098 in/s)
	Operating speed of return	0.001 mm/s to maximum speed ESRM3 only: 0.001 to 100 mm/s (0.00004 to 3.94 in/s)	6.000 mm/s (0.24 in/s) ESRM3 only: 2.500 mm/s (0.098 in/s)
Speed parameters	Starting speed	0.001 to 200 mm/s (0.00004 to 7.87 in/s) ESRM3 only: 0.001 to 100 mm/s (0.00004 to 3.94 in/s)	6.000 mm/s (0.24 in/s) ESRM3 only: 2.500 mm/s (0.098 in/s)
	Acceleration	0.001 to 20.000 m/s^2 (0.00328 to 65.6000 ft/s^2)	0.450 m/s^2 (1.476 ft/s^2)
	Deceleration	0.001 to 20.000 m/s^2 (0.00328 to 65.6000 ft/s^2)	0.450 m/s^2 (1.476 ft/s^2)
	Common operating speed	0.001 to 200 mm/s (0.00004 to 7.87 in/s) ESRM3 only: 0.001 to 100 mm/s (0.00004 to 3.94 in/s)	100.00 mm/s (3.94 in/s)
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	−8388.608 to 8388.607 mm (−330.260 to330.260 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	−8388.608 to 8388.607 mm (−330.260 to330.260 in.)	−1.00 mm (−0.04 in.)
	Area 1	−8388.608 to 8388.607 mm (−330.260 to330.260 in.)	0.00 mm
	Area 2	−8388.608 to 8388.607 mm (−330.260 to330.260 in.)	0.00 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

Note Push-motion operation can be set for products in the **ESR** series. However, such products are not designed to support the push-motion operation. Accordingly, never perform push-motion operation with any of these products, because the product may be damaged.

10.6 SPV series

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Operating speed	0.01 to 1500 mm/s (0.0004 to 59.06 in/s) For the SPVM6 DC input type: 0.01 to 400 mm/s (0.0004 to 15.75 in/s)	100.00
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, (PushMotion)	SingleMotion
	Push-motion current	0 to 100%	20
I/O PARAMETERS	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	On
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	0 to 50%	50
	Speed filter	1 to 100 ms	12
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Return method	2 (2-sensor mode) , 3 (3-sensor mode)	3
	Starting speed of return	0.01 to 200 mm/s (0.0004 to 7.87 in/s)	SPVM6: 35.00 mm/s (1.38 in/s) SPVM8: 45.00 mm/s (1.77 in/s)
	Operating speed of return	0.01 to 1500 mm/s (0.0004 to 59.06 in/s) For the SPVM6 DC input type: 0.01 to 400 mm/s (0.0004 to 15.75 in/s)	SPVM6: 35.00 mm/s (1.38 in/s) SPVM8: 45.00 mm/s (1.77 in/s)
Speed parameters	Starting speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s)	SPVM6: 35.00 mm/s (1.38 in/s) SPVM8: 45.00 mm/s (1.77 in/s)
	Acceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Deceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Common operating speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s)	100.00 mm/s (3.94 in/s)
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	−1.00 mm (−0.04 in.)
	Area 1	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Area 2	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

Note Push-motion operation can be set for products in the **SPV** series. However, such products are not designed to support the push-motion operation. Accordingly, never perform push-motion operation with any of these products, because the product may be damaged.

10.7 PWA Ⅱ series

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	PWAM6: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.) PWAM8: −8388.608 to 8388.607 mm (−330.260 to330.260 in.)	PWAM6: 0.00 PWAM8: 0.000
	Operating speed	Positioningoperation PWAM6: 0.01 to 200.00 mm/s (0.0004 to 7.87 in/s) PWAM8: 0.001 to 70.00 mm/s (0.00004 to 2.76 in/s)	PWAM6: 50.00 PWAM8: 30.000
		Push-motionoperation PWAM6: 0.01 to 6.00 mm/s (0.0004 to 0.24 in/s) PWAM8: 0.001 to 6.00 mm/s (0.00004 to 0.24 in/s)	−
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, PushMotion	SingleMotion
	Push-motion current	0 to 100%	20
I/O PARAMETERS	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	PWAM6: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.) PWAM8: −8388.608 to 8388.607 mm (−330.260 to330.260 in.)	PWAM6: 0.00 PWAM8: 0.000
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	On
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	PWAM6: 0 to 60% PWAM8: 0 to 70%	PWAM6: 60 PWAM8: 70
	Speed filter	1 to 100 ms	12
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	PWAM6: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.) PWAM8: −8388.608 to 8388.607 mm (−330.260 to330.260 in.)	PWAM6: 0.00 PWAM8: 0.000
	Return method	2 (2-sensor mode) , 3 (3-sensor mode)	3
	Starting speed of return	PWAM6: 0.01 to 200 mm/s (0.0004 to 7.87 in/s) PWAM8: 0.001 to 70 mm/s (0.00004 to 2.76 in/s)	PWAM6: 5.00 mm/s (0.20 in/s) PWAM8: 1.600 mm/s (0.06 in/s)
	Operating speed of return	PWAM6: 0.01 to 200 mm/s (0.0004 to 7.87 in/s) PWAM8: 0.001 to 70 mm/s (0.00004 to 2.76 in/s)	PWAM6: 5.00 mm/s (0.20 in/s) PWAM8: 1.600 mm/s (0.06 in/s)
Speed parameters	Starting speed	PWAM6: 0.01 to 200 mm/s (0.0004 to 7.87 in/s) PWAM8: 0.001 to 70 mm/s (0.00004 to 2.76 in/s)	PWAM6: 5.00 mm/s (0.20 in/s) PWAM8: 1.600 mm/s (0.06 in/s)
	Acceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Deceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Common operating speed	PWAM6: 0.01 to 200 mm/s (0.0004 to 7.87 in/s) PWAM8: 0.001 to 70 mm/s (0.00004 to 2.76 in/s)	PWAM6: 50.00 mm/s (1.97 in/s) PWAM8: 30.000 mm/s (1.18 in/s)

Setting items		Setting range	Initial value
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	PWAM6: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.) PWAM8: −8388.608 to 8388.607 mm (−330.260 to330.260 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	PWAM6: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.) PWAM8: −8388.608 to 8388.607 mm (−330.260 to330.260 in.)	−1.00 mm (−0.04 in.)
	Area 1	PWAM6: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.) PWAM8: −8388.608 to 8388.607 mm (−330.260 to330.260 in.)	PWAM6: 0.00 mm PWAM8: 0.000 mm
	Area 2	PWAM6: −83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.) PWAM8: −8388.608 to 8388.607 mm (−330.260 to330.260 in.)	PWAM6: 0.00 mm PWAM8: 0.000 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

10.8 EZC Ⅱ series

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Operating speed	Positioning operation 0.01 mm/s to maximum speed	100.00
		Push-motion operation 0.01 to 25.00 mm/s (0.0004 to 0.98 in/s)	−
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, PushMotion	SingleMotion
	Push-motion current	0 to 100%	20
I/O PARAMETERS	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	Off
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	0 to 50% For the EZCM4 200-230 V type: 0 to 65%	50 For the EZCM4 200-230 V type: 65
	Speed filter	1 to 100 ms	15
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Return method	Push1, Push2, 2 (2-sensor mode) , 3 (3-sensor mode)	Push1
	Starting speed of return	• Push1, Push2 0.01 to 25.00 mm/s (0.0004 to 0.98 in/s) • 2-sensor mode, 3-sensor mode 0.01 to 200 mm/s (0.0004 to 7.87 in/s)	6.00 mm/s (0.24 in/s)
	Operating speed of return	• Push2 EZCM□D: 0.01 to 100 mm/s (0.0004 to 3.94 in/s) EZCM□E: 0.01 to 50 mm/s (0.0004 to 1.97 in/s) • 3-sensor mode 0.01 mm/s to maximum speed	6.00 mm/s (0.24 in/s)
Speed parameters	Starting speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s)	6.00 mm/s (0.24 in/s)
	Acceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Deceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Common operating speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s)	100.00 mm/s (3.94 in/s)
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	−1.00 mm (−0.04 in.)
	Area 1	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Area 2	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

Note When performing a return-to-home operation with any **EZC** Ⅱ series model, do not change the return direction (from the motor side).

10.9 EZA series

Setting items		Setting range	Initial value
Operating data	Operating mode	Inc, Abs	Inc
	Position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Operating speed	Positioning operation 0.01 mm/s to maximum speed	100.00
		Push-motion operation 0.01 to 25.00 mm/s (0.0004 to 0.98 in/s)	−
	Acceleration/ Deceleration No.	0 to 3	0
	Operating function	SingleMotion, LinkedMotion, PushMotion	SingleMotion
	Push-motion current	0 to 100%	20
I/O PARAMETERS	Stop action	Imd stop, Dec stop, Imd stop+MB+C.OFF Dec stop+MB+C.OFF	Dec stop
	Stop logic	NO set, NC set	NO set
	C.OFF logic	NO set, NC set	NO set
	HMSTOP action	Imd stop, Dec stop	Dec stop
	HMSTOP logic	NO set, NC set	NO set
	HOME/PRESET switching	HOME, PRESET	HOME
	PRESET position	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Pulse input switching	1P/2P, A/B	1P/2P
	LS detection enable/disable	On, Off	Off
	LS logic	NO set, NC set	NO set
	HOME logic	NO set, NC set	NO set
	Overtravel	Imd stop, Dec stop	Imd stop
Motor parameters	Operating current	0 to 100%	100%
	Standstill current	0 to 50% For the EZAM4 200-230 V type: 0 to 65%	50 For the EZAM4 200-230 V type: 65
	Speed filter	1 to 100 ms	15
	END signal detection width	1 to 32000	256
Home parameters	Return direction	To Motor, Opp Motor	To Motor
	Home offset	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00
	Return method	Push1, Push2, 2 (2-sensor mode) , 3 (3-sensor mode)	Push1
	Starting speed of return	• Push1, Push2 0.01 to 25.00 mm/s (0.0004 to 0.98 in/s) • 2-sensor mode, 3-sensor mode 0.01 to 200 mm/s (0.0004 to 7.87 in/s)	6.00 mm/s (0.24 in/s)
	Operating speed of return	• Push2 EZAM□D: 0.01 to 100 mm/s (0.0004 to 3.94 in/s) EZAM□E: 0.01 to 50 mm/s (0.0004 to 1.97 in/s) • 3-sensor mode 0.01 mm/s to maximum speed	6.00 mm/s (0.24 in/s)
Speed parameters	Starting speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s)	6.00 mm/s (0.24 in/s)
	Acceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Deceleration	0.01 to 20.00 m/s^2 (0.0328 to 65.6000 ft/s^2)	0.45 m/s^2 (1.476 ft/s^2)
	Common operating speed	0.01 to 200 mm/s (0.0004 to 7.87 in/s)	100.00 mm/s (3.94 in/s)
Common parameters	Softlimit enable/disable	On, Off	On
	Upper softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	Valid stroke +1 mm (+0.04 in.)
	Lower softlimit	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	−1.00 mm (−0.04 in.)
	Area 1	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Area 2	−83886.08 to 83886.07 mm (−3302.60 to 3302.60 in.)	0.00 mm
	Coordinate setting	To Motor, Opp Motor	Opp Motor
	← key direction	To Motor, Opp Motor	To Motor

Note When performing a return-to-home operation with any **EZA** series model, do not change the return direction (from the motor side).

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