CKD

SM-612271

INSTRUCTION MANUAL

Electric Actuator

EC07/EC63/ECPT (Controller)

- Read this manual carefully and thoroughly before using this product.
- Pay extra attention to the instructions concerning safety.
- After reading this manual, keep it in a safe and convenient place.

2nd Edition

CKD Corporation

To use this product safely

Before use, be sure to read this instruction manual.

When a device using an electric actuator is designed, it is necessary to manufacture a safe device, checking that the system that is operated according to the machine mechanism of the device and by an electric machine control is surely safe.

To use our product safely, the selection, use and handling of the product and appropriate safety control are important.

To secure the safety of the device, be sure to observe the warning and caution matters.

Please design a safe device by checking that the safety in the device can be secured.

DANGER	A limited case where it is assumed that a dangerous situation will occur in which a death or severe injury will be caused and the urgency (degree of imminency) when danger occurs is high if the product is handled wrongly.
WARNING	A case where it is assumed that a dangerous situation will occur in which a death or severe injury will be caused if the product is handled wrongly.
CAUTION	A case where it is assumed that a dangerous situation will occur in which a minor injury will be caused or only physical damage will occur if the product is handled wrongly.

In this instruction manual, the ranks of safety precautions are classified as “Danger”, “Warning” and “Caution”.

A matter written in “Caution” may lead to a critical result depending on the situation.

All the descriptions are important, so be sure to observe them.

⚠ DANGER

Do not use the product for the following usage.

- Medical equipment related to maintenance, control, etc. of human life and body
- Mechanism and machine device for movement and transfer of person
- Important safety parts of machine device

<At time of designing and selection>

- Do not use the product in a place where there are dangerous substances such as an igniting substance, inflammable substance and explosive substance. Ignition, inflammation or explosion may occur.
- The product should not be splashed with water droplets, oil droplets, etc. A fire accident or failure may be caused.
- When attaching the product, be sure to perform reliable retention and fixation (including workpieces). An injury may be caused due to a fall, drop, abnormal operation, etc. of the product.
- Be sure to use a DC stabilized power (DC 24 V ± 10%) with an allowance as a power for the motor, power for control and power for the input/output circuit. If this product is connected directly to an AC power, a fire accident, rupture, damage may be caused.

<At time of attachment, installation and adjustment>

- When the product can operate, do not enter the operation range. An injury may be caused due to an unexpected operation of the product etc.
- In the case of the ERL2 series, a finger etc. may be caught between the motor part and slider. Care should be taken.

⚠ WARNING

- This product has been designed and manufactured as a component for general industrial machines. So it should be handled by a person with sufficient knowledge and experience.
- Use it within the specification scope of the product.
  It cannot be used outside the specifications specific to the product. No modification and additional processing of the product must be performed.
  The applicable scope of this product is use as a device or component for general industrial machines, so outdoor use and use under the following conditions and environments are excluded from the applicable scope.
  (However, at the time of adoption, if you consult us and understand the specifications of our product, it will be applicable, but take safety measures to prevent danger even if a failure occurs.)
  (1) Use for purposes for which safety is required such as nuclear power, railroads, aviation, ships, vehicles, medical machines, equipment touching drinks and food directly and for its purposes, amusement equipment, emergency operation (shutoff, opening, etc.) circuits, press machines, brake circuits and safety measures.
  (2) Use for purposes for which safety is required particularly in which people and properties are expected to be affected significantly.
- Be sure to observe the organization standards, laws, etc. on safety related to device designs.
- Never remove equipment until the safety has been checked.
  (1) The inspection and maintenance of machines and devices should be performed only after their safety is checked in all systems related to this product.
  (2) Even when an operation is stopped, there may be a high-temperature part and live part, so perform them carefully.
  (3) The inspection and maintenance of equipment should be performed only after the powers of the device and relevant equipment are turned off and compressed air in the system is discharged. They should be performed carefully to avoid an electric shock.
- Be sure to observe the instruction manual and precautions of each product to prevent an accident.
  (1) Unexpected movement may be performed during a teaching work and trial run, so be careful not to put your hand into the actuator. If an operation is performed from a position where the shaft body cannot be seen, be sure to check that it is safe even if the actuator moves before an operation.
- Be sure to observe the precautions to prevent an electric shock.
  (1) Do not touch the heatsink, cement resistance and motor in the controller.
  They are hot and may cause a burn injury. An inspection etc. should be performed only after a sufficient time has passed. Even immediately after the power is turned off, a high voltage is applied until electric charge accumulated in the inside condenser is discharged, so do not touch it for approximately 3 minutes.
  (2) Before maintenance and an inspection, turn off the switch of the controller power supply. An electric shock due to a high voltage may occur.
  (3) Do not attach and remove connectors with the power on. A malfunction, failure or electric shock may occur.
- Install overcurrent protective equipment.
  As for wiring for the controller, install overcurrent protective equipment (breaker for wiring or circuit protector, etc.) to the primary side of the power for powers (power connector and power terminal block) and for control (input/output connector) in accordance with “JIS B 9960-1: 2008 Safety of machinery -- Electrical equipment of machines -- Part 1: General requirements”.

  (Excerpt from JIS B 9960-1 7.2.1 General information)

  If a current in the circuit of a machine exceeds the rating of the component or the current capacity of the conductor, whichever is lower, take preventive measures against overcurrent. The rated values or set values to be used are described in Paragraph 7.2.10.

- Do not execute a command lower than the minimum resolution and a command lower than the repetitive positioning accuracy of the encoder. Normal positioning control may not be performed. (ECPT)

<At time of designing and selection>

- If an emergency stop is performed, it may take several seconds until a stop depending on the velocity during movement and installed load.
- If the machine stops in the case of an error of the system such as an emergency stop and power failure, design a safety circuit or device so that no device damage, bodily injury, etc. will occur.
- Install safety fences so that workers cannot enter the movable range of the electric actuator. Install the emergency stop button switch in a place where it can be operated easily as a device for an emergency. The structure and wiring should be such that the emergency stop button switch will not return automatically and a person cannot return it carelessly.
- When the shaft body is used without horizontal attachment, use the product with a brake. If servo off (including an emergency stop and alarm) and brake off are performed, the actuator may drop and an injury may be caused.
- The brake with a brake may not necessarily retain the actuator completely in all cases. If safety should be secured, for example, if maintenance is performed for the purpose of moving the slider with an unbalanced load etc. or if the machine is stopped for a long time, retention by the brake only is not reliable. Be sure to make it into a balanced state or install a mechanical lock mechanism.
- Install the product in a place where the humidity is low indoors. In a place splashed with rainwater or place where the humidity is high (humidity is 85% or more, place where condensation occurs), a short circuit or fire accident may be caused. Oil droplets and oil mist are strictly prohibited.
- Use and store the product with no condensation at operation and storage temperatures. An abnormal stop or life reduction of the product may be caused. If heat is not removed, provide ventilation.
- Install the product in a place where there is no direct sunlight, dust, vicinity of a heating element, corrosive gas, explosive gas, inflammable gas and combustible substance. Chemical resistance has not been taken into account.
- Use and store the product in a place where there are no strong electromagnetic waves, ultraviolet rays and X-rays. A malfunction or failure may be caused.

<At time of attachment, installation and adjustment>

- Since precision parts are contained, avoid overturning, vibrations and shocks during conveyance.
- Put the product in a horizontal state when placing it temporarily.
- Do not stand or put an object on the package.
- During transportation and conveyance, the ambient temperature should be -10 to 50°C and the ambient humidity should be 35 to 80% so that no condensation, freezing, etc. will occur.
- Attach the product to an incombustible substance. If it is attached directly to a combustible substance or attached to the vicinity of a combustible substance, a fire accident may be caused.
- Perform class D grounding (ground resistance: 100 Ω or less) for the product. If a short circuit occurs, an electric shock or malfunction may be caused.
- Perform the wiring of the product without fail while checking it in this document so that no wrong wiring and looseness of connectors will occur. Check the insulation of the wiring. An overcurrent may flow into this product and it may be damaged due to a contact with another circuit, grounding fault or insulation defect between terminals. An abnormal operation or fire accident may be caused.
- Before supplying electricity to the product, be sure to check the safety of the operation range of the equipment. If the LED of the product does not blink even if the power is turned on, turn off the power immediately. If electricity is supplied carelessly, an electric shock or injury may be caused.
- The machine and device should be activated carefully after whether measures have been taken to prevent installed parts from being removed is checked.
- Your hand or body should not touch the product body during an operation or immediately after a stop. A burn injury may be caused.
- Do not stand or put an object on the product. A fall accident, fall of the product, injury due to a drop, damage to the product, malfunction due to damage, runaway, etc. may be caused.
- Even if the power is broken, take measures so that no human body and device will be damaged.
- Do not damage cables. Do not apply unnecessary stress to them. Do not put a heavy object on them. Do not pinch them. A continuity defect or electric shock may be caused.
- When moving a movable part of the product by hand to set it (direct teaching), check that the servo is off using the teaching pendant beforehand.
- The direct teaching function is a teaching operation performed with the servo off. When servo off is done for the actuator, a movable part of the device may perform unintentional movement. At the time of servo off switching, take measures to prevent danger and operate it considering the safety sufficiently.
- Before operating the actuator, check that it is safe even if the actuator operates.

⚠ CAUTION

<At time of designing and selection>

- Avoid using this product in a place where a high current or ferromagnetic field occurs. In addition, avoid arranging the cables of this product along high-power motor power lines, sharing the same conduit, and using the same type of cables (multicore cables) as those of such power lines, so that no induction noise will be applied during wiring. Be careful of an inverter power and wiring part (same wiring and piping are unacceptable) used for a robot etc. Provide the frame ground of the same power and be sure to insert a filter into the output part.
- If this product's output part and induction loads that generate a surge, such as a solenoid valve and relay, share the power, a surge current will flow into the output part and damage may be caused, so separate the output system of an induction load and this product's output power. If the power cannot be separated, connect surge absorbing elements in parallel directly to all the induction loads.
- Select a power whose capacity has an allowance for the number of products installed. If the capacity has no allowance, a malfunction may be caused.
- Do not disassemble the product.
- A fixed cable cannot be used for usage associated with repetitive bending. In the case of use at a point associated with repetitive bending, connect it to a movable cable.
- Fix a movable cable so that it will not move easily. When fixing a cable, do not bend it to an acute angle (bending radius: 68 mm or less).
- The origin position is recognized when the power is turned on. If there is an outside stopper or retention mechanism (brake etc.) when the power is turned on, an unintended position may be recognized as the origin position. Pay attention to the layout of the outside stopper etc. so that the origin can be detected without fail after the power is turned on.
- The customer should have the responsibility to check the conformance of our product to a system, machine and device used by the customer.

<At time of attachment, installation and adjustment>

- Do not hold a movable part and cable part of the product during transfer and installation. An injury or disconnection may be caused.
- Do not install the product in a place subjected to strong vibrations or shocks.
- Do not operate a movable part of the product with external force. Do not perform an operation with sudden deceleration. A malfunction or damage may occur due to a regenerative current.
- Do not hit the piston rod and table on the mechanical stopper etc. except for an origin return and pressing operation. Feed screws may be damaged due to shocks and an operation defect may be caused.
- Do not apply external force to the actuator during an origin return. The origin may be recognized wrongly.
- There should be no dent, scratch, etc. on movable parts. An operation defect may be caused.
- The durability will vary depending on the transfer load, environment, etc. Suitable actuators should be chosen so that they can transfer loads satisfactorily. Movable parts should not be subjected to shocks.
- Wires which have not been used must be insulated. A malfunction, failure or electric shock may occur.

<At time of use and maintenance>

- Wiring work and inspections should be performed by professional engineers.
- Wiring should be performed only after the product is installed. An electric shock may be caused.
- Do not work with wet hands. An electric shock may be caused.
- Wiring work and inspections should be performed only after 5 minutes have passed since the power is turned off and the voltage is checked using a tester etc. An electric shock may be caused.
- Do not attach and remove wires and connectors with the power on. A malfunction, failure or electric shock may occur.
- As for a lead wire used for a power cable, use a wire diameter which can allow the maximum instantaneous current sufficiently. Heat generation or damage may occur during an operation.
- Only the dedicated cable can be connected to the I/O, SIO, encoder and connector for the motor of the product. A failure of the product or unexpected accident may be caused.
- Conduct periodic inspections two to three times per year to check that the product operates normally.
- The greasing interval should be approximately 100 km normally. However, it will vary depending on the use conditions, so it is recommended to determine the greasing interval by an initial inspection.

- If abnormal heat generation, smoke generation, abnormal odor, abnormal sound, vibrations, etc. occur in the product, turn off the power immediately. Damage to the product or a fire accident due to a continuous current flow may be caused.
- If the servo is turned off with gravity or inertia force applied, it may continue to operate or drop. These operations should be performed in an equilibrium state where no gravity and inertia force are applied or after the safety is checked without fail.
- When performing maintenance, an inspection and repair, be sure to stop the power supply to this product beforehand. Call others' attention so that a third party will not turn on the power carelessly.
- When disposing of the product, be sure to outsource it to a professional waste disposer etc. in accordance with the laws on waste disposal and cleaning.
- In the control board contained in this product, a condenser is connected between the same circuit and metal body to prevent static electricity damage. So do not perform a withstand voltage test and insulation resistance test in the device to which this product is attached. If they are performed, this product will be damaged. If necessary as a device, perform them after removing this product.
- When performing electric machine welding work for a device to which this product is attached, remove all the F.G. (frame ground) connections of this product beforehand. If the work is performed without the connections removed, this product may be damaged due to a welding current or transient high voltage or surge voltage during welding.
- Do not use the product in an environment where a ferromagnetic field occurs. A malfunction may be caused.
- Do not disassemble and modify the product. An injury, accident, malfunction, failure, etc. may occur.
- Excessive deviation may be caused during pressing movement. When pressing movement is finished, be sure to execute deviation clear or servo off. (ECPT)
- Do not execute a stop command during acceleration or deceleration. A velocity change (acceleration) is caused and there may be danger. (ECPT)

Warranty clause

The warranty period and warranty scope are shown in the following.

1) Warranty period

The warranty period of the product shall be 1 year from delivery.

(An operating time in one day shall be 8 hours or less. If the end of life is reached within 1 year, the period shall be the warranty period.)

2) Warranty scope

If a failure occurs for which we are responsible during the above warranty period, we will repair the product for free promptly.

However, if any of the following is applicable, it shall be excluded from the scope of this warranty.

[1] If the product is used outside the scope of the conditions and environments written in the product specifications.

[2] If a failure is caused by wrong use and wrong control such as careless handling.

[3] If a failure is caused by a reason other than the delivered product.

[4] If a failure is caused by use other than the appropriate use of the product.

[5] If a failure is caused by a change of a structure, performance, specifications, etc. not related to us and repair not designated by us performed after the delivery.

[6] In the case of damage which can be avoided if your machine and equipment have the functions, structures, etc. that are standard in the industry when this product is assembled to your machine and equipment and used.

[7] If a failure is caused by a reason which is unpredictable with the technology used practically at the time of the delivery.

[8] If a failure is caused by a fire accident, earthquake, flood, lightening, other natural disasters, act of providence, pollution, salt damage, gas disaster, abnormal voltage and other external factors.

The warranty mentioned here means the warranty for the delivered product itself. Damage induced by a failure of the delivered product shall be excluded.

3) Warranty in case where product is exported to another country

[1] If a product is returned to our plant or a company or plant designated by us, we will repair it. Works and costs related to the return shall be excluded from the warranty.

[2] A repaired product will be delivered to a place in Japan designated by the customer using the Japanese packing specifications.

4) Check of conformance

The customer should have the responsibility to check the conformance of our product to a system, machine and device used by the customer.

5) Others

This warranty clause specifies basic matters.
If the warranty descriptions written on the individual specification diagrams or specifications are different from this warranty clause, the specification diagrams or specifications shall be prioritized.

Table of contents

---MEMO---

1. Introduction

Thank you for purchasing our controller for the electric actuator “EC07/EC63/ECPT”. This instruction manual describes basic matters for installation, operations, etc. to fully deliver the performance of the controller for the electric actuator “EC07/EC63/ECPT”. To use the product correctly, read this manual carefully beforehand.

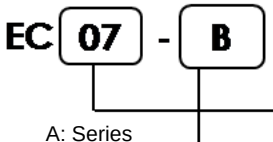
Keep this instruction manual in a safe place to avoid losing it.

- Do not perform handling and operations not written in this instruction manual.
- The specifications and appearance written in this instruction manual are subject to change without notice in the future.

---MEMO---

2. Overview

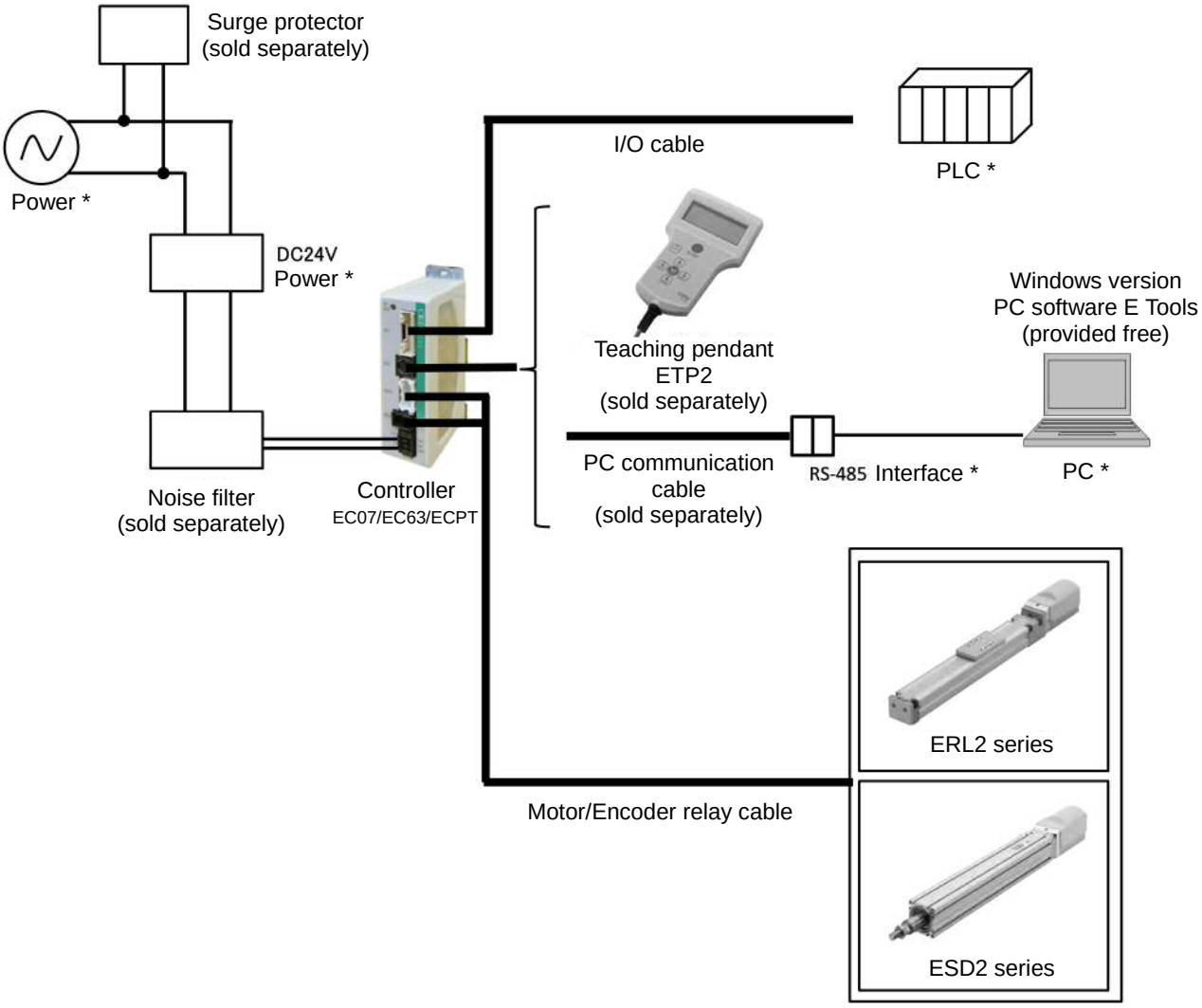
2.1. Controller type code system



A:Series	
7	7 points
63	63 points
PT	Pulse string input positioning type

B:Attachment method	
A	EC07 Standard attachment
B	EC07 DIN rail attachment
C	EC63 Standard attachment
D	EC63 DIN rail attachment
E	ECPT Standard attachment
F	ECPT DIN rail attachment

2.2 System composition



Equipment with * and fine line parts should be prepared by the customer.

Item	Name	Type code
Standard composition (when set type code is selected)	Controller	EC07/EC63/ECPT
	Actuator	ERL2/ESD2 series
	I/O cable	EC-CBLIF
	Motor/Encoder relay cable	EC-CBLME1
Sold separately	Teaching pendant	ETP2
	PC communication cable	EC-CBLPC1
	Surge protector	AX-NSF-RAV-781BXZ-4
	Noise filter	AX-NSF-NF2015A-OD
Provided free	Windows version PC software	E Tools

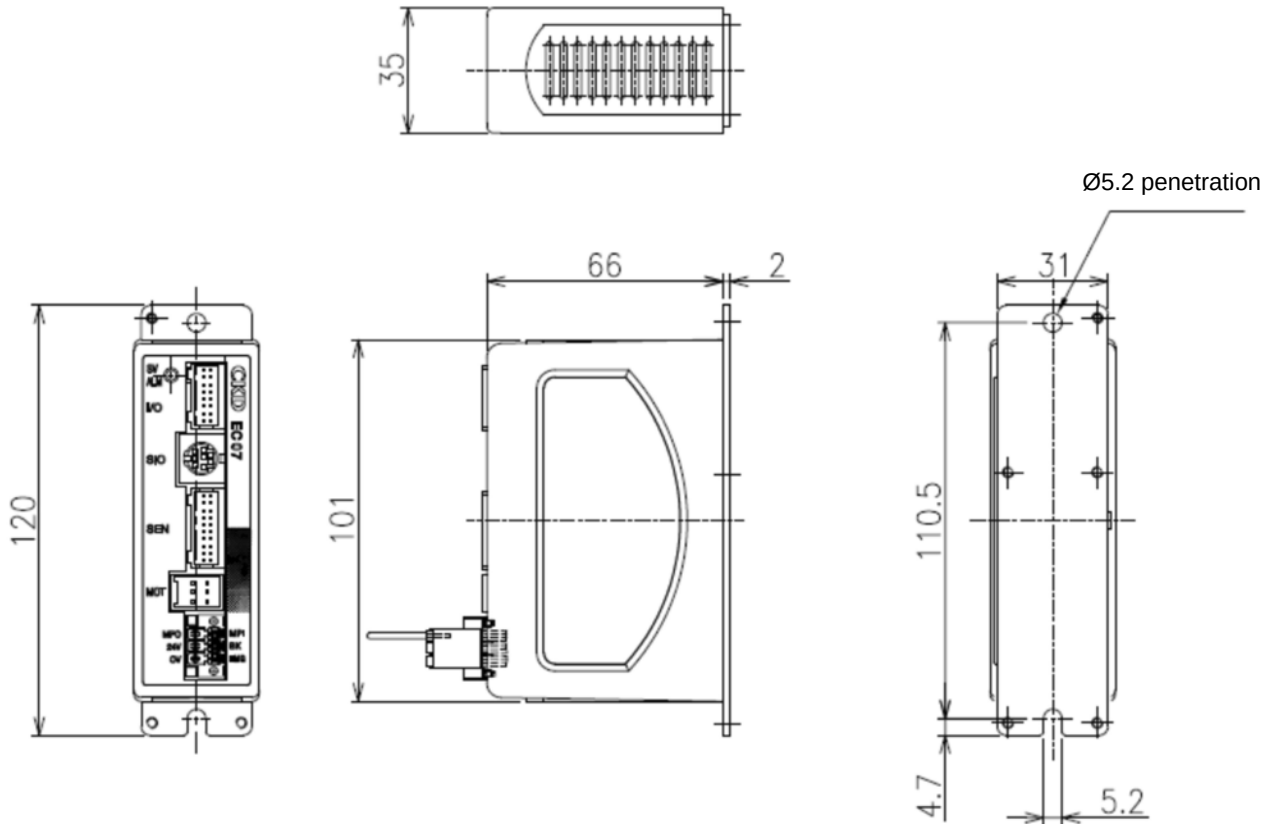
3. Specifications

3.1. Basic specifications

Item	Series		
	EC07	EC63	ECPT
Actuator	ERL2/ESD2 series		
Setting tool	Teaching pendant (ETP2) Setting software E Tools		
PIO mode (maximum number of positioning points)	Standard mode (7 points) Simple mode (3 points) Solenoid valve mode double 2 position type (2 points) Solenoid valve mode double 3 position type (2 points) Solenoid valve mode single type (2 points)	Standard mode (63 points) Simple mode (7 points) Solenoid valve mode double 2 position type (2 points) Solenoid valve mode double 3 position type (2 points) Solenoid valve mode single type (2 points)	(Pulse string control mode Pulse/Direction UP/DOWN A/B phase (4 communication))
Body lamp	Green: Motor energization (motor de-energization during blinking)/ Red: When alarm occurs (can be reset during blinking)		
Number of input points	7 points (photo coupler insulation)	10 points (photo coupler insulation)	7 points (photo coupler insulation and pulse string input terminal are excluded)
Number of output points	7 points (photo coupler insulation)	12 points (photo coupler insulation)	9 points (photo coupler insulation and present position output terminal are excluded)
Motor power shutoff	Open between MPO/MPI terminals in the power connector.		
Emergency stop release	Input DC 24 V ± 10% to the EMG terminal in the power connector.		
Forcible release of electromagnetic brake	Input DC 24 V ± 10% to the BK terminal in the power connector.		
Power voltage	DC 24 V ± 10%		
Power capacity (current consumption)	When ERL2–45, ESD2–35 and 45 are connected: 3.0 A or less When ERL2–60 and ESD2–55 are connected: 4.3 A or less		
Insulation resistance	100 MΩ or more at DC 500 V		
Withstand voltage	AC 1000 V for 1 minute		
Ambient operation temperature	0 ~ 40°C There should be no freezing.		
Ambient operation humidity	35 ~ 80%RH There should be no condensation.		
Ambient storage temperature	-10 ~ 50°C There should be no freezing.		
Ambient storage humidity	35 ~ 80%RH There should be no condensation.		
Atmosphere	There should be no corrosive gas, explosive gas and dust.		
Prevention structure	IEC Standards, Equivalent to IP30		
Mass	Approx. 150 g (standard attachment) Approx. 180 g (DIN rail attachment)	Approx. 180 g (standard attachment) Approx. 210 g (DIN rail attachment)	

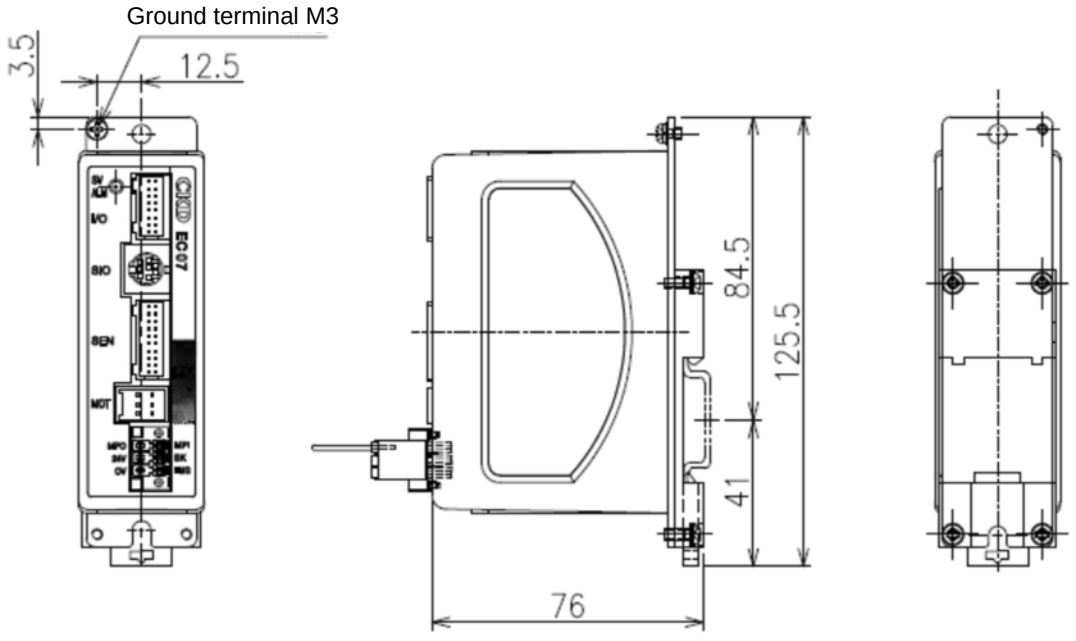
3.2. Outside sizes

• EC07 outside size

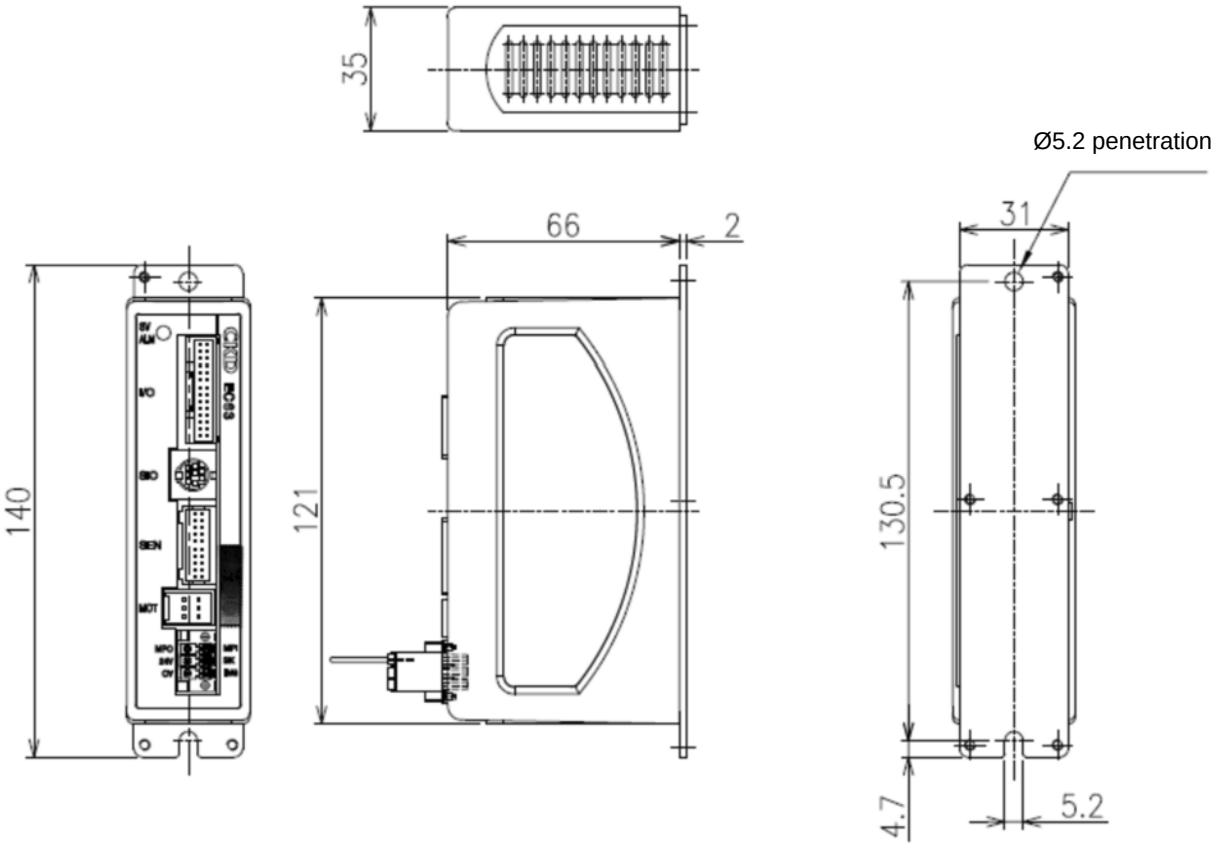


[Option]

*Can be attached to the DIN rail.

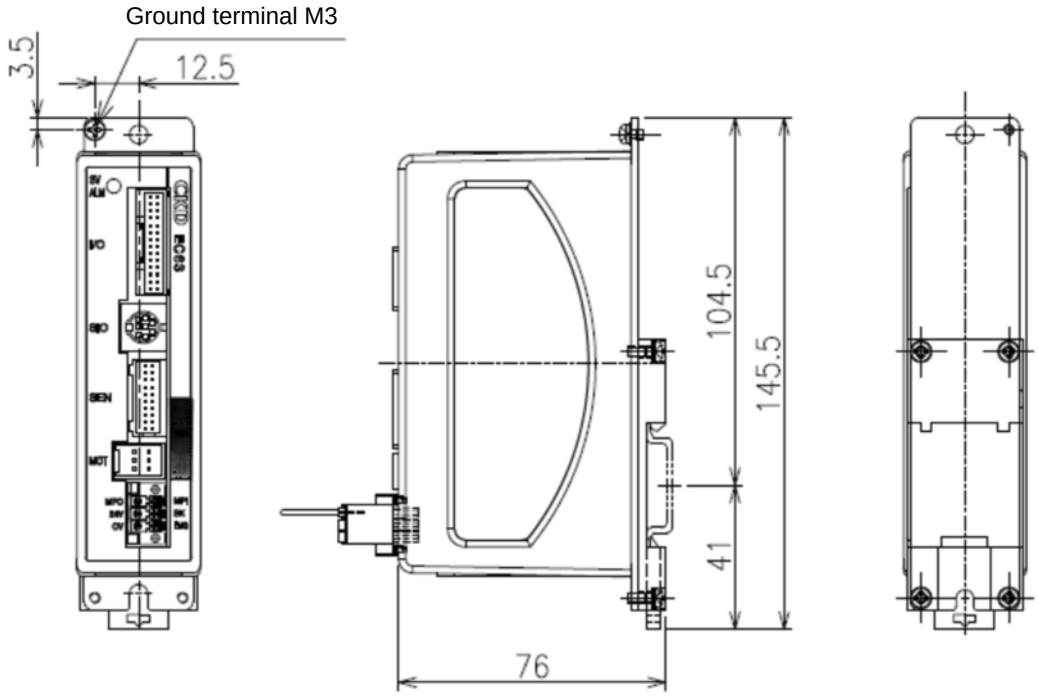


• EC63, ECPT outside size



[Option]

* Can be attached to the DIN rail.



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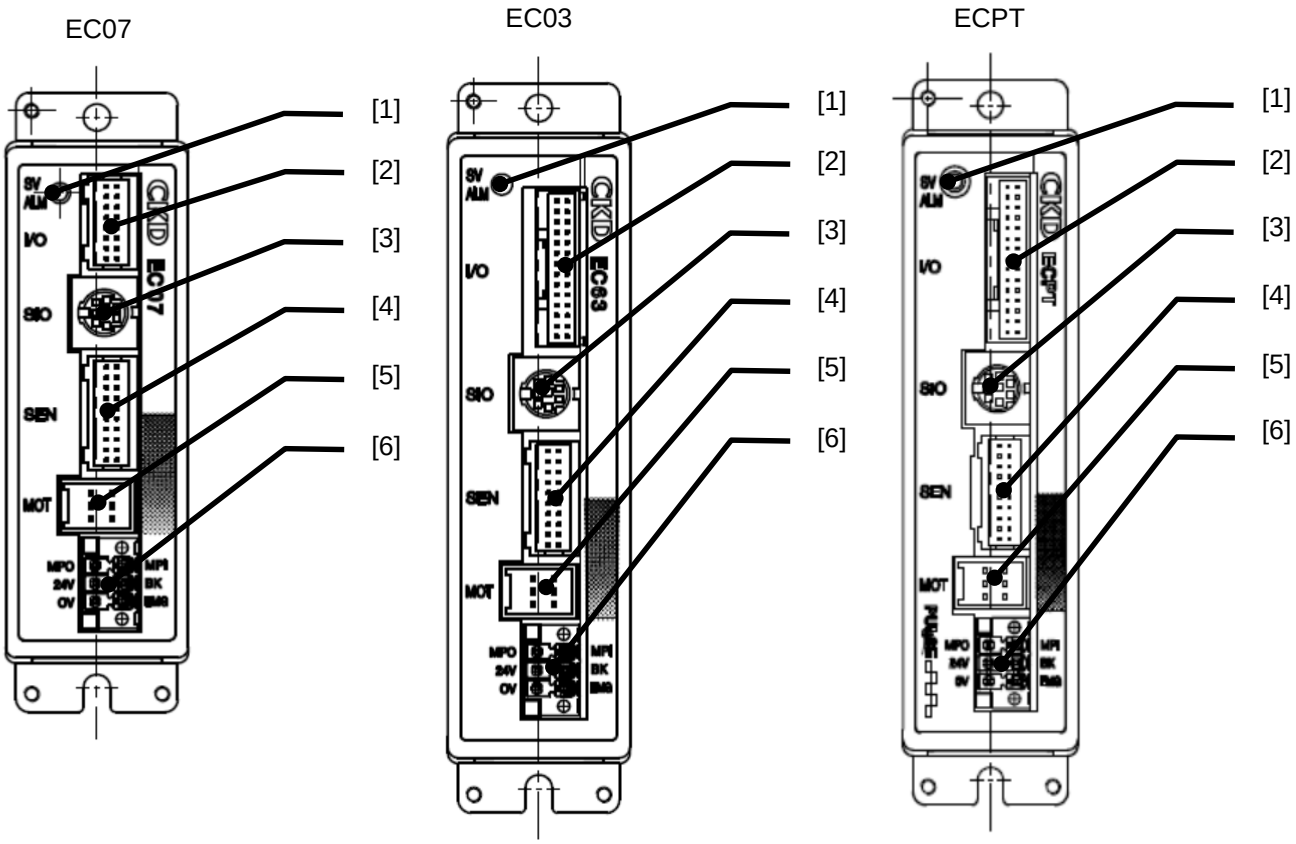
3.3 Explanation of panels



[1] Indication lamp
Indicates the status of the controller.
Green lamp: Motor energization during illumination
Motor de-energization during blinking
Red lamp: An alarm which cannot be reset occurs during illumination
An alarm which can be reset occurs during blinking

[2] I/O connector
Connect outside connection equipment (such as PLC) to input/output control signals.

[3] SIO connector
Connect the setting tool to perform parameter setting and a manual operation.

[4] Encoder connector
Connect the relay cable to input the encoder signal.

[5] Motor connector
Connect the relay cable to output the power signal to the motor.

[6] Power connector
Input the control power and motor power.

4. Installation

4.1. Precautions for installation

- The product should be carried and handled with sufficient care so that it will not be shocked, for example, it will not be dropped.
- When storing and using the product, check the environment temperature and atmosphere in the product specifications.
- This product cannot be installed and used in a place splashed with water or oil.
- A short circuit or fire accident may be caused. Oil droplets and oil mist are strictly prohibited.
- The product should be used in a place where the ambient operation temperature is 0 to 40°C. If heat is not removed, provide ventilation.
- Install the product in a place where there is no direct sunlight, dust, vicinity of a heating element, corrosive gas, explosive gas, inflammable gas and combustible substance. Chemical resistance has not been taken into account for this product.
- Avoid using this product in a place where a high current or ferromagnetic field occurs. In addition, avoid arranging the cables of this product along high-power motor power lines, sharing the same conduit, and using the same type of cables (multicore cables) as those of such power lines, so that no induction noise will be applied during wiring. Be careful of an inverter power and wiring part (same wiring and piping are unacceptable) used for a robot etc. Provide the frame ground of the same power and be sure to insert a filter into the output part.
- Fix a cable so that it will not move easily. When fixing a cable, do not bend it to an acute angle (bending radius: 68 mm or less).
- For parameter setting, use the setting tools (teaching pendant and setting software E Tools). Make a space of 70 mm or more in front of the controller so that the connector can be attached or removed.

4.2. EMC measures

If EMC measures are required, refer to “10.3. Example of EMC measures”.

---MEMO---

5. Wiring

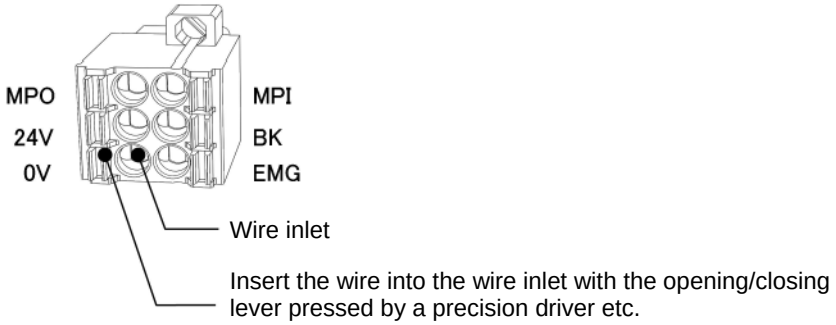
5.1. Wiring of power

5.1.1. Power connector specifications

Power plug terminal list (DFMC 1.5/3-STF-3.5 manufactured by Phoenix Contact)

Terminal name	Function name	Explanation of function
0 V	Common power (-)	DC 0 V common in the motor power, control power, brake release and emergency stop input is connected.
EMG	Emergency stop input	The emergency stop switch at contact b is connected. DC 24 V is input: An emergency stop will be released. DC 0 V or release: An emergency stop will be activated.
24 V	Common power (+)	DC 24 V common in the motor power and control power is input.
BK	Brake release	The brake will be released forcibly. DC 24 V is input: The brake will be released forcibly. DC 0 V or release: The brake can be operated.
MPO	Motor power shutoff	MPI and MPO are connected with a jumper line at the time of shipment.
MPI	Motor power shutoff	By shutting it off, the motor power will be shut off.

Power plug (The power plug is an accessory.)



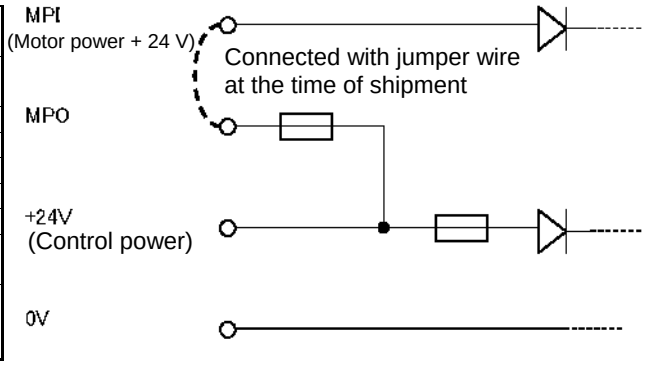
The following wire should be used for the connection to the power plug.

Core wire	0.5 mm^2 (AWG20) single wire, twisted wire and twisted wire with rod terminal with no insulation sleeve
Lead wire peeling allowance	8 mm from lead wire tip

⚠ WARNING	● At the time of a normal operation, be sure to set the input to the brake release (BK) to DC 0 V or release so that the brake can be operated. If DC 24 V is applied to the brake release (BK), the brake will be released forcibly, no lock will be activated at the time of servo off and an injury or damage to a workpiece may occur due to a drop of a movable part.

5.1.2. Power circuit

Item	Actuator type code	Specifications
Motor power voltage	-	DC 24 V ± 10%
Maximum instantaneous current at motor part	ERL2-45	2.7 A
	ERL2-60	4.0 A
	ESD2-35	2.7 A
	ESD2-45	2.7 A
	ESD2-55	4.0 A
Control power voltage	-	DC 24 V ± 10%
Current consumption at control part	-	300 mA or less (including current consumption of ETP2)



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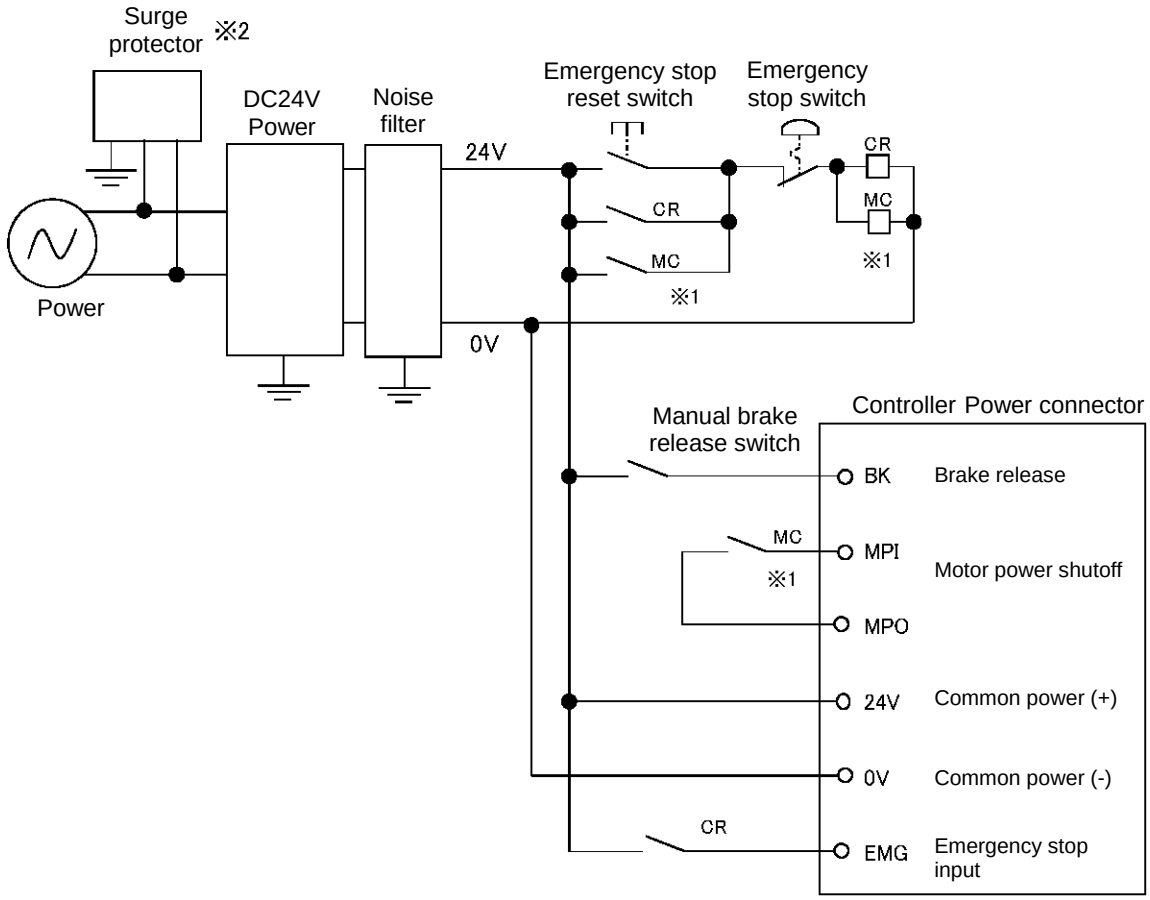
5.1.3. Basic composition of power



*1 If shutting off the motor drive source externally for safety category measures, connect a contact such as an electromagnetic switch between the MPI and MPO terminals.
*2 To take measures for the CE marking, a surge protector is required.

WARNING	● At the time of a normal operation, be sure to set the input to the brake release (BK) to DC 0 V or release so that the brake can be operated. If DC 24 V is applied to the brake release (BK), the brake will be released forcibly, no lock will be activated at the time of servo off and an injury or damage to a workpiece may occur due to a drop of a movable part.

CAUTION	● To prevent wrong wiring, check it again before energization. ● Connect wires securely so that they will not be loosened and removed.

5.2. Wiring with actuator

Use the dedicated motor/encoder relay cable for wiring between the controller and actuator.

5.2.1. Motor/Encoder relay cable type code system

EC-CBLME1- [S] - [1]

A: Cable type

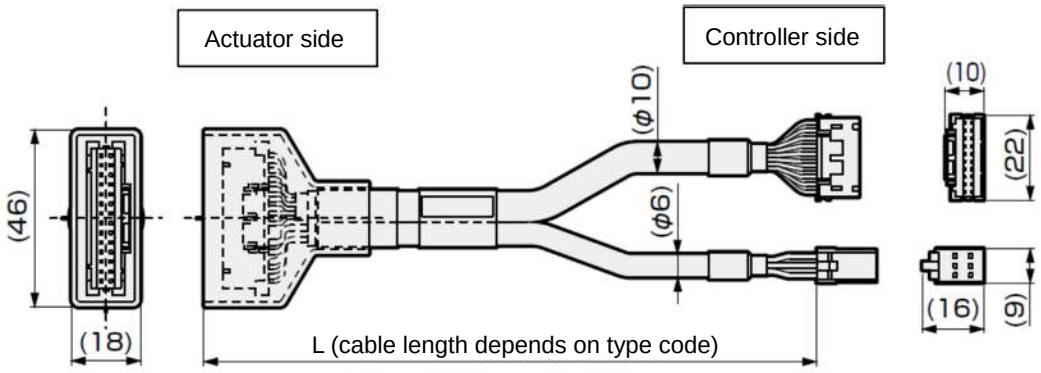
A:	Cable type
S	Fixed cable
R	Movable cable

B: Cable length (L)

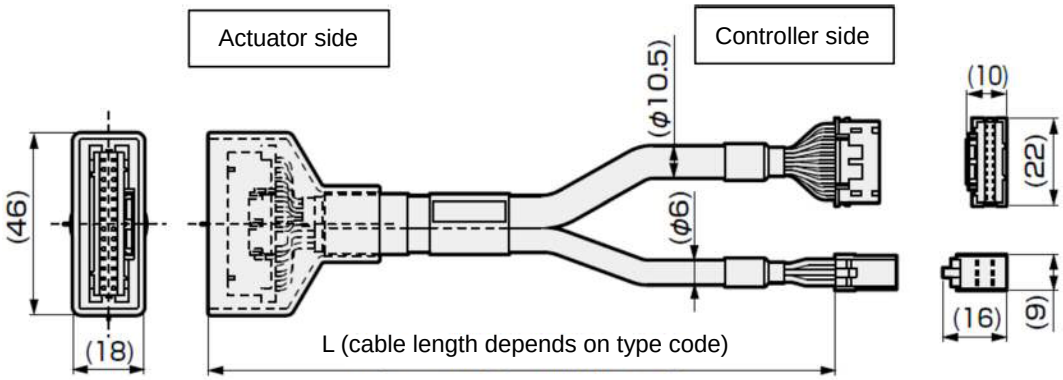
B:	Cable length (L)
1	1m
3	3m
5	5m
X	10m

5.2.2. Motor/Encoder relay cable outside sizes

• Fixed cable



• Movable cable



[SM-612271]

5.3. I/O wiring

Use the dedicated I/O cable for wiring between the controller and higher system (PLC).

5.3.1. I/O cable type code system

EC-CBLIF1 - 07 - 2

A: Controller type

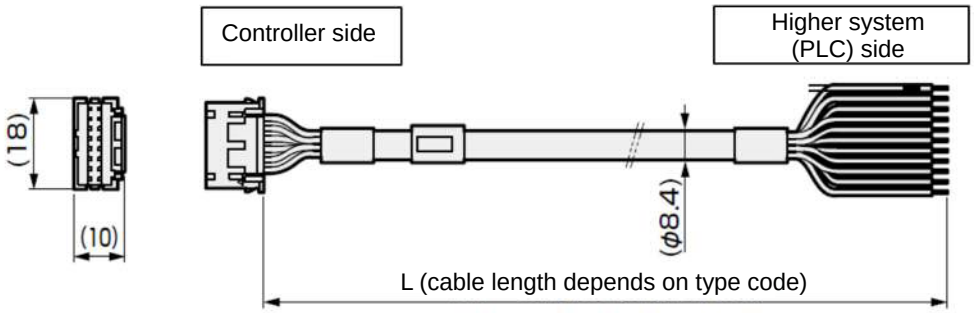
A:	Controller type
07	EC07
63	EC63
PT	ECPT

B: Cable length (L)

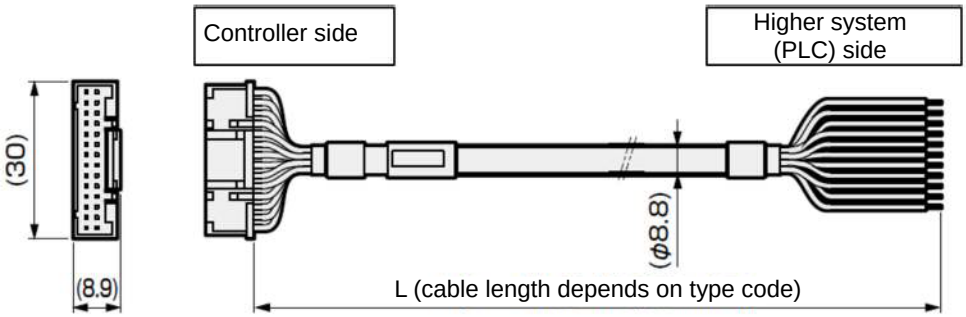
B:	Cable length (L)
2	2m
3	3m
5	5m

5.3.2. I/O cable outside sizes

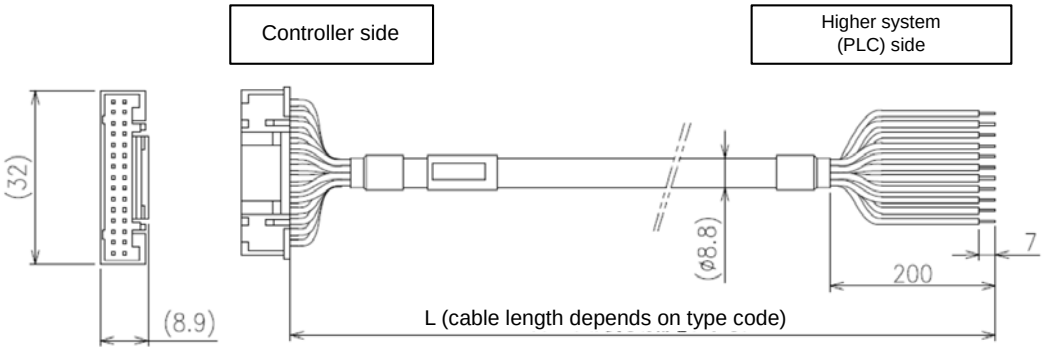
• I/O cable for EC07



• I/O cable for EC63



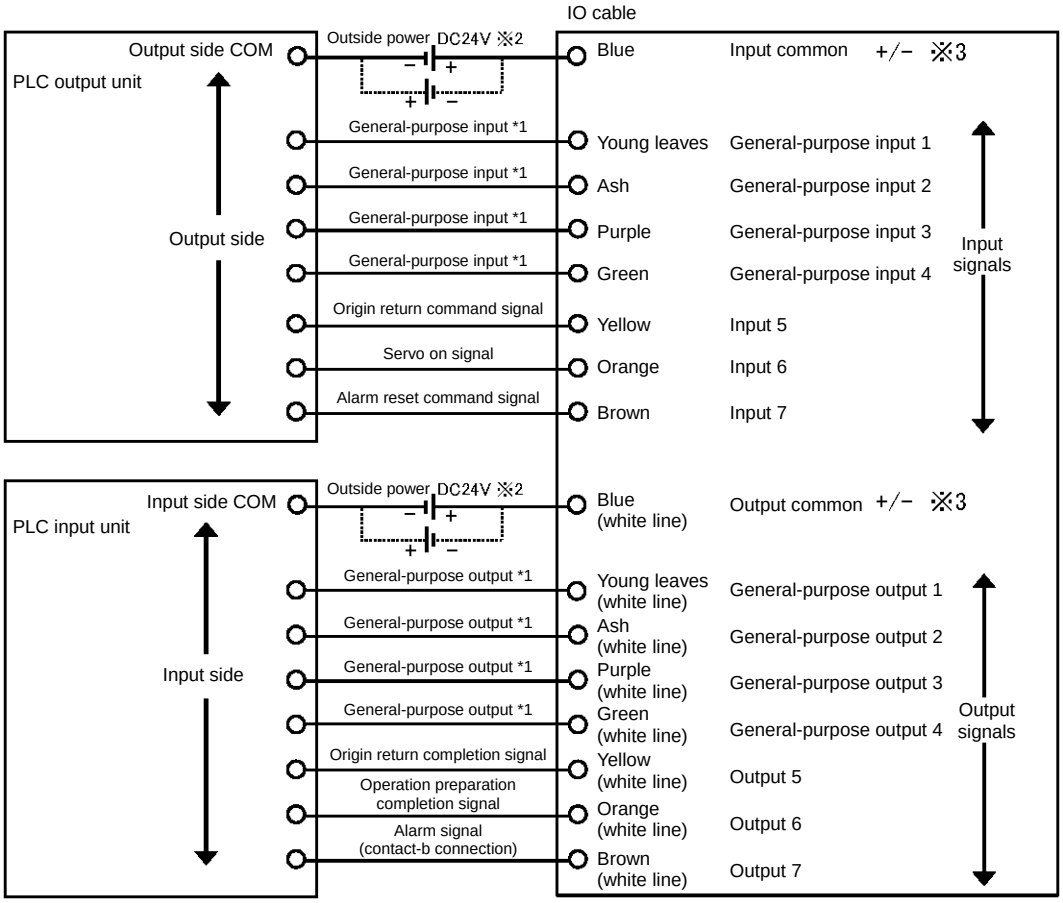
• I/O cable for ECPT



5.3.3. I/O cable specifications

Item	Specifications		
Model	EC-CBLIF1-07	EC-CBLIF1-63	EC-CBLIF1-PT
Type	20-core type Cabtyre cord (UL94V-0)	28-core type Cabtyre cord (UL94V-0)	30-core type Cabtyre cord
Sheath material	Vinyl chloride		
Sheath diameter (approx.) [mm]	φ8.4	φ8.8	φ8.8
Number of wire cores [cores]	20	28	30
Cross section of wire cores [mm^2]	0.2 (AWG24)		
Wire core material	Annealed copper wire		
Lead wire peeling allowance	Approx. 7 [mm] from lead wire tip		

5.3.4. Basic composition of I/O (EC07)



*1 For the general-purpose input/output, refer to the general-purpose input/output allocation (EC07).

*2 The outside power (DC 24 V) is required for both input and output. The input/output common can be used with both + and −.

*3 The input common and output common are not connected in the controller.

CAUTION	● To prevent wrong wiring, check it again before energization. ● Connect wires securely so that they will not be loosened and removed. ● Wires which have not been used must be insulated. A malfunction, failure or electric shock may occur. ● After energization, check that the input/output signals are correct using the setting tool.

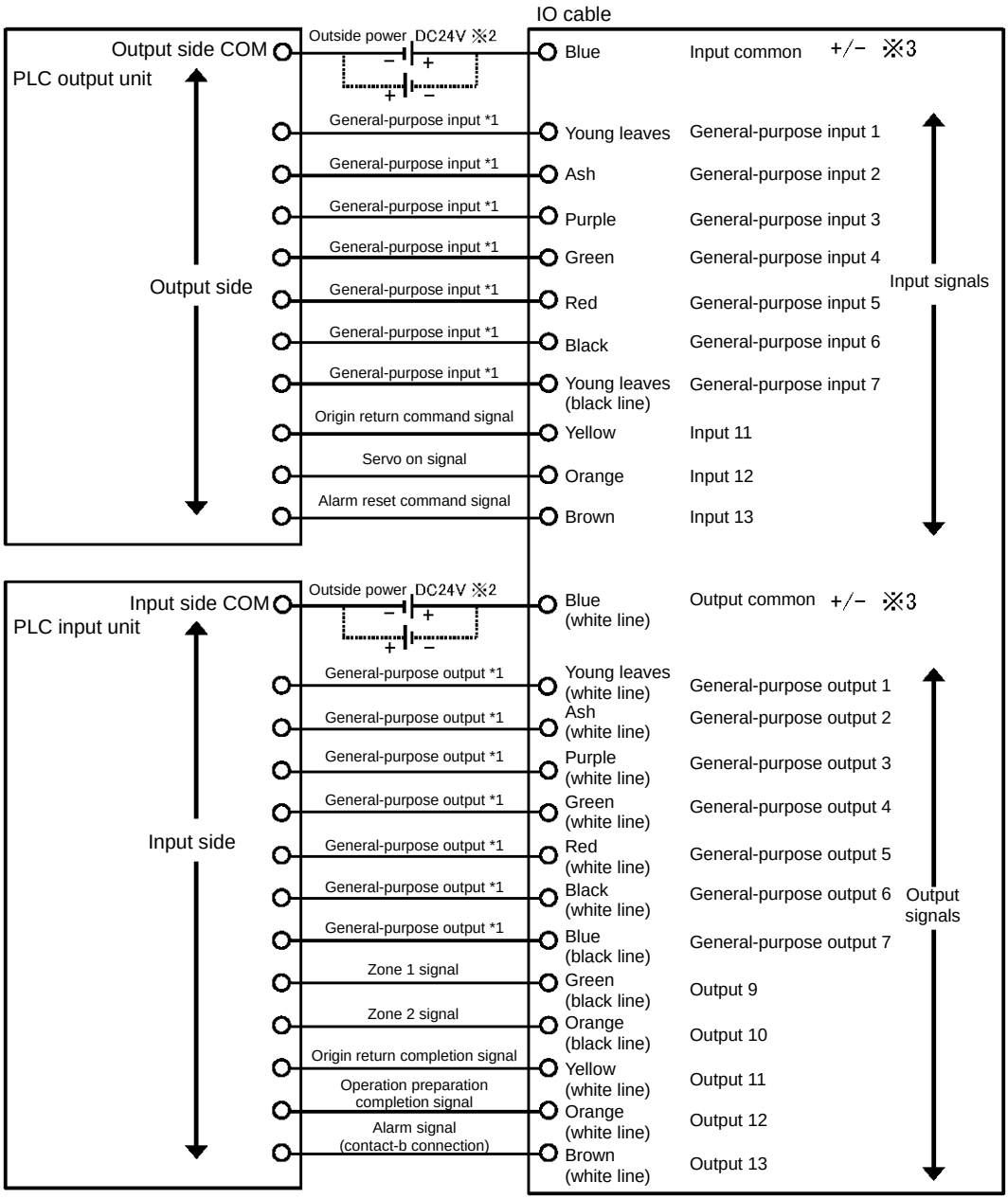
5.3.5. I/O cable allocation (EC07)

Line color	Name	Description
Blue	Input common (+/-)	Common (+/−) for input
Young leaves	General-purpose input 1	The role of the input will vary depending on the PIO mode.
Ash	General-purpose input 2	
Purple	General-purpose input 3	
Green	General-purpose input 4	
Yellow	Input 5	Origin return command signal
Orange	Input 6	Servo on command signal
Brown	Input 7	Alarm reset command signal
Blue (white line)	Output common (+/-)	Common (+/−) for output
Young leaves (white line)	General-purpose output 1	The role of the output will vary depending on the PIO mode.
Ash (white line)	General-purpose output 2	
Purple (white line)	General-purpose output 3	
Green (white line)	General-purpose output 4	
Yellow (white line)	Output 5	Origin return completion signal
Orange (white line)	Output 6	Operation preparation completion signal
Brown (white line)	Output 7	Alarm signal

5.3.6. General-purpose input/output allocation (EC07)

PIO mode	Standard mode	Simple mode	Solenoid valve mode		
			Double 2 position type	Double 3 position type	Single type
General-purpose input 1	Point movement start	Point 1 movement start	Solenoid valve movement command 1	Solenoid valve movement command 1	-
General-purpose input 2	Point selection bit 2	Point 2 movement start	Solenoid valve movement command 2	Solenoid valve movement command 2	Solenoid valve movement command
General-purpose input 3	Point selection bit 1	Point 3 movement start	-	-	-
General-purpose input 4	Point selection bit 0	-	-	-	-
General-purpose output 1	Point movement completion	Point 1 movement completion	Point 1 movement completion	Point 1 movement completion	Point 1 movement completion
General-purpose output 2	Point check bit 2	Point 2 movement completion	Point 2 movement completion	Point 2 movement completion	Point 2 movement completion
General-purpose output 3	Point check bit 1	Point 3 movement completion	Switch 1 output	Switch 1 output	Switch 1 output
General-purpose output 4	Point check bit 0	-	Switch 2 output	Switch 2 output	Switch 2 output

5.3.7. Basic composition of I/O (EC63)



*1 For the general-purpose input/output, refer to the general-purpose input/output allocation (EC63).

*2 The outside power (DC 24 V) is required for both input and output. The input/output common can be used with both + and −.

*3 The input common and output common are not connected in the controller.

CAUTION	● To prevent wrong wiring, check it again before energization. ● Connect wires securely so that they will not be loosened and removed. ● Wires which have not been used must be insulated. A malfunction, failure or electric shock may occur. ● After energization, check that the input/output signals are correct using the setting tool.

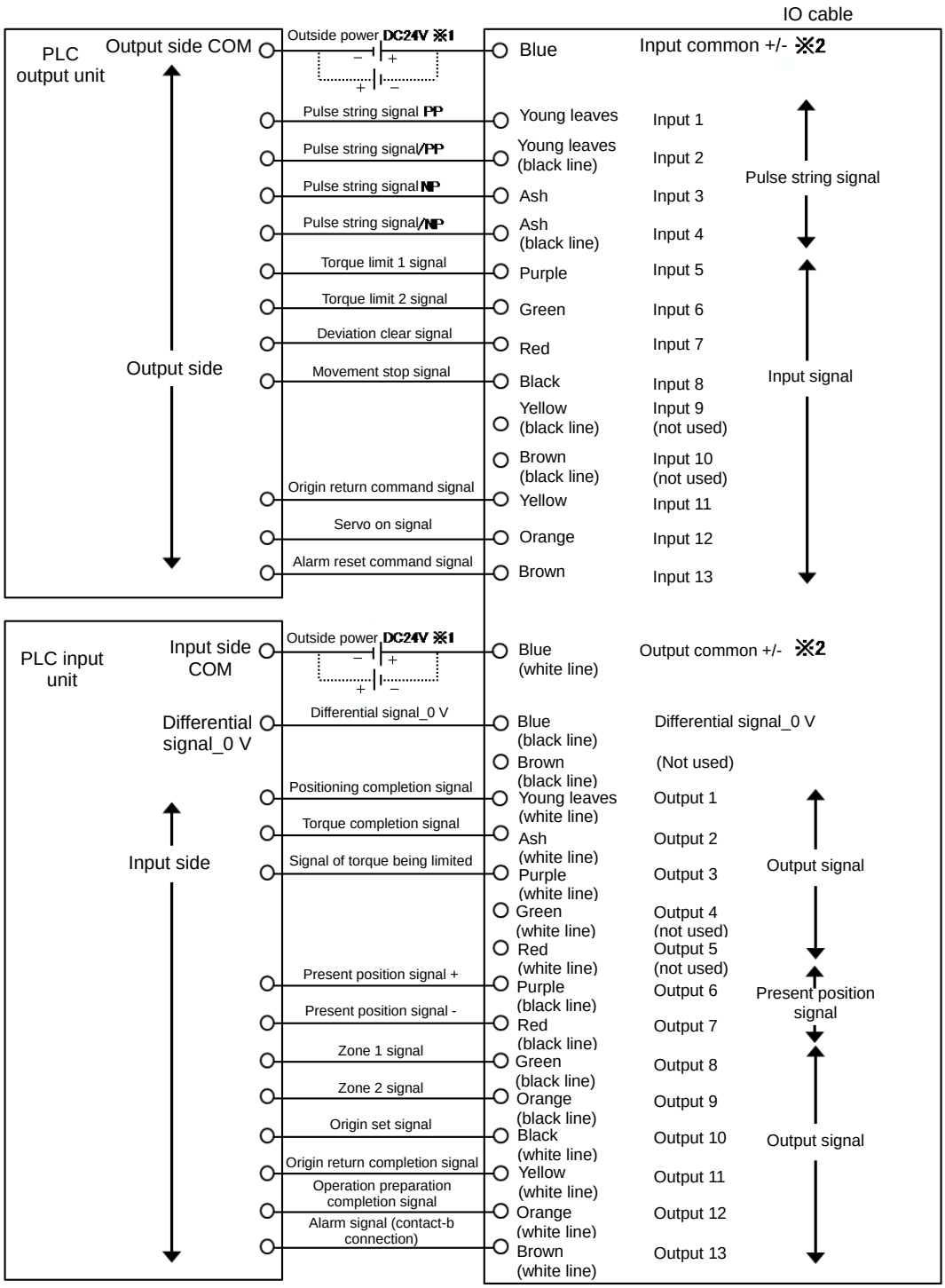
5.3.8. I/O cable allocation (EC63)

Line color	Name	Description
Blue	Input common (+/-)	Common (+/−) for input
Young leaves	General-purpose input 1	The role of the input will vary depending on the PIO mode.
Ash	General-purpose input 2	
Purple	General-purpose input 3	
Green	General-purpose input 4	
Red	General-purpose input 5	
Black	General-purpose input 6	
Young leaves (black line)	General-purpose input 7	
Yellow	Input 11	Origin return command signal
Orange	Input 12	Servo on command signal
Brown	Input 13	Alarm reset command signal
Blue (white line)	Output common (+/-)	Common (+/−) for output
Young leaves (white line)	General-purpose output 1	The role of the output will vary depending on the PIO mode.
Ash (white line)	General-purpose output 2	
Purple (white line)	General-purpose output 3	
Green (white line)	General-purpose output 4	
Red (white line)	General-purpose output 5	
Black (white line)	General-purpose output 6	
Blue (black line)	General-purpose output 7	
Green (black line)	Output 9	Zone 1 signal
Orange (black line)	Output 10	Zone 2 signal
Yellow (white line)	Output 11	Origin return completion signal
Orange (white line)	Output 12	Operation preparation completion signal
Brown (white line)	Output 13	Alarm signal

5.3.9. General-purpose input/output allocation (EC63)

PIO mode	Standard mode	Simple mode	Solenoid valve mode		
			Double 2 position type	Double 3 position type	Single type
General-purpose input 1	Point movement start	Point 1 movement start	Solenoid valve movement command 1	Solenoid valve movement command 1	-
General-purpose input 2	Point selection bit 5	Point 2 movement start	Solenoid valve movement command 2	Solenoid valve movement command 2	Solenoid valve movement command
General-purpose input 3	Point selection bit 4	Point 3 movement start	-	-	-
General-purpose input 4	Point selection bit 3	Point 4 movement start	-	-	-
General-purpose input 5	Point selection bit 2	Point 5 movement start	-	-	-
General-purpose input 6	Point selection bit 1	Point 6 movement start	-	-	-
General-purpose input 7	Point selection bit 0	Point 7 movement start	-	-	-
General-purpose output 1	Point movement completion	Point 1 movement completion	Point 1 movement completion	Point 1 movement completion	Point 1 movement completion
General-purpose output 2	Point check bit 5	Point 2 movement completion	Point 2 movement completion	Point 2 movement completion	Point 2 movement completion
General-purpose output 3	Point check bit 4	Point 3 movement completion	Switch 1 output	Switch 1 output	Switch 1 output
General-purpose output 4	Point check bit 3	Point 4 movement completion	Switch 2 output	Switch 2 output	Switch 2 output
General-purpose output 5	Point check bit 2	Point 5 movement completion	-	-	-
General-purpose output 6	Point check bit 1	Point 6 movement completion	-	-	-
General-purpose output 7	Point check bit 0	Point 7 movement completion	-	-	-

5.3.10. Basic composition of I/O (ECPT)



*1 The outside power (DC 24 V) is required for both input and output. The input/output common can be used with both + and -.

*2 The input common and output common are not connected in the controller.

CAUTION	● To prevent wrong wiring, check it again before energization. ● Connect wires securely so that they will not be loosened and removed. ● Wires which have not been used must be insulated. A malfunction, failure or electric shock may occur. ● After energization, check that the input/output signals are correct using the setting tool.

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5.3.11. I/O cable allocation (ECPT)

Line color	Name	Description
Blue	Input common (+/-)	Common (+/-) for input
Young leaves	Input 1	Pulse string signal PP
Young leaves (black line)	Input 2	Pulse string signal /PP
Ash	Input 3	Pulse string signal NP
Ash (black line)	Input 4	Pulse string signal /NP
Purple	Input 5	Torque limit 1 signal
Green	Input 6	Torque limit 2 signal
Red	Input 7	Deviation clear signal
Black	Input 8	Operation stop signal
Yellow (black line)	Input 9	Not used
Brown (blue line)	Input 10	Not used
Yellow	Input 11	Origin return command signal
Orange	Input 12	Servo on command signal
Brown	Input 13	Alarm reset command signal
Blue (white line)	Output common (+/-)	Common (+/-) for output
Blue (black line)	Differential signal_0 V	Deviation signal_0 V
Yellow (black line)	-	Not used
Young leaves (white line)	Output 1	Positioning completion signal
Ash (white line)	Output 2	Torque completion signal
Purple (white line)	Output 3	Signal of torque being limited
Green (white line)	Output 4	Not used
Red (white line)	Output 5	Not used
Purple (black line)	Output 6	Present position signal +
Red (black line)	Output 7	Present position signal -
Green (black line)	Output 8	Zone 1 signal
Orange (black line)	Output 9	Zone 2 signal
Black (white line)	Output 10	Origin set signal
Yellow (white line)	Output 11	Origin return completion signal
Orange (white line)	Output 12	Operation preparation completion signal
Brown (white line)	Output 13	Alarm signal

5.3.12. Input/output circuit

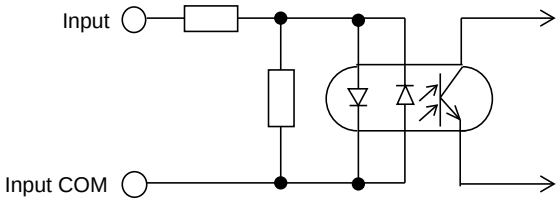
- Input circuit (common in EC07, EC63 and ECPT)

Input specifications

Item	EC07	EC63	ECPT
Number of input points	7 points	10 points	7 points (pulse string input terminal is excluded)
Input voltage	DC 24 V ± 10%		
Input current	3 mA/1 point		
Input current at the time of on	2 mA (min)		
Input current at the time of off	0.5 mA (max)		

* The maximum current consumption is a value including the output circuit.

Input circuit



The input has no polarity.
(The input COM can use both + and −.)

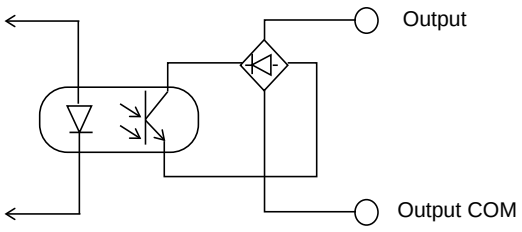
- Output circuit (common in EC07, EC63 and ECPT)

Output specifications

Item	EC07	EC63	ECPT
Number of input points	7 points	10 points	9 points (present position output terminal is excluded)
Load voltage	DC 24 V ± 10%		
Load current	10 mA or less/1 point		
Inside reduced voltage	6 V or less (at 25°C or less) *		
Leaked current	10 μA		
Output short-circuit protection circuit	Provided		
Connected load	PLC		

* 6 V or less when the load current is 9 mA at 40°C.

Output circuit



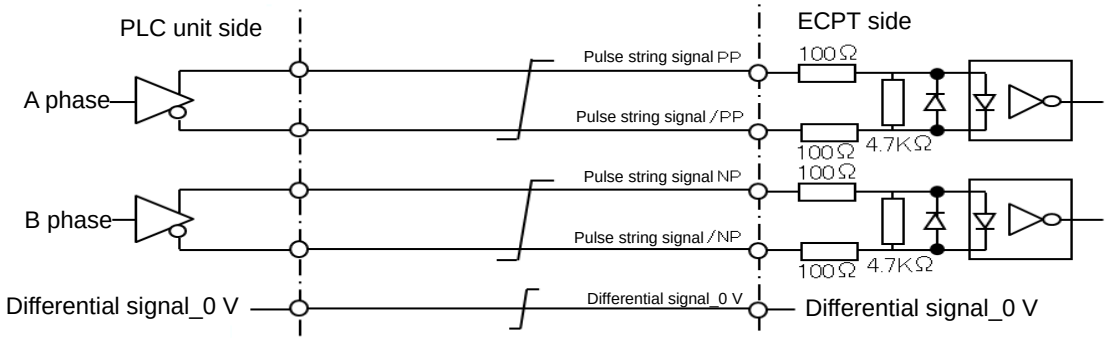
The output has no polarity.
(The output COM can use both + and −.)

• Pulse string signal circuit (ECPT)

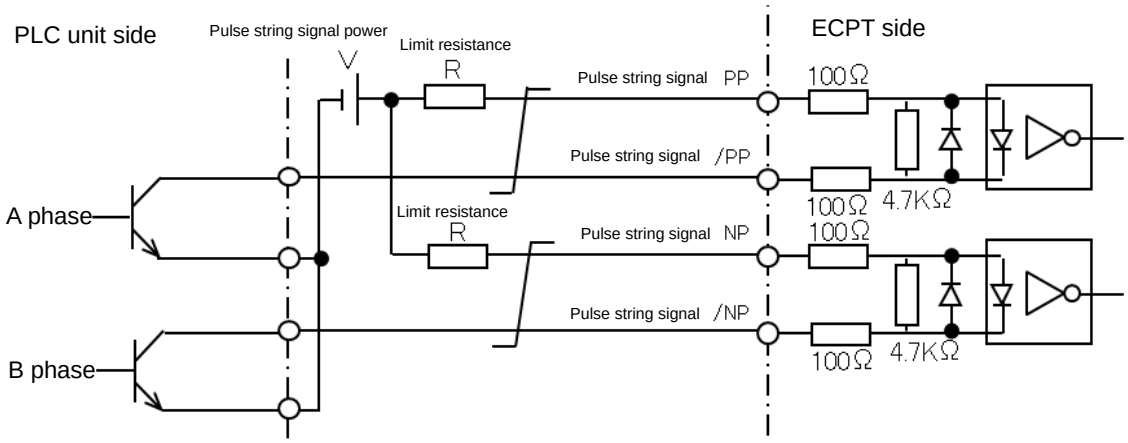
Pulse string signal circuit specifications

Item	Specifications
Pulse string signal type	Open collector type (maximum collector current: 12 mA), differential type
Maximum input frequency	60 kpps (open collector type), 100 kpps (differential type)

If the pulse string signal output of the PLC unit is a differential type



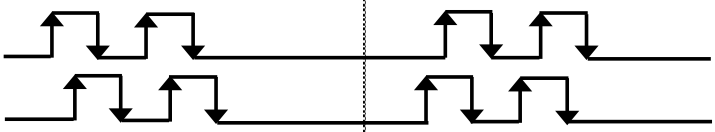
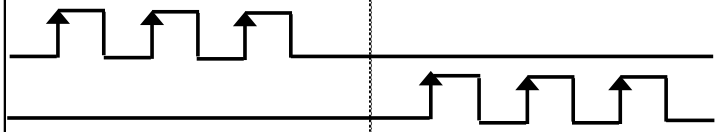
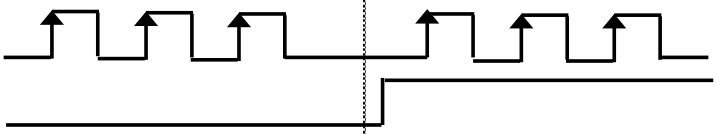
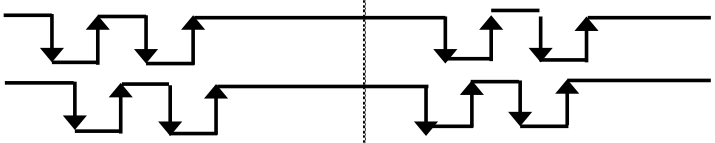
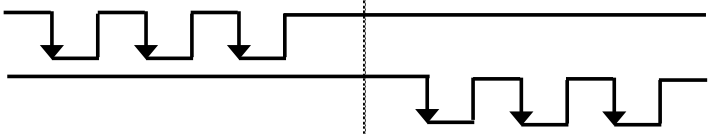
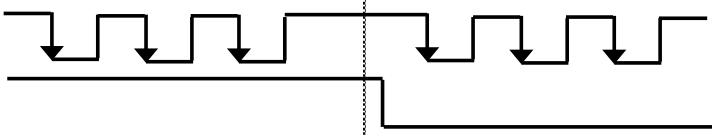
If the pulse string signal output of the PLC unit is an open collector type



If the specification of the pulse string signal output is an open collector output, the current limit resistance is required.

Pulse string signal power V	Recommended limit resistance R
5 V	1/4 W, 510 Ω
12 V	1/4 W, 2.0 KΩ
24 V	1/4 W, 4.7 KΩ

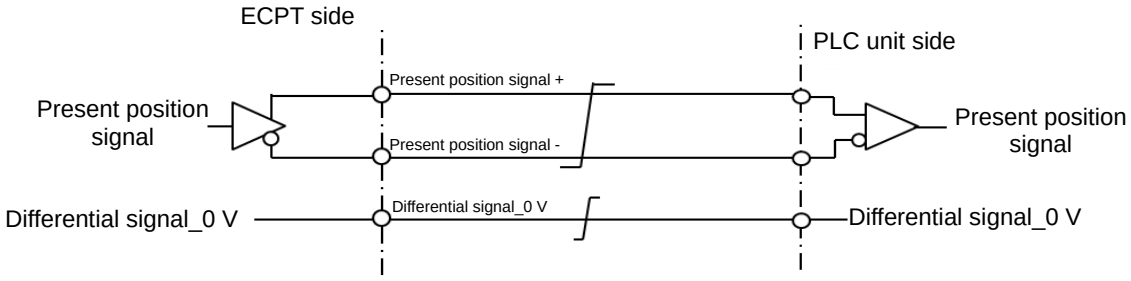
Pulse string signal form (ECPT)

Pulse form		Signal name	UP count (reverse motor side direction)	DOWN count (motor side direction)
Positive logic	A/B phase input	PP・/PP NP・/NP		
	Up/Down input	PP・/PP NP・/NP		
	Pulse/Direction input	PP・/PP NP・/NP		
Negative logic	A/B phase input	PP・/PP NP・/NP		
	Up/Down input	PP・/PP NP・/NP		
	Pulse/Direction input	PP・/PP NP・/NP		

- Present position output circuit (ECPT)

Present position output signal circuit specifications

Item	Specifications
Present position signal type	Differential type
Maximum output frequency	10 kpps



5.4. Wiring of setting tool

5.4.1 Teaching pendant (ETP2)

- Connection

Connect the connector of the teaching pendant to the SIO connector on the controller front surface.

- Removal

Operate the operation key of the teaching pendant to return the screen to the initial screen or main menu screen and remove the connector of the teaching pendant.

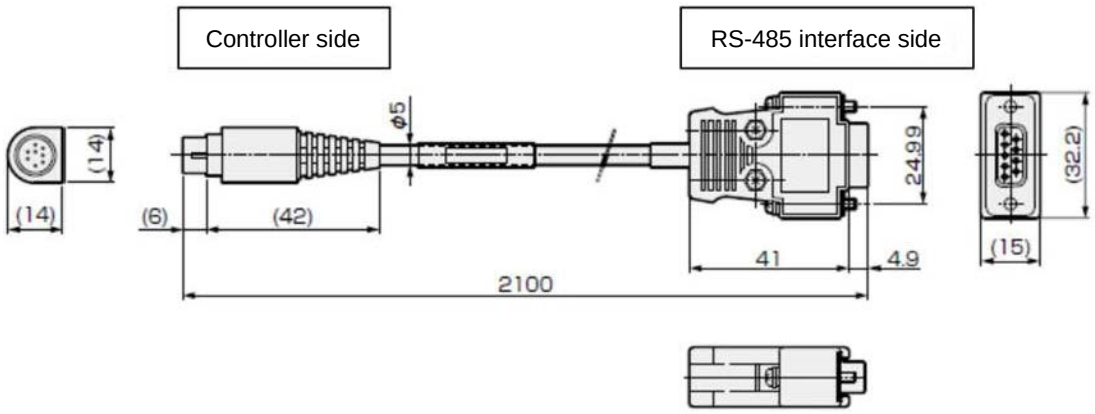
CAUTION	● In the case of a screen other than the initial screen and main menu screen, communication is performed with the controller. If it is removed in this status, a malfunction etc. may be caused. ● The input/output signals of the I/O connector of the controller will be ineffective in movement and setting with some exceptions. If it is removed in this status, it cannot be controlled from the higher equipment such as PLC. ● For details, check the instruction manual of the teaching pendant (ETP2). ● Connect wires securely so that they will not be loosened and removed. ● The setting tool is assumed to be connected only at the time of adjustment. At the time of a normal operation, remove the cable from the controller before use. ● Never connect other equipment.

5.4.2. Setting software E Tools

5.4.2.1. PC communication cable type code

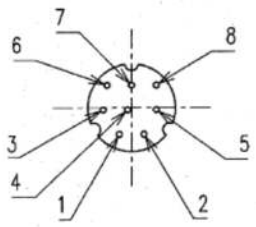
EC-CBLPC1

5.4.2.2. PC communication cable outside size



5.4.2.3. PC communication cable allocation

Mini DIN connector allocation

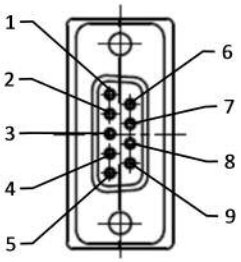


Communication name	Pin number
TxD+	1
TxD−	2
TP(COM)	3
−	4
−	5
TP(+24)	6
SG	7
−	8

※1

Dsub9 pin allocation

Pin number	Communication name
4	TxD+
5	TxD−
−	−
−	−
−	−
−	−
1	SG
−	−
−	−



*1 Pin 3 and pin 6 of the mini DIN connector are connected in the cable.
DC 24 V is applied to pin 6 of the mini DIN connector from the controller.

5.4.2.4. Communication specifications

Item	Specifications
Interface	RS-485 (half duplex)
Synchronization type	Asynchronous type
Communication speed	19200 bps
Parity	Even number
Data length	8 bit
Stop bit	1 stop bit
Flow control	None

5.4.2.5. Connection method

- Connection

Connect the PC communication cable (EC-CBLPC1) to the SIO connector on the controller front surface. The RS-485 interface is required separately for the connection with the PC.

Recommended RS-485 interface type code

PCCM-COM-1PDUSBH-R manufactured by Misumi

COM-1PD (USB) H manufactured by Contec

- Removal

After completing the setting software E Tools, remove the connector.

⚠ CAUTION	● The RS-485 interface and PC communication cable (EC-CBLPC1) are required separately for the connection between the PC and controller. ● If an RS-485 interface not recommended is used, pay attention to wire connection. If they are connected by wrong wire connection, the connected equipment and this product may be damaged. ● The input/output signals of the I/O connector of the controller will be ineffective in movement and setting with some exceptions. If it is removed in this status, it cannot be controlled from the higher equipment such as PLC. ● For details, check the instruction manual of the setting software E Tools. ● Connect wires securely so that they will not be loosened and removed. ● The setting tool is assumed to be connected only at the time of adjustment. At the time of a normal operation, remove the cable from the controller before use. ● Never connect other equipment.

6. Setting of parameter data

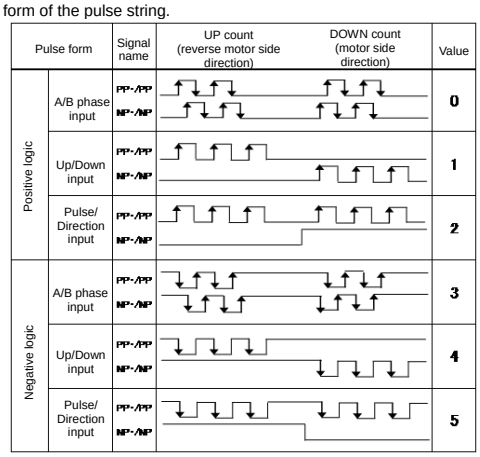
Setting tools are required for the setting and change of a parameter. Prepare the following setting tools. For details such as setting methods, check the instruction manual of the setting tools.

- Teaching pendant (ETP2)
- Setting software E Tools

6.1 Parameter table

Name	Description			Set range	Initial value	Unit	
Soft limit +	Set the movable range in the + direction (opposite motor side). The set range is soft limit – to + stroke.			Soft limit - to + Stroke + Margin (3 mm)	0.00	(mm)	*1
Soft limit -	Set the movable range in the – direction (motor side). The set range is – stroke to soft limit +.			Stroke - Margin (3 mm) to Soft limit +	0.00	(mm)	*1
Origin return velocity	Set the velocity at the time of an origin return.	Screw lead: 6 mm (model whose actuator type code, screw lead code is [06])		1~15	15	(mm/s)	
		Screw lead: 12 mm (model whose actuator type code, screw lead code is [12])		1~30			
Origin offset	Set the amount of offset of the origin position. For details, refer to “8.4. Origin return movement”.			0 to Stroke	1.00	(mm)	
Automatic origin return	Set the automatic origin return to effective (1) or ineffective (0) when the power is turned on.			0~1	0 (ineffective)	(mm)	
PIO mode	Set the PIO mode. 0: Standard mode 1: Simple mode 2: Solenoid valve mode (double 2 position type) 3: Solenoid valve mode (double 3 position type) 4: Solenoid valve mode (single type) For details, refer to “8.5. Transfer movement”.			0~4	0 (standard mode)	None	
Common positioning width (one side)	Set the common allowable value in the positioning completion output. If 0 is set in point data, this value will be referred to.			0.01~9.99	0.10	(mm)	
Common velocity	Set the common velocity in the transfer zone. If 0 is set in point data, this value will be referred to.	Actuator type code ERL2-45 ESD2-35, ESD2-45	Screw lead: 6 mm (model whose actuator type code, screw lead code is [06])	15~300	100	(mm/s)	
		Actuator type code ERL2-45 ESD2-35, ESD2-45	Screw lead: 12 mm (model whose actuator type code, screw lead code is [12])	30~600			
		Actuator type code ERL2-45 ESD2-35, ESD2-45	Screw lead: 6 mm (model whose actuator type code, screw lead code is [06])	15~200			
		Actuator type code ERL2-45 ESD2-35, ESD2-45	Screw lead: 12 mm (model whose actuator type code, screw lead code is [12])	30~400			
Common acceleration	Set the common acceleration in the transfer zone. If 0 is set in point data, this value will be referred to.			1.0~3.0	1.0	(m/s^2)	
Common acceleration	Set the common acceleration in the transfer zone. If 0 is set in point data, this value will be referred to.			1.0~3.0	1.0	(m/s^2)	
Common pressing current	Set the common current value in the pressing zone. If 0 is set in point data, this value will be referred to.		Actuator type code ERL2-45, ESD2-35, ESD2-45	1~100	50	(%)	
			Actuator type code ERL2-60, ESD2-55	1~80			
Common pressing velocity	Set the common velocity in the pressing zone. If 0 is set in point data, this value will be referred to.		Screw lead: 6 mm (model whose actuator type code, screw lead code is [06])	1~15	10	(mm/s)	
			Screw lead: 12 mm (model whose actuator type code, screw lead code is [12])	1~30			
Common pressing distance	Set the common pressing distance in the pressing zone. If 0 is set in point data, this value will be referred to.			- Stroke to + Stroke	+10.00	(mm)	
Current during stop	Set the current value for retaining workpieces during a stop.		Actuator type code ERL2-45 ESD2-35, ESD2-45	1~100	80	(%)	
			Actuator type code ERL2-60, ESD2-55	1~80			

* The initial value (shipment value) of the soft limit is 0. Unless this value is set correctly, point data cannot be set. The alarm of the point data (position) may be caused at the start of transfer movement. For the method to set the soft limit, refer to “6.2. Soft limit”.

<table>
<tr><th>Name</th><th>Description</th><th>Set range</th><th>Initial value</th><th>Unit</th></tr>
<tr><td>Pressing judgment time</td><td>Set the time until pressing completion is judged in the pressing zone.
(If the current value reaches the pressing current value during the pressing judgment time, the pressing is judged to be completed.)</td><td>1~9999</td><td>200</td><td>(ms)</td></tr>
<tr><td>Control gain 1</td><td rowspan="3">This setting is ineffective.</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">None</td></tr>
<tr><td>Control gain 2</td></tr>
<tr><td>Control gain 3</td></tr>
<tr><td>Zone 1 +</td><td>Set the + side position of the zone 1 output.
For details, refer to “6.3. Zone output”.</td><td>-999.99~999.99</td><td>0.00</td><td>(mm)</td></tr>
<tr><td>Zone 1 -</td><td>Set the + side position of the zone 1 output.
For details, refer to “6.3. Zone output”.</td><td>-999.99~999.99</td><td>0.00</td><td>(mm)</td></tr>
<tr><td>Zone 2 +</td><td>Set the + side position of the zone 2 output.
For details, refer to “6.3. Zone output”.</td><td>-999.99~999.99</td><td>0.00</td><td>(mm)</td></tr>
<tr><td>Zone 2 -</td><td>Set the + side position of the zone 2 output.
For details, refer to “6.3. Zone output”.</td><td>-999.99~999.99</td><td>0.00</td><td>(mm)</td></tr>
<tr><td>Zone hysteresis</td><td>Set the hysteresis of the zone 1 and zone 2 outputs.
For details, refer to “6.3. Zone output”.</td><td>0.00~9.99</td><td>0.00</td><td>(mm)</td></tr>
<tr><td>Position output range +</td><td>Set the + side position of the present position output range.
For details, refer to “6.4 Position output range”.</td><td>-999.99~999.99</td><td>0.00</td><td>(mm)</td></tr>
<tr><td>Position output range -</td><td>Set the - side position of the present position output range.
For details, refer to “6.4 Position output range”.</td><td>-999.99~999.99</td><td>0.00</td><td>(mm)</td></tr>
<tr><td>Position output frequency</td><td>Set the carrier frequency of the present position output.
For details, refer to “6.4 Position output range”.</td><td>0.2~10.0</td><td>1.0</td><td>kHz</td></tr>
<tr><td>Pulse string type</td><td>Set the form of the pulse string.
 
</td><td>0~5</td><td>0
(Positive logic, AB phase input)</td><td>None</td></tr>
<tr><td rowspan="2">Pressing velocity limit</td><td rowspan="2">Set the velocity at which it is possible to transition to pressing movement during pulse string control.
It transitions to the pressing movement by turning on the torque limit 1 (torque limit 2) signal at a velocity set at the pressing velocity limit or lower.
The maximum velocity during pressing movement is the pressing velocity limit value.
For details, refer to “8.9.1. Set items related to pressing movement”.</td><td>Screw lead: 6 mm
(model whose actuator type code, screw lead code is [06])</td><td>1~15</td><td rowspan="2">10</td><td rowspan="2">(mm/s)</td></tr>
<tr><td>Screw lead: 12 mm
(model whose actuator type code, screw lead code is [12])</td><td>1~30</td></tr>
<tr><td rowspan="2">Pressing current 1</td><td rowspan="2">Set current value 1 in pressing movement during pulse string control.
For details, refer to “8.9.1. Set items related to pressing movement”.</td><td>Actuator type code
ERL2-45,
ESD2-35,ESD2-45</td><td>1~100</td><td rowspan="2">50</td><td rowspan="2">%</td></tr>
<tr><td>Actuator type code
ERL2-60,
ESD2-55</td><td>1~80</td></tr>
<tr><td rowspan="2">Pressing current 2</td><td rowspan="2">Set current value 2 in pressing movement during pulse string control.
For details, refer to “8.9.1. Set items related to pressing movement”.</td><td>Actuator type code
ERL2-45,
ESD2-35,ESD2-45</td><td>1~100</td><td rowspan="2">50</td><td rowspan="2">%</td></tr>
<tr><td>Actuator type code
ERL2-60,
ESD2-55</td><td>1~80</td></tr>
<tr><td>Positioning deviation width</td><td colspan="2">A condition for the positioning completion signal during pulse string control to be turned ON.
If the difference between the movement indication amount by a pulse string signal and actual movement amount becomes within the set value, the positioning completion signal will be turned ON.</td><td>0.01~9.99</td><td>0.10</td><td>(mm)</td></tr>
<tr><td>Electronic gear ratio numerator</td><td colspan="2">Specify the movement amount of the actuator per pulse during pulse string control.
$$\text{Unit movement amount [mm/1pulse]} = \frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ration denominator}} \times \frac{\text{Lead length [mm]}}{\text{1024 Encoder resolution}}$$</td><td>0001~9999</td><td>1024</td><td>None</td></tr>
<tr><td>Electronic gear ratio denominator</td><td colspan="2">[Recommended value]
A movement amount of 0.01 mm per pulse.
<table>
<tr><th>Lead length of actuator</th><th>6 mm</th><th>12 mm</th></tr>
<tr><td>Electronic gear ratio numerator</td><td>1024</td><td>1024</td></tr>
<tr><td>Electronic gear ratio denominator</td><td>600</td><td>1200</td></tr>
</table>
For details, refer to “6.5. Electronic gear ratio”.</td><td>0001~9999</td><td>600</td><td>None</td></tr>
</table>

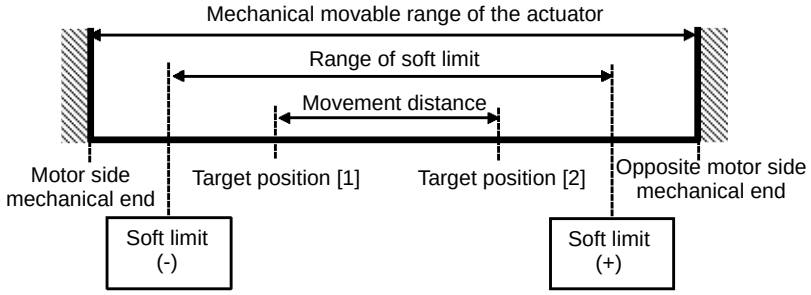
6.2. Soft limit

The movable range can be set in the transfer movement and pressing movement.

If the range of the soft limit is exceeded during the above movement, an alarm will be output. If the movement completion position is outside the range of the soft limit, an alarm will be output at the time of a movement start.

Set the motor side to the coordinate of - and opposite motor side to the coordinate of +. The position coordinate after the origin return will be = 0.

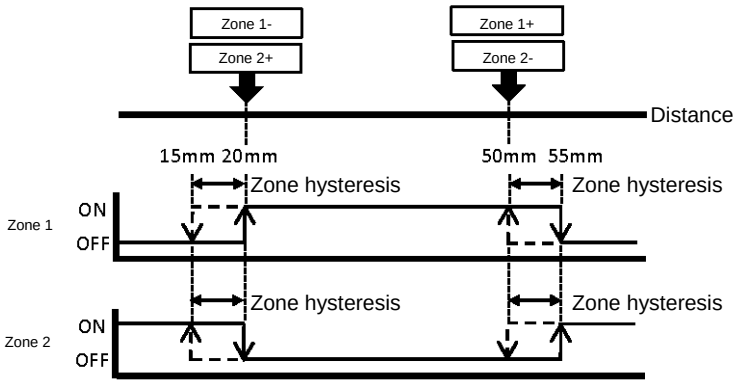
Set the soft limit within the range that is outside of the “movement distance (including the target positions [1] and [2])” and inside of the “mechanical movable range of the actuator”.



6.3. Zone output (function of EC63 and ECPT)

When the present position is in the set position range regardless of the movement after origin return completion, zone 1 and zone 2, which are output signals, can be turned on and off.

Example Zone 1 −: 20 mm, Zone 1 +: 50 mm, Zone hysteresis: 5 mm should be set
Zone 2 −: 50 mm, Zone 2 +: 20 mm, Zone hysteresis: 5 mm should be set



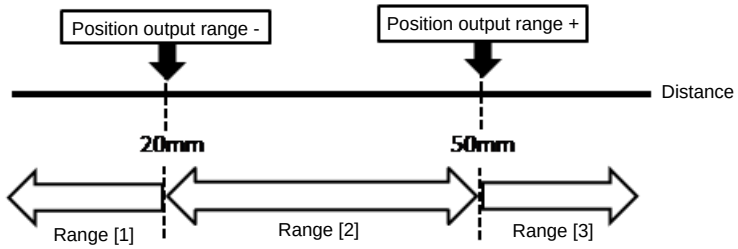
6.4. Position output range (function of ECPT)

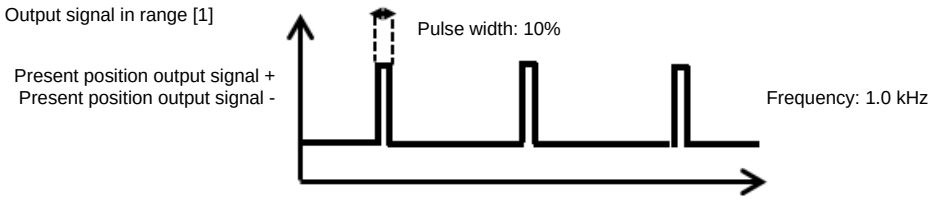
When the present position is in the position output range regardless of the movement after origin return completion, the present position output signal is output.

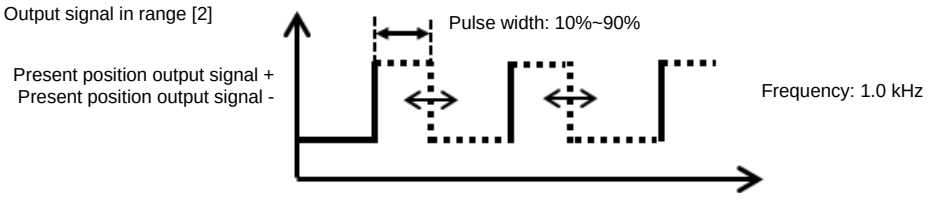
It is output at a pulse width of 10 to 90% between the position output range - to position output +.

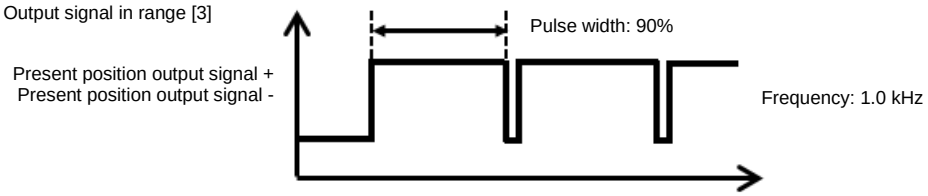
Example Position output range -: 20 mm, Position output range +: 50 mm, Position output frequency: 1.0 kHz should be set

When the present position is 20 mm or less (range [1]), it is output at a pulse width of 10%.
When the present position is between 20 and 50 mm (range [2]), it is output at a pulse width of 10 to 90%.
When the present position is 50 mm or more (range [3]), it is output at a pulse width of 90%.









6.5. Electronic gear ratio (function of ECPT)

The unit movement amount of the actuator per pulse of the pulse string input can be set.

$$\text{Unit movement amount [mm/1pulse]} = \frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ration denominator}} \times \frac{\text{Lead length [mm]}}{\text{1024 (Encoder resolution)}}$$

The value in the following table at which the unit movement amount is 0.01 [mm/1 pulse] is recommended.

Lead length of actuator	6 mm	12 mm
Electronic gear ratio numerator	1024	1024
Electronic gear ratio denominator	600	1200

Example If you want to use an actuator whose lead length is 6 mm and set the unit movement amount to 0.01 mm

$$\text{Unit movement amount [mm/1pulse]} = \frac{1024}{600} \times \frac{6 \times 100}{1024} = 0.01 \text{ [mm/1pules]}$$

By setting the electronic gear ratio numerator to 1024 and the electronic gear ratio denominator to 600, the unit movement amount of the actuator per pulse becomes 0.01 mm.

Example If you want to use an actuator whose lead length is 12 mm and set the unit movement amount to 0.01 mm

$$\text{Unit movement amount [mm/1pulse]} = \frac{1024}{1200} \times \frac{12 \times 100}{1024} = 0.01 \text{ [mm/1pules]}$$

By setting the electronic gear ratio numerator to 1024 and the electronic gear ratio denominator to 1200, the unit movement amount of the actuator per pulse becomes 0.01 mm.

CAUTION	● Set the unit movement amount so that it will not be 0.01 [mm/1 pulse] or less. ● Set the electronic gear ratio numerator and electronic gear ratio denominator so that there will be no redundant unit movement amount. ● Perform setting so that the velocity, acceleration and deceleration will not exceed the specifications of the actuator during an operation.

---MEMO---

7. Setting of point data (EC07, EC63)

Setting tools are required for the setting and change of point data. Prepare the following setting tools. For details such as setting methods, check the instruction manual of the setting tools.

- Teaching pendant (ETP2)
- Setting software E Tools

7.1. Number of positioning points

The number of point data which can be set will vary depending on the PIO mode. The PIO mode can be set using a parameter.

PIO mode		Controller	
		EC07	EC63
Standard mode		7 points at maximum	63 points at maximum
Simple mode		3 points at maximum	7 points at maximum
Solenoid valve mode	Double 2 position type	2 points	2 points
	Double 3 position type	2 points	2 points
	Single type	2 points	2 points

7.2. Point data list

The following items can be set for each point.

Item to set		Description
Position		In the case of positioning movement, set the final target position [mm]. In the case of pressing movements 1 and 2, set the pressing start position [mm]. *The positioning movement and pressing movements 1 and 2 should be set in the “mode”. *The final target positions of pressing movements 1 and 2 are determined by the “position” and “pressing distance”. For details, refer to “7.2.1 Setting of position”.
Mode	Position designation	Select the absolute position designation [ABS] and relative position designation [INC]. For details, refer to “7.2.2 Setting of mode (position designation)”.
	Movement	Select the positioning movement [POSI], pressing movement 1 [PRS1] and pressing movement 2 [PRS2]. For details, refer to “7.2.3 Setting of mode (movement)”.
Positioning width		Set the output ranges of the point movement completion output signal and switches 1 and 2 output signals using the width (one side) for the final target position [mm]. For details, refer to “7.2.4 Setting of positioning width”.
Velocity		Set the velocity [mm/s] in the transfer zone. For details, refer to “7.2.5 Setting of velocity”.
Acceleration		Set the acceleration [mm/s^2] in the transfer zone. For details, refer to “7.2.6 Setting of acceleration”.
Deceleration		Set the deceleration [mm/s^2] in the transfer zone. For details, refer to “7.2.7 Setting of deceleration”.
Pressing current		Set the current value [%] in the pressing zone. For details, refer to “7.2.8 Setting of pressing current”.
Pressing velocity		Set the velocity [mm/s] in the pressing zone. For details, refer to “7.2.9 Setting of pressing velocity”.
Pressing distance		Set the width [mm] of the pressing zone. For details, refer to “7.2.10 Setting of pressing distance”.

7.2.1. Setting of position

In the case of positioning movement, set the final target position [mm]. In the case of pressing movements 1 and 2, set the pressing start position [mm].

• Setting range and initial value (shipment value)

Actuator type code Model type code	Position setting range [mm]	Initial value of position [mm]
ERL2/ESD2	-stroke ~ + stroke	0

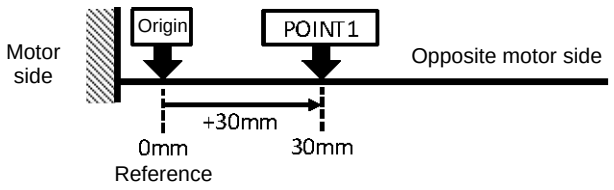
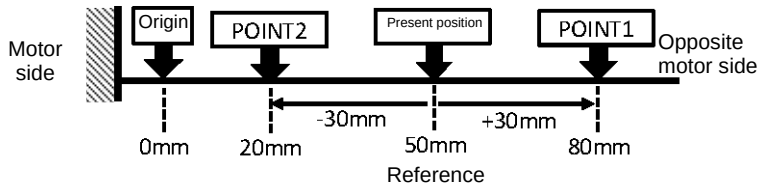
7.2.2. Setting of mode (position designation)

As a method to designate a position, the absolute position designation based on the origin (ABS) and relative position designation based on the present position (INC) can be selected.

• Setting range and initial value (shipment value)

Actuator type code / Model type code	Selection of position designation	Initial value of position designation
ERL2/ESD2	ABS (Absolute position designation) INC (Relative position designation)	ABS (Absolute position designation)

• Setting examples

Position designation	Explanation	Setting example
ABS (Absolute position designation)	Set the distance from the origin position based on the origin (0 mm).	Example Set POINT 1 Position: + 30 mm.  The final target position of POINT 1 is a point 30 mm away from the origin.
INC (Relative position designation)	Set the distance from the present position based on the present position. If a – value is input, it will be the motor side and if a + value is input, it will be the opposite motor side.	Example Set POINT 1 Position: + 30 mm POINT 2 Position: - 30 mm  The final target position of POINT 1 is a point 80 mm away from the origin. The final target position of POINT 2 is a point 20 mm away from the origin.

⚠ CAUTION	● When using the PIO mode of the parameter in the solenoid valve mode, set it to ABS (absolute position designation). In the solenoid valve mode, if set to INC (relative position designation), it moves in ABS (absolute position designation).

7.2.3. Setting of mode (movement)

The positioning movement (POSI), pressing movement 1 (PRS1) and pressing movement 2 (PRS2) can be selected.

• Setting range and initial value (shipment value)

Actuator type code / Model type code	Selection of movement	Initial value of movement
ERL2/ESD2	POSI (positioning movement) PRS1 (pressing movement 1) PRS2 (pressing movement 2)	POSI (positioning movement)

• Explanation of movement

Movement	Explanation
POSI (positioning movement)	Movement for general transfer. When reaching the positioning completion width inside, it will output the completion signal. When reaching the positioning completion point, it will stop. For details, refer to “8.5. Positioning movement”.
PRS1 (pressing movement 1)	Movement for pressing workpieces, etc. to the pressing completion point during pressing movement. Even if it stops halfway due to external force during this period, it will not be detected as an alarm. It can be used for clamping etc. When reaching the set pressing current, it will output the completion signal. When reaching the pressing completion point, the pressing movement will be finished and stop. For details, refer to “8.6. Pressing movement”.
PRS2 (pressing movement 2)	Movement for pressing workpieces, etc. to the pressing completion point during pressing movement. Even if it stops halfway due to external force during this period, it will not be detected as an alarm. It can be used for press-fitting etc. It moves at the set pressing current. When reaching the positioning width inside, it will output the completion signal. When reaching the pressing completion point, the pressing movement will be finished and stop. For details, refer to “8.6. Pressing movement”.

7.2.4. Setting of positioning width

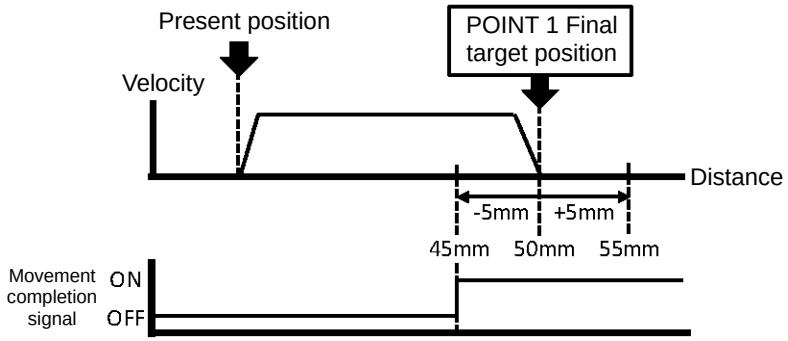
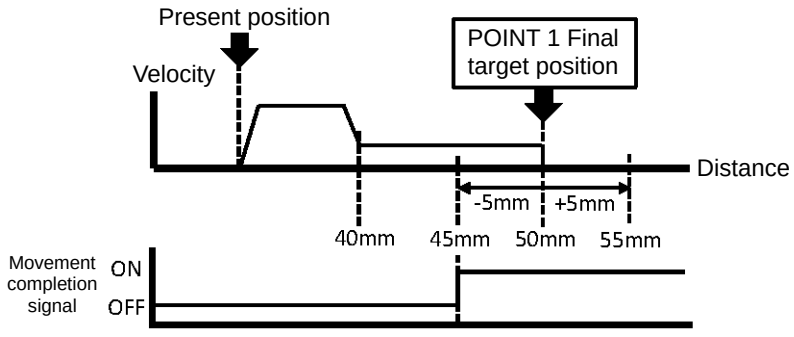
Set the output range of the point movement completion output signal and switches 1 and 2 output signals using the width for the final target position (one side).

• Setting range and initial value (shipment value)

Actuator type code / Model type code	Positioning width setting range [mm]	Initial value of positioning width [mm]
ERL2/ESD2	0.00 ~ 9.99 *1	0.00 *2

*1 If the value is set to 0.00, the common positioning width of parameter data will be applied.
*2 To the initial value (shipment value), 0.00 has been set and the common positioning width will be applied.

• Setting examples

Movement	Setting example
POSI (positioning movement)	Example Set POINT 1 Position (absolute position): + 50 mm Positioning width: 5 mm  When moving to the range of 45 mm to 55 mm, it will output the movement completion signal. Even if it is outside the positioning width range due to an overshoot etc., the completion signal will be retained.
PRS1 (pressing movement 1)	The completion signal is judged by the set pressing current, so the setting of the positioning width is not reflected.
PRS2 (pressing movement 2)	Example Set POINT 1 Position (absolute position): + 40 mm, Pressing distance: + 10 mm, Positioning width: 5 mm  When moving to the range of 45 mm to 55 mm, it will output the movement completion signal. Even if it is outside the positioning width range due to pressing back etc., the completion signal will be retained.

7.2.5. Setting of velocity

The velocity in the transfer zone can be set.

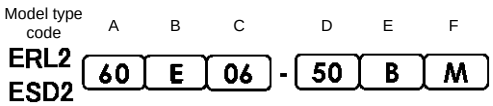
• Setting ranges and initial values (shipment values)

Actuator type code			Velocity setting range [mm/s]	Initial value of velocity [mm/s]
Model type code	A (body size)	C (screw lead)		
ERL2	45	06	15 ~ 300 *1	0 *2
		12	30 ~ 600 *1	0 *2
	60	06	15 ~ 200 *1	0 *2
		12	30 ~ 400 *1	0 *2
ESD2	35	06	15 ~ 300 *1	0 *2
		12	30 ~ 600 *1	0 *2
	45	06	15 ~ 300 *1	0 *2
		12	30 ~ 600 *1	0 *2
	55	06	15 ~ 200 *1	0 *2
		12	30 ~ 400 *1	0 *2

*1 If the value is set to 0, the common velocity of parameter data will be applied.

*2 To the initial value (shipment value), 0 has been set and the common velocity will be applied.

Actuator type code indication method



A: Body size
B: Motor attachment direction
C: Screw lead
D: Stroke
E: Brake
F: Origin position

CAUTION	● The set velocity may not be reached depending on the movement distance, acceleration and deceleration.

7.2.6. Setting of acceleration

The acceleration in the transfer zone can be set.

• Setting range and initial value (shipment value)

Actuator type code / Model type code	Acceleration setting range [m/s^2]	Initial value of acceleration [m/s^2]
ERL2/ESD2	1.0 ~ 3.0 *1	0.0 *2

*1 If the value is set to 0.0, the common acceleration of parameter data will be applied.

*2 To the initial value (shipment value), 0.0 has been set and the common acceleration will be applied.

7.2.7. Setting of deceleration

The deceleration in the transfer zone can be set.

• Setting range and initial value (shipment value)

Actuator type code / Model type code	Deceleration setting range [m/s^2]	Initial value of deceleration [m/s^2]
ERL2/ESD2	1.0 ~ 3.0 *1	0.0 *2

*1 If the value is set to 0.0, the common deceleration of parameter data will be applied.

*2 To the initial value (shipment value), 0.0 has been set and the common deceleration will be applied.

7.2.8. Setting of pressing current

The current value in the pressing zone can be set.

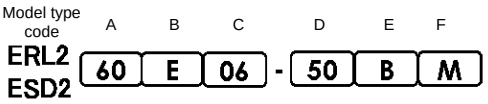
• Setting ranges and initial values (shipment values)

Actuator type code		Pressing current setting range [%]	Initial value of pressing current [%]
Model type code	A Body size		
ERL2	45	0 ~ 100 *1	0 *2
	60	0 ~ 80 *1	0 *2
ESD2	35	0 ~ 100 *1	0 *2
	45	0 ~ 100 *1	0 *2
	55	0 ~ 80 *1	0 *2

*1 If the value is set to 0, the common pressing current of parameter data will be applied.

*2 To the initial value (shipment value), 0 has been set and the common pressing current will be applied.

Actuator type code indication method



A: Body size
B: Motor attachment direction
C: Screw lead
D: Stroke
E: Brake
F: Origin position

7.2.9. Setting of pressing velocity

The velocity in the pressing zone can be set.

• Setting range and initial value (shipment value)

Actuator type code / Model type code	Pressing velocity setting range [mm/s]	Initial value of pressing velocity [mm/s]
ERL2/ESD2	1 ~ 30 *1	0 *2

*1 If the value is set to 0, the common pressing velocity of parameter data will be applied.

*2 To the initial value (shipment value), 0 has been set and the common pressing velocity will be applied.

7.2.10. Setting of pressing distance

The width of the pressing zone can be set.

• Setting range and initial value (shipment value)

Actuator type code / Model type code	Pressing distance setting range [mm]	Initial value of pressing distance [mm]
ERL2/ESD2	- stroke ~ + stroke *1	0 *2

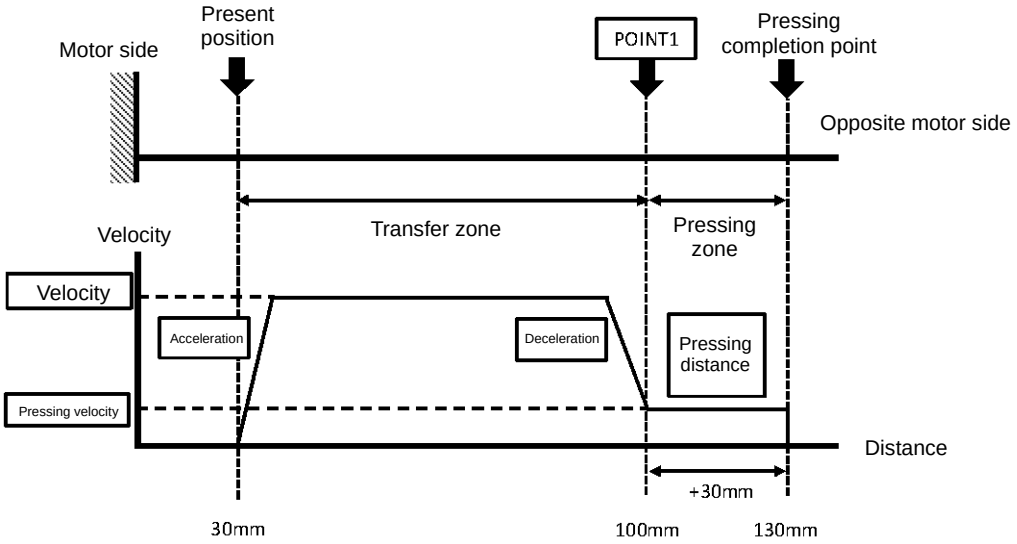
*1 If the value is set to 0, the common pressing distance of parameter data will be applied.

*2 To the initial value (shipment value), 0 has been set and the common pressing distance will be applied.

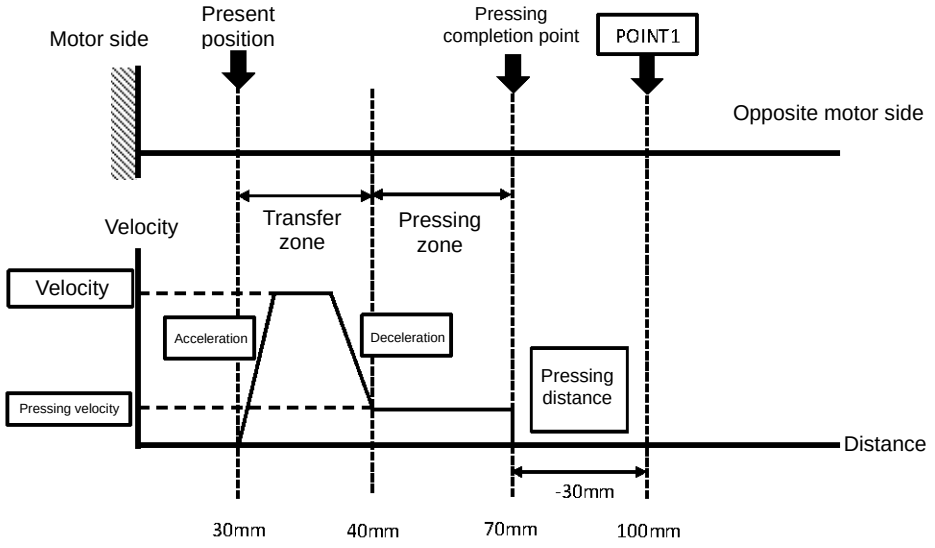
• Setting examples

The pressing completion point is determined by the code and value of the pressing distance.

Example Set POINT 1 Position (absolute position): + 100 mm, Pressing distance: + 30 mm



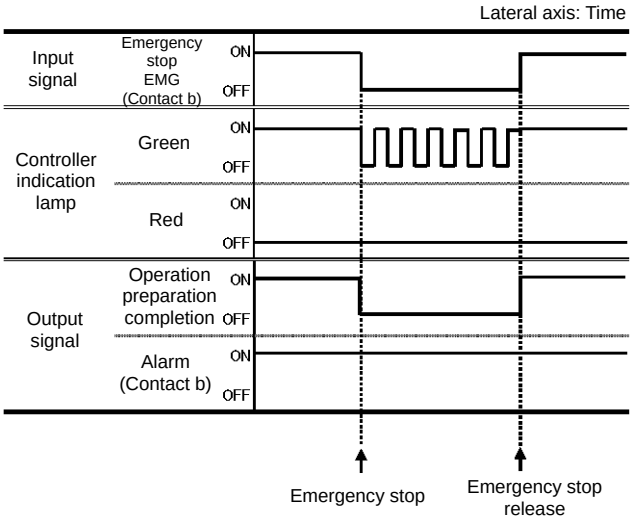
Example Set POINT 1 Position (absolute position): + 100 mm, Pressing distance: - 30 mm



8. Operation

8.1. Emergency stop and release

If an emergency stop is performed during an operation, the motor will be de-energized after a deceleration stop.
The operation preparation completion output is off until the emergency stop is released. If a brake is attached, the brake will be locked.
When releasing the emergency stop, be sure to check the surrounding safety and turn on the emergency stop signal (contact-b connection).

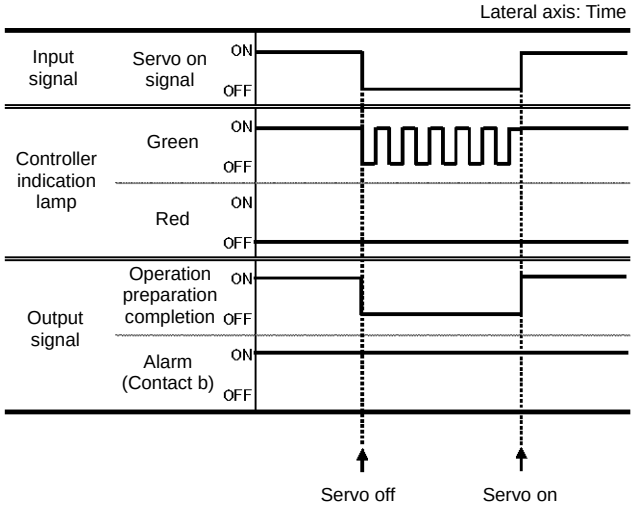


CAUTION	● The emergency stop status is not considered as an alarm, so no alarm signal is output. Avoid the disconnection of the wire for an emergency stop. ● Even during movement in the higher system (such as PLC), by performing the stop operation from the teaching pendant and setting software E Tools, the operation preparation completion output will be turned off and the motor will be de-energized after a deceleration stop. The operation preparation completion output is turned on by releasing the stop from the teaching pendant and setting software E Tools. Movement may start suddenly depending on the input signal from the higher system, so care should be taken. ● The input signal of the solenoid valve mode (single type and double 3 position type) is a level input, so it may operate at the same time as an emergency stop release depending on the input signal. When releasing an emergency stop, be sure to check that it is safe even if the actuator operates. Example: If input 2 is turned off (target position [1] is indicated) and an emergency stop is performed during an operation in the single type, a deceleration stop is done on the spot. If an emergency stop is released, input 2 is off, so it will move to target position [1] at the same time as the emergency stop release. In the case of the double 3 position type, be careful to set inputs 1 and 2 to off for safety during servo off.

8.2. Servo on/off

If servo off is performed during an operation, the motor will be de-energized after a deceleration stop. The operation preparation completion output is off during servo off. If a brake is attached, the brake will be locked.

The on/off operation of the servo can be performed regardless of the status of the servo on signal using the teaching pendant and setting software E Tools.

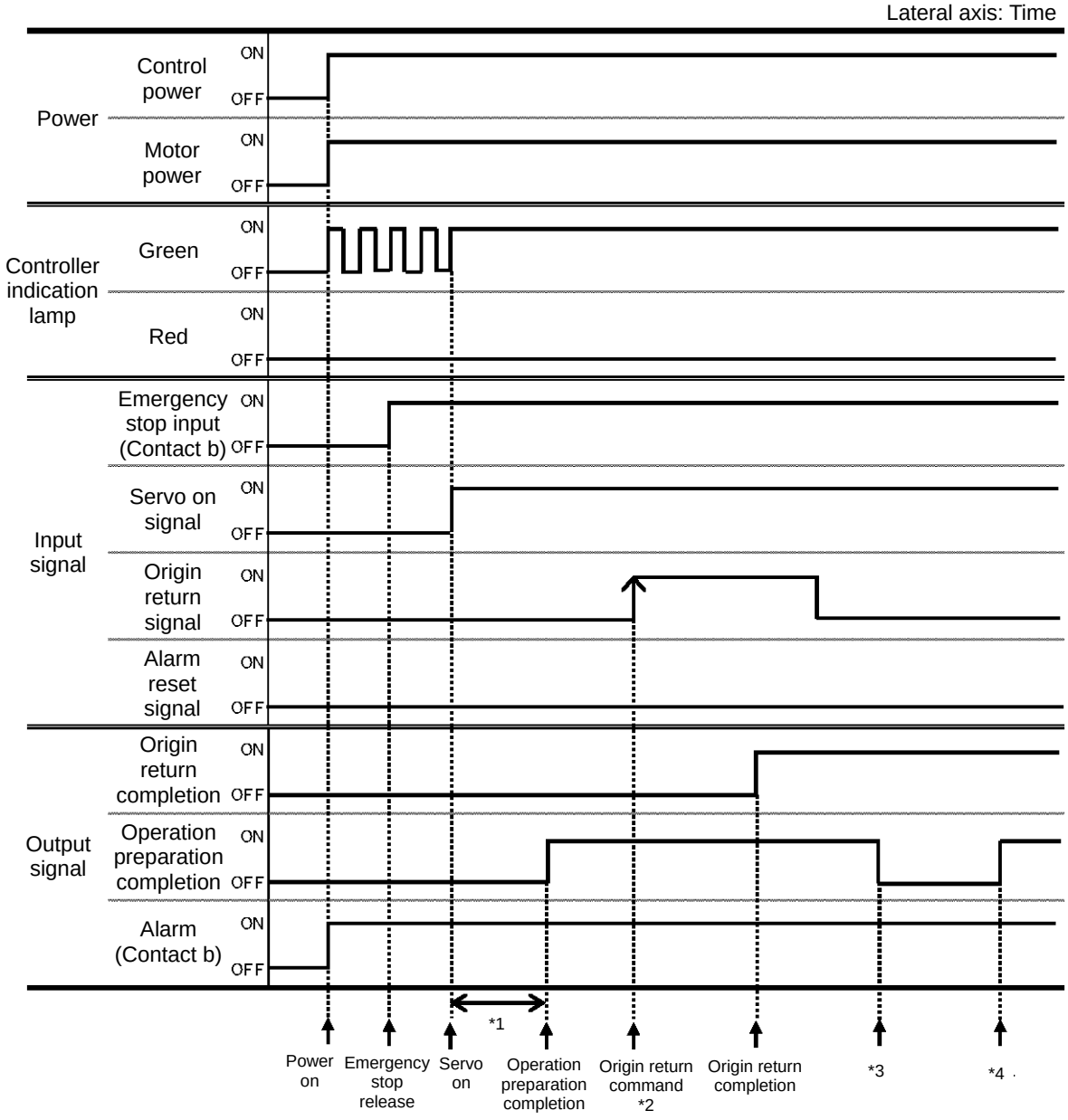


WARNING	● If servo off is performed during movement, the operation may continue due to the inertia force of a workpiece, so consider safety without fail.

CAUTION	● If the operation by the teaching pendant and setting software E Tools is effective, the servo on/off operation by the servo on signal will not be accepted. ● The input signal of the solenoid valve mode (single type and double 3 position type) is a level input, so it may operate at the same time as servo on depending on the input signal. At the time of servo on, be sure to check that it is safe even if the actuator operates. Example: If input 2 is turned off (target position [1] is indicated) and servo off is performed during an operation in the single type, a deceleration stop is done on the spot. In the case of servo on, input 2 is off, so it will move to target position [1] at the same time as the servo on. In the case of the double 3 position type, be careful to set inputs 1 and 2 to off for safety during servo off.

8.3. Power activation sequence

The following shows the time chart from power activation to origin return completion for which the origin return signal is used.



*1 When servo on is performed for the first time after power activation, it takes 1.5 to 5.0 sec until the operation preparation is completed depending on the position of the stroke.

*2 Movement in the case where the automatic origin return of parameter data is ineffective.

*3 The case where the operation in the setting tool is effective (SIO mode).

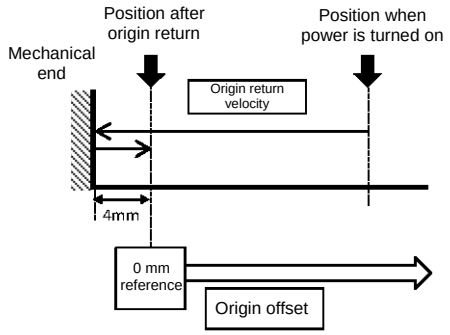
*4 The case where the operation in the setting tool is ineffective (PIO mode).

CAUTION	● Since a stepping motor is used, an excitation phase detection will be performed when servo on is performed for the first time after power activation.

8.4. Origin return movement

When origin return movement is performed, the mechanical end will be detected and reverse movement will be performed only by 4 mm + origin offset (*1).
The position at which the origin return movement is completed will be the origin (0 mm) (*2).

*1 The shipment value of the origin offset is 1 mm.
*2 The origin direction depends on the model.



• Items to set related to origin return movement

Item to set	Overview
Origin return velocity	The velocity during an origin return can be set.
Origin offset	The amount of offset of the origin position can be set.
Automatic origin return	Whether an origin return is “performed” or “not performed” automatically can be selected at the time of power activation.

For details, refer to “6.1. Parameter table”.

• Input signal

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

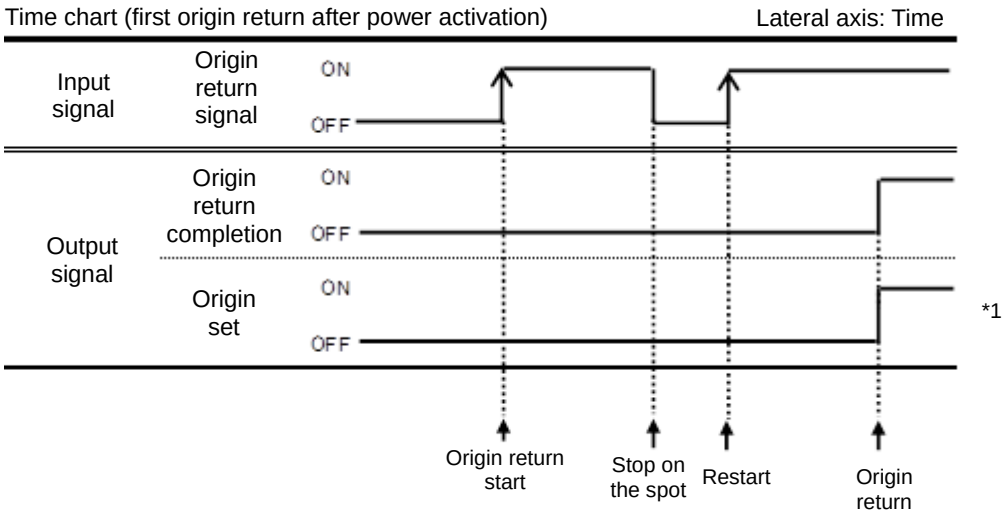
Input 5 (EC07) Input 11 (EC63, ECPT) Origin return command signal	Description of control
1↑	Origin return movement is started by the origin return command signal: on edge signal.
0	Origin return movement is interrupted and stopped on the spot by the origin return command signal: off during the origin return movement.

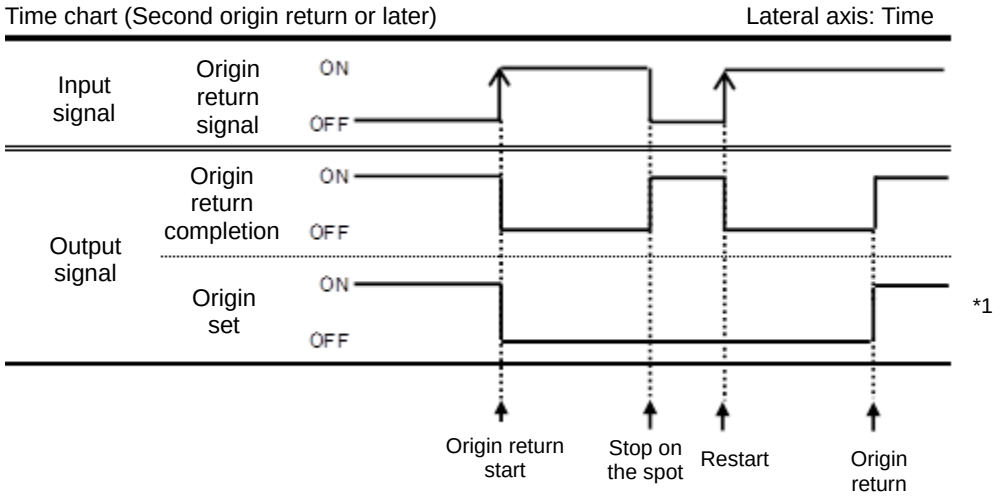
• Output signal

0: Off, 1: On

Input 5 (EC07) Input 11 (EC63, ECPT) Origin return completion signal	Description of control
1	An on output is performed with an origin return completed.
0	An off output is performed with an origin return not conducted. An off output is performed during origin return movement.

• Time chart





*1 The origin set signal is the output signal of ECPT only.
It is turned off if operated (may be operated) not by a pulse string signal after origin return completion. In this case, the recognition of the origin position of the higher controller and that of ECPT may be different, so it is recommended to execute an origin return again.

8.5. Positioning movement (EC07, EC63)

8.5.1. Standard modes

After designating a point number with point selection bits, start movement by the on edge input to the point movement start signal.

During movement, turn off all the point selection bits and interrupt the movement by the on edge input to the point movement start signal to stop it on the spot.

8.5.1.1. Standard mode (EC07)

• Input signal (EC07)

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

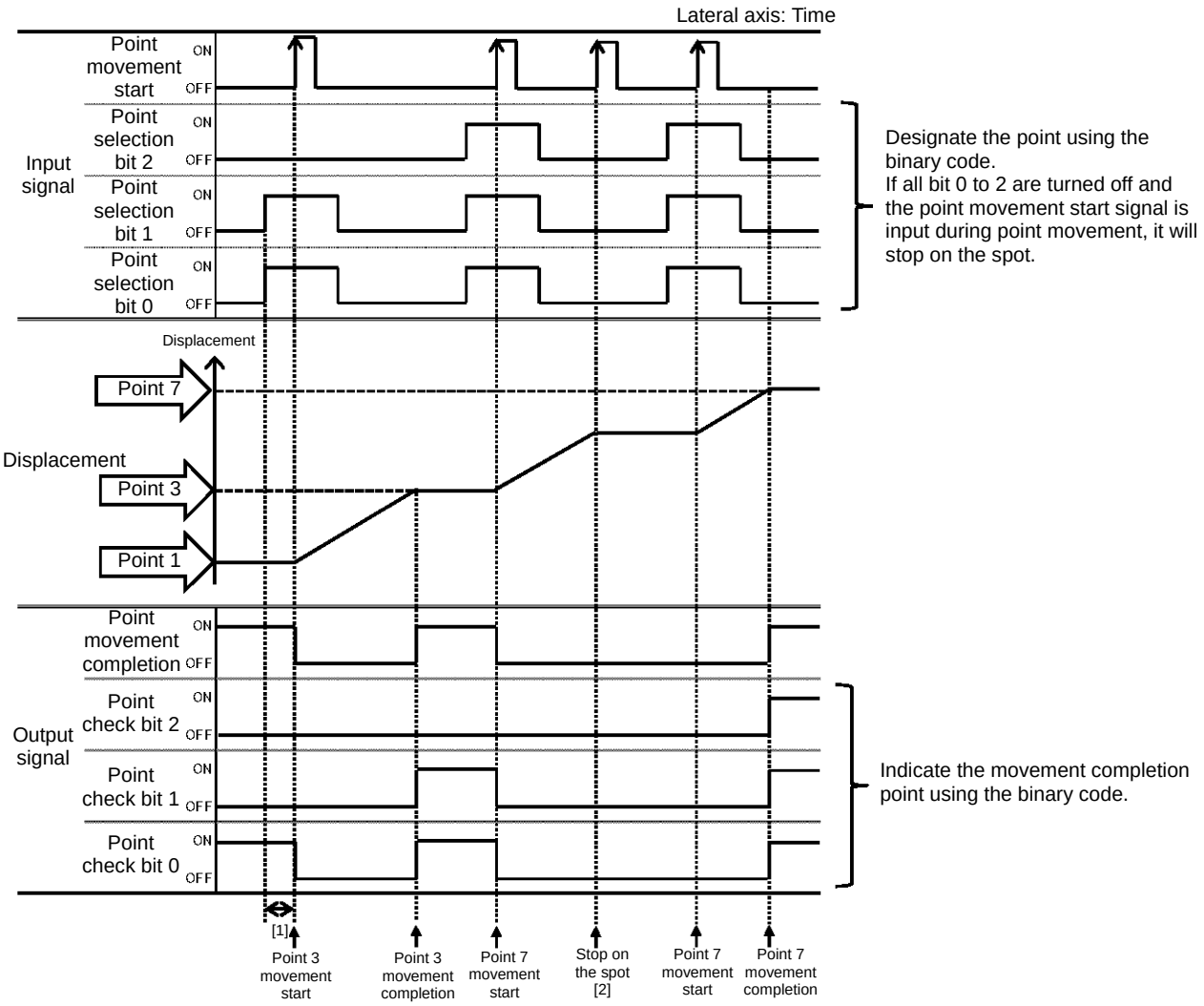
General-purpose input 1	General-purpose input 2	General-purpose input 3	General-purpose input 4	Description of control
Point movement completion	Point selection bit 2	Point selection bit 1	Point selection bit 0	
1↑	0	0	0	By the point movement start: on edge signal and point selection bit 2 to 0: off level signal, if it is during the point movement, the movement will be interrupted and stopped on the spot.
1↑	Designate the point number using the binary code (point selection bit 0 is the least significant bit).			By the point movement start: on edge signal and point selection bit 2 to 0: point number, it will move to the designated point number.
	0	0	1	Example: Command of movement to point 1
	0	1	1	Example: Command of movement to point 3
	1	1	1	Example: Command of movement to point 7

• Output signal (EC07)

0: Off, 1: On

General-purpose output 1	General-purpose output 2	General-purpose output 3	General-purpose output 4	Description of control
Point movement completion	Point check bit 2	Point check bit 1	Point check bit 0	
1	Indicate the point number using the binary code (point check bit 0 is the least significant bit).			When the movement to the designated point is completed, the point movement completion will be turned on. By the point number whose movement is completed, point check bit 2 to 0 will be turned on.
	0	0	1	Example: Completion of movement to point 1
	0	1	1	Example: Completion of movement to point 3
	1	1	1	Example: Completion of movement to point 7

• Time chart (EC07)



[1]: There should be a time of 20 msec or more between the point selection bit and point start signal.

[2]: No completion signal is output at the time of an on-the-spot stop.

8.5.1.2 Standard mode (EC63)

• Input signal (EC63)

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

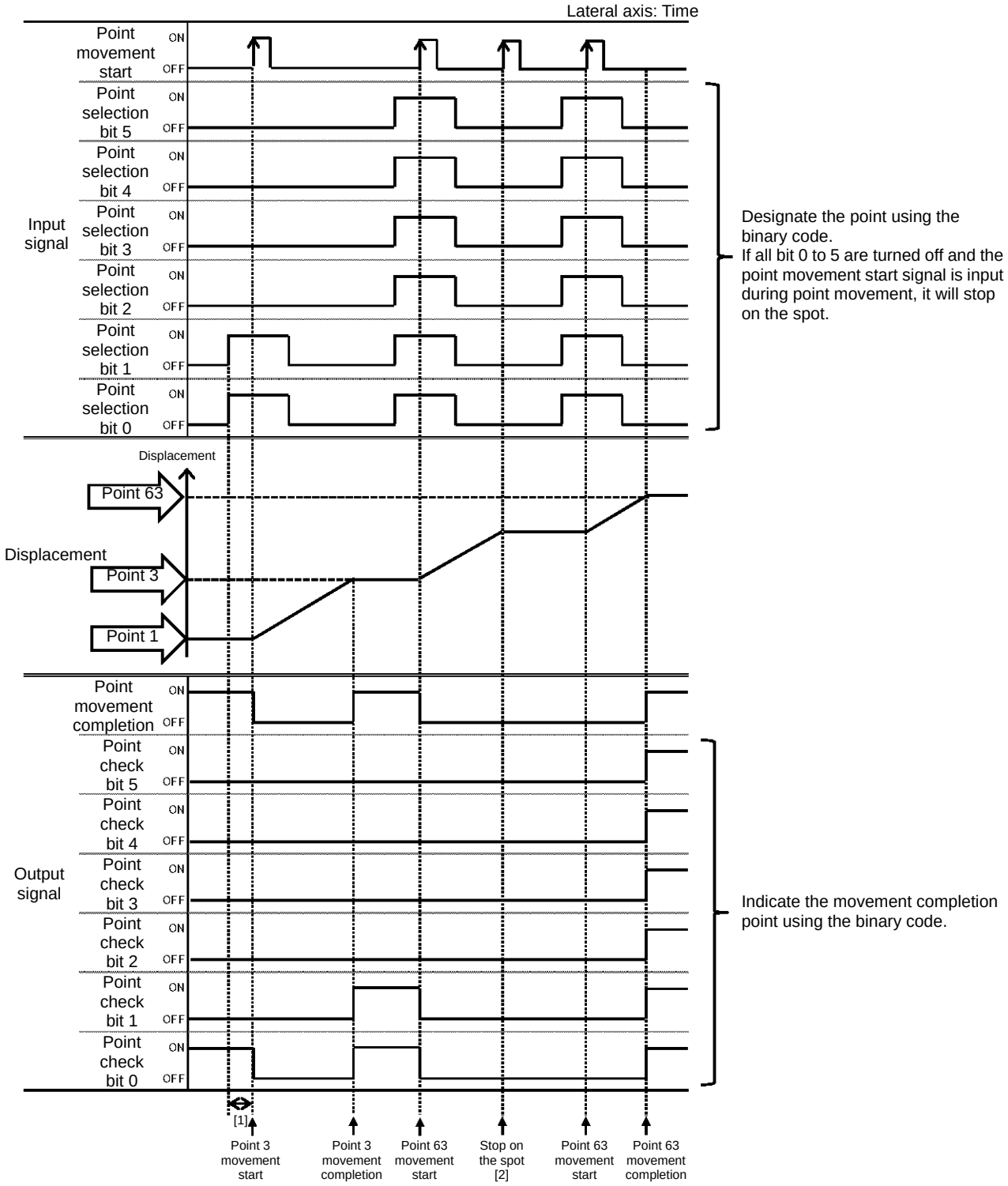
General-purpose input 1	General-purpose input 2	General-purpose input 3	General-purpose input 4	General-purpose input 5	General-purpose input 6	General-purpose input 7	Description of control
Point movement start	Point selection bit 5	Point selection bit 4	Point selection bit 3	Point selection bit 2	Point selection bit 1	Point selection bit 0	
1↑	0	0	0	0	0	0	By the point movement start: on edge signal and point selection bit 5 to 0: off level signal, if it is during the point movement, the movement will be interrupted and stopped on the spot.
1↑	Designate the point number using the binary code (point selection bit 0 is the least significant bit).						By the point movement start: on edge signal and point selection bit 5 to 0: point number, it will move to the designated point number.
	0	0	0	0	0	1	Example: Command of movement to point 1
	0	0	0	0	1	1	Example: Command of movement to point 3
	1	1	1	1	1	1	Example: Command of movement to point 63

• Output signal (EC63)

0: Off, 1: On

General-purpose output 1	General-purpose output 2	General-purpose output 3	General-purpose output 4	General-purpose output 5	General-purpose output 6	General-purpose output 7	Description of control
Point movement completion	Point check bit 5	Point check bit 4	Point check bit 3	Point check bit 2	Point check bit 1	Point check bit 0	
1	Indicate the point number using the binary code (point check bit 0 is the least significant bit).						When the movement to the designated point is completed, the point movement completion will be turned on. By the point number whose movement is completed, point check bit 5 to 0 will be turned on.
	0	0	0	0	0	1	Example: Completion of movement to point 1
	0	0	0	0	1	1	Example: Completion of movement to point 3
	1	1	1	1	1	1	Example: Completion of movement to point 63

• Time chart (EC63)



[1]: There should be a time of 20 msec or more between the point selection bit and point start signal.

[2]: No completion signal is output at the time of an on-the-spot stop.

8.5.2. Simple modes

Start movement by the on edge input to the point movement start signal.

During movement, by turning off all the point movement start signals, interrupt the movement to stop it on the spot.

8.5.2.1. Simple mode (EC07)

• Input signal (EC07)

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

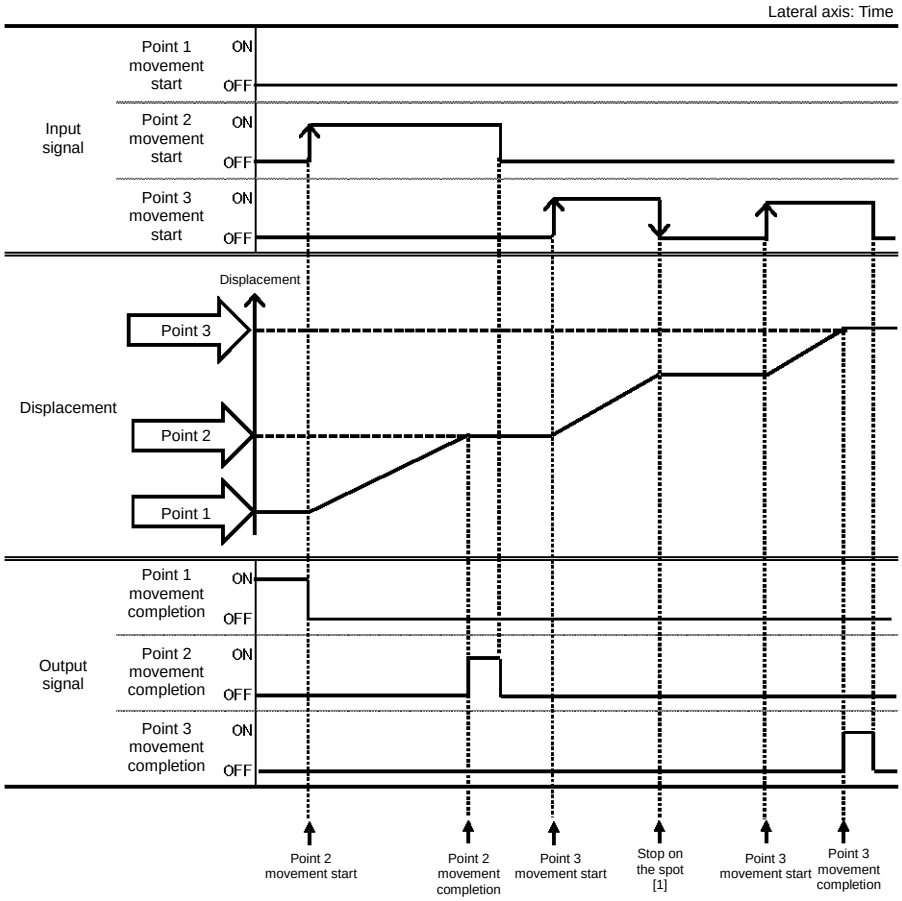
General-purpose input 1	General-purpose input 2	General-purpose input 3	Description of control
Point 1 movement start	Point 2 movement start	Point 3 movement start	
0	0	0	By point movement start signal 1 to 3: off level signal, if it is during the point movement, the movement will be interrupted and stopped on the spot.
1↑	0	0	Command of movement to point 1
0	1↑	0	Command of movement to point 2
0	0	1↑	Command of movement to point 3

• Output signal (EC07)

0: Off, 1: On

General-purpose output 1	General-purpose output 2	General-purpose output 3	Description of control
Point check bit 1	Point check bit 2	Point check bit 3	
1	0	0	Completion of movement to point 1
0	1	0	Completion of movement to point 2
0	0	1	Completion of movement to point 3

• Time chart (EC07)



[1]: No completion signal is output at the time of an on-the-spot stop.

8.5.2.2 Simple mode (EC63)

• Input signal (EC63)

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

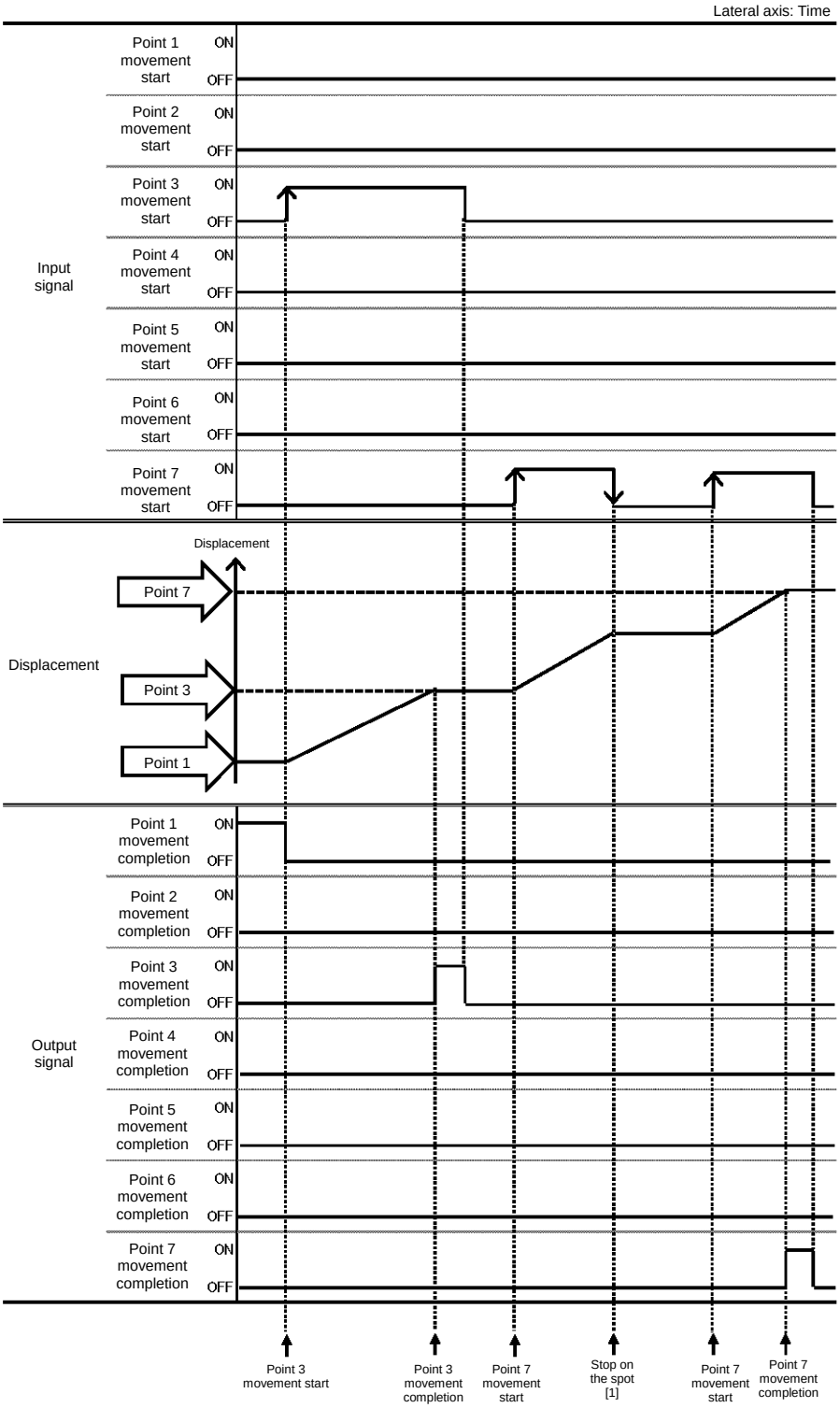
General-purpose input 1	General-purpose input 2	General-purpose input 3	General-purpose input 4	General-purpose input 5	General-purpose input 6	General-purpose input 7	Description of control
Point 1 movement start	Point 2 movement start	Point 3 movement start	Point 4 movement start	Point 5 movement start	Point 6 movement start	Point 7 movement start	
0	0	0	0	0	0	0	By point movement start signal 1 to 7: off level signal, if the point is moving, the movement will be interrupted and stopped on the spot.
1↑	0	0	0	0	0	0	Command of movement to point 1
0	1↑	0	0	0	0	0	Command of movement to point 2
0	0	1↑	0	0	0	0	Command of movement to point 3
0	0	0	1↑	0	0	0	Command of movement to point 4
0	0	0	0	1↑	0	0	Command of movement to point 5
0	0	0	0	0	1↑	0	Command of movement to point 6
0	0	0	0	0	0	1↑	Command of movement to point 7

• Output signal (EC63)

0: Off, 1: On

General-purpose output 1	General-purpose output 2	General-purpose output 3	General-purpose output 4	General-purpose output 5	General-purpose output 6	General-purpose output 7	Description of control
Point 1 movement completion	Point 2 movement completion	Point 3 movement completion	Point 4 movement completion	Point 5 movement completion	Point 6 movement completion	Point 7 movement completion	
1	0	0	0	0	0	0	Completion of movement to point 1
0	1	0	0	0	0	0	Completion of movement to point 2
0	0	1	0	0	0	0	Completion of movement to point 3
0	0	0	1	0	0	0	Completion of movement to point 4
0	0	0	0	1	0	0	Completion of movement to point 5
0	0	0	0	0	1	0	Completion of movement to point 6
0	0	0	0	0	0	1	Completion of movement to point 7

• Time chart (EC63)



[1]: No completion signal is output at the time of an on-the-spot stop.

8.5.3. Solenoid valve mode (double 2 position type)

- Input signal

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

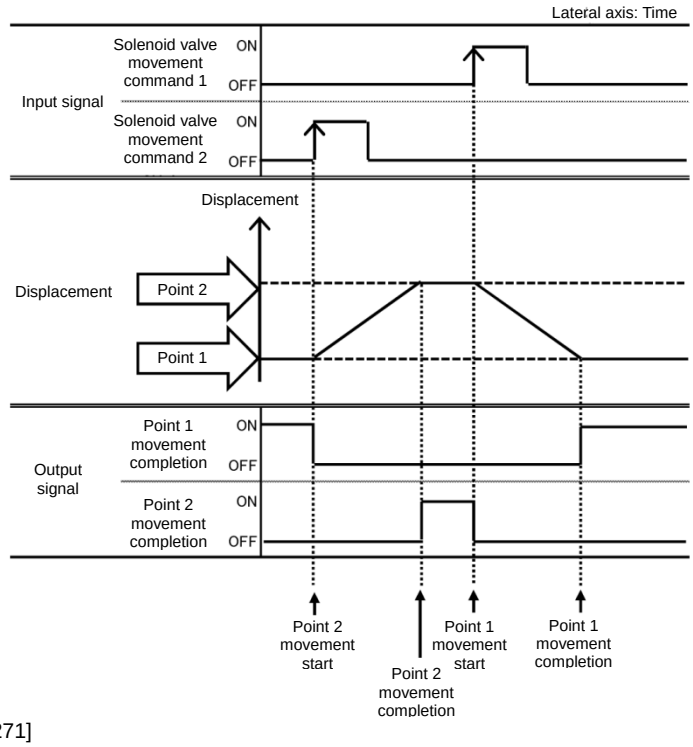
General-purpose input 1	General-purpose input 2	Description of control
Solenoid valve movement command 1	Solenoid valve movement command 2	
1↑	0	By solenoid valve movement command 1: on edge signal and solenoid valve movement command 2: off level signal, it will move to point 1.
0	1↑	By solenoid valve movement command 1: off level signal and solenoid valve movement command 2: on edge signal, it will move to point 2.

- Output signal

0: Off, 1: On

General-purpose output 1	General-purpose output 2	General-purpose output 3	General-purpose output 4	Description of control
Point 1 movement completion	Point 2 movement completion	Switch 1 output	Switch 2 output	
1	0	0	0	Completion of movement to point 1
0	1	0	0	Completion of movement to point 2
0	0	1	0	The present position is in the positioning completion width of point 1.
0	0	0	1	The present position is in the positioning completion width of point 2.

- Time chart



[SM-612271]

8.5.4. Solenoid valve mode (double 3 position type)

• Input signal

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

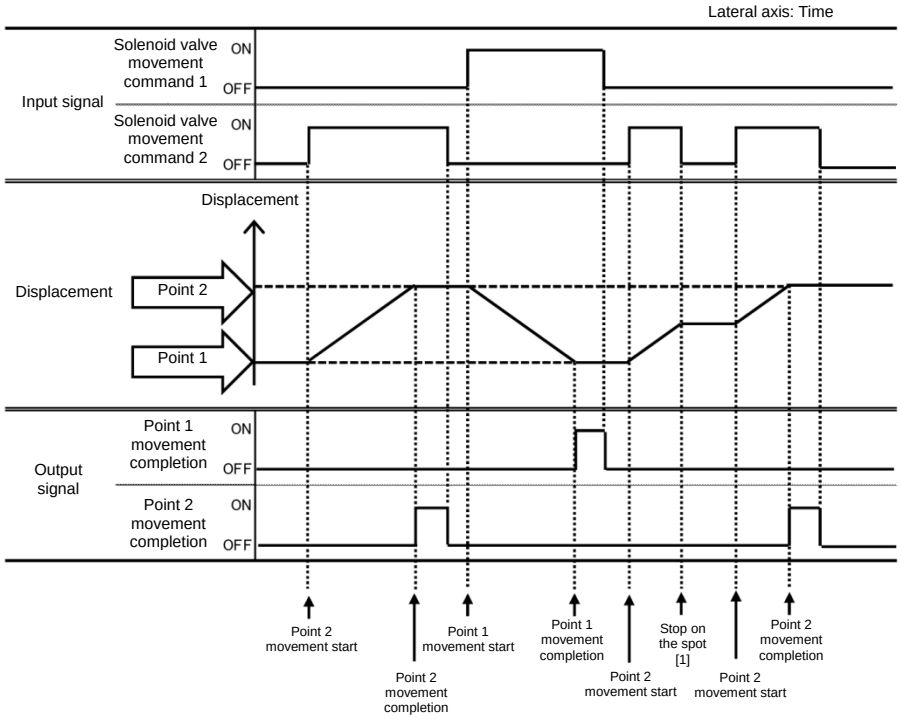
General-purpose input 1	General-purpose input 2	Description of control
Solenoid valve movement command 1	Solenoid valve movement command 2	
0	0	By the solenoid valve movement command 1: off level signal and solenoid valve movement command 2: off level signal, during movement to the point, the movement will be interrupted and stopped on the spot.
1	0	By the solenoid valve movement command 1: on level signal and solenoid valve movement command 2: off level signal, it will move to point 1.
0	1	By the solenoid valve movement command 1: off level signal and solenoid valve movement command 2: on level signal, it will move to point 2.

• Output signal

0: Off, 1: On

General-purpose output 1	General-purpose output 2	General-purpose output 3	General-purpose output 4	Description of control
Point 1 movement completion	Point 2 movement completion	Switch 1 output	Switch 2 output	
1	0	0	0	Completion of movement to point 1
0	1	0	0	Completion of movement to point 2
0	0	1	0	The present position is in the positioning completion width of point 1.
0	0	0	1	The present position is in the positioning completion width of point 2.

• Time chart



[1]: No completion signal is output at the time of an on-the-spot stop.

[SM-612271]

8.5.5. Solenoid valve mode (single type)

- Input signal

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

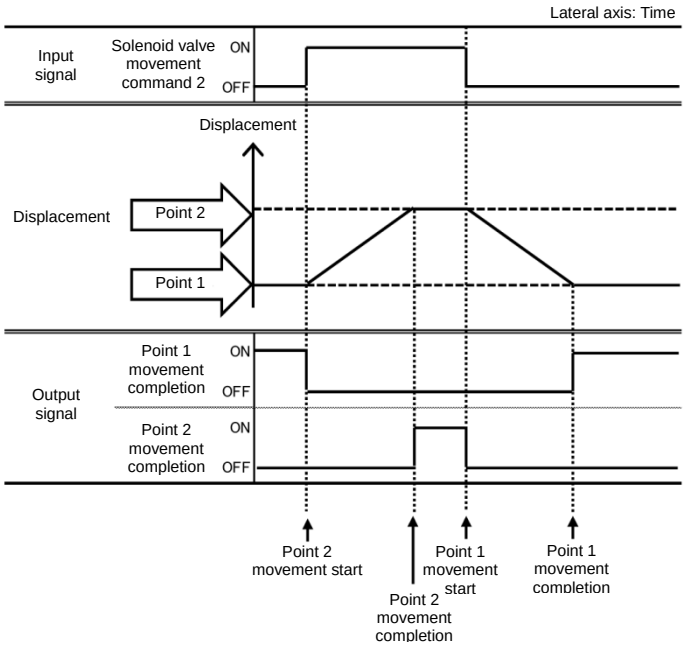
General-purpose input 2 Solenoid valve movement command	Description of control
0	By the solenoid valve movement command: off level signal, it will move to point 1.
1	By the solenoid valve movement command: on level signal, it will move to point 2.

- Output signal

0: Off, 1: On

General-purpose output 1 Point 1 movement completion	General-purpose output 2 Point 2 movement completion	General-purpose output 3 Switch 1 output	General-purpose output 4 Switch 2 output	Description of control
1	0	0	0	Completion of movement to point 1
0	1	0	0	Completion of movement to point 2
0	0	1	0	The present position is in the positioning completion width of point 1.
0	0	0	1	The present position is in the positioning completion width of point 2.

- Time chart



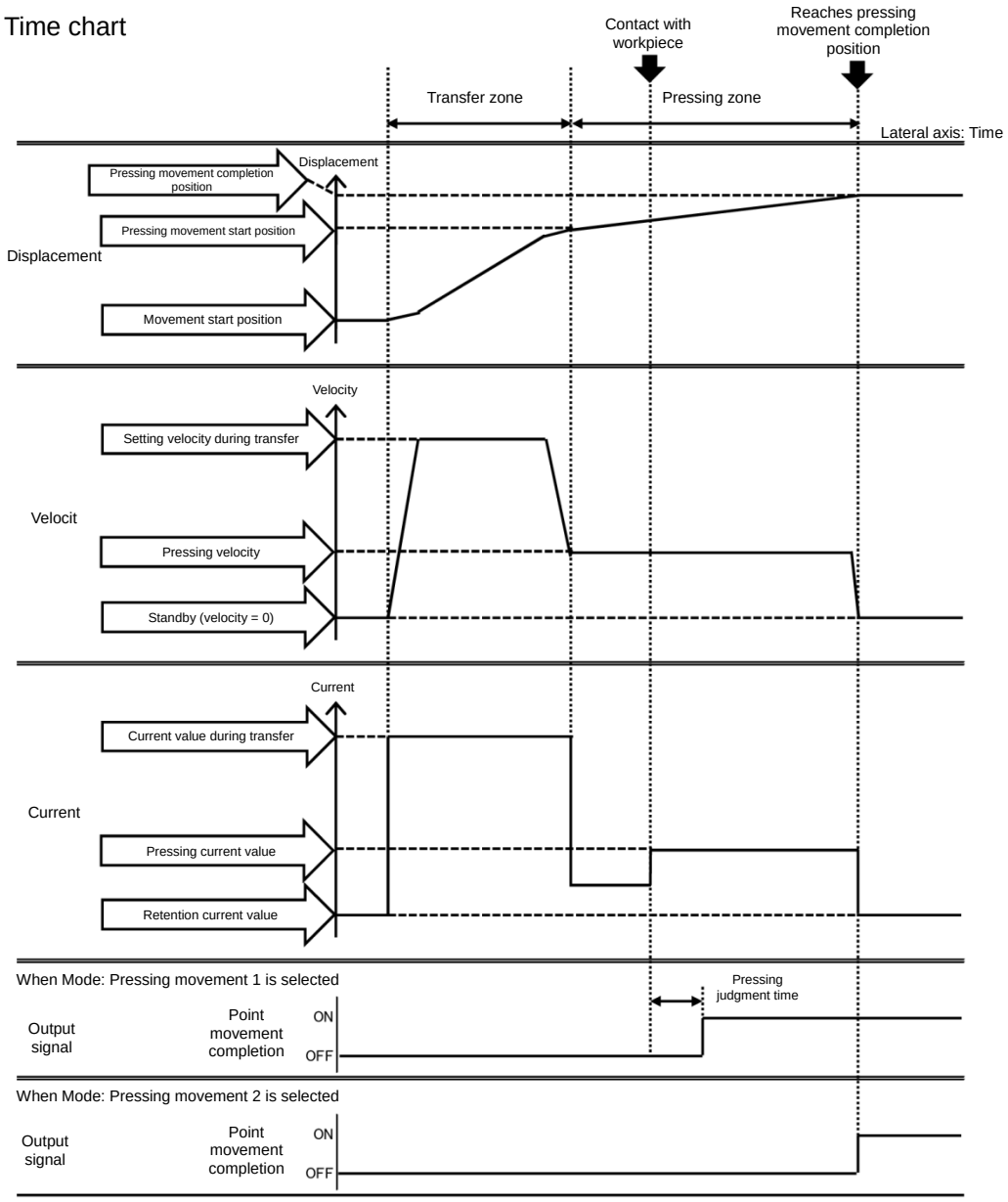
8.6. Pressing movement (EC07, EC63)

The pressing movement can be performed by setting pressing movement 1 or pressing movement 2. After transfer movement, movement is done below the set pressing current value in the pressing zone. Even in the case of a stop due to a contact with a workpiece, no alarm will be detected.

• Items to set related to pressing movement

Item to set	Overview
Pressing current	The maximum current value in the pressing zone can be set. For details, refer to “7.2.8. Setting of pressing current”.
Pressing velocity	The velocity in the pressing zone can be set. For details, refer to “7.2.9. Setting of pressing velocity”.
Pressing distance	The pressing zone width can be set. For details, refer to “7.2.10. Setting of pressing distance”.
Pressing judgment time	When pressing movement 1 is set, the time until pressing completion is judged can be set. For details, refer to “6.1. Parameter table”.

• Time chart



[SM-612271]

8.7. Movement if new movement signal is input during movement (EC07, EC63)

If a new movement signal is input during movement,

- If the new target positions are in the same movement direction
  The velocity and positions will be changed depending on the setting of the target positions.
- If the new target positions are in the reverse direction
  A deceleration stop and movement in the reverse direction will be performed.

CAUTION	● The set velocity may not be reached depending on the movement distance, acceleration and deceleration. ● If a new movement signal is input near the soft limit, the alarm of soft limit over may be output.

8.8. Positioning movement by pulse string (ECPT)

Execute positioning movement in accordance with an input pulse string signal.

• Setting example

Code	Target actuator example	Input pulse string signal example	Setting example
Movement 1	ERL2-60E C 06 – 200BM C : Screw lead 6 mm	Pulse string type: Positive logic, Up/Down input Electronic gear ratio numerator: 1024 (recommended value) Electronic gear ratio denominator: 600 (recommended value)	Movement amount: +200 mm Movement velocity: 50 mm/s Acceleration: 1.0 m/s^2 Deceleration: 1.0 m/s^2
Movement 2			Movement amount: -100 mm Movement velocity: 300 mm/s Acceleration: 3.0 m/s^2 Deceleration: 3.0 m/s^2

• Calculation example

Movement 1

$$\text{Pulse amount [pulse]} = \text{Movement amount [mm]} \Big/ \left(\frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ration denominator}} \times \frac{\text{Screw lead [mm]}}{\text{1024 (Encoder resolution)}} \right)$$

$$= 200 \Big/ \left(\frac{1024}{600} \times \frac{6}{1024} \right)$$

$$= 20000\,[\text{pulse}]$$

$$\text{Pulse velocity [pulse/sec]} = \text{Velocity [mm/s]} \Big/ \left(\frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ration denominator}} \times \frac{\text{Screw lead [mm]}}{\text{1024 (Encoder resolution)}} \right)$$

$$= 50 \Big/ \left(\frac{1024}{600} \times \frac{6}{1024} \right)$$

$$= 5000\,[\text{pulse/sec}]$$

$$\text{Acceleration/Deceleration time [sec]} = \text{Velocity [mm/s]} \Big/ \left(\frac{\text{Acceleration/Deceleration velocity [m/s}^2\text{]}}{1000} \right)$$

$$= 50 \Big/ \left(\frac{1.0}{1000} \right)$$

$$= 0.05\,[\text{sec}]$$

Movement 2

$$\text{Pulse amount [pulse]} = \text{Movement amount [mm]} \Big/ \left(\frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ration denominator}} \times \frac{\text{Screw lead [mm]}}{\text{1024 (Encoder resolution)}} \right)$$

$$= 100 \Big/ \left(\frac{1024}{600} \times \frac{6}{1024} \right)$$

$$= 10000\,[\text{pulse}]$$

$$\text{Pulse velocity [pulse/sec]} = \text{Velocity [mm/s]} \Big/ \left(\frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ration denominator}} \times \frac{\text{Screw lead [mm]}}{\text{1024 (Encoder resolution)}} \right)$$

$$= 300 \Big/ \left(\frac{1024}{600} \times \frac{6}{1024} \right)$$

$$= 30000\,[\text{pulse/sec}]$$

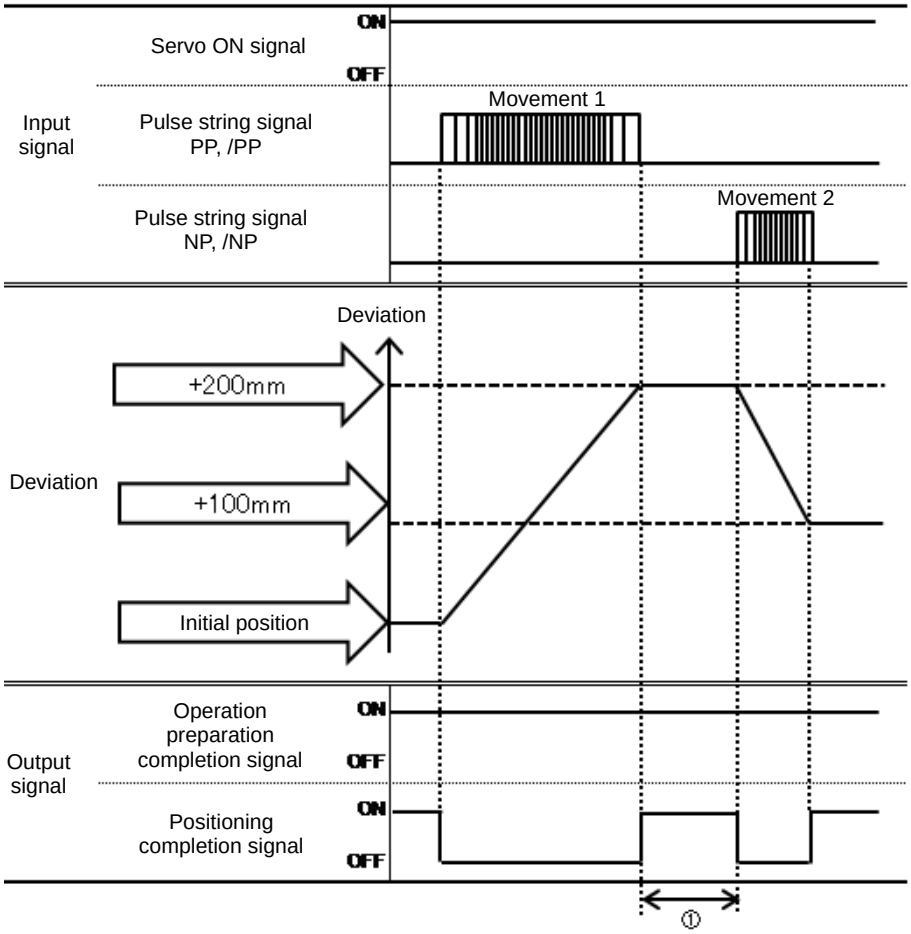
$$\text{Acceleration/Deceleration time [sec]} = \text{Velocity [mm/s]} \Big/ \left(\frac{\text{Acceleration/Deceleration velocity [m/s}^2\text{]}}{1000} \right)$$

$$= 300 \Big/ \left(\frac{3.0}{1000} \right)$$

$$= 0.1\,[\text{sec}]$$

• Time chart

Lateral axis: Time



(1): There should be a time of 100 msec or more between the signals.

CAUTION	● Perform setting so that the velocity, acceleration and deceleration of the actuator will not exceed the specifications of the actuator. If they exceed and an operation is performed, a sudden movement or runaway may occur.

8.9. Pressing movement by pulse string (ECPT)

The pressing movement can be performed by turning on the torque limit 1 (torque limit 2) signal at a velocity lower than the pressing velocity limit “refer to 8.9.2. Pressing movement time chart 1”. Since a large amount of deviation of pulse signals has accumulated during pressing movement, after pressing movement completion, after inputting a deviation clear signal, it is necessary to perform origin return movement “refer to 8.9.3. Time chart after pressing movement 1” or input a pulse signal in the reverse direction for the deviation of the pulse signal “refer to 8.9.4. Time chart after pressing movement 2”.

8.9.1. Items to set related to pressing movement

Item to set	Overview
Pressing velocity limit	An item to set required to perform the pressing movement with a pulse string. It transitions to the pressing movement by turning on the torque limit 1 (torque limit 2) signal at a velocity lower than the pressing velocity limit. The maximum velocity after pressing movement transition is the pressing velocity limit value.
Pressing current 1	An item to set required to perform the pressing movement with a pulse string. The maximum current value during the pressing movement can be set. The value of pressing current 1 becomes the maximum current value by turning on the torque limit 1 signal.
Pressing current 2	An item to set required to perform the pressing movement with a pulse string. The maximum current value during the pressing movement can be set. The value of pressing current 2 becomes the maximum current value by turning on the torque limit 2 signal.

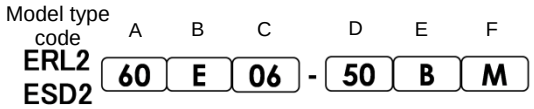
• Setting range and initial value of pressing velocity limit (shipment value)

Actuator type code Model type code	Setting range of pressing velocity limit [mm/s]	Initial value of pressing velocity limit [mm/s]
ERL2/ESD2	1~30	10

• Setting range and initial value of pressing current 1 and 2 (shipment value)

Actuator type code		Setting range of pressing current 1 and 2 [%]	Initial value of pressing current 1 and 2 [%]
Model type code	A Body size		
ERL2	45	1~100	50
	60	1~80	50
ESD2	35	1~100	50
	45	1~100	50
	55	1~80	50

Actuator type code indication method



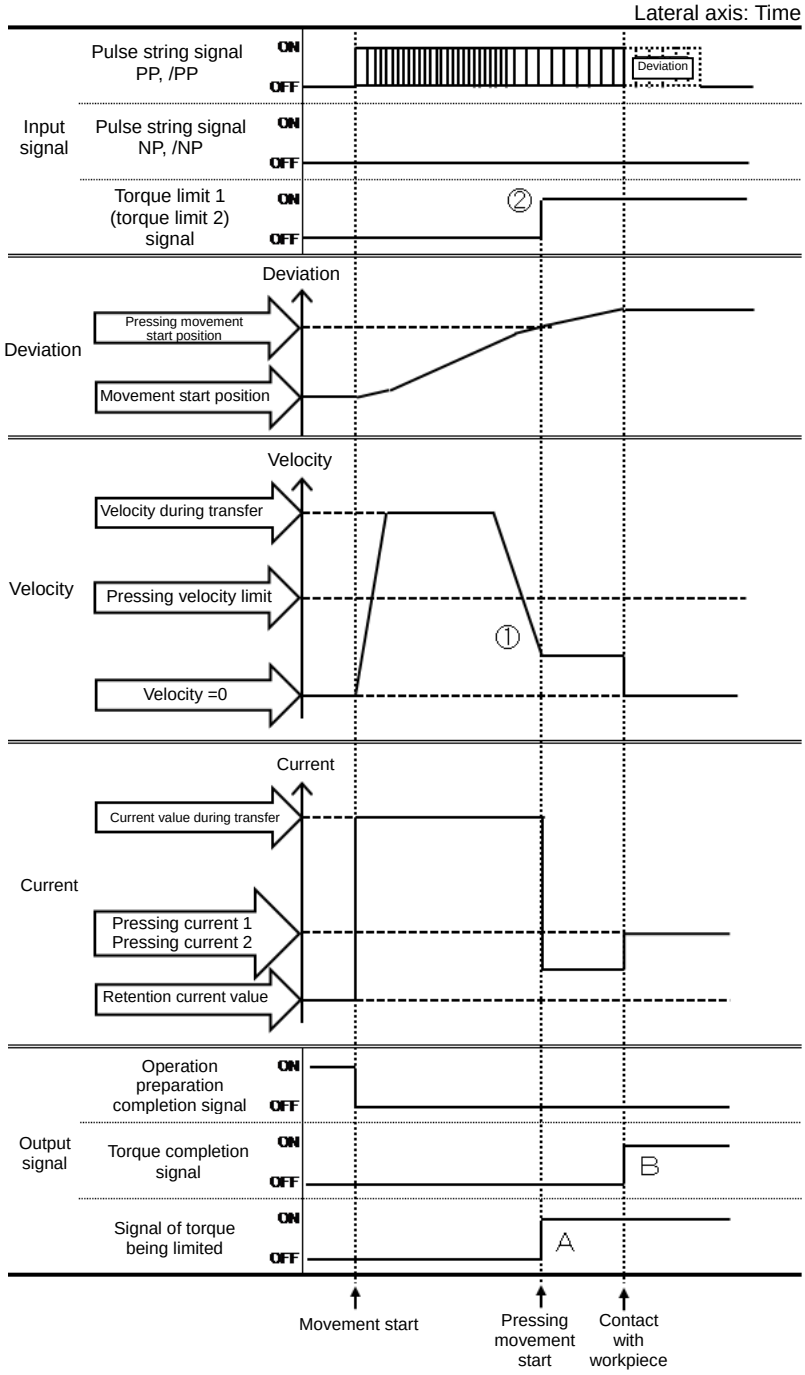
A: Body size
B: Motor attachment direction
C: Screw lead
D: Stroke
E: Brake
F: Origin position

CAUTION	● Excessive deviation (accumulated pulses) may be caused during pressing movement. If a torque limit is released in this state, a sudden movement or runaway may occur.

8.9.2. Pressing movement time chart 1

[1] Set the velocity of the actuator to the pressing velocity limit or lower.

[2] Turn on the torque limit 1 (torque limit 2) signal.



A: Turned on during pressing movement.
B: Turned on if reaching set pressing current value 1 (pressing current value 2).
If a low pressing current value is set, on/off may be repeated.

8.9.3. Time chart after pressing movement 1

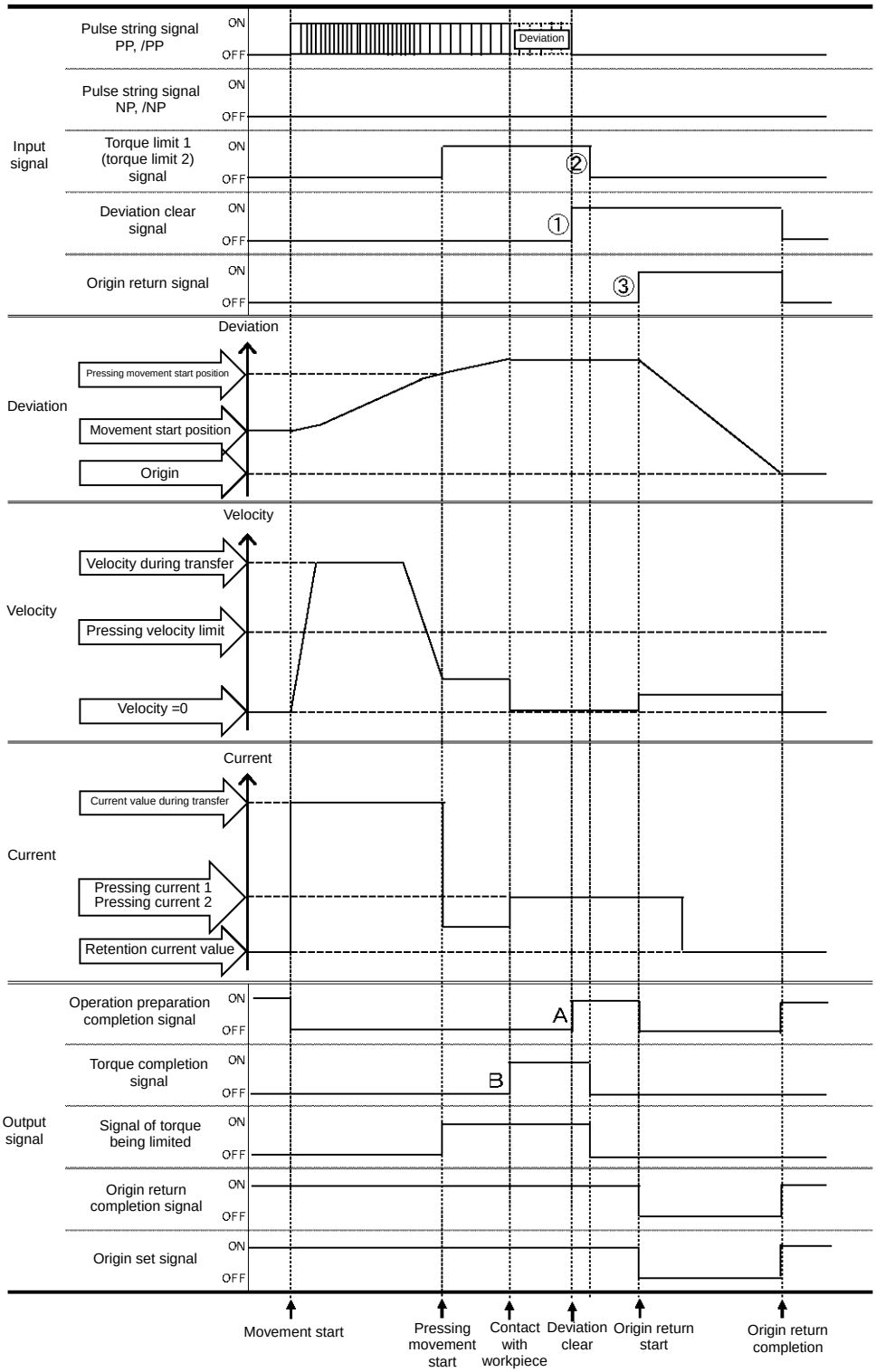
A procedure to perform origin return movement after pressing movement.

[1] Turn on the deviation clear signal.

[2] Turn off the torque limit 1 (torque limit 2) signal.

[3] Turn on the origin return signal.

Lateral axis: Time



A: If deviation changes, the positioning completion signal is turned off.

B: If a low pressing current value is set, on/off may be repeated.

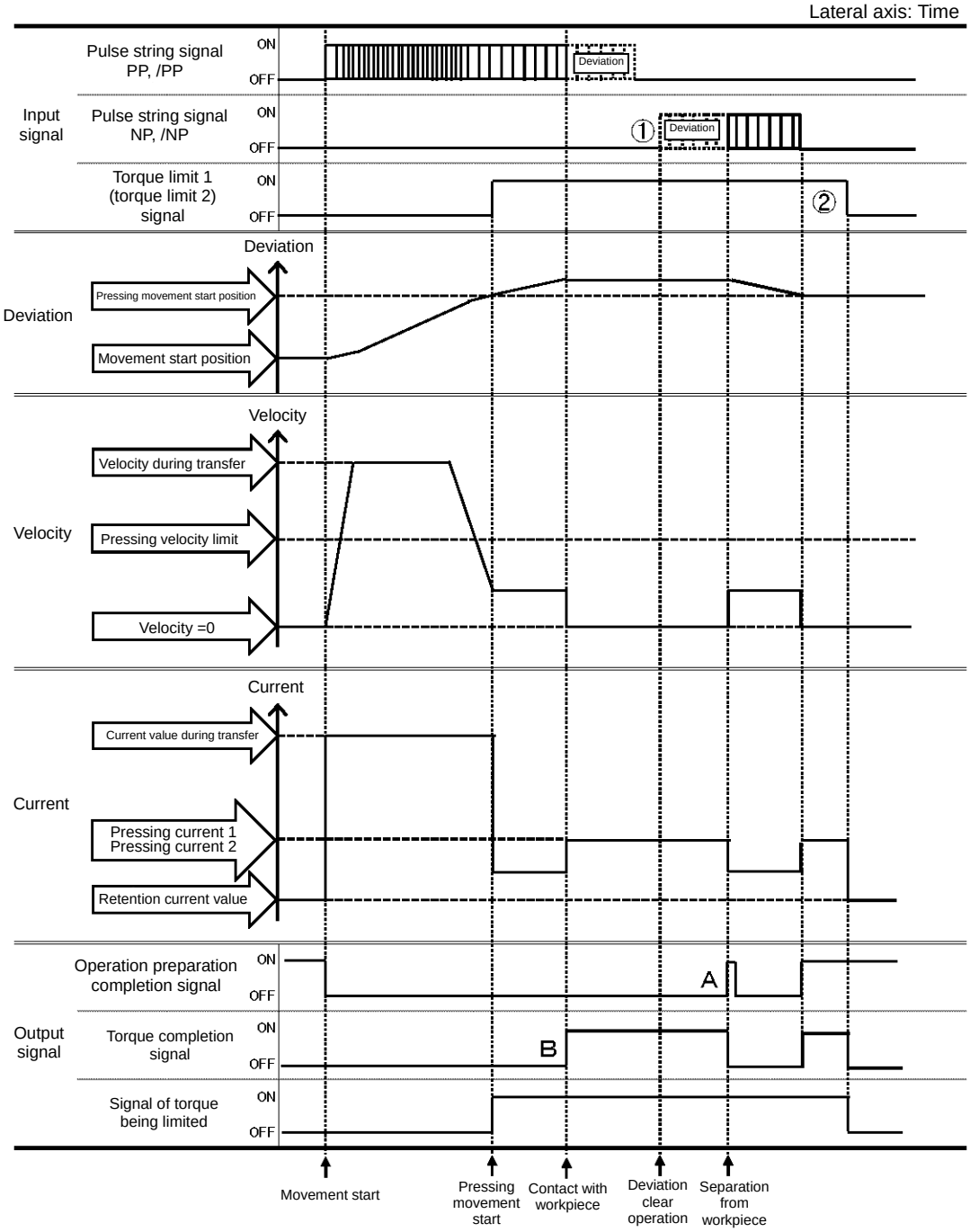
[SM-612271]

8.9.4. Time chart after pressing movement 2

A procedure to input a pulse signal in the reverse direction for the deviation of the pulse signal after pressing movement.

[1] Input a pulse signal in the reverse direction for the deviation of the pulse signal.

[2] Turn off the torque limit 1 (torque limit 2) signal.

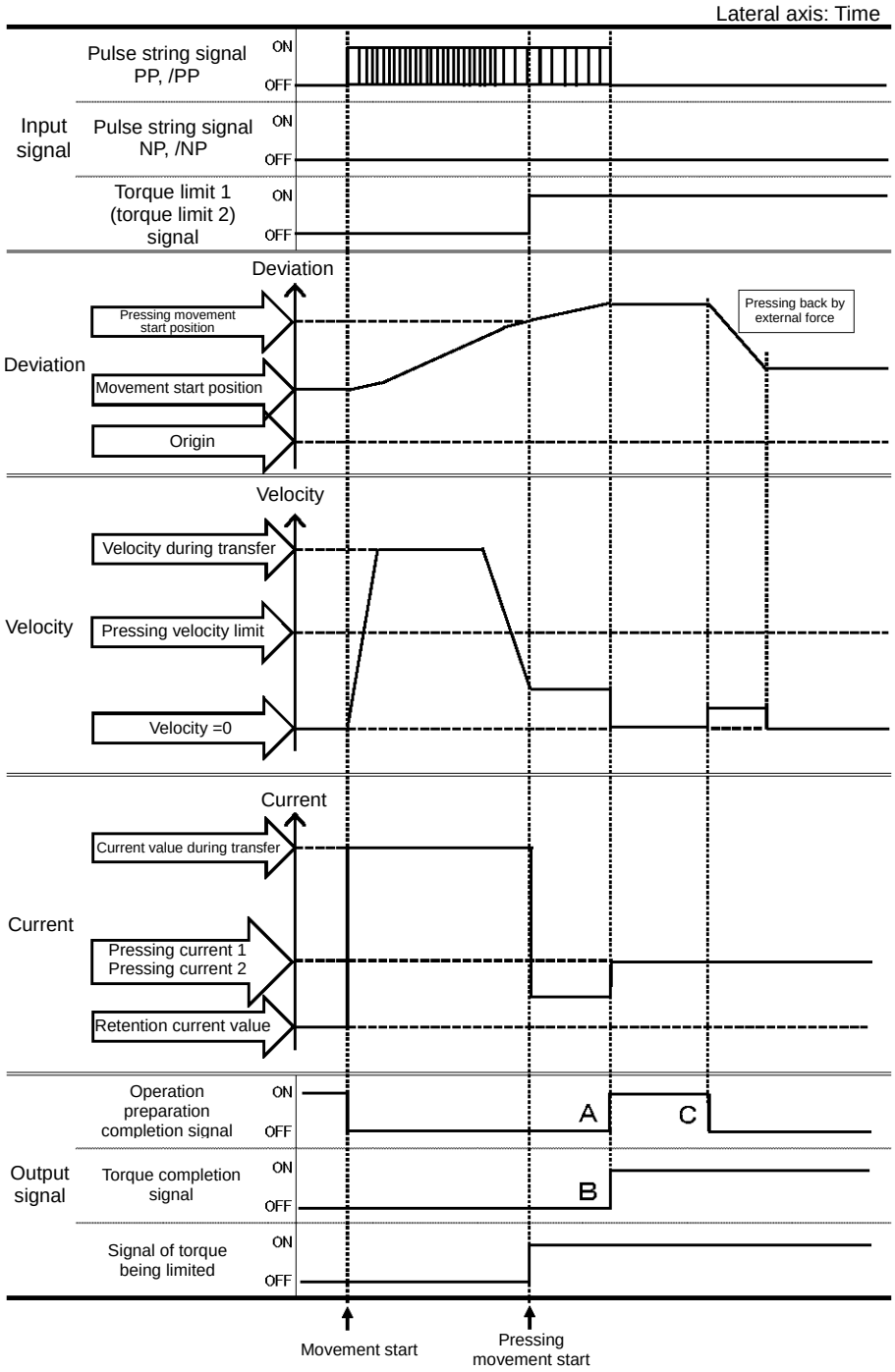


A: If deviation changes, the positioning completion signal is turned off.
B: If a low pressing current value is set, on/off may be repeated.

8.9.5. Pressing movement without contact with workpiece

If there is no contact with a workpiece, it tries to retain the stop position at the set pressing current value.

If the stop position changes due to external force etc., pressing movement is performed to eliminate the change.



A: If the deviation becomes within the positioning deviation width, the positioning completion signal is turned on.
B: If set pressing current value 1 (pressing current value 2) is reached at the stop position, it is turned on.
C: If it becomes outside the positioning deviation width due to external force etc., the positioning completion signal is turned off.

8.10. Input of deviation clear signal (ECPT)

Clear the difference (deviation) between the movement indication amount by a pulse string signal and actual movement amount.

The pulse string signals input with the deviation clear signal on are not counted.

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

Input 7 (ECPT) Deviation clear signal	Description of control
1 ↑	Deviation is cleared by an on edge signal.
1	The pulse string signals input during an on level are not counted.

CAUTION	● If a deviation clear signal is input during movement, the deviation is cleared and it is stopped suddenly. Depending on the velocity and load conditions during movement, it cannot be stopped completely and an alarm may be output. ● If a deviation clear signal is input near the soft limit, the alarm of soft limit over may be output.

8.11. Input of movement stop signal (ECPT)

If a movement stop signal is input during a differential, a deceleration stop is performed.

The pulse string signals input with the movement stop signal on are not counted.

0: Off (level input), 1: On (level input), 0↓: Off edge input, 1↑: On edge input

Input 8 (ECPT) Movement stop signal	Description of control
1 ↑	A deceleration stop is performed by an on edge signal.
1	The pulse string signals input during an on level are not counted.

CAUTION	● Depending on the velocity and load conditions during movement, it cannot be stopped completely and an alarm may be output. ● If a deviation clear signal is input near the soft limit, the alarm of soft limit over may be output.

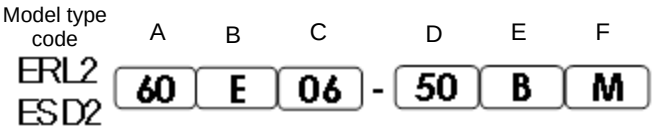
8.12. Retention movement after movement completion

After the final target position is reached, it will be retained at the current at the time of the stop set with a parameter.

If a load exceeding the retention force in the following table is applied during retention, an alarm will be activated and servo off is performed.

Actuator type code			Retention force [N]
Model type code	A (body size)	B (screw lead)	
ERL2	45	06	60
		12	20
	60	06	160
		12	80
ESD2	35	06	120
		12	50
	45	06	120
		12	50
	55	06	280
		12	80

Actuator type code indication method



A: Body size
B: Motor attachment direction
C: Screw lead
D: Stroke
E: Brake
F: Origin position

WARNING	● If it is installed with a workpiece attached in the vertical direction, due to vibrations and sudden shocks of the device, a load larger than the above retention force may be applied and the workpiece may drop. Be sure to take safety measures to prevent a drop. ● At the time of alarm activation, the servo is off. If installing it with a workpiece attached in the vertical direction, be sure to take safety measures to prevent a drop.

---MEMO---

9. Failures and measures

9.1. Alarm indications and measures

Alarm code	Alarm item	Description	Measures	Reset
10~17	Memory (loading)	Indicates that an error has been detected in data loading from a memory when the power is turned on.	In the case of “13”, there is an error in parameter data. Initialize the parameter data and turn on the power again. In the case of “15”, there is an error in point data. Initialize the point data and turn on the power again. In the case of “17”, there is	Impossible
20~27	Memory (writing)	Indicates that an error has been detected in data writing into a memory when data are changed.	If it reoccurs even if the power is turned on again, contact us.	Impossible
30	Temperature	Indicates that the temperature in the controller is high.	Check the ambient temperature. If it reoccurs even if the power is turned on again, contact us.	Impossible
31	Current	Indicates that an overcurrent has flowed in the motor.	If it reoccurs even if the power is turned on again, contact us.	Impossible
32	No encoder connection	Indicates that there is an error in the connection condition between the controller and actuator.	Check the connection condition between the cable and connector. If it reoccurs even if the power is turned on again, contact us.	Impossible
38	No SIO connection	Indicates that there is an error in the connection condition of the connector during use in the SIO mode.	Check the connection condition between the cable and connector. If the connector is removed, connect the connector, set the mode to the PIO mode and then perform an alarm reset.	Possible
40	Parameter data	Indicates that there is an error in parameter data when the power is turned on.	Re-set the “Soft limit +”, “Soft limit −”, “Origin return velocity”, “Origin offset amount” and “Current during stop” parameters and turn on the power again.	Impossible
41	Point data (position)	Indicates that when a point movement command is input, there is an error in the point data of the point number.	The final target position has exceeded the range of the soft limit. Re-set the “Position” and “Pressing distance” point data and perform an alarm reset.	Possible
42	Point data (velocity)	Indicates that when a point movement command is input, there is an error in the point data of the point number.	The pressing velocity is higher than the velocity or the set range has been exceeded. Re-set the “Velocity”, “Acceleration”, “Deceleration” and “Pressing velocity” point data and perform an alarm reset.	Possible
43	Point data (pressing)	Indicates that when a point movement command is input, there is an error in the point data of the point number.	The range of point data has been exceeded. Re-set the “Pressing current” point data and perform an alarm reset.	Possible
60	Servo on	Indicates that there is an error in the encoder data signal of motor excitation when the servo is turned on for the first time after the power is turned on.	Check the connection condition between the cable connecting the controller and actuator and connector. Check that the actuator is not restrained and perform an alarm reset.	Possible
61	Encoder	Indicates that the Z phase signal of the encoder cannot be detected during first movement after the power is turned on.	Check the connection condition between the cable connecting the controller and actuator and connector. Check that there is no problem and perform an alarm reset.	Possible
62	Origin return	Indicates that the mechanical end cannot be detected even in the case of movement of a distance longer than the stroke of the actuator during an origin return.	Check the connection condition between the cable connecting the controller and actuator and connector. Check that there is no problem and perform an alarm reset.	Possible
64	Soft limit over	Indicates that the origin position has exceeded the range of the soft limit during point movement.	If it occurs due to an overshoot at the time of positioning to the soft limit vicinity, review the load conditions etc. It will occur also in the case where a point movement command is input outside the soft limit range. In this case, by moving the actuat	Possible

Alarm code	Alarm item	Phenomenon	Cause/Measures	Reset
65	Overload (M)	Indicates that movement cannot be performed.	Review the load conditions and operation conditions. Check that there is no problem and perform an alarm reset.	Possible
66	Overload (P)	Indicates that it has been pressed back to the pressing start position by external force etc. during pressing.	Review the load conditions and operation conditions. Check that there is no problem and perform an alarm reset.	Possible
67	Overload (S)	Indicates that a stop cannot be performed.	Review the load conditions and operation conditions. Check that there is no problem and perform an alarm reset.	Possible
68	Overload (H)	Indicates that displacement has occurred during a stop.	Review the load conditions and operation conditions. Review the setting of the “Current during stop” of the parameter data. Check that there is no problem and perform an alarm reset.	Possible
69	Overload (C)	Indicates that an overcurrent has flowed in the motor.	Review the load conditions and operation conditions. Check that there is no problem and perform an alarm reset.	Possible

9.2. Check when trouble occurs

When trouble occurs, check the safety sufficiently and conduct a check in accordance with the following procedure.

1	Check the lamp status of the controller. Green illumination: Motor energization (servo on) Green blinking: Motor de-energization (servo off) Red illumination: Alarm occurrence status (not releasable) Red blinking: Alarm occurrence status (releasable)
2	Check whether there is an error on the higher controller side.
3	Check the voltage of the control power DC 24 V.
4	Check the description of the alarm. The description of the alarm can be checked using the teaching pendant (ETP2) or setting software E Tools.
5	Check the status of I/O. The status of I/O can be checked using the teaching pendant (ETP2) or setting software E Tools.
6	Check that there are no “disconnection” and “catching” of a cable and it is connected correctly. When checking the continuity, turn off the power and remove the wire to prevent an electric shock beforehand.
7	Check that measures against noise have been taken (connection of ground wire, attachment of surge killer, etc.).
8	Check the process until trouble occurrence and situation of the operation at the time of the occurrence.
9	Check the serial No. of the product.

If there are any questions on trouble occurrence, check 1 to 9 and contact the dealer where you purchased the product or our branch office or sales office in your neighborhood.

9.3. Troubleshooting

No.	Phenomenon occurring	Cause	Measures
1	Even if the power is turned on, the body lamp will not be illuminated.	The wiring is wrong.	Check the wire of the power.
		The wire is disconnected.	Check the catching, disconnection, connector and terminal of the wire.
		Failure or damage of product.	A repair is required. Check Paragraph 9.2 and contact us.
2	The body lamp remains illuminated in red.	An alarm has been activated.	Check the cause for alarm occurrence in Paragraph 9.1 to remove the alarm description.
		System error	A repair is required. Check Paragraph 9.2 and contact us.
3	No operation preparation completion signal is output.	No origin return has been perform	Perform an origin return.
		The emergency stop signal is contact-a connection.	Set the wiring of the emergency stop (EMG) to contact-b connection.
		The wiring is wrong.	Recheck “5. Wiring”.
4	An unintended operation is performed by a signal of PLC.	The input signal is unstable.	The input from the higher system may have caused chattering. Secure the input signal for 20 msec or more.
		The origin return cannot be performed and stops halfway.	The transfer load may be too high. Check the specifications again.
		The setting of the position, velocity, acceleration or pressing force is wrong.	Check the description of the point data.
		The setting of the PIO mode is different.	Check the description of the “PIO mode” of the parameter data.
		The wiring is wrong.	Recheck “5. Wiring”.
		The friction load is high.	Check the friction load during transfer. Check that there is no galling with a workpiece etc.
		Colliding with a workpiece.	Check the assembly condition and setting condition.
		The inside resistance of the product has increased.	Review of environment conditions and use conditions Check the use period (operation distance).
		The actuator body is damaged.	A repair is required. Check Paragraph 9.2 and contact us.
5	The product vibrates.	The fastening of the actuator is loosened.	Retighten the bolts.

No.	Phenomenon occurring	Cause	Measures	
6	Cannot be operated by PLC.	The mode is the SIO mode.	Change the mode to the PIO mode using the setting tool.	
		The wiring is wrong.	Recheck Paragraph in this instruction manual.	
		The wire is disconnected.	Check the catching, disconnection, connector and terminal of the wire.	
		An overload error occurs.	Check the transfer load and velocity again.	
		The power capacity is insufficient.	Check that the power capacity satisfies the required voltage and current.	
7	Moves under a workpiece's own weight during an emergency stop.	The servo is turned off at the time of an emergency stop.	Type with no brake	Use the type with a brake.
			The brake has been released forcibly.	Turn off the forcible release of the brake.
		A load exceeding the retention force is applied.	Check whether external force higher than the retention force is applied. Review the setting of the "Current during stop" of the parameter data.	
8	A positioning completion output is not turned off.	The positioning completion output width is too large for the movement distance.	Check the "Positioning width" of the point data.	
9	The pressing movement cannot be performed.	It is not set to the pressing movement.	Check the "Mode" of the point data.	
10	A loss of synchronism occu	Overload or overspeed.	Check that the workpiece mass and operation velocity satisfy the specification values.	
12	The velocity is not achieved. (Very slow)	It is set to the pressing/movement, not the general transfer movement.	Check the "Mode" of the point data.	
13	An overshoot occurs.	The transfer mass and deceleration are high.	Check that the workpiece mass and operation velocity satisfy the specification values. Decrease the value of the deceleration.	
14	The target takt is not reached.	The setting of acceleration or velocity is wrong.	Check the "Acceleration" and "Velocity" of the point data.	

---MEMO---

10. Measures for European Standards

When using this product as a product conforming to the European Standards, read this chapter carefully and use it in accordance with the descriptions.
A product to which the CE mark is attached is a product conforming to the European Standards. A product to which the CE mark is not attached does not conform to the European Standards.
This product is a component incorporated into your device and used. The CE mark attached to the product indicates that conformance has been declared under our limited conditions (Fig. 1) for the EMC Directive. If you complete the device into which this product has been incorporated and ship it into the European area or use it in the European area as a final product, be sure to check the conformance to the EU Directive yourself.

10.1. EU Directive/European Standards

EMC Directive: 2004/108/EC
EN61000-6-2:2005
EN55011:2009/A1:2010

10.2. Precautions for use in Europe (EU member nations)

10.2.1. Conforming actuators and teaching pendant

Table 1 shows the combination of actuators and a teaching pendant conforming to the controller type codes.

Table 1 Controller type code, conforming actuator and teaching pendant

Controller type code	Conforming actuator	Conforming teaching pendant
EC series	ERL2 series ESD2 series	ETP2 series

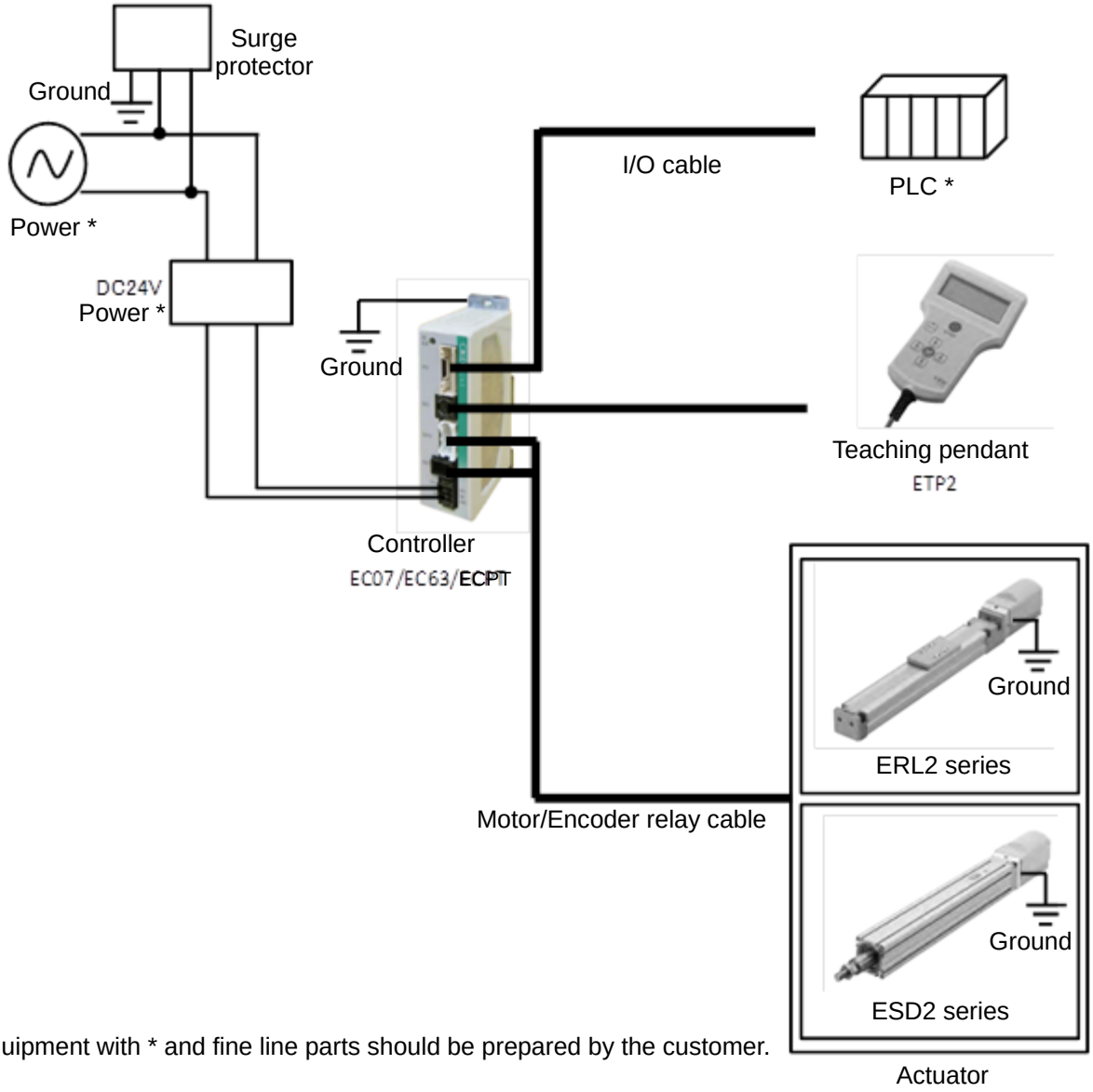
10.2.2. Use environments

Table 2 Use environment

Condition	Temperature	Humidity
During use	0 to 40°C, There should be no freezing	35 to 80%RH, There should be no condensation
During storage	-10 to 50°C, There should be no freezing	35 to 80%RH, There should be no condensation
During transportation	-10 to 50°C, There should be no freezing	35 to 80%RH, There should be no condensation

10.2.3 Installation method

Fig. 1 shows the installation method when this product conforms to the European Standards.
To take measures for the European Standards, the surge protector (Table 3) is required.



* Equipment with * and fine line parts should be prepared by the customer.

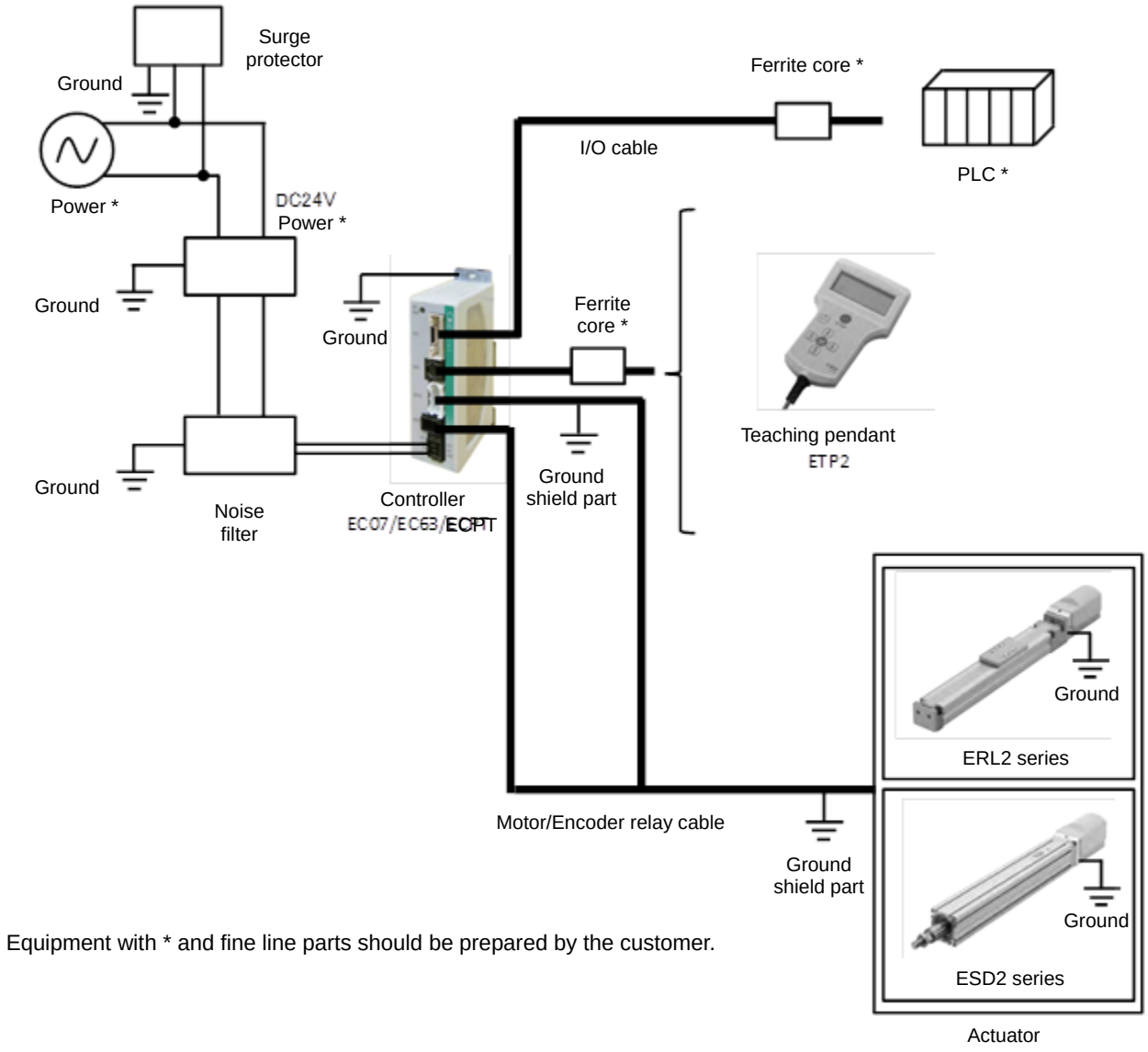
Fig. 1 Installation method

Table 3 Component used

Component used	Type code	Manufacturer
Surge protector	R-A-V-781BXZ-4	Okaya Electric Industries Co., Ltd.
	R-A-V-781BWZ-4	
	RSPD-250-Q4	
	RSPD-250-U4	

10.3. Example of EMC measures

Fig. 2 shows an example of EMC measures for this product.
To conform to the European Standards, take appropriate EMC measures with your final product (entire device).
For the controller, refer to “10.3.1. Example of controller EMC measures”. For the actuator, refer to “10.3.2. Example of actuator EMC measures”. For the motor/encoder relay cable, refer to “10.3.3. Example of motor/encoder EMC measures.



Equipment with * and fine line parts should be prepared by the customer.

Fig. 2 Example of EMC measures

Table 4 Component used

Component used	Type code	Manufacturer
Noise filter (Single phase/15 A)	NF2015A-OD	Soshin Electric Co., Ltd

CAUTION	● These examples of EMC measures are examples of measures under our installation conditions. The results of EMC measures will vary depending on the differences of your device, installation conditions, etc.

10.3.1. Example of controller EMC measures

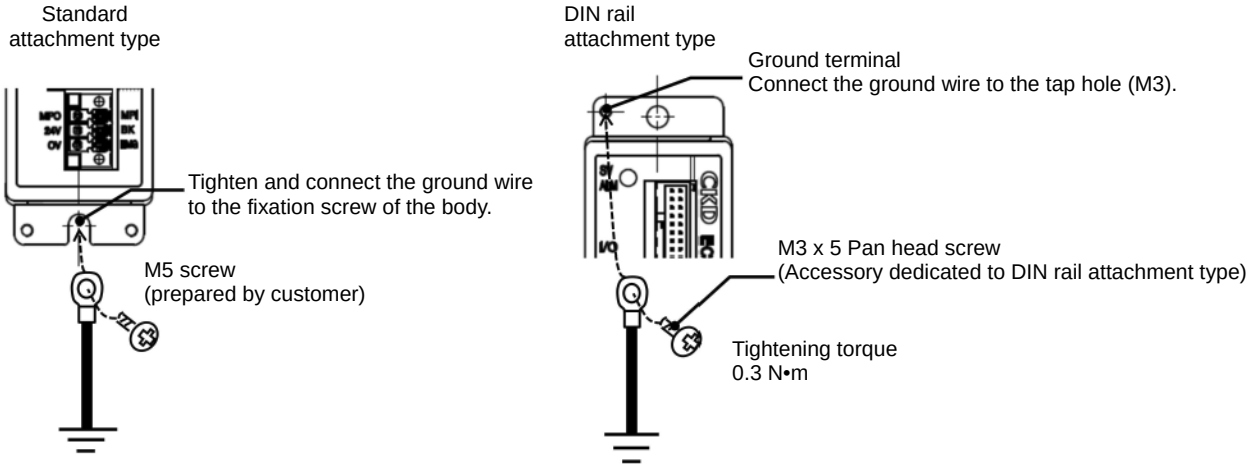


Fig. 3 Method to ground controller

10.3.2. Example of actuator EMC measures

Connect the ground wire to the ground terminal on the actuator side to ground it.

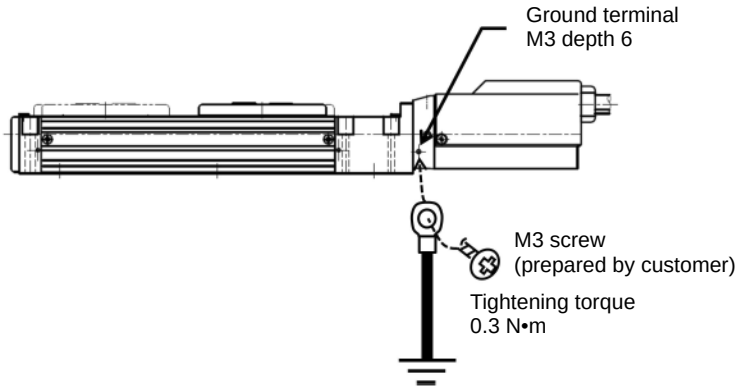


Fig. 4 Method to ground actuator

10.3.3. Example of motor/encoder relay cable EMC measures

Peel off the outside sheath of the encoder cable (cable connected to “SEN” on the controller panel) of the motor/encoder relay cable and ground the braided shield part with an FG clamp etc. Pass the wire through the metal duct.

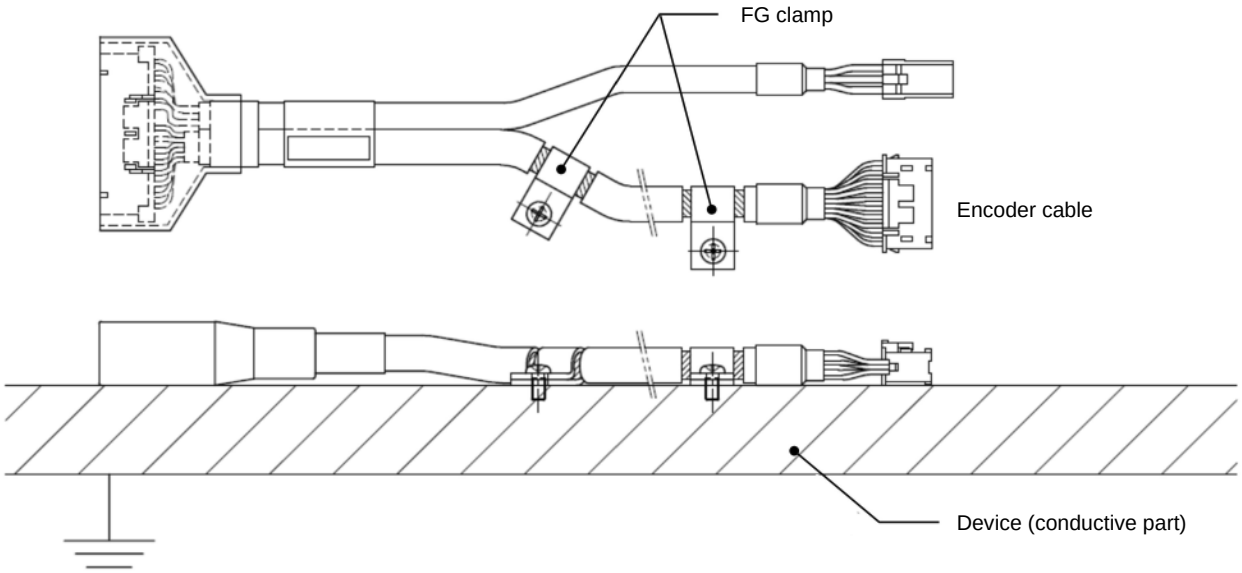


Fig. 5 Method to ground motor/encoder relay cable

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