



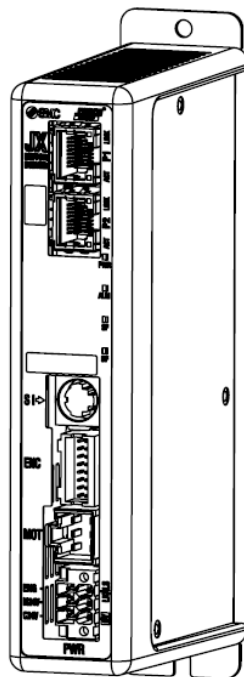
Operation Manual

PRODUCT NAME

***PROFINET Direct input
High performance type
Step Motor Controller
(Servo/24 VDC)***

Model / Series / Product Number

JXCPH



SMC Corporation

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JXCPH/Controller

1. Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1, and other safety regulations.

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.

ISO 4413: Hydraulic fluid power -- General rules relating to systems.

IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)

ISO 10218: Manipulating industrial robots -Safety.

etc.



Caution

CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



Warning

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury.



Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1.The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2.When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4.Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



JXCPH/Controller

1. Safety Instructions

Caution

The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.

If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

Limited Warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility,

a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction(WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Caution

SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

2. Outlines of Product

2.1 Features

Features of the controller.

- PROFINET compatible

This device can be directly connected to a PROFINET fieldbus network. It will then be possible to establish communication with a PROFINET Master (PLC).

- Actuator control

Positioning operation and operation at a specific speed and force for the actuator are possible by controlling the Step motor (servo 24VDC).

- Specified force operation

Control the gripping force or the pushing force of the actuator.

- Separated power supply

Power supply input is separated into the motor power supply and control power supply. Even if the power supply for the motor is turned OFF, the information from the encoder position is retained whilst the control power supply is ON, and PROFINET communication and serial communication is available.

- Return to origin

Returning to origin is possible by a signal from PROFINET.

- Alarm detection function

Abnormal conditions are automatically detected. Alarms are output via EtherNet/IP communication. The alarm history can be stored in the controller memory.

- Positioning / pushing operation is available with step data and numerical operation mode

It is possible to operate the actuator by using the saved step data and by numeric data operation instruction by using PROFINET communication.

In the step data operation mode, the operation is instructed by manipulating the memory which is relevant to input/output port such as DRIVE signal and INP signal. The actuator operates in accordance with the step data operating pattern of the specified step data.

In the numerical operation mode, the operation is executed by specifying the relevant numeric data.

- "AREA" signal

The controller has an "AREA" signal that turns ON if the actuator position is within the range specified by "Area 1" and "Area 2" in the step data.

- Data input method

It is possible to perform status monitoring, reset alarms and set Step data via PROFINET communication, ACT controller software or teaching box. In addition the ACT controller software or teaching box can be used for parameter setup and trial run.

- Easy mode and Normal mode

There are two available modes for the controller setting software and the teaching box. In Easy mode, you can start the operation by only setting the speed, position, etc. In Normal mode, further detailed setup can be performed.

- High performance type

The cycle time of the device is improved by increasing the maximum acceleration speed and maximum speed.

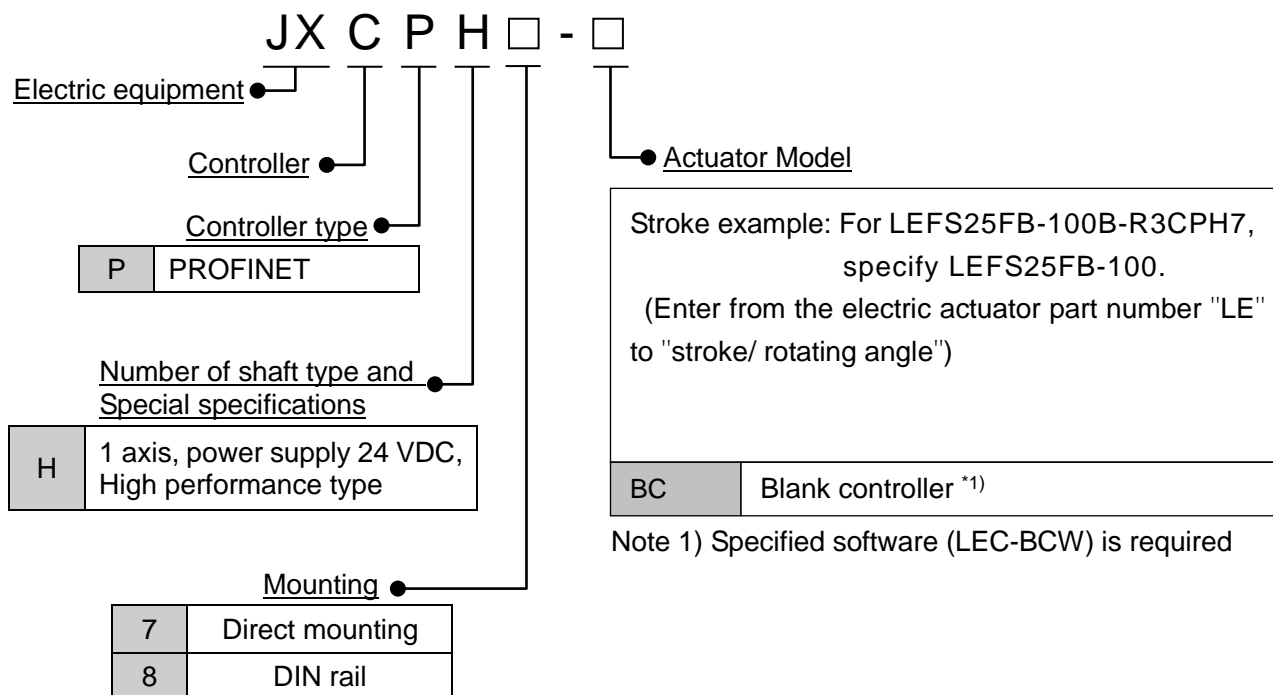
Caution

Please keep this manual safe for future use. It will be necessary to refer to this manual along with the operation manuals for other electric actuators, teaching box, and controller setting software at installation and fault finding.

Keep this operation manual accessible for reference.

2.2 How to Order

How to order is shown below.



⚠ Caution

Single controllers are also shipped after setting the actuator specification parameters.

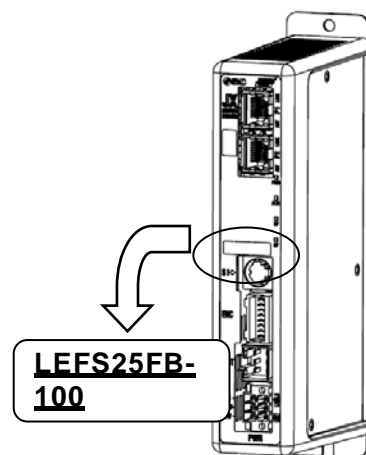
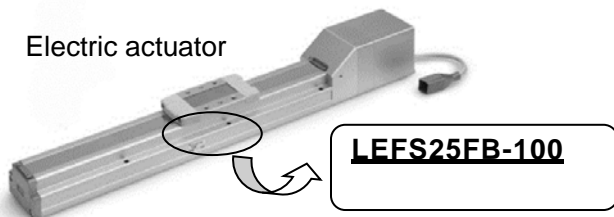
Confirm the combination of the controller and the actuator is correct.

Connect the designated electric actuator to the high performance controller.

<Check the following before use.>

- Check the actuator label for the actuator model number.
- Check that the actuator model matches the label on the controller.

Electric actuator



⚠ Caution

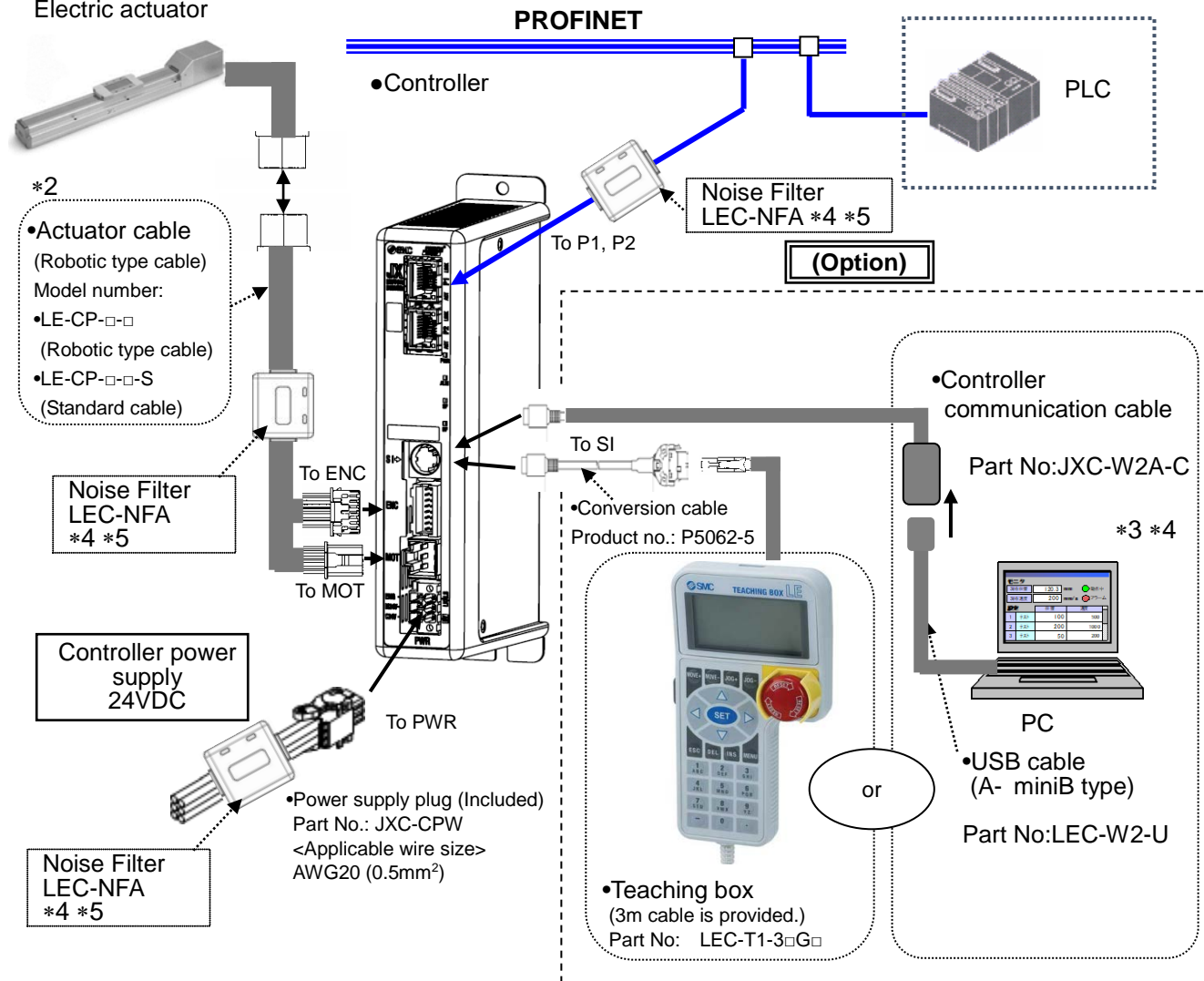
Refer to the chart of the catalog for checking the chart of <Speed - Work load> of actuator.

2.3 Product configuration

An example of the controller structure is shown below. *1

*2

Electric actuator



*1. The above configuration is based on passing the CE marking exam. (For conformity standards, please refer to the declaration document on the SMC website.)

*2. These items are included when ordered using the part number for an actuator set.

*3. Latest version of the controller setting software must be used.

Please download the controller configuration software from the SMC website

<https://www.smcworld.com>

*4. Optional products.

*5. For details on how to install the noise filter, please refer to **14.8 Noise Filter Set (P. 63)**.

Warning

Refer to **5. External Connections (P.22)** for wiring.

Refer to **16. Precautions for wiring and cable (P.71)** when handling the wiring and cables.

The Communication cable must be connected to a PC using a USB cable through a conversion unit. Do not connect the teaching box to a PC, as this may cause damage to the personal computer.

2.4 Start up procedure

Install, wire, set and operate the controller referring to the procedure below when the product is used for the first time.

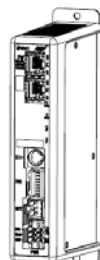
(1) Checking the contents of the package

After unpacking everything, check the description on the label to identify the controller and the number of accessories. If any parts are missing or damaged, please contact your distributor.

| Product name | Quantity |
|--------------------------------|----------|
| Controller (JXCPH□-□) | 1 pc. |
| Power supply plug (JXC-CPW) | 1 pc. |
| Actuator *1 | 1 pc. |

*1. These items are included when ordered using the part number for an actuator set.

Controller



Power supply plug
(JXC-CPW)



Option

Controller communication cable



USB cable



Teaching box
(Conversion cable is needed)



[Options]

- Controller communication cable (Part No: JXC-W2A-C)
- USB cable (Part No: LEC-W2-U)
- Teaching box (Part No: LEC-T1-3*G*)
When connecting the teaching box to the JXCPH controller, the P5062-5 cable is required.

(2) Mounting the controller

Refer to section **3.4 Mounting (P.16)** for instructions on how to mount the controller.

(3) Wiring and Connection

Connect the cables to the controller.

Refer to **5. External Connections (P.22)** for the wiring of the connectors.

(4) Supply of power

Supply power 24VDC.

If the condition is normal, LED on the front of the controller turns ON as shown on the table below

| Items | LED condition | Status |
|-------|-----------------|--------------|
| PWR | Green LED is ON | Supply power |
| ALM | OFF | No alarm |

Refer to **7. LED display (P.29)** for the explanation of LED lamps.

If the red [ALM] LED on the front of the controller (JXC) is ON, an alarm has been triggered.

Caution

When an alarm is generated

Refer to a corresponding memory of PROFINET or connect a PC or teaching box to the SI serial I/O connector and check the details of the alarm. Then, remove the cause of the error referring to the **15. Alarm for Motor Control (P.64)**.

* Please refer to the manuals of the controller setting software or the teaching box for details of the alarms.

(5) Configuration

Using the PLC setting software, the following steps are required to use the JXCPH on a PROFINET network.

- Install the GSDML file and icon.
- Using the hardware configurator, create a PROFINET network then add the device (JXCPH controller).
- Using hardware configurator, assign a device name and IP address to the device (JXCPH controller).
- Write a device name directly into the physical device (JXCPH), this should match the name used in the hardware configuration.

When the setting of the PLC and JXCPH controller is completed and the PROFINET communication is established, the LED's on the front of the controller will be set as shown in the table below.

| Items | LED condition | Status |
|-------|-----------------|-------------------------------------|
| PWR | Green LED is ON | Supply power |
| ALM | OFF | No alarm |
| SF | OFF | Controller is operating correctly. |
| BF | OFF | PROFINET connection is established. |

Refer to **7 LED display (P.29)** for the explanation of the LED's.

Communication between PLC and controller is not established when the BF red LED is on or is flashing red.

⚠ Caution

Communication between PLC and controller is not established.

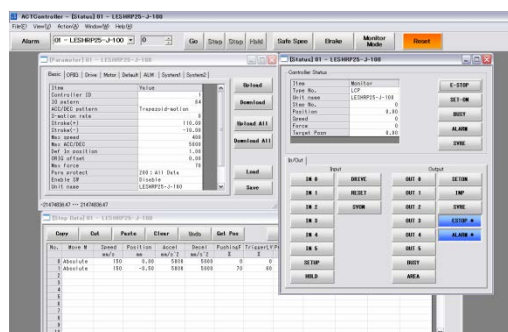
Refer to **19. Troubleshooting (P.81)**

Check if the communication speed of the PLC and controller and the information of the host computer are correctly set.

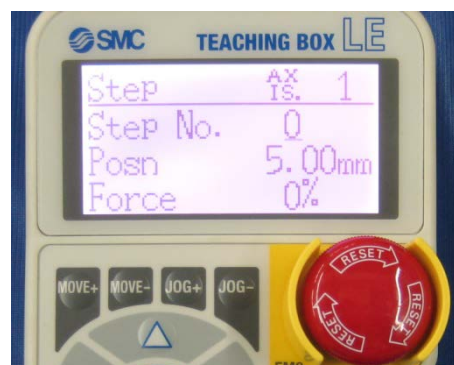
(6) Setup of the operation parameters

Set up the operation pattern (step data, basic parameters and return to origin parameters) to specify the target position, speed, etc. by using a PC (with the controller setting software) or the teaching box.

■PC (Normal mode)



■Teaching box



Please refer to the manuals of the controller setting software or the teaching box for how to set up the operation pattern.

(7) Test run

Refer to **9. Memory map (P.31)** for the assignment of the memory.

Input signals from PLC for checking the operation. Refer to **13. Operation Instructions (P. 53)** for the operation.

3. Specifications

3.1 Specifications

Basic specifications of the product.

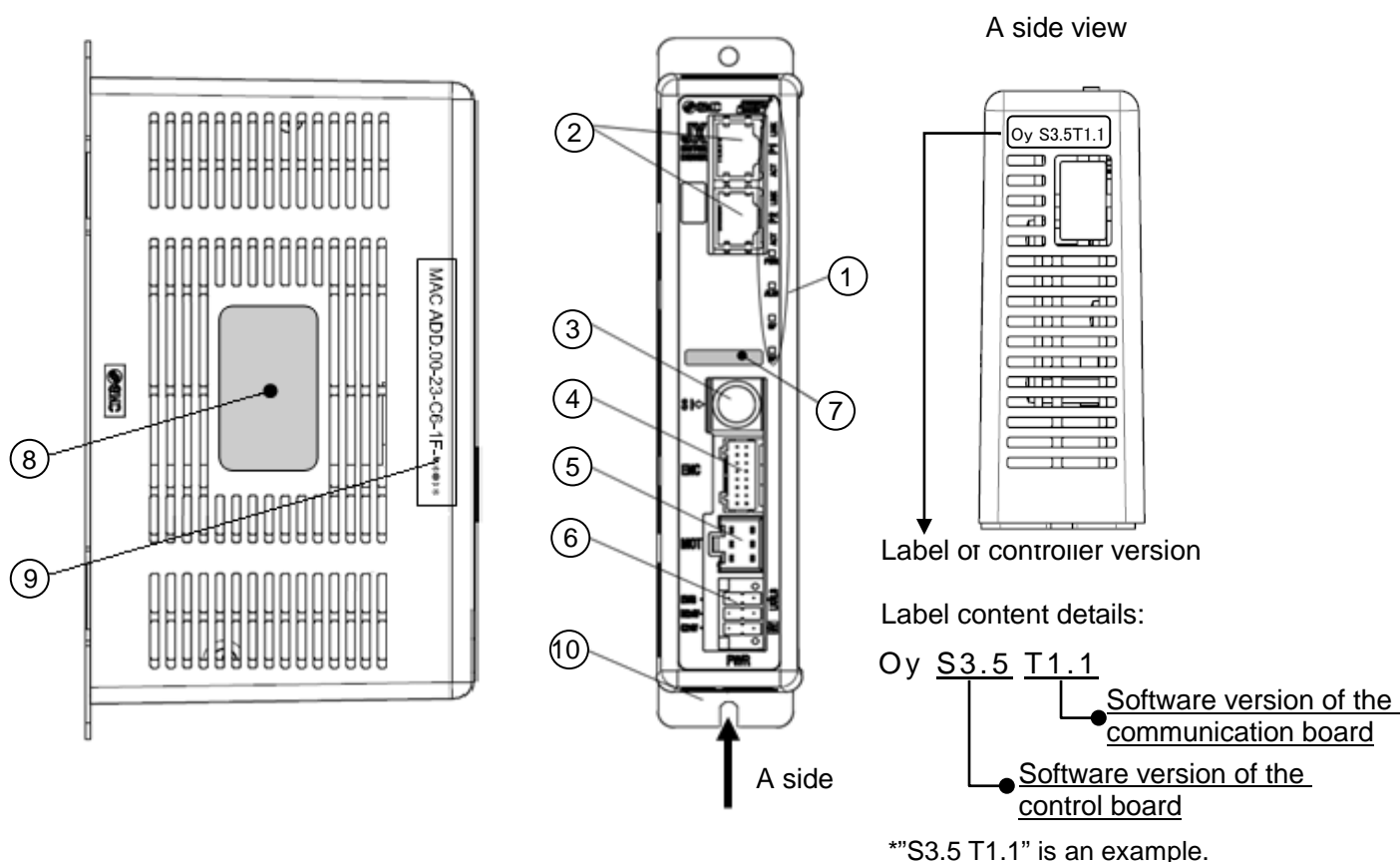
| Item | Specifications | |
|------------------------------|--|--------------------------------|
| Compatible motor | Step motor (servo 24 VDC) | |
| Power supply | Power supply voltage: 24 VDC±10% | |
| Current consumption | 200 mA or less (Controller) Refer to the specification of actuator to be connected for total power consumption. | |
| Compatible encoder | Incremental A/B phase (800 pulse/rotation) Battery-less absolute encoder (4096 pulses/rotation) | |
| LED display | LED | Details |
| | PWR | Power supply |
| | ALM | Alarm status |
| | SF | Controller status |
| | BF | PROFINET communication status. |
| Locking | With unlocking terminal | |
| Cable length | Actuator cable: 20 m or less | |
| Cooling method | Air-cooling type | |
| Operating temperature range: | 0°C to 40°C No freezing | |
| Operating humidity range | 90% RH or less (No condensation) | |
| Insulation resistance | Between the external terminals and case 50 MΩ (500 VDC) | |
| Weight | 260 g (Direct mounting type) 280 g (DIN rail mounting type) | |

[PROFINET communication]

| Items | Specification |
|--------------------------|---|
| Protocol | PROFINET (Version 2.32) |
| IP address setting range | 0.0.0.0 to 255.255.255.255 (set using DCP service) |
| Communication speed | 100 Mbps |
| Communication method | Full duplex/ Half duplex (automatic negotiation) |
| Communication cable | Standard Ethernet cable (STP, CAT5 or higher, 100BASE-TX) |
| Setup file | GSDML file (download from SMC website). |
| Occupied area | Input 36 byte / Output 36 byte |
| Vendor ID | 83h (SMC Corporation) |
| Device ID | 52h |
| Applicable function | I/O data Record data MRP Device_Access Conformance Class C (RT/IRT) |

3.2 Parts Description

Details of the parts of the controller.

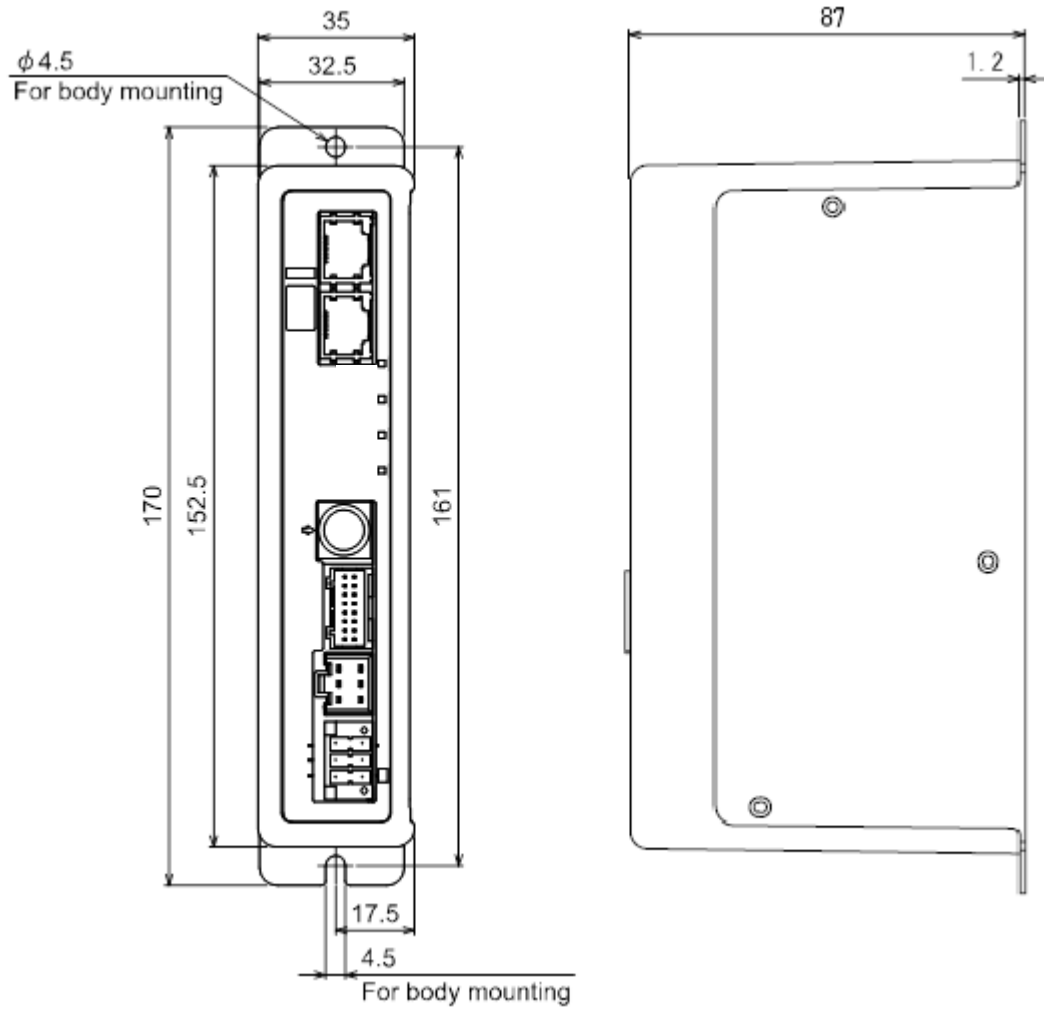


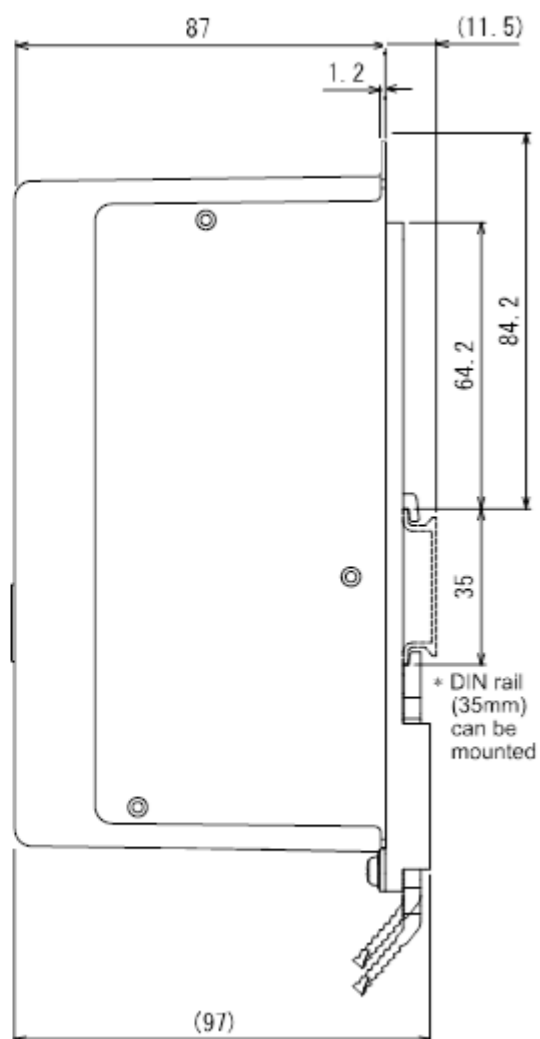
| No. | Display | Name | Details |
|-----|---------|---------------------------------------|--|
| 1 | - | Display | LED's to indicate the controller status. |
| 2 | P1, P2 | PROFINET communication connectors | Connect to the PROFINET network. |
| 3 | SI | Serial I/O connector (8 poles) | Connector for the teaching box (LEC-T1) or the controller communication cable (JXC-W2A-C). |
| 4 | ENC | Encoder connector (16 poles) | Connect to the actuator cable. |
| 5 | MOT | Motor driving connector (6 poles) | |
| 6 | PWR | Power supply connector (5 poles) | Connect to the controller power supply (24VDC) using the power supply plug. Control power (+), Stop signal (+), Motor power (+), Lock release (+), Common power (-) |
| 7 | - | Applicable actuator part number label | Label indicating the actuator part number which can be connected to the controller. |
| 8 | - | Controller part number label | Label indicating the controller part number. |
| 9 | - | MAC address | Label indicating the PROFINET MAC address. |
| 10 | - | FE | Functional Ground When the controller is mounted, tighten screws and connect the grounding cable. |

3.3 External Dimensions

The appearance of this product is as shown in the diagram below:

(1) Screw mounting (JXCPH7-□)



[illegible]

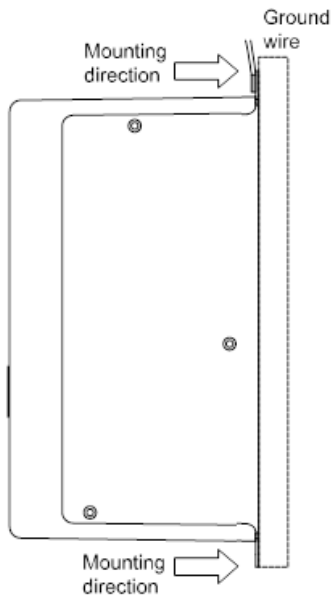
3.4 Mounting

(1) Mounting

The controller can be direct mounted using screws or mounted on a DIN rail. Details of the controller mounting options are shown below.

[1] Thread mounting (JXCPH7-□)

(Mounting with two M4 screws)

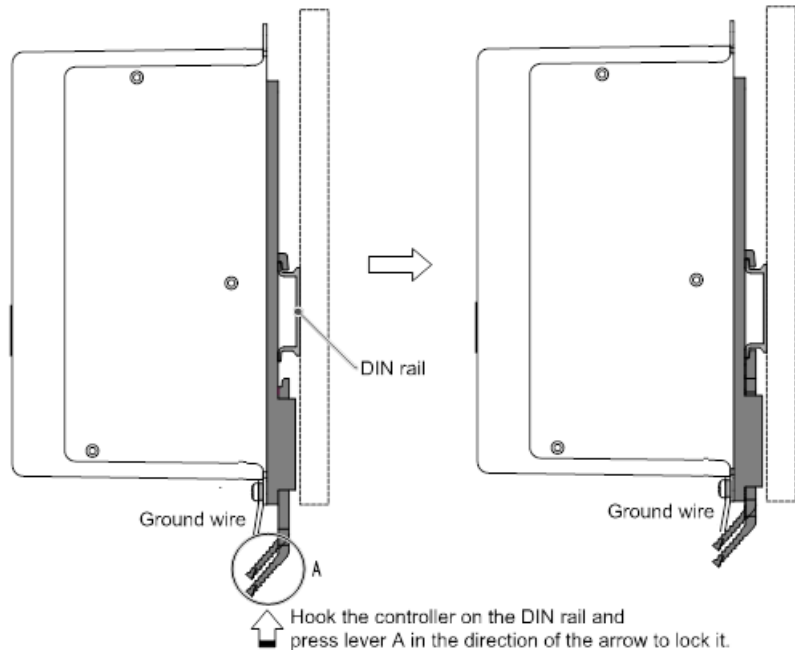


[2] DIN rail mounting (JXCPH8-□)

(Mounting with DIN rail)

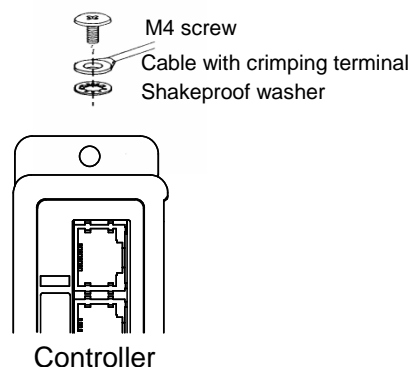
Before locked onto DIN rail

Locked onto DIN rail



(2) Grounding

Place the grounding cable with crimped terminal between the M4 screw and shakeproof washer as shown below and tighten the screw.

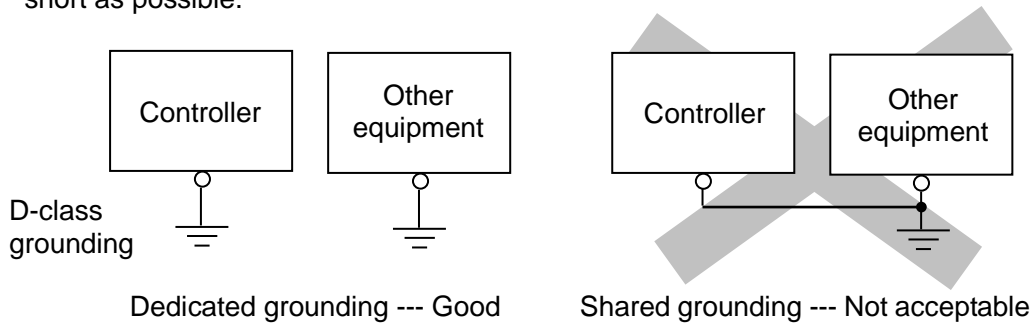


Caution

The M4 screw, cable with crimped terminal and toothed washer need to be prepared by the user. Ground the controller to shield it from electric noise.

⚠ Caution

- (1) A dedicated Ground connection must be used. Grounding should be to a D-class ground (ground resistance of 100Ω or less).
- (2) The cross sectional area of the grounding cable shall be 2mm² minimum. The Grounding point should be as near as possible to the controller. Keep the grounding cable as short as possible.



(3) Mounting location

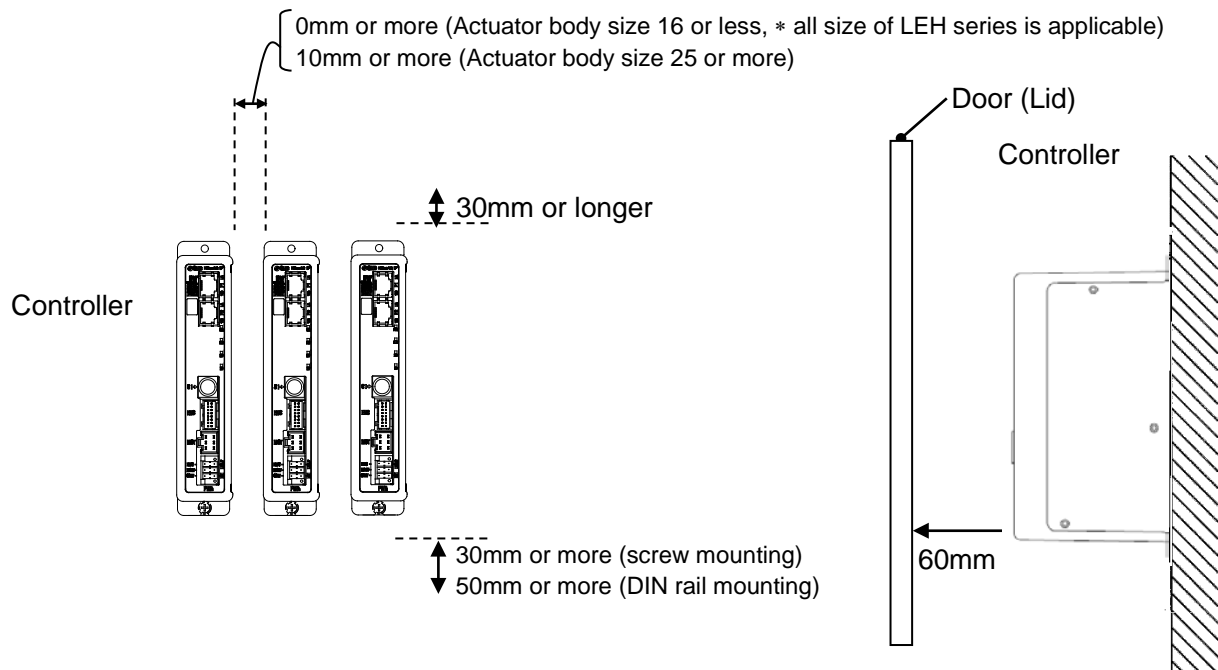
Design the size of the control panel and the installation type so that the temperature surrounding the controller is within the operating temperature range.

Mount the controller vertically on the wall with 30mm or 50 more of space on the top and bottom of the controller as shown below.

Allow 60mm or more of space between the front of the controller and the cover of the control cabinet to allow access to the connectors.

Leave enough space between the controllers so that the operating temperatures of the controllers stay within the specification range.

Avoid mounting the controller near a vibration source, such as a large electromagnetic contactor or circuit fuse breaker on the same panel, or keep it away from the controller.



⚠ Caution

If the mounting surface for the controller is not flat or is uneven, excessive stress can be applied to the case, which can cause failure. Mount on a flat surface.

4. Initial Setting method

Appropriate setting is required in order to establish the communication of the controller (JXCPH) on the PROFINET network.

The required initial setting and setting method are explained below. Please refer to the SIEMENS PLC setting software "TIA PORTAL (Ver.14)", the representative PROFINET master device as an example.

Please note that this controller, PLC and PC should be wired correctly in accordance with "5. External Connections (P.22)", "6.Details of Power supply plug (P.24)".

The required setting method such as GSDML file installation varies depending on which setting software will be used, so if the software other than TIA PORTAL is used, please refer to the operation manual of the applicable setting software.

4.1 GSDML file and icons

A GSDML file is required by the setting software, to configure the JXCPH for a PROFINET network. Furthermore, special icons are necessary for the display of the JXCPH controller within the setting software.

GSDML file and special icons can be downloaded from the URL below.

URL <https://www.smcworld.com>

Document/ download → Operation Manuals → Electric Actuator → JXCPH → Configuration File

4.2 GSDML file installation

The following instructions describe how to install a GSDML file using the TIA PORTAL setting software.

- (1) Start the STEP7 application, then select "Options" → "Manage general station description files (GSD)" from menu bar.
- (2) "Manage general station description file" window will be displayed. Select the folder in which the GSDML file is stored.
- (3) A list of stored GSDML files will be displayed. Select the file to install, and press "Install".

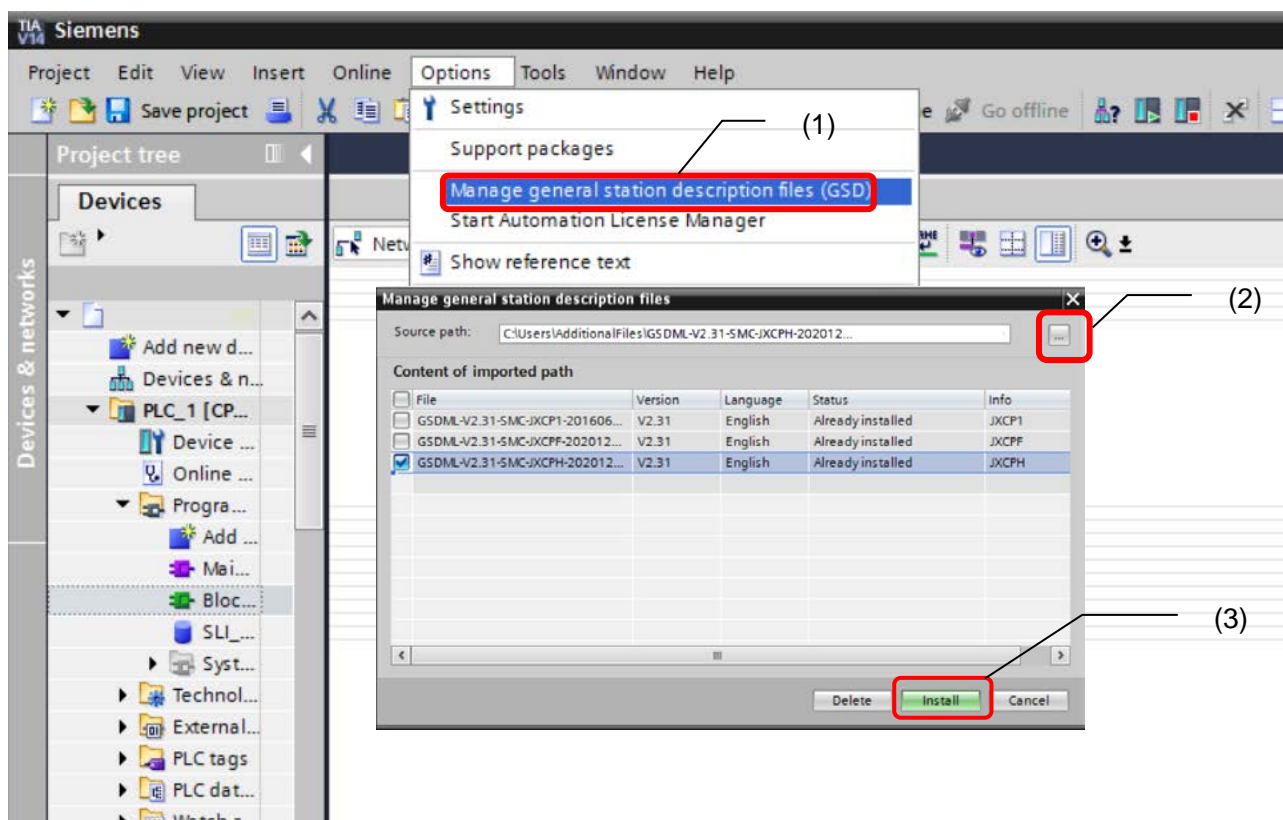


Fig.4.1 Installation of GSDML file

(4) JXCPH hardware component will be added to "Hardware Catalog" window folder.

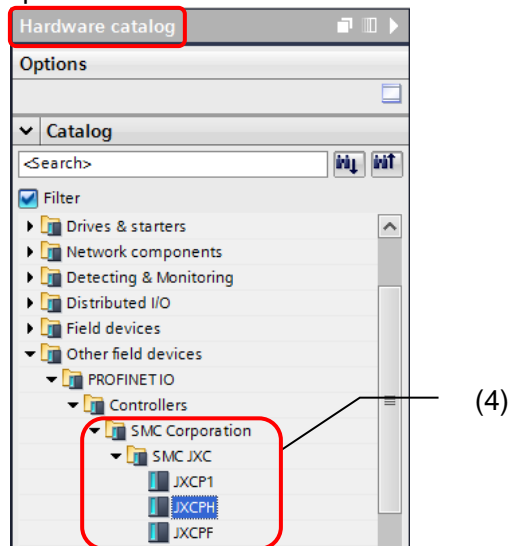


Fig.4.2 Installation of GSDML file

4.3 Addition of JXCPH controller to PROFINET network

- (1) Select "JXCPH" from "Hardware catalog" and drag and drop it on the "Devices & networks" screen.
- (2) Connect the PLC and EX600-SPN3 / SPN4.

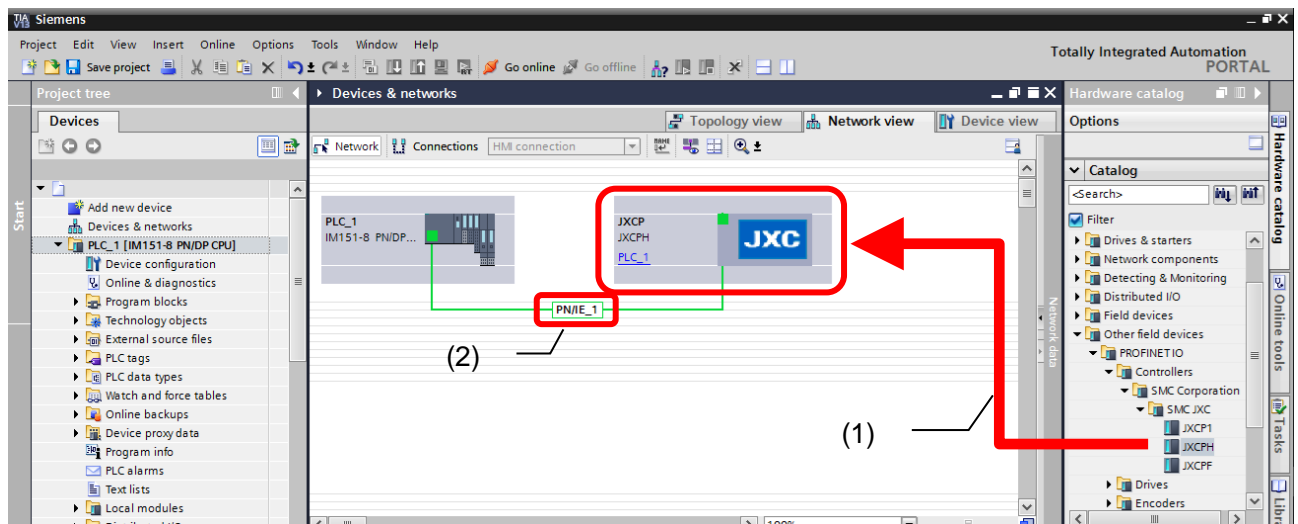


Fig. 4.3 Addition of JXCPH to PROFINET network

4.4 Registration of the device name of the JXCPH controller to be connected

- (1) Select "Network view" tab → "Properties" tab of JXCPH.
- (2) Write the PROFINET device name.
- (3) Press the "Download to device" icon.

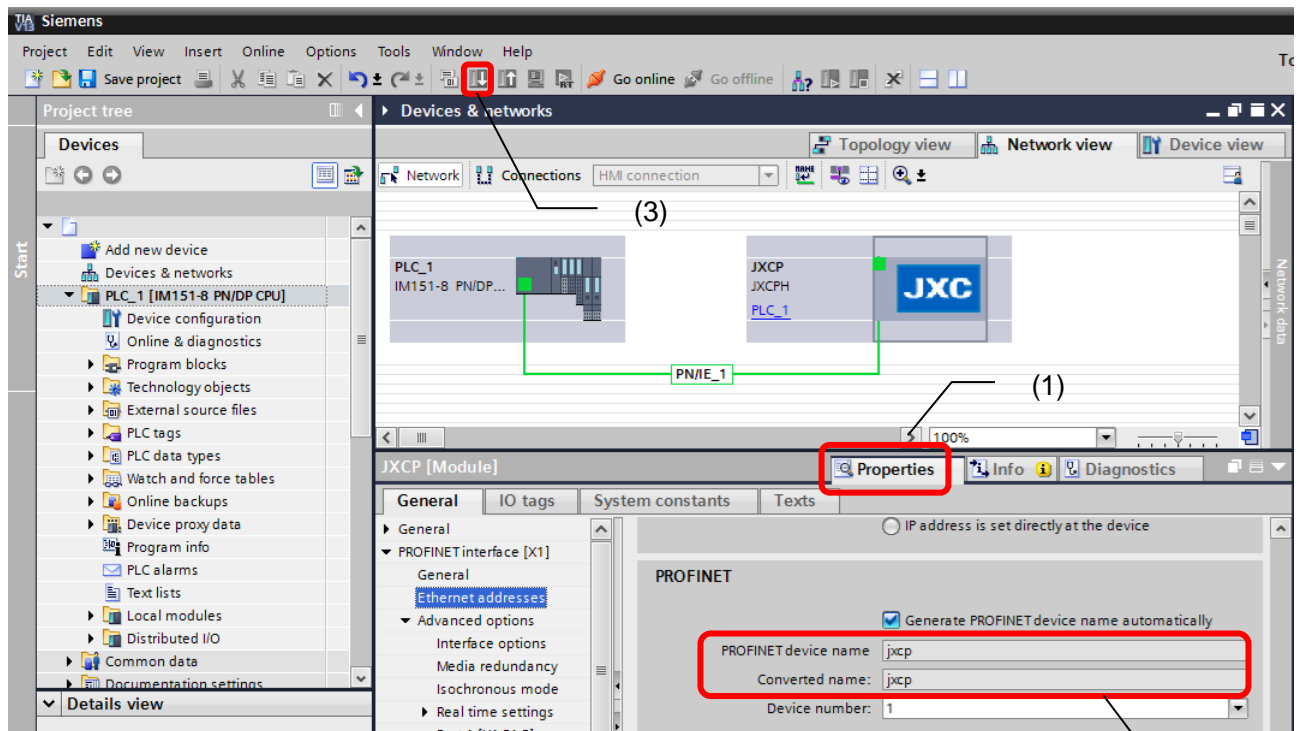


Fig.4.4 Registration of the device name.

4.5 Assign Device Name

- (1) Select JXCPH on the "Network view" tab, right-click the mouse and select "Assign device name".

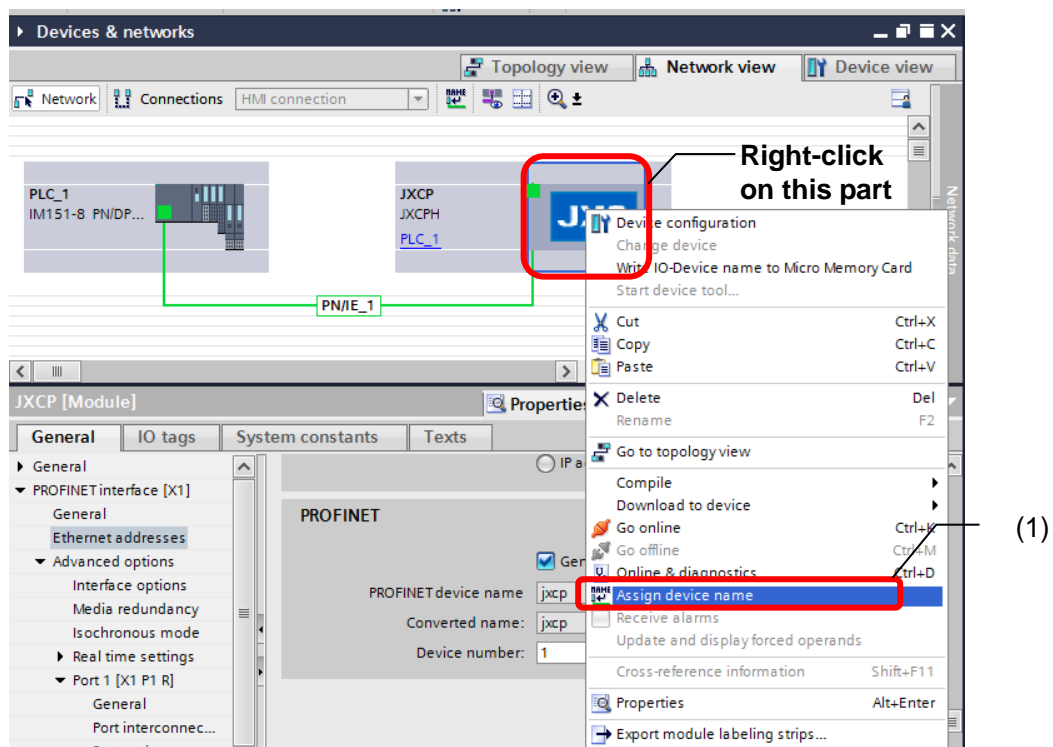


Fig.4.5 Assign Device Name

- (2) Press "Update list" to update "Assign PROFINET device name" window.
- (3) Connected SI unit on the network will be displayed in "Accessible devices in the network".
- (4) Press "Assign name" to complete the configuration.

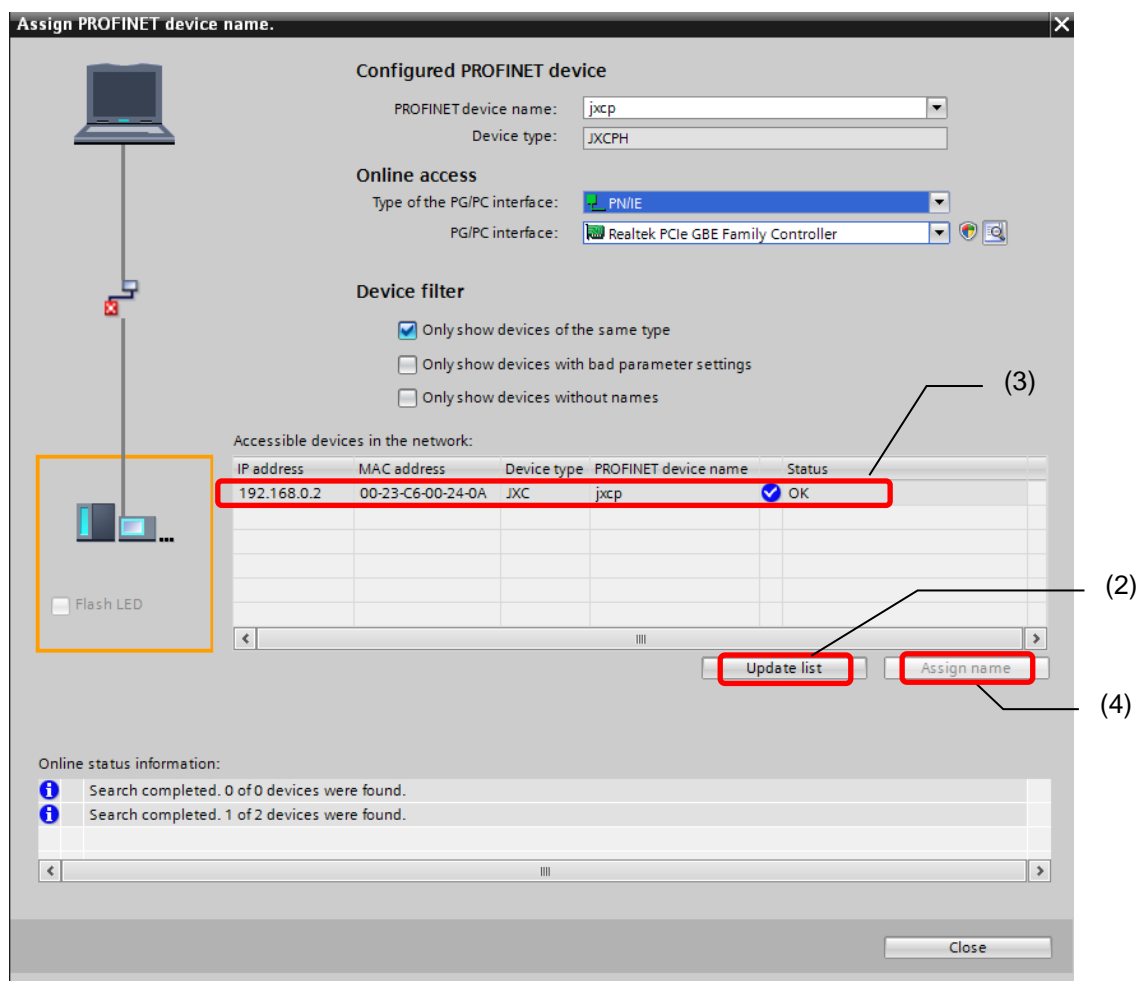


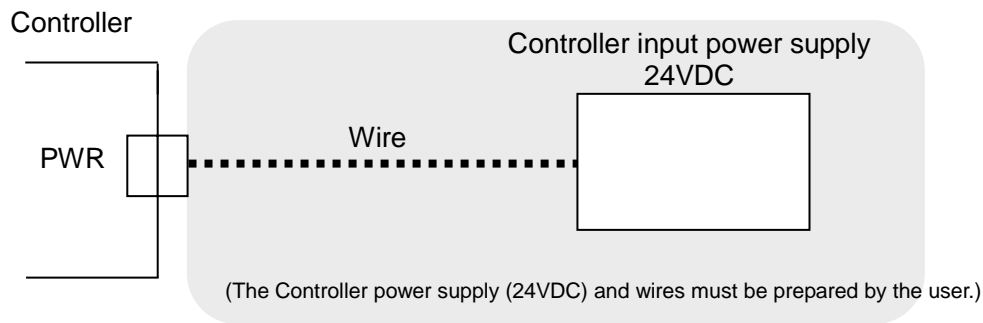
Fig.4.6 Assign Device Name

<Initial setting completed>

5. External Connections

An example of standard wiring of the controller is shown for each connector.

5.1 PWR: Power supply connector



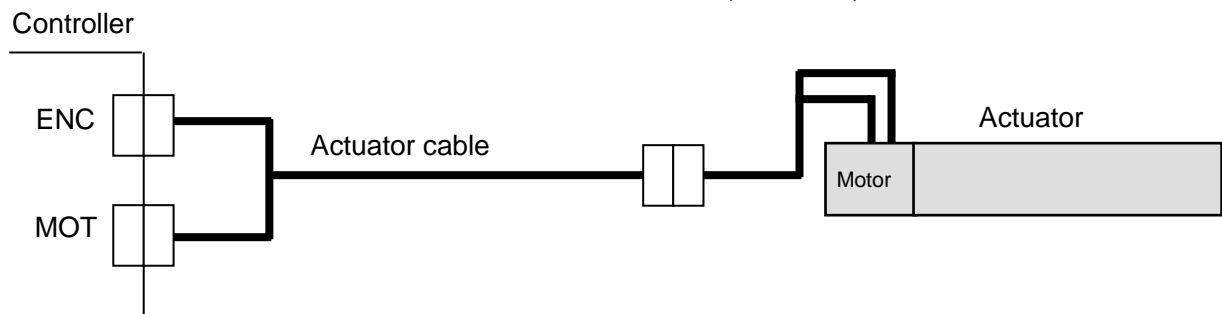
* Refer to [6.Details of Power supply plug \(P.24\)](#) for wiring.

Caution

Do not use an inrush current limited type of power supply for the controller.

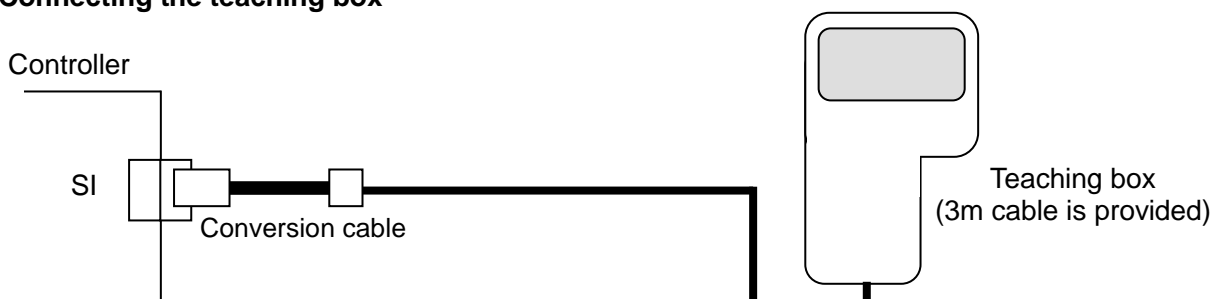
5.2 MOT: Motor connector, ENC: Encoder connector

Connect the controller and the actuator with the actuator cable (LE-CP-□)

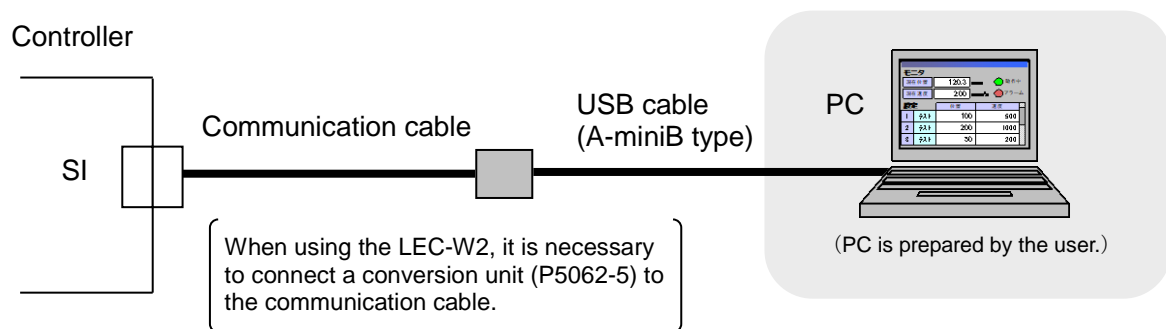


5.3 SI: Serial I/O Connector

(1) Connecting the teaching box



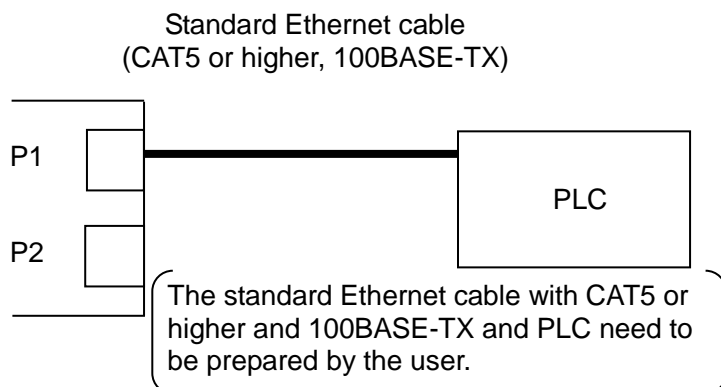
(2) Connection with a PC



Caution

- (1) Do not connect any device other than the specified device (JXC-W2/W2A-C, LEC-W2/W2A-C, LEC-T1).
If connected to other equipment, this product may be damaged due to differences in signal wiring.
- (2) When connecting cables, do not allow conductors to be caught in the connector insertion port.

5.4 P1, P2: PROFINET communication connector

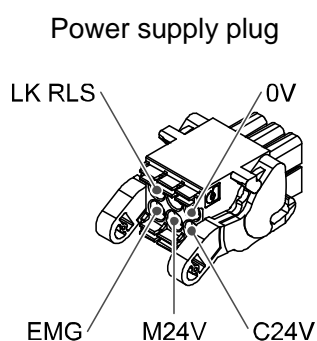


- * Cable can be connected to either P1 or P2.
Follow the topology of PROFINET communication for details.

6. Details of Power Supply Plug

6.1 PWR: Power supply plug specifications

The specifications of the power supply plug supplied with the controller are shown below.



| Pin No. | Terminal | Function | Functional explanation |
|---------|----------|------------------|--|
| 1 | C24V | Power supply (+) | The positive control power. |
| 2 | M24V | Motor power (+) | The positive power for the actuator motor to be supplied via the controller. |
| 3 | EMG | Stop (+) | The positive power for Stop signal |
| 4 | 0V | Common power (-) | The negative common power for M24V, C24V, EMG and LK RLS. |
| 5 | - | NC | N/A |
| 6 | LK RLS | Unlocking (+) | The positive power for lock release. |

* Equivalent to Phoenix Contact: DFMC1, 5/3-ST-LR

6.2 Electrical Wiring Specifications

Prepare the electrical wiring according to the following specifications (to be prepared by the user).

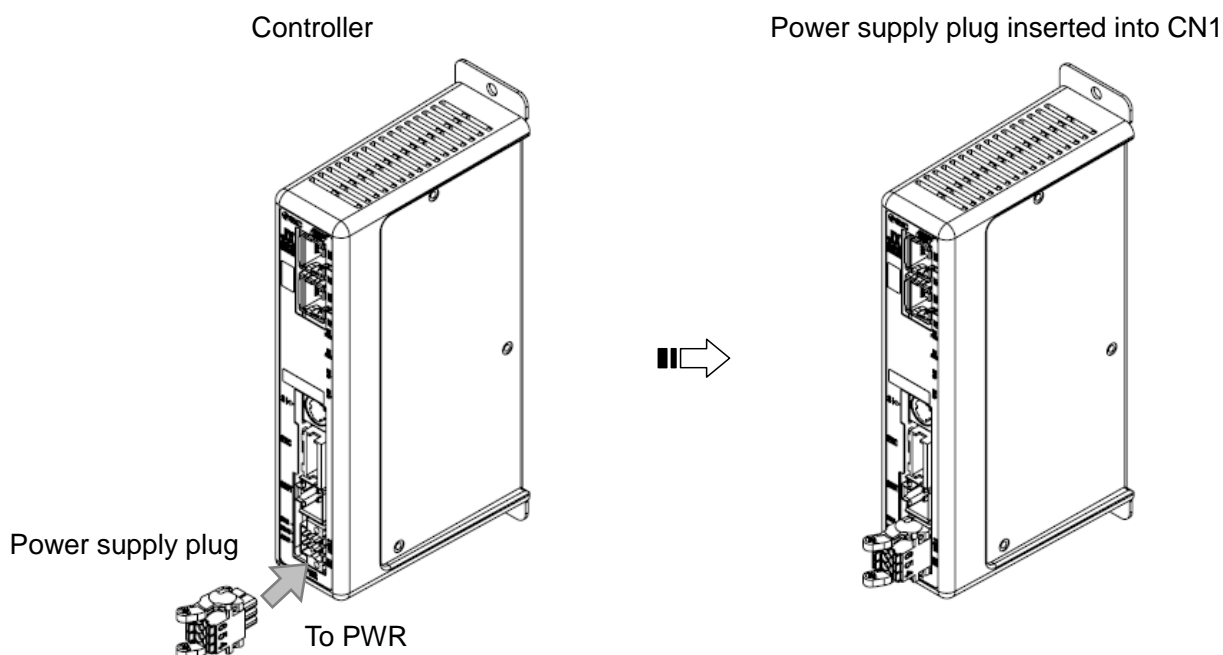
| Item | Specifications |
|----------------------|--|
| Applicable wire size | Single, stranded wire → AWG20 (0.5mm ²) * The rated temperature of the insulation coating should be 60°C or more. The O.D. should be ø2.5mm or less. |
| Stripped wire length | ø2.5mm or less 8mm |

Caution

Do not connect multiple wires to one terminal.

After wiring the power supply plug, connect it to PWR power connector of the controller.

* Refer to **6.3 Power Supply Plug Wiring (P.25)** for wiring.

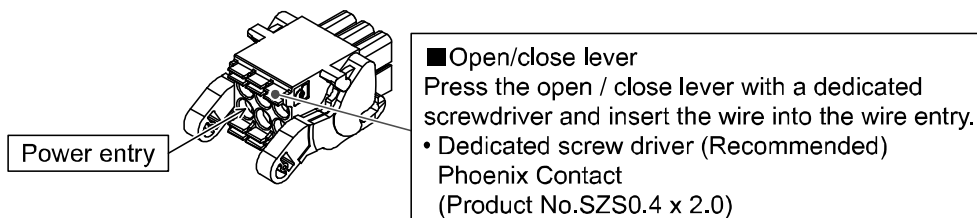


6.3 Power Supply Plug Wiring

Connect the power supply plug to the 24VDC controller power supply according to instructions (1) (2) and (3) and then insert it into the PWR connector of the controller.

(1) Wiring of power supply (C24V, M24V, 0V)

Connect the positive of the 24VDC controller power supply to the C24V and M24V and connect the negative of that power supply to the 0V terminal.



(2) Wiring of the stop switch (EMG)

Stop switch must be installed by the user to stop the actuator in abnormal situations.

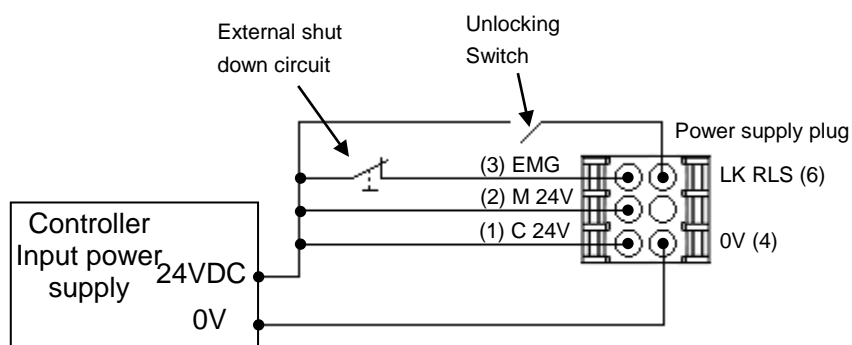
Refer to **6.4 Wiring of stop circuit (P.26)** for wiring.

(3) Wiring of the lock release (LK RLS)

Install an unlocking switch for adjustment or recovery during an emergency of the locking actuator.

* Switch (24V DC, contact capacity 0.5A or more) is provided by customer.

One terminal of the lock release switch should be connected to the 24VDC power supply and the other should be connected to the LK RLS terminal. When this is switched on, the lock will be released.



⚠ Caution

- (1) Do not use a power supply with "inrush-current control" for the controller power supply.
- (2) It is unnecessary to connect LK RLS terminal when the actuator does not have locking mechanism.
- (3) The LK RLS terminal is only used for adjustment and emergency return. It must not be energized during normal operation.

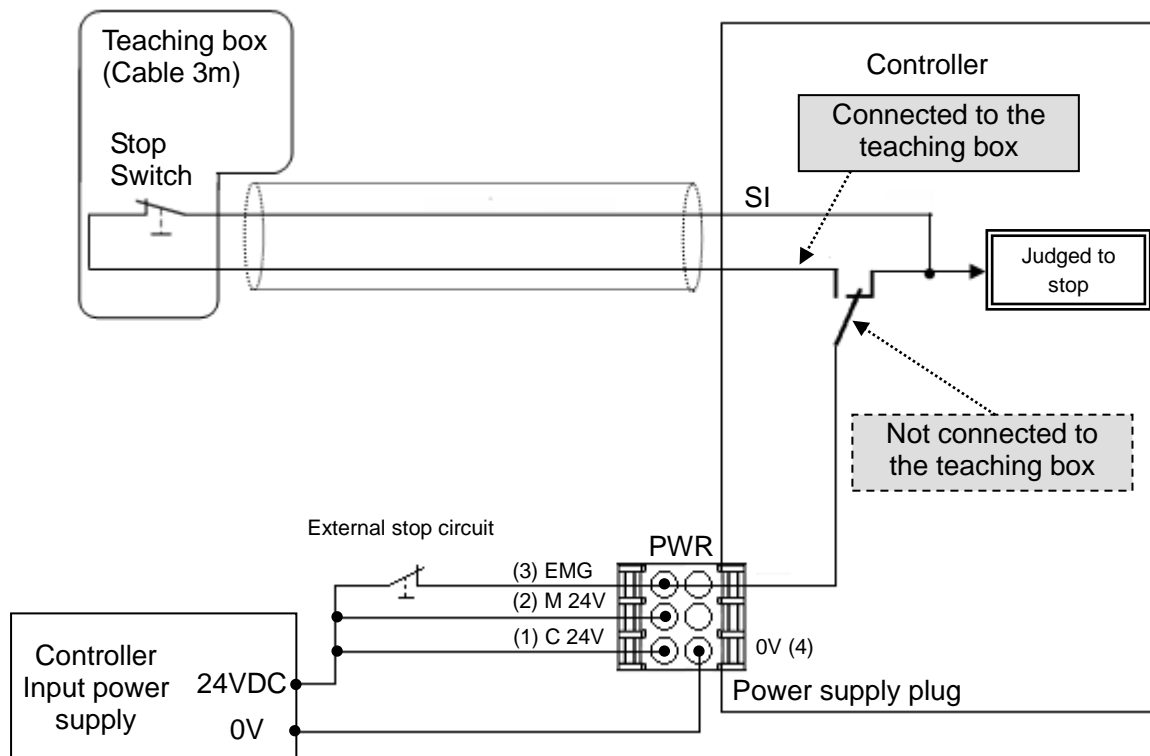
6.4 Wiring of stop circuit

The actuator stops its operation when the external stop switch or the stop switch of the teaching box is activated.

(1) Stop (example of recommended circuit)

When the controller recognizes the connection of the teaching box, the stop of the teaching box is activated.

(Circuit example)



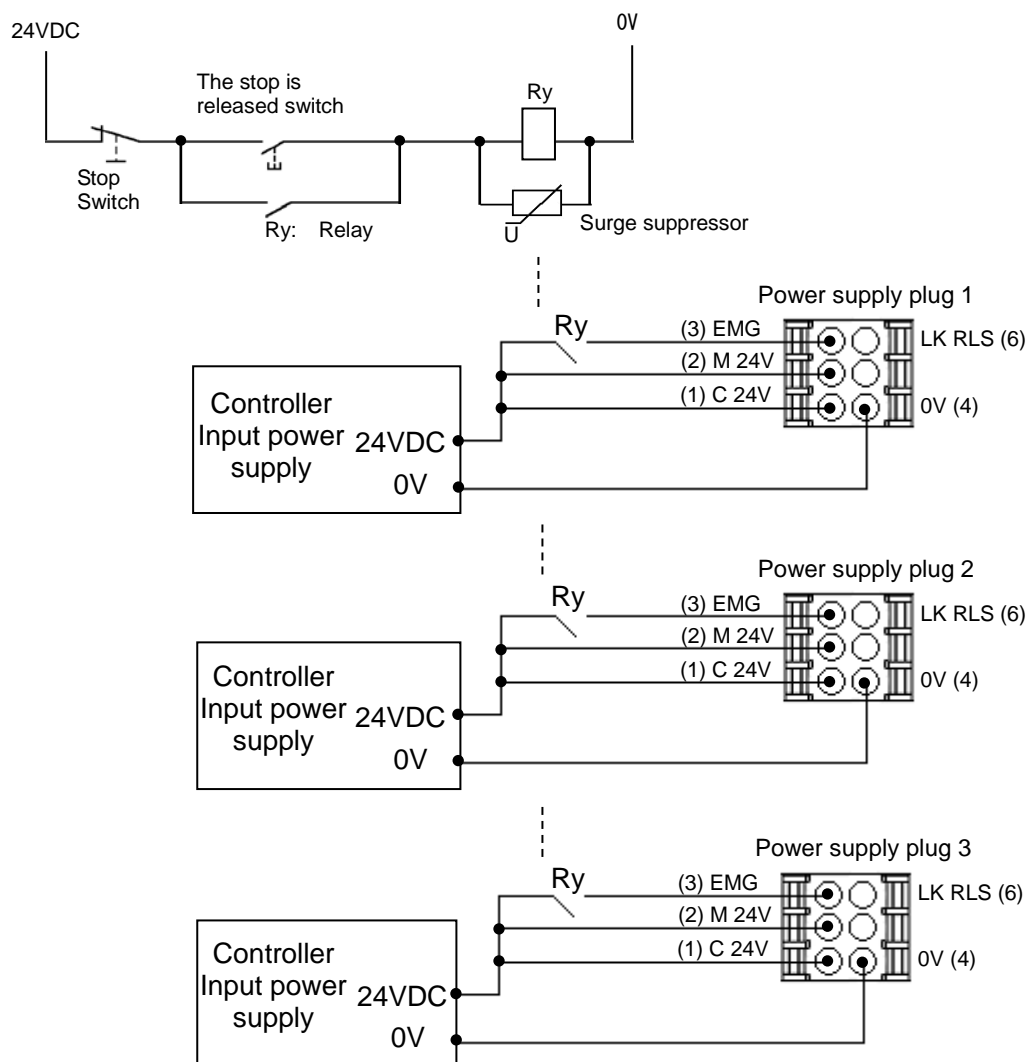
Warning

The teaching box's stop switch is effective only for the controller that is connected to it.

(2) Stop (relay contact (1))

If the system where this controller is installed has a stop circuit for the whole system, or if the system has multiple controllers with individual power supply, relay contacts should be made between the 24VDC controller power supply and the EMG terminal of the power supply plug.

(Circuit example)



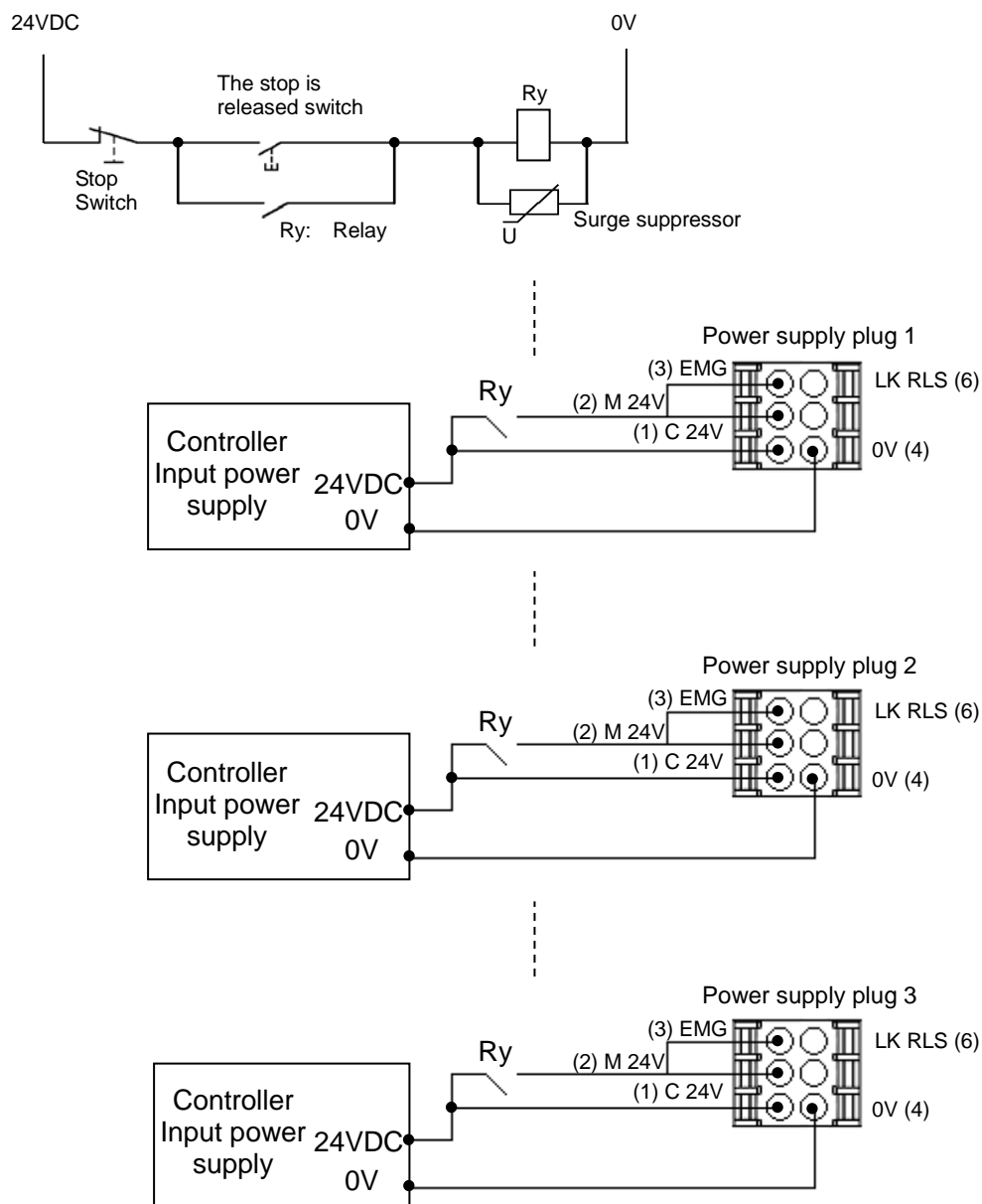
Caution

When shutdown is input, the controller stops with maximum deceleration, then the motor is turned OFF.

(3) Motor power shutdown (relay contact (2))

If it is necessary to have a circuit to shutdown the motor power externally, relay contacts should be made between the 24VDC controller power supply and the M24V and EMG terminal of the power supply plug.

(Circuit example)



Warning

- (1) Relay contacts should be made between the 24VDC controller power supply and the M24V and EMG terminal of the power supply plug. The actuator may make unexpected movement.
- (2) Do not perform return to origin (SETUP) when motor drive power (M24V) is disconnected. The controller cannot recognize the correct origin point if a return to origin instruction is made with the motor drive power (M24V) disconnected.
- (3) Do not energize the LK RLS terminal while the motor drive power (M24V) is disconnected.

7. LED display

7.1 LED display

Refer to the table below for details of the LED status.

| LED | Details | | |
|-----|-------------------------------|---------------------|--|
| PWR | Power supply status. | OFF | Power is not supplied |
| | | Green LED is ON | Power is supplied |
| ALM | Controller alarm status. | OFF | Normal operation |
| | | Red LED is ON | Alarm generated |
| SF | Controller status. | OFF | Normal operation |
| | | Red LED is ON | Alarm generated (Linked to ALM) |
| BF | PROFINET communication status | OFF | PROFINET communication is established. |
| | | Red LED is flashing | PROFINET communication is not established. |
| | | Red LED is ON | Both Port1 and Port2 are not connected. |

7.2 LED and Controller Status

Refer to the table below for the LED and the controller status.

| Controller status | | LED description | | | |
|---------------------------------------|-----------------------------------|-----------------------|---------------|---------------|------------|
| | | PWR | ALM | SF | BF |
| When power is supplied | | Green LED is ON | LED is OFF | - | - |
| When PROFINET communication is normal | | - | - | LED is OFF | LED is OFF |
| Motor controller | Controller alarm generated | LED is OFF | Red LED is ON | Red LED is ON | - |
| | Controller system error generated | Green LED is ON | Red LED is ON | - | - |
| | Writing to controller EEPROM | Green LED is flashing | - | - | - |

-: LED display is unstable

Caution

Do not turn OFF the power supply for the controller or disconnect and connect the cable while data is being written to EEPROM (PWR LED (green) is flashing).

* This is to avoid the possibility of incorrect / corrupt data (step data, parameter)

8. Operation methods

8.1 Outline

Two types of operation method are available for this product. The first method is “Operation by Step No.”. When using this method, step data stored in the product can be driven by sending specific commands over the network. The second method is “Operation by numerical instruction”. When using this method the numerical data (e.g. Position, speed etc.) is changed based on the already set step data.

8.2 Operation by Step No.

The function of this mode is to read/write the memory bits corresponding to the input/output port signals (e.g. DRIVE, INP) using a master (PLC) on the PROFINET network.

When an operation is based on the preset step data, select the step data No. from the PROFINET communication output data bits then activate the DRIVE signal.

Refer to **13.2 Operation procedure for Operation by Step No. (P.53)**.

8.3 Position/speed monitor

Reads the current position and current speed for monitoring.

Refer to **9. Memory map (P.31)** for the current position and speed.

8.4 Operation by numerical instruction

When numerical data relating to the actuator speed, position etc. is sent, the actuator will execute this data provided it is within the allowable range of values.

For the JXCPH controller, it is possible to instruct all step data items (operation method, speed, position, acceleration, deceleration, pushing force, switch point, pushing speed, positioning thrust, area 1, area 2, positioning width) by numeric values.

Preparatory operations such as turning the servo on and performing a return to origin are required before the actuator may execute step data or numerical data.

Refer to **13.3 Operation procedure for operation by numerical instruction (P.58)**.

9. Memory map

9.1 Memory allocation


(1) Input Area Mapping

●Input area mapping list (data sent from JXCPH controller to PROFINET master)

| SLOT | SUBSLOT | Offset (Byte) | Size | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|------|---------|---------------|-------|-----------------------|-------|-------|-------|------|-------|------|------|
| 1 | 1 | 0 | BYTE | - | - | OUT5 | OUT4 | OUT3 | OUT2 | OUT1 | OUT0 |
| | | 1 | BYTE | ALARM | ESTOP | WAREA | AREA | INP | SETON | SVRE | BUSY |
| | | 2 | BYTE | - | - | - | READY | - | - | - | - |
| | | 3 | BYTE | - | - | - | - | - | - | - | - |
| | | 4 | DWORD | Current position | | | | | | | |
| | | 5 | | | | | | | | | |
| | | 6 | | | | | | | | | |
| | | 7 | | | | | | | | | |
| | | 8 | WORD | Current speed | | | | | | | |
| | | 9 | | | | | | | | | |
| | | 10 | WORD | Current pushing force | | | | | | | |
| | | 11 | | | | | | | | | |
| | | 12 | DWORD | Target position | | | | | | | |
| | | 13 | | | | | | | | | |
| | | 14 | | | | | | | | | |
| | | 15 | | | | | | | | | |
| | | 16 | BYTE | Alarm 1 | | | | | | | |
| | | 17 | BYTE | Alarm 2 | | | | | | | |
| | | 18 | BYTE | Alarm 3 | | | | | | | |
| | | 19 | BYTE | Alarm 4 | | | | | | | |
| | | 20 | - | Reserved | | | | | | | |
| | | 21 | - | Reserved | | | | | | | |
| | | 22 | - | Reserved | | | | | | | |
| | | 23 | - | Reserved | | | | | | | |
| | | 24 | - | Reserved | | | | | | | |
| | | 25 | - | Reserved | | | | | | | |
| | | 26 | - | Reserved | | | | | | | |
| | | 27 | - | Reserved | | | | | | | |
| | | 28 | - | Reserved | | | | | | | |
| | | 29 | - | Reserved | | | | | | | |
| | | 30 | - | Reserved | | | | | | | |
| | | 31 | - | Reserved | | | | | | | |
| | | 32 | - | Reserved | | | | | | | |
| | | 33 | - | Reserved | | | | | | | |
| | | 34 | - | Reserved | | | | | | | |
| | | 35 | - | Reserved | | | | | | | |

(2) Input area details

●Byte0: Input port equivalent signal details

| Byte | Bit | Signal name | Description | | | | | | | | | | | | |
|------|------|-------------|---|-------|-------|-------|-------|-------|-------|-----|-----|-----|-----|----|----|
| 0 | 0 | OUT0 | <div>When the operation is started and “DRIVE” is turned OFF, the step No. executed by “DRIVE” will be refreshed/updated by the combination of “OUT0” to “OUT5” (binary digit).</div> <div>(E.g.) Step data No.3 is output</div> <table><tr><td>OUT5</td><td>OUT 4</td><td>OUT 3</td><td>OUT 2</td><td>OUT 1</td><td>OUT 0</td></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr></table> <div><div> Caution</div><div><div>(1) When “RESET” is turned ON, these signals turn OFF.</div><div>(2) During the alarm, these signals output the alarm group.</div><div>(3) During the pushing operation, if the actuator runs over the defined pushing width, these signals turn OFF.</div></div></div> | OUT5 | OUT 4 | OUT 3 | OUT 2 | OUT 1 | OUT 0 | OFF | OFF | OFF | OFF | ON | ON |
| | OUT5 | OUT 4 | | OUT 3 | OUT 2 | OUT 1 | OUT 0 | | | | | | | | |
| | OFF | OFF | | OFF | OFF | ON | ON | | | | | | | | |
| | 1 | OUT1 | | | | | | | | | | | | | |
| | 2 | OUT2 | | | | | | | | | | | | | |
| | 3 | OUT3 | | | | | | | | | | | | | |
| | 4 | OUT4 | | | | | | | | | | | | | |
| | 5 | OUT5 | | | | | | | | | | | | | |
| 6 | - | - | | | | | | | | | | | | | |
| 7 | - | - | | | | | | | | | | | | | |

●Byte1: Input port equivalent signal details

| Byte | Bit | Signal name | Description |
|------|-----|-------------|---|
| 1 | 0 | BUSY | <p>This terminal is ON during the movement of the actuator (during the positioning operation, etc.).</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">! Caution</p> <p>During the pushing operation without movement (no movement but the actuator generating the pushing force), "BUSY" is OFF.</p> </div> |
| | 1 | SVRE | When the servo motor is OFF, "SVRE" is OFF. When the servo motor is ON, "SVRE" is ON. |
| | 2 | SETON | When the actuator is in the SETON status (the position information is established), this signal turns ON. When the position status is not established, this signal is OFF. |
| | 3 | INP | <p>The condition when "INP" turns ON depends on the actuator action.</p> <ul style="list-style-type: none"> -Return to origin Turns ON at the origin when within the \pm"default in position" in the Basic parameters. -During positioning operation Turns ON when the current position is within "Step data position \pm positioning range". -During pushing operation Turns ON when the pushing force exceeds the value set in the step data "Trigger LV". <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">! Caution</p> <p>After the pushing operation is completed, even if it switches automatically to energy saving mode, "INP" remains ON. When movement starts again from the pushing stopped state, pushing operation is repeated with the normal pushing force.</p> <p>(E.g.) Step data "force" is 100% Step data "Trigger LV" is 80% The energy saving setting of the actuator is 40% { The actuator model determines the energy settings. Please refer to the manual of the actuator for more details. </p> </div> <div style="text-align: center;"> <p>The graph illustrates the relationship between pushing force and the INP signal. The y-axis represents Pushing force (%) with markers at 40, 80, and 100. The x-axis represents Time. A solid line shows the force starting at 100%, dropping to 80% (labeled 'Trigger LV'), and then to 40% (labeled 'Energy saving mode'). A bracket labeled 'INP [ON]' spans the period from the initial 100% force down to the 40% energy saving mode level.</p> </div> |
| | 4 | AREA | When the actuator is within the output range between Area1 and Area2 in the step data, this terminal will turned ON. The area output setting range changes depending on the active step data. |
| | 5 | WAREA | When the actuator is within the output range between "W area 1 and W area 2" of basic parameter, this terminal will turn ON. |

| | | | |
|--|---|-------|--|
| | 6 | ESTOP | During activation of the Teaching Box stop switch, this signal is ON. During the normal operation, it is OFF. This is synchronized to the input for the EMG signal on the controller PWR connector. |
| | 7 | ALARM | Alarm generated when abnormal conditions occur to the actuator or its controlling status. OFF when there are no alarms. ON in alarm condition. |

The table below shows the changes in the output signal with respect to the state of the controller.

| Status | Signal | BUSY | INP | SVRE | Lock | SETON | OUT0 to 5 |
|--|--------|------|---------|------|--------|-------|-----------|
| During stopping when "SVON" is OFF after turning ON the power supply to the controller | | OFF | OFF | OFF | Lock | OFF | OFF |
| During stopping when "SVON" is ON after turning ON the power supply to the controller | | OFF | OFF | ON | Unlock | OFF | OFF |
| During returning to origin | | ON | OFF | ON | Unlock | OFF | OFF |
| The actuator is at the origin. On completion of "SETUP" | | OFF | ON(*1) | ON | Unlock | ON | OFF |
| During movement by positioning/pushing operation | | ON | OFF | ON | Unlock | ON | ON(*2) |
| The actuator is paused by "HOLD" | | OFF | OFF | ON | Unlock | ON | ON(*2) |
| On completion of the positioning operation | | OFF | ON(*4) | ON | Unlock | ON | ON(*2) |
| Stopped due to pushing a workload in pushing operation | | OFF | ON | ON | Unlock | ON | ON(*2) |
| Stopped due to no detection of workload during a pushing operation | | OFF | OFF | ON | Unlock | ON | OFF |
| During stopping when "SVON" is OFF after returning to the home position | | OFF | OFF(*4) | OFF | Lock | ON | ON(*3) |
| EMG signal stop from the PWR connector when the actuator is at the origin | | OFF | OFF(*4) | OFF | Lock | ON | OFF |

*1 The signal turns ON when the actuator is within the range defined in the basic parameter setup.

*2 The signal is updated on the transition of (ON → OFF) of the DRIVE signal.

*3 Retains the previous state.

*4 The signal turns ON when the actuator is "In position" according to the step data.

●Byte2,3: Controller information flag

| Byte | Bit | Signal name | Description |
|------|-----|-------------|---|
| 2 | 0-3 | (Unused) | Set always OFF(0) |
| | 4 | READY | READY turns ON when Servo is ON and no alarm is generated. The READY flag turns ON. |
| | 5 | (Unused) | Set always OFF(0) |
| | 6-7 | (Unused) | Set always OFF(0) |
| 3 | 0-7 | (Unused) | Set always OFF(0) |

●Byte4-7: Current position

| Byte | Signal name | Description |
|------|------------------|--|
| 4 | Current position | Current position of the actuator is shown in multiples of 0.01mm when numerical data can be read. (*5) E.g.) 800.00[mm](80000d=13880h) is output. "Byte4" = 00h "Byte5" = 01h "Byte6" = 38h "Byte7" = 80h |
| 5 | | |
| 6 | | |
| 7 | | |

*5 Please refer to **20. Handling of sent/received data (P.87)** for handling of the data.

●Byte8, 9: Current speed

| Byte | Signal name | Description |
|------|---------------|--|
| 8 | Current speed | Current speed of the actuator is shown in multiples of 1mm/s when numerical data can be read. (*5) E.g.) 300[mm/s](300d=012Ch) is output. "8Byte" = 01h "9Byte" = 2Ch |
| 9 | | |

●Byte10, 11: Current pushing force

| Byte | Signal name | Description |
|------|-----------------------|---|
| 10 | Current pushing force | Current pushing force of the actuator is shown in multiples of 1% when numerical data can be read. (*5) |
| 11 | | |

●Byte12-15: Target position

| Byte | Signal name | Description |
|------|-----------------|---|
| 12 | Target position | Target position of the actuator is shown in multiples of 0.01mm when numerical data can be read. (*5) E.g.) When 800.00[mm](80000d=13880h) is input. "Byte12" = 00h "Byte13" = 01h "Byte14" = 38h "Byte15" = 80h |
| 13 | | |
| 14 | | |
| 15 | | |

●Byte16-19: Alarm

| Byte | Signal name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------|--|------------------|-----|---|-----|-----|-----|---|-----|---|-----|---------|---|-----|-----|-----|-----|---------|---|---|-----|-----|-----|---------|---|---|---|-----|-----|
| 16 | Alarm 1 | Alarm code shown as a 3 digit decimal number when read numerical data is valid and alarm is generated. 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | Alarm 2 | Latest alarm code generated will be output to alarm 1. Alarm is updated by another alarm. The code of the alarm generated in the past will be shifted as alarm 1 → 2 → 3 → 4. When the number of alarm generated exceeds the maximum alarm output of each tool (PC Setting Software or Teaching box), the oldest alarm code is deleted from the record. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | Alarm 3 | E.g.) Alarm was generated in order of (1) -> (5) <table><tr><td>Alarm 1 (Latest)</td><td>(1)</td><td rowspan="4">→</td><td>(2)</td><td rowspan="4">→</td><td>(3)</td><td rowspan="4">→</td><td>(4)</td><td rowspan="4">→</td><td>(5)</td></tr><tr><td>Alarm 2</td><td>0</td><td>(1)</td><td>(2)</td><td>(3)</td><td>(4)</td></tr><tr><td>Alarm 3</td><td>0</td><td>0</td><td>(1)</td><td>(2)</td><td>(3)</td></tr><tr><td>Alarm 4</td><td>0</td><td>0</td><td>0</td><td>(1)</td><td>(2)</td></tr></table> | Alarm 1 (Latest) | (1) | → | (2) | → | (3) | → | (4) | → | (5) | Alarm 2 | 0 | (1) | (2) | (3) | (4) | Alarm 3 | 0 | 0 | (1) | (2) | (3) | Alarm 4 | 0 | 0 | 0 | (1) | (2) |
| Alarm 1 (Latest) | (1) | → | (2) | → | | (3) | | → | | (4) | | → | (5) | | | | | | | | | | | | | | | | | |
| Alarm 2 | 0 | | (1) | | | (2) | | | | (3) | | | (4) | | | | | | | | | | | | | | | | | |
| Alarm 3 | 0 | | 0 | | | (1) | | | | (2) | | | (3) | | | | | | | | | | | | | | | | | |
| Alarm 4 | 0 | | 0 | | 0 | (1) | (2) | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | Alarm 4 | (1) to (5) in the table indicate the alarm codes which are generated. Refer to “ <u>15.3. Alarms and countermeasures (P.66)</u> ” for detailed alarm information. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

*5 Please refer to **20. Handling of sent/received data (P.87)** for handling of the data.

(3) Output area mapping


●Output area mapping list (data sent from PROFINET master to JXCPH controller)

| SLOT | SUBSLOT | Offset (Byte) | Size | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|------|---------|---------------|-------|-------------------------------|---------------|---------------|---------------|---------------|------------|-------------------|--------------|
| 2 | 1 | 0 | BYTE | - | - | IN5 | IN4 | IN3 | IN2 | IN1 | IN0 |
| | | 1 | BYTE | FLGTH | JOG+ | JOG- | SETUP | RESET | DRIVE | SVON | HOLD |
| | | 2 | BYTE | Acceleration | Position | Speed | Movement mode | - | - | Speed restriction | - |
| | | 3 | BYTE | "In-Position" tolerance range | Area output 2 | Area output 1 | Moving force | Pushing speed | Trigger LV | Pushing force | Deceleration |
| | | 4 | BYTE | Start flag | | | | | | | |
| | | 5 | BYTE | Movement mode | | | | | | | |
| | | 6 | WORD | Speed | | | | | | | |
| | | 7 | | | | | | | | | |
| | | 8 | DWORD | Position | | | | | | | |
| | | 9 | | | | | | | | | |
| | | 10 | | | | | | | | | |
| | | 11 | | | | | | | | | |
| | | 12 | WORD | Acceleration | | | | | | | |
| | | 13 | | | | | | | | | |
| | | 14 | WORD | Deceleration | | | | | | | |
| | | 15 | | | | | | | | | |
| | | 16 | WORD | Pushing force | | | | | | | |
| | | 17 | | | | | | | | | |
| | | 18 | WORD | Trigger LV | | | | | | | |
| | | 19 | | | | | | | | | |
| | | 20 | WORD | Pushing speed | | | | | | | |
| | | 21 | | | | | | | | | |
| | | 22 | WORD | Moving force | | | | | | | |
| | | 23 | | | | | | | | | |
| | | 24 | DWORD | Area1 | | | | | | | |
| | | 25 | | | | | | | | | |
| | | 26 | | | | | | | | | |
| | | 27 | | | | | | | | | |
| | | 28 | DWORD | Area2 | | | | | | | |
| | | 29 | | | | | | | | | |
| | | 30 | | | | | | | | | |
| | | 31 | | | | | | | | | |
| | | 32 | DWORD | In-Position | | | | | | | |
| | | 33 | | | | | | | | | |
| | | 34 | | | | | | | | | |
| | | 35 | | | | | | | | | |

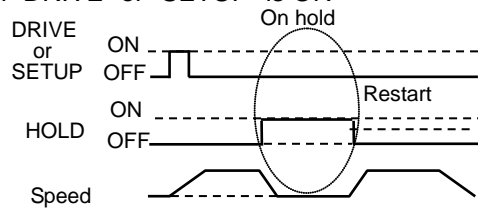
* Set always OFF(0) to “-” memory.

(4) Output area details

●Byte0,1: Output port to which signal is allocated

| Byte | Bit | Signal name | Description | | | | | | | | | | | | |
|------|-----|-------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| 0 | 0 | IN0 | <p>The step data No. instruction the drive will be specified by the combination of “IN0” to “IN5” (binary digit).</p> <p>E.g.) Step data No.3 has been assigned</p> <table><tr><td>IN5</td><td>IN4</td><td>IN3</td><td>IN2</td><td>IN1</td><td>IN0</td></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr></table> <div><div>Caution</div><p>Be sure to decide the step data No. via the “IN*” signal before turning “DRIVE” ON. Otherwise, the actuator might operate with unexpected step data.</p></div> | IN5 | IN4 | IN3 | IN2 | IN1 | IN0 | OFF | OFF | OFF | OFF | ON | ON |
| | IN5 | IN4 | | IN3 | IN2 | IN1 | IN0 | | | | | | | | |
| | OFF | OFF | | OFF | OFF | ON | ON | | | | | | | | |
| | 1 | IN1 | | | | | | | | | | | | | |
| | 2 | IN2 | | | | | | | | | | | | | |
| | 3 | IN3 | | | | | | | | | | | | | |
| | 4 | IN4 | | | | | | | | | | | | | |
| | 5 | IN5 | | | | | | | | | | | | | |
| 6 | - | Set always OFF(0) | | | | | | | | | | | | | |
| 7 | - | Set always OFF(0) | | | | | | | | | | | | | |

●Byte1: Output port to which signal is allocated

| Byte | Bit | Signal name | Description |
|------|-----|-------------|---|
| 1 | 0 | HOLD | <p>If "HOLD" is turned ON during operation, the speed decreases at maximum deceleration set in the basic parameters until the actuator stops. The remaining stroke will be on hold as long as "HOLD" is ON and when "HOLD" is turned OFF, the actuator restarts and travels for the remaining stroke.</p> <ul style="list-style-type: none"> - When "DRIVE" or "SETUP" is ON  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Caution</p> <p>(1) Do not turn on "SETUP", "DRIVE", "JOG+/JOG-" or Start flag when "HOLD" is ON. The actuator may make unexpected movement.</p> <p>(2) The signals are rendered invalid whilst "HOLD" is in operation.</p> </div> |
| | 1. | SVON | <p>"SVON" signal turns the servo motor ON. When "SVON" is ON, the servo motor will be turned ON. When it is OFF, the servo motor will be turned OFF.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Caution</p> <p>(1) When "SVON" is ON for the first time after supplying power to the controller, the actuator moves several mm to improve the control accuracy.</p> <p>(2) When "SVON" is OFF, turn OFF "DRIVE" and "SETUP".</p> </div> |
| | 2 | DRIVE | <p>When "DRIVE" is turned ON, the system scans "IN0" to "IN5" and starts the operation of the actuator. (*6) Then, when "DRIVE" is turned OFF, the number of the active step data will be output via the "OUT0" to "OUT5" signals.</p> |
| | 3 | RESET | <p>"RESET" is a signal to reset the alarm and the operation. After "RESET", the speed decreases at maximum deceleration of the basic parameter until the actuator stops. "INP" and "OUT0" to "OUT5" will be turned OFF (however, if the actuator is stopped within the in-position range, "INP" will turn ON).</p> |
| | 4 | SETUP | <p>When "SVRE" is ON, the "SETUP" operation (return to origin operation) will be performed. During the "SETUP" operation, "BUSY" will turn ON. After completion of the "SETUP" operation, "SETON" and "INP" will turn ON.</p> |
| | 5 | JOG(-) | <p>Jogging in the (-) direction. The actuator moves when the signal is ON and stops when the signal is OFF. When the "FLGTH" (signal for switching Jogging and Inching) is ON, movement towards the (-) side is made according to the "JOG(-)" signal. "INP" and "OUT0" to "OUT5" are OFF during Jogging/Inching. When Jogging/Inching is completed, "INP" will turn ON, but "OUT0" to "OUT5" will remain OFF.</p> |
| | 6 | JOG(+) | <p>Jogging in the (+) direction. Operation is the same as "JOG(-)". with "-" changed to "+"</p> |
| | 7 | FLGTH | <p>FLGTH switches the function (Jogging and Inching) of Jogging signal "JOG(-)" and "JOG(+)". Inching starts when this signal is ON and when the Jogging signal turns ON. The Inching amount is set in the operation parameters.</p> |

*6 Turn ON "DRIVE" when stopped. If "DRIVE" is turned ON while operating, it may lead to unexpected operation.

●Byte2,3: Controlling of the controller/numerical data flag

| Byte | Bit | Signal name | Description |
|------|-----|-------------------|--|
| 2 | 0 | (Unused) | Set always OFF(0) |
| | 1 | Speed restriction | Speed is restricted for all operations. Value for speed limit varies depending on actuator type. |
| | 2 | (Unused) | Set always OFF(0) |
| | 3 | (Unused) | Set always OFF(0) |
| | 4 | Movement mode | When the operation is commanded numerically, values can be changed while the set values are ON. (*7) |
| | 5 | Speed | |
| | 6 | Position | |
| | 7 | Acceleration | |
| | 0 | Deceleration | |
| | 1 | Pushing force | |
| | 2 | Trigger LV | |
| | 3 | Pushing speed | |
| 3 | 4 | Moving force | |
| | 5 | AREA 1 | |
| | 6 | AREA 2 | |
| | 7 | In-Position | |

●Byte4,5: Movement mode/Start flag

| Byte | Bit | Signal name | Description |
|------|------|---------------|--|
| 4 | 0 | Start flag | Data transmission flag during numerically instructed operation. Turn OFF during waiting for transmitting. Turn ON when transmitting numerical data to the controller. (*7, *8, *9) |
| | 1-7. | (Unused) | Set always OFF(0) |
| 5 | 0-1. | Movement mode | 1: ABS (Absolute) 2: INC (Relative) (*7, *10) |
| | 2-7. | (Unused) | Set always OFF(0) |

●Byte6, 7: Speed

| Byte | Signal name | Description | |
|------|-------------|-------------------------------|-----------|
| | | Input range | Min. unit |
| 6 | Speed | 1 to Basic parameters | 1mm/s |
| 7 | | "Maximum speed" (*5, *7, *11) | |

●Byte8-11: Target position

| Byte | Signal name | Description | |
|------|-----------------|---|-----------|
| | | Input range | Min. unit |
| 8 | Target position | Basic parameter "Stroke(-)" - "Stroke (+)" (*5, *7, *11) | 0.01mm |
| 9 | | | |
| 10 | | | |
| 11 | | | |

*5 Please refer to **20. Handling of sent/received data (P.87)** for handling of the data.

*7 Change the numerical data input flag and the numerical data only when the start flag is OFF.
If the numerical data input flag or the numerical data are changed when the start flag is ON, it may lead to unexpected operation.

*8 Turn ON the start flag from OFF only when stopped. If the numerical data input flag or the numerical data is changed while operating, it may lead to unexpected operation.

*9 To avoid unintentionally changing the numerical data, it is recommended to turn OFF the start flag after starting an operation.

*10 Do not input numbers other than [1(ABS)] and [2(INC)].

*11 The actuator model determines the limit for the input values. Please refer to the manual of the actuator for more details.

●Byte12,13: Acceleration

| Byte | Signal name | Description | |
|------|--------------|---|--------------------|
| | | Input range | Min. unit |
| 12 | Acceleration | 1 ~ Basic parameters (*5, *7, *11) | 1mm/s ² |
| 13 | | "Maximum acceleration/deceleration speed" | |

●Byte14,15: Deceleration

| Byte | Signal name | Description | |
|------|--------------|------------------------------------|--------------------|
| | | Input range | Min. unit |
| 14 | Deceleration | 1 ~ Basic parameters (*5, *7, *11) | 1mm/s ² |
| 15 | | "Maximum deceleration speed" | |

●Byte16,17: Pushing force

| Byte | Signal name | Description | |
|------|---------------|---------------|-----------|
| | | Input range | Min. unit |
| 16 | Pushing force | (*5, *7, *11) | 1% |
| 17 | | | |

●Byte18,19: Trigger LV

| Byte | Signal name | Description | |
|------|-------------|---------------|-----------|
| | | Input range | Min. unit |
| 18 | Trigger LV | (*5, *7, *11) | 1% |
| 19 | | | |

●Byte20,21: Pushing speed

| Byte | Signal name | Description | |
|------|---------------|---------------|-----------|
| | | Input range | Min. unit |
| 20 | Pushing speed | (*5, *7, *11) | 1mm/s |
| 21 | | | |

●Byte22,23: Moving force

| Byte | Signal name | Description | |
|------|--------------|---------------|-----------|
| | | Input range | Min. unit |
| 22 | Moving force | (*5, *7, *11) | 1% |
| 23 | | | |

●Byte24-27: AREA 1

| Byte | Signal name | Description | |
|------|-------------|--|-----------|
| | | Input range | Min. unit |
| 24 | AREA 1 | Basic parameter "Stroke (-)" - "Stroke (+)" (*5, *7, *11) | 0.01mm |
| 25 | | | |
| 26 | | | |
| 27 | | | |

*5 Please refer to **21. Definitions and terminology (P.88)** for handling of the data.

*7 Change the numerical data input flag and the numerical data, when the start flag is OFF. If the numerical data input flag and the numerical data are changed when the start flag is ON, it might lead to unexpected operation.

*11 The actuator model determines the limit for the input values. Please refer to the manual of the actuator for more details.

●Byte28-31: AREA 2

| Byte | Signal name | Description | |
|------|-------------|--|-----------|
| | | Input range | Min. unit |
| 28 | AREA 2 | Basic parameter "Stroke (-)" - "Stroke (+)" (*5, *7, *11) | 0.01mm |
| 29 | | | |
| 30 | | | |
| 31 | | | |

●Byte32-35: In-Position

| Byte | Signal name | Description | |
|------|-------------|---------------|-----------|
| | | Input range | Min. unit |
| 32 | In-Position | (*5, *7, *11) | 0.01mm |
| 33 | | | |
| 34 | | | |
| 35 | | | |

(5) Record data (request sent from PROFINET master to JXCPH controller)

A record request is used to update the Step data items stored in the JXCPH controller.

●Record data object

| SLOT | SUB SLOT | Index | Record Data Length (Byte) | Details |
|------|----------|-------|---------------------------|-----------------------|
| 2 | 1 | 5 | 32 bytes | Step data No.0 (*12) |
| | | 6 | 32 bytes | Step data No.1 (*12) |
| | | : | : | : |
| | | 68 | 32 bytes | Step data No.63 (*12) |

●Details of Record Data Index

| Offset (Byte) | Size | Setting items *13 | Set range | Min. unit |
|---------------|-------|-------------------|---|--------------------|
| 0-1 | WORD | Movement mode | 1:ABS (Absolute) 2:INC (Relative) (*10, *14) | - |
| 2-3 | WORD | Speed | 1 to "Max speed" of the basic parameter (*5, *11, *14) | 1mm/s |
| 4-7 | DWORD | Position | Basic parameter "Stroke(-)" - "Stroke (+)" (*5, *11, *14) | 0.01mm |
| 8-9 | WORD | Acceleration | 1 to "Max ACC" of the basic parameter (*5, *11, *14) | 1mm/s ² |
| 10-11 | WORD | Deceleration | 1 to "Max DEC" of the basic parameter (*5, *11, *14) | 1mm/s ² |
| 12-13 | WORD | Pushing force | (*5, *11, *14) | 1% |
| 14-15 | WORD | Trigger LV | (*5, *11, *14) | 1% |
| 16-17 | WORD | Pushing | (*5, *11, *14) | 1mm/s |
| 18-19 | WORD | Moving force | (*5, *11, *14) | 1% |
| 20-23 | DWORD | Area1 | Basic parameter "Stroke(-)" - "Stroke (+)" (*5, *11, *14) | 0.01mm |
| 24-27 | DWORD | Area2 | Basic parameter "Stroke(-)" - "Stroke (+)" (*5, *11, *14) | 0.01mm |
| 28-31 | DWORD | In-Position | Basic parameter "Stroke(-)" - "Stroke (+)" (*5, *11, *14) | 0.01mm |

*5 Please refer to **20. Handling of sent/received data (P.87)** for handling of the data.

*7 Change the numerical data input flag and the numerical data, when the start flag is OFF
If the numerical data input flag and the numerical data are changed when the start flag is ON, it might lead to unexpected operation.

*10 Do not input numbers other than [1(ABS)] and [2(INC)].

*11 The actuator model determines the limit for the input values. Please refer to the manual of the actuator for more details.

*12 Please refer to "●Details of Record Data Index" for details of each index.

*13 Please refer to **10.1 Step Data(P.42)** for details of Step Data items.

*14 Change the Step data items in Record Data while stopping. If the Step data items in Record Data are changed while operating, it might lead to unexpected operation.

10. Settings and Data Entry

In order to move the actuator to a specific position, it is necessary to setup the patterns of operations with a PC (with the controller setting software) or the teaching box or record data. This setup data input by the software or teaching box will be recorded in the memory of the controller.

For the controller setting software and the teaching box, there are two available modes (the Easy mode and the Normal mode).

You can select the appropriate one depending on the operation.

- Easy mode

In Easy mode, the actuator can be started by entering only a limited number of settings with the controller setting software and the teaching box.

- * The combination of settings you need to set up will change depending on the type of actuator.
(A combination of data can be selected).

- Normal mode

In Normal mode, a more detailed setup can be made (conditions for actuator and controller, etc.) than in Easy mode.

Three kinds of setting data can be changed in this mode; "Step data", "Basic parameter" and "Return to origin parameter".

10.1 Step Data

A "step data" is the setting data mainly describing the movement of the actuator. Total 64 step data (12 attributes per step) can be handled with this controller. Each step data will become effective as soon as it is recorded into the controller.

E.g.) Step data on the PC (controller setting software) screen [Normal mode]

| No. | Movement mode | Speed mm/s | Position (mm) | Acceleration mm/s ² | Deceleration mm/s ² | Pushing force % | Trigger LV % | Pushing speed mm/s | Moving force % | Area 1 (mm) | Area 2 (mm) | In pos (mm) |
|-----|---------------|------------|---------------|--------------------------------|--------------------------------|-----------------|--------------|--------------------|----------------|-------------|-------------|-------------|
| 0 | Absolute | 100 | 20.00 | 1000 | 1000 | 0 | 0 | 0 | 100 | 18.00 | 22.50 | 0.5 |
| 1 | Absolute | 50 | 10.00 | 1000 | 1000 | 70 | 60 | 5 | 100 | 6.0 | 12.0 | 1.5 |
| | | | | | | | | | | | | |
| 63 | Absolute | 20 | 5.00 | 500 | 500 | 0 | 0 | 0 | 100 | 3.0 | 8.0 | 1.2 |

Step Data details

| Description | | Range | Explanation | | | | | | | | | | | | | | | | |
|-----------------------------|-------------------|--|---|-----------------------|---|---|---------|-----------------------|---|----------|-------------------------------|--|----------|---|---|----------|----------|---|---|
| Controller setting software | Teaching box (TB) | | | | | | | | | | | | | | | | | | |
| No. | Step No. | 0 to 63 | Number of the step data. | | | | | | | | | | | | | | | | |
| Movement mode | Movement mode | 3 types (Refer to the table on the right) | Specifies the co-ordinate system for the target position. | | | | | | | | | | | | | | | | |
| | | | <table><tr><th>Software</th><th>TB</th><th>PLC</th><th>Details</th></tr><tr><td>Blank</td><td>Disable</td><td>0</td><td>The step data is ineffective.</td></tr><tr><td>Absolute</td><td>Absolute</td><td>1</td><td>The target position will be defined in relation to the absolute origin point.</td></tr><tr><td>Relative</td><td>Relative</td><td>2</td><td>The target position will be defined relative to the current position.</td></tr></table> | Software | TB | PLC | Details | Blank | Disable | 0 | The step data is ineffective. | Absolute | Absolute | 1 | The target position will be defined in relation to the absolute origin point. | Relative | Relative | 2 | The target position will be defined relative to the current position. |
| | | | Software | TB | PLC | Details | | | | | | | | | | | | | |
| | | | Blank | Disable | 0 | The step data is ineffective. | | | | | | | | | | | | | |
| | | | Absolute | Absolute | 1 | The target position will be defined in relation to the absolute origin point. | | | | | | | | | | | | | |
| Relative | Relative | 2 | The target position will be defined relative to the current position. | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Speed | Speed | (*1) | The speed to move to the target position. (Unit: mm/s) | | | | | | | | | | | | | | | | |
| Position | Position | Basic parameter "Stroke (-)" - "Stroke (+)" | The target position (unit: mm) | | | | | | | | | | | | | | | | |
| Acceleration | Acceleration | 1 ~ Basic parameters "Maximum acceleration/ deceleration speed" | Sets the acceleration to reach to travel speed. (Unit: mm/s ²) | | | | | | | | | | | | | | | | |
| Deceleration | Deceleration | 1 ~ Basic parameters "Maximum acceleration/ deceleration speed" | Sets the deceleration from travel speed to stop. (Unit: mm/s ²) | | | | | | | | | | | | | | | | |
| Pushing force | Pushing force | (*1) | The setting to define the pushing operation or the positioning operation. For the positioning operation, the value specifies the force as a percentage of the maximum force (Unit: %). * The maximum force depends on the actuator. Please refer to the manual and the rated force of the actuator. | | | | | | | | | | | | | | | | |
| | | | <table><tr><th>Value</th><th>Movement mode</th><th>Details</th></tr><tr><td>0</td><td>Positioning operation</td><td>The actuator moves to the position specified in the "Position".</td></tr><tr><td>1 to 100</td><td>Pushing operation</td><td>The actuator moves to the position specified in the "Position" and then, performs a pushing action with a force not more than the set force.</td></tr></table> | Value | Movement mode | Details | 0 | Positioning operation | The actuator moves to the position specified in the "Position". | 1 to 100 | Pushing operation | The actuator moves to the position specified in the "Position" and then, performs a pushing action with a force not more than the set force. | | | | | | | |
| | | | Value | Movement mode | Details | | | | | | | | | | | | | | |
| | | | 0 | Positioning operation | The actuator moves to the position specified in the "Position". | | | | | | | | | | | | | | |
| 1 to 100 | Pushing operation | The actuator moves to the position specified in the "Position" and then, performs a pushing action with a force not more than the set force. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Trigger LV | Trigger LV | (*1) | ■Effective only for the pushing operation (the value for the "Pushing force" is between 1 to 100). "Trigger LV" is the setting to define the conditions where "INP" will turn ON. When the actuator generates a force greater than this value, "INP" will turn ON. This parameter is set according to the value of the pushing force or lower. (Unit: %) For the positioning operation, this value is ignored. | | | | | | | | | | | | | | | | |

| Pushing speed | Pushing speed | (*1) | <div>■Effective only for the pushing operation (when the value for the "Pushing force" is from 1 to 100). This defines the movement speed during the pushing operation. If this Speed is too high, it may cause damage to the actuator or work piece due to impacts. Therefore, enter a value within the range appropriate for the actuator. (Unit: mm/s) Please refer to the actuator manual for the appropriate range of the speed. For the positioning operation, this value is ignored.</div> | | | | | | |
|-----------------------|---|---|---|---------------|---------|-----------------------|---|-------------------|--|
| Moving force | Moving force | (*1) | <div>The setting to define the maximum torque during the positioning operation. (Unit: %) Enter a value within the range appropriate for the actuator. (Unit: mm/s) Please refer to the actuator manual for the appropriate range of the speed.</div> | | | | | | |
| Area 1 | AREA 1 | Basic parameter "Stroke (-)" - "Stroke (+)" | <div>The setting to define the conditions where “AREA” will turn ON. (Unit: mm) If the current position is within the range between Area1 and Area2, the “AREA” signal will turn ON. * If Area1 > Area2, the alarm "Step Data ALM1" will be activated. (However, no alarm is generated if "Area1" = "Area2" = 0, the “AREA” signal will be OFF).</div> | | | | | | |
| Area 2 | AREA 2 | Basic parameter "Stroke (-)" - "Stroke (+)" | | | | | | | |
| In position | In position | (*1) | <div>The functions of this will be different between the pushing operation and the positioning operation. * Positioning operation: Positioning range (Unit: mm) * Pushing operation: Pushing distance (Unit: mm)</div> | | | | | | |
| | | | <table><tr><th>Movement mode</th><th>Details</th></tr><tr><td>Positioning operation</td><td><div>This is the setting to define the conditions where “INP” will turn ON. When the actuator enters within this range from the target position, “INP” will turn ON. (It is not necessary to change this from the initial value). If it is required to receive a signal before the actuator completes the positioning operation, this value should be larger. * “INP” will turn ON. Target position - in position ≤ actuator position ≤ target position + in position</div></td></tr><tr><td>Pushing operation</td><td><div>This is the setting to define the distance pushed by the actuator during the pushing operation. When the actuator has exceeded this distance, the pushing operation will end. In this case, “INP” will not turn ON.</div></td></tr></table> | Movement mode | Details | Positioning operation | <div>This is the setting to define the conditions where “INP” will turn ON. When the actuator enters within this range from the target position, “INP” will turn ON. (It is not necessary to change this from the initial value). If it is required to receive a signal before the actuator completes the positioning operation, this value should be larger. * “INP” will turn ON. Target position - in position ≤ actuator position ≤ target position + in position</div> | Pushing operation | <div>This is the setting to define the distance pushed by the actuator during the pushing operation. When the actuator has exceeded this distance, the pushing operation will end. In this case, “INP” will not turn ON.</div> |
| | | | Movement mode | Details | | | | | |
| Positioning operation | <div>This is the setting to define the conditions where “INP” will turn ON. When the actuator enters within this range from the target position, “INP” will turn ON. (It is not necessary to change this from the initial value). If it is required to receive a signal before the actuator completes the positioning operation, this value should be larger. * “INP” will turn ON. Target position - in position ≤ actuator position ≤ target position + in position</div> | | | | | | | | |
| Pushing operation | <div>This is the setting to define the distance pushed by the actuator during the pushing operation. When the actuator has exceeded this distance, the pushing operation will end. In this case, “INP” will not turn ON.</div> | | | | | | | | |

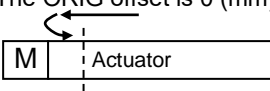
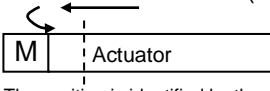
*1 The range varies depending on the actuator. Please refer to the manual of the actuator for more details.

10.2 Basic parameters

The "Basic parameter" is the data to define the operating conditions of the controller, conditions of the actuator, etc.

Details of basic parameters

Activation: "■" = Effective as soon as it is recorded into the controller
 "○" = Become effective after restarting the controller
 "-" = The parameter cannot be changed (fixed value)

| Description | | Range | Explanation | Write |
|--|--|-------------|--|-------|
| Controller configuration software | Teaching box | | | |
| Controller ID | Controller ID | 1 to 32 | Identification number (axis) parameters of serial communications are set. | ○ |
| IO pattern | IO pattern | Fixed value | This is the fixed value for this controller. (* Do not change the setting) The value for this should be 64 (Standard). | - |
| Acceleration/ deceleration pattern | Acceleration/ deceleration pattern | Fixed value | This is the fixed value for this controller. (* Do not change the setting) This defines the trapezoidal acceleration/deceleration parameter. | - |
| S-motion rate | S-motion rate | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |
| Stroke (+) | Stroke (+) | (*1) | This defines the positive (+) side limit of the position. (Unit: mm) Any value greater than the [stroke(+)] value cannot be entered in the "Position" field data of step parameter setup. | ■ |
| Stroke (-) | Stroke (-) | (*1) | This defines the positive (+) side limit of the position. (Unit: mm) Any value less than the [stroke(-)] value cannot be entered in the "Position" field data of step parameter setup. | ■ |
| Maximum velocity | Maximum velocity | (*1) | This defines the maximum limit of the speed. (Unit: mm/s) Any value greater than the [Max speed] value cannot be entered in the "Speed" field data of step parameter setup. | ■ |
| Maximum Acceleration/ Deceleration speed | Maximum Acceleration/ Deceleration speed | (*1) | This defines the maximum limit of the ACC/DEC. (Unit: mm/s ²) Any value greater than the [Max ACC/DEC] value cannot be entered in the "Accel" field data of step parameter setup. | ■ |
| Default In position | Default In positioning | (*1) | This defines the range to activate the INP output when the actuator is within it after the return to origin operation. (Unit: mm) | ■ |
| ORIG offset | ORIG offset | (*1) | <p>This defines the position of the actuator after the return to origin operation. (Unit: mm)</p> <p>■The ORIG offset is 0 (mm).</p>  <p>The position is identified by the controller after the return to the origin operation (0mm).</p> <p>■The ORIG offset is 100 (mm).</p>  <p>The position is identified by the controller after the return to the origin operation (100mm).</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Caution</p> <p>If the value for the "ORIG offset" is changed, the "Stroke (+)" and "Stroke (-)" of the basic parameters should be checked.</p> </div> <p>In the examples on the left, the actuator positions are not different but the reference point that the controller recognizes will be changed after the return to origin operation.</p> | ■ |
| Maximum pushing force | Maximum pushing force | (*1) | The maximum force for the pushing operation. (Unit %) | ■ |

| | | | | |
|-----------------|-----------------|---|---|---|
| Para protect | Para protect | 1 to 2 | Sets the range in which parameter and step data can be changed. 1. Basic parameter + Step data (Basic parameter + Return to origin parameter + Step data) 2. Basic parameter (Basic parameter + Return to origin parameter) | ■ |
| Enable SW | Enable SW | 1 to 2 | This defines the status of the Enable switch of the teaching box. 1. Enabled 2. Disabled | ■ |
| Unit name | Unit name | Fixed value | Indication of actuator type compatible with the controller. (Do not change the setting) | - |
| W-AREA1 | W-AREA1 | Basic parameter "Stroke (-)" - "Stroke (+)" | This is the setting to define the conditions where the "W-AREA" signal will turn ON. [Unit: mm] If the current position is within the range between the W-AREA1 and W-AREA2, "WAREA" will turn ON. * If W-AREA1 > W-AREA2, the "Parameter ALM" alarm will be activated. However if W-AREA1 = W-AREA2 = 0, "WAREA" will be OFF and no alarm will be generated. | ■ |
| W-AREA2 | W-AREA2 | Basic parameter "Stroke (-)" - "Stroke (+)" | | ■ |
| ORG Correct | Link Offset | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |
| Sensor type | Sensor type | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |
| Option 1 | Option 1 | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | ○ |
| Undefine No. 11 | Undefine No. 11 | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | ○ |
| Undefine No. 12 | Undefine No. 12 | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |

*1 The range varies depending on the actuator. Please refer to the manual of the actuator for more details.

10.3 Return to origin parameter

The "Return to origin parameter" is the setting data for the return to origin operation.

Details of Return to origin parameter

Activation: "■" = Effective as soon as it is recorded into the controller
 "○" = Become effective after restarting the controller
 "-" = The parameter cannot be changed (fixed value)

| Description | | Range | Explanation | Write |
|---|-------------------------|-------------|--|-------|
| Controller configuration software | Teaching box | | | |
| ORIG direction | ORIG direction | 1 to 2 | Sets the direction of return to origin operation. 1. CW 2. CCW | ○ |
| ORIG mode | Return to origin mode | 1 to 2 | The setting for the return to origin operation. 1. Pushing origin operation [Stop] 2. Limit switch origin [Sensor] | ■ |
| ORIG limit | ORIG limit | (*1) | A pushing force level at which to set the origin. | ■ |
| ORIG time | ORIG time | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |
| ORIG speed | ORIG speed | (*1) | The allowable speed to move to origin. | ■ |
| ORIG ACC/DEC | ORIG ACC | (*1) | The acceleration and deceleration during finding origin. | ■ |
| Creep speed | Creep speed | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |
| ORIG sensor | ORIG sensor | 0 to 2 | The setting for ORIG sensor. 0. The origin sensor is not effective. [Disable] 1. The origin sensor is N.O type. [N.O]. 2. The origin sensor is N.C type. [N.C.] | ■ |
| Did not detect sensor when returning to ORIG. | Origin switch direction | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |
| Undefine No. 21 | Undefine No. 21 | Fixed value | This is the fixed value for this controller. (* Do not change the setting) | - |

*1 The range varies depending on the actuator. Please refer to the manual of the actuator for more details.

11. Operations

11.1 Return to Origin

After entering the setting data, it is necessary to perform a return to origin operation (to establish the origin point) before starting the positioning or pushing operation. (To ensure the position of origin)

■Return to origin

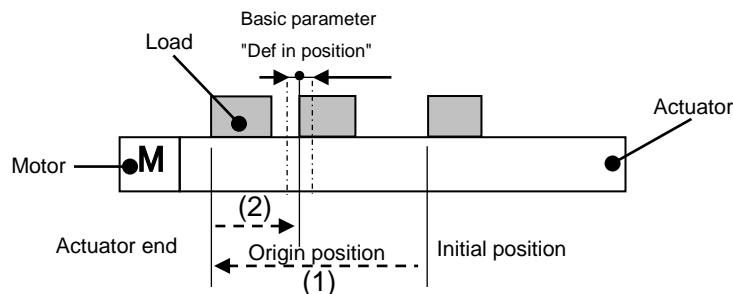
The actuator moves in the return to origin direction (* this direction is dependent on the actuator) from the initial position at the moment of power-on: Refer to (1) in the figure below.

When the actuator reaches the end of travel limit it pauses for a short time. The controller recognizes the position as the end of travel limit of the actuator. Then, the actuator moves at a low speed in the direction opposite to the return to origin direction: Refer to (2) in the figure below.

The position after the travel becomes the origin.

Return to Origin position command → Travels in the set Origin position direction → Stops traveling → Reverse travel → Sets the Origin position

E.g.) Return to Origin position reference example



⚠ Caution

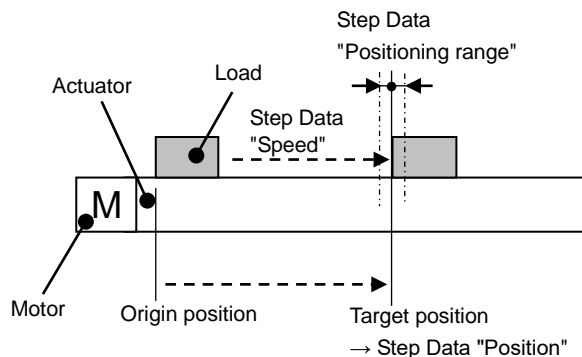
This direction is dependent on the actuator.

11.2 Positioning Operation

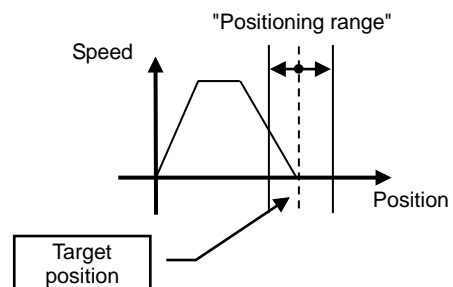
Step data "Pushing force" is set to 0.

The actuator moves to the target position specified by the step data "Position".

•(E.g.) Positioning Operation



•(E.g.) Positioning operation [Speed/Position]



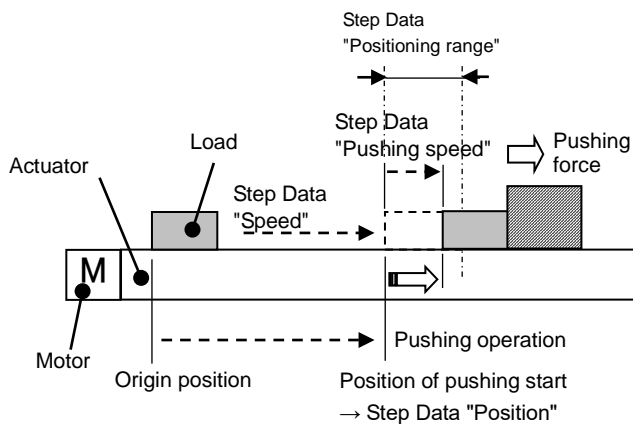
11.3 Pushing Operation

The pushing operation is active when the value of the "Pushing F%" in the Step data is set to "1" or more. Similar to the positioning operation, the actuator moves according to the settings of "Position" and "Speed" in the step data and then, when it reaches the target position, it starts the pushing process. The actuator pushes the load with a force no more than the maximum force set in the "Pushing force" of the step data.

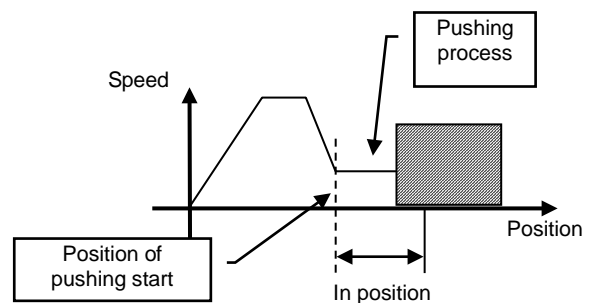
(1) Pushing operation is successfully performed.

During the pushing operation, if the pushing force is kept higher than the value specified by "Trigger LV" of the step data for a certain time, "INP" will turn ON. Even after the completion of the pushing operation, the actuator will keep generating the force set in the step data.

•(E.g.) Pushing operation

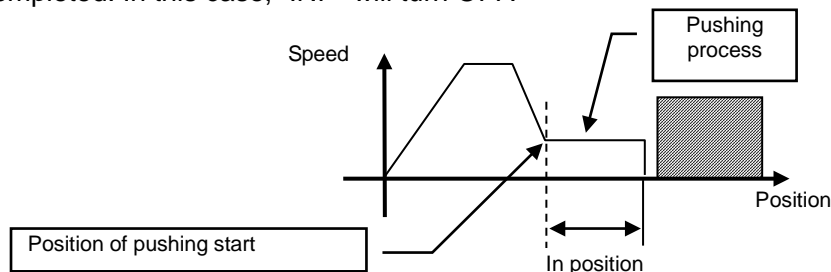


•(E.g.) Pushing operation [Speed/Position]



(2) Pushing operation fails (empty pushing).

If the pushing process is not completed even after the actuator runs over the range specified in the step data from the target position (the starting point of the pushing process), the operation will be completed. In this case, "INP" will turn OFF.



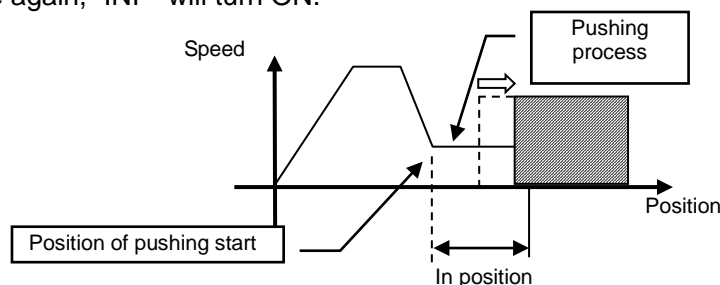
(3) Movement of the workpiece after the completion of the pushing process

[1] The workpiece moves in the pushing direction.

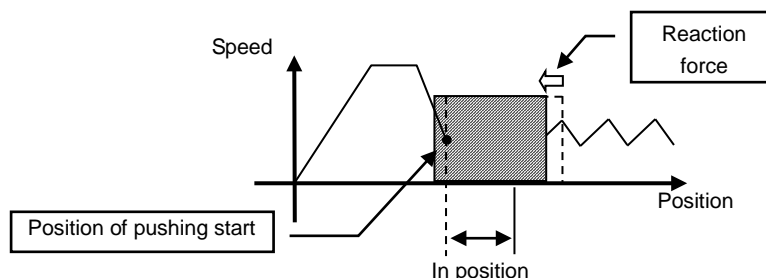
After completion of the pushing operation, if the reaction force from the workpiece becomes smaller, the actuator may move with a force smaller than that specified in the "Trigger LV" of the step data.

In this case, "INP" will turn OFF and the actuator moves within the positioning range according to the balance of the force.

If the pushing force is kept higher than the value specified by "Trigger LV" of the step data for a certain time again, "INP" will turn ON.



- [2] Movement of the workpiece in the direction opposite to the pushing direction (The actuator is pushed back since the reaction force from the workpiece is too large.)
 After completion of the pushing operation, if the reaction force from the workpiece becomes larger, the actuator may be pushed back. In this case, while "INP" remains ON, the actuator will be pushed back to the point where the reaction force and the actuator pushing force are balanced (pushed back toward the target position).
 If the actuator is pushed back over the target position, the alarm (ORIG ALM) will be activated.



11.4 Controller signal response time

The controller signal response delay include the following factors.

- (1) Controller signal scan delay
- (2) Delay due to signal analysis
- (3) Delay of command analysis

Set the time more than twice the communication cycle time for the interval between the signals, when the signals are continuously input, as PLC processing delays and controller scanning delays can occur.

11.5 Methods of interrupting operation

There are 3 methods of interrupting operation and stopping the actuator during positioning operation and pushing operation, as shown below. The state after the interruption is different, therefore use the method appropriate to the application.

•Stopping by "EMG" signal

If the "EMG" signal is turned OFF during operation, after the actuator decelerates and stops, the servo will turn OFF, and the stopped position is not held.

(For an actuator with lock, it will be held by the lock function).

•Stopping by "RESET" signal

If the "RESET" signal is turned ON during operation, after the actuator decelerates and stops, the stopped position is held.

(The servo does not turn OFF).

•Stopped by "HOLD" signal

The actuator decelerates to stop when the "HOLD" signal is ON during operation.

(The servo does not turn OFF).

⚠ Caution

If instructed to stop by the "EMG" or "RESET" signal, all "OUT" signals will turn OFF.

12. Operation Examples

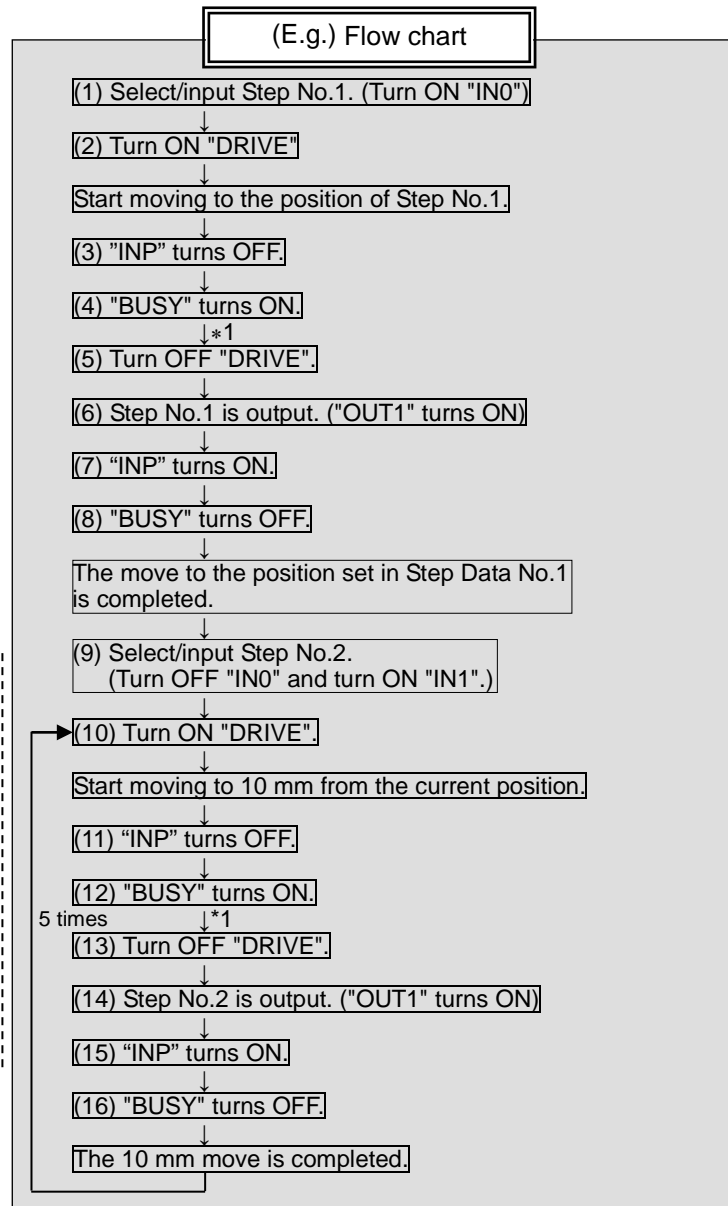
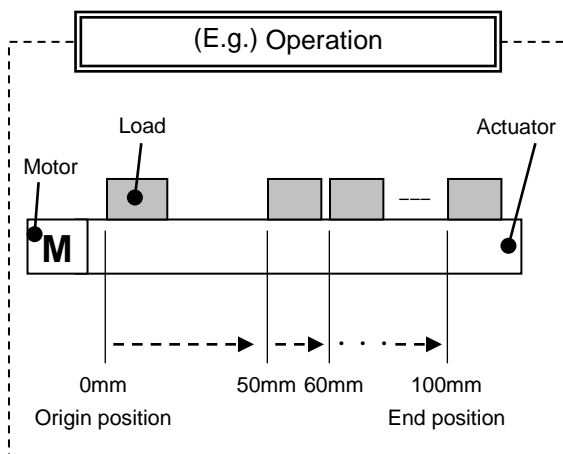
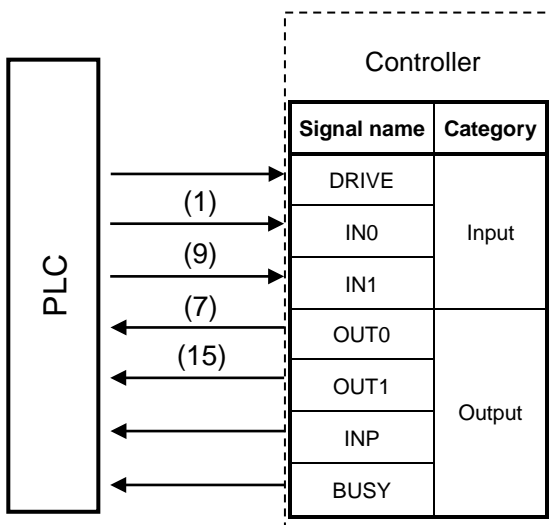
12.1 Positioning Operation

E.g.) Move an actuator from the origin to 100mm point at 50mm/s. (Step No.1 instruction)

Next, move the actuator from the 50mm point to 100mm point by moving it 5 times continuously, 10mm at a time, at a speed of 50mm/s. (Step No. 2)

■[Normal mode] Step data (e.g.)

| No. | Movement mode | Speed mm/s | Position (mm) | Acceleration mm/s ² | Deceleration mm/s ² | Pushing force % | Threshold Force Value % | Pushing speed Speed mm/s | Moving force % | Area 1 (mm) | Area 2 (mm) | In pos (mm) |
|-----|---------------|------------|---------------|--------------------------------|--------------------------------|-----------------|-------------------------|--------------------------|----------------|-------------|-------------|-------------|
| 0 | - | - | - | - | - | - | - | - | - | - | - | - |
| 1 | Absolute | 100 | 50.00 | 1000 | 1000 | 0 | 0 | 0 | 100 | 0 | 0 | 0, 1 |
| 2 | Relative | 50 | 10.00 | 1000 | 1000 | 0 | 0 | 0 | 100 | 0 | 0 | 0, 1 |



*1 "SVRE" and "SETON" must be ON.

12.2 Pushing Operation

Eg.) Move the actuator from the origin to a point 100 mm away at 100 mm/s. (Step Data No.1 is used for this operation).

From the 100 mm point, the actuator must start a pushing operation of 10 mm/s speed and 50% or less force.

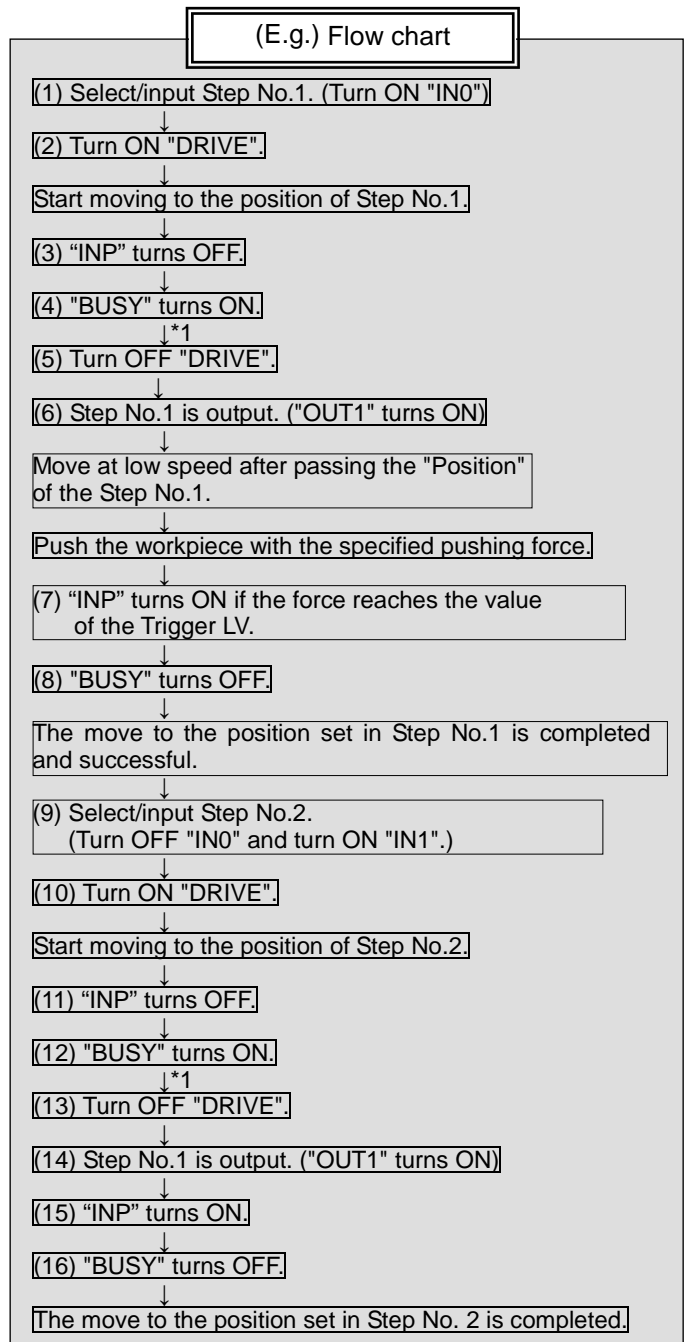
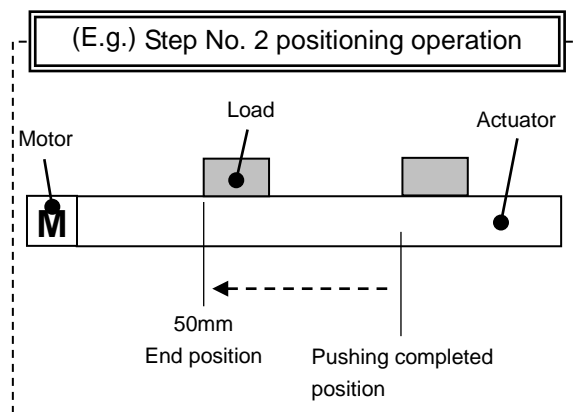
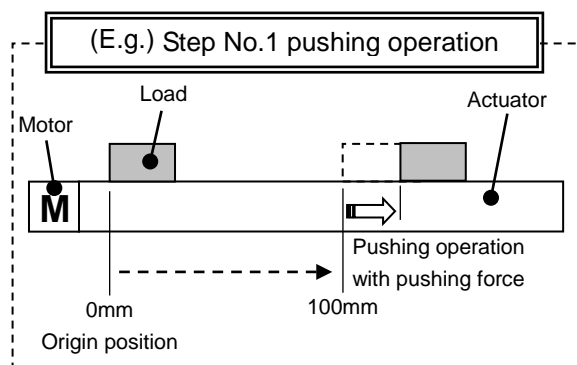
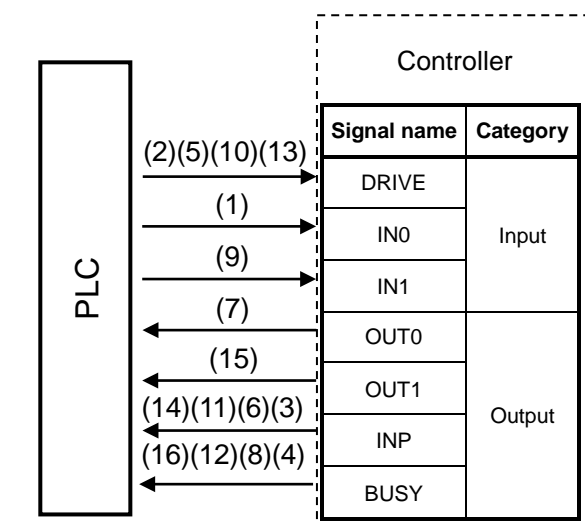
(the pushing distance is up to 5 mm).

Then, the actuator should move from the position where the pushing operation was completed (where "INP" turned ON) to a point 50 mm away at 50 mm/s.

(Step Data No.2 is used for this operation).

■[Normal mode] Step data example

| No. | Movement mode | Speed mm/s | Position (mm) | Acceleration mm/s ² | Deceleration mm/s ² | Pushing force % | Threshold Force Value % | Pushing speed mm/s | Moving force % | Area 1 (mm) | Area 2 (mm) | In pos (mm) |
|-----|---------------|------------|---------------|--------------------------------|--------------------------------|-----------------|-------------------------|--------------------|----------------|-------------|-------------|-------------|
| 0 | - | - | - | - | - | - | - | - | - | - | - | - |
| 1 | Absolute | 100 | 100.00 | 1000 | 1000 | 50 | 40 | 10 | 100 | 0 | 0 | 5 |
| 2 | Absolute | 50 | 50.00 | 1000 | 1000 | 0 | 0 | 0 | 100 | 0 | 0 | 0, 1 |



*1 "SVRE" and "SETON" must be ON.

13. Operation Instructions

13.1 Overview of the Operation Instructions

Shows operation instruction method of each function shown in **8. Operation methods (P.30)**.

13.2 Operation procedure for Operation by Step No.

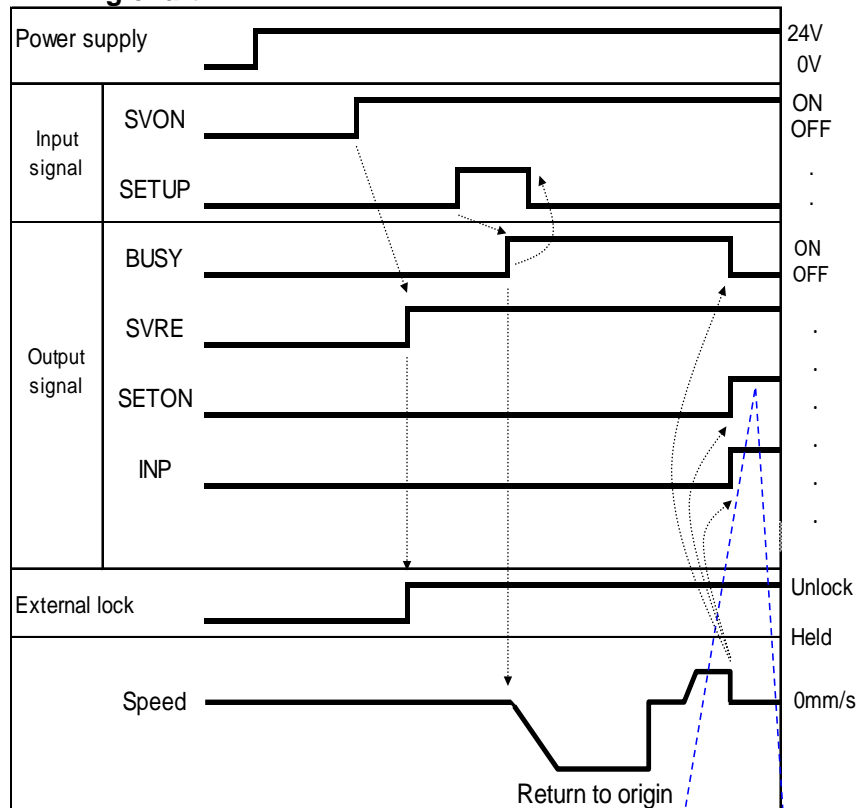
Refer to the following "Procedures" and "Timing charts" for details of the Return to Origin, operation mode procedures and the signal timing. Refer to **9.1 Memory allocation (P.31)** for the memory allocation of signals.

[1] Power on and Return to Origin position

- Procedure -

- (1) Turn the power supply ON.
- (2) Turn ON "SVON".
- (3) "SVRE" turns ON.
* The time when "SVRE" turns ON depends on the type of actuator and the customers application.
* The actuator with lock is unlocked.
- (4) Turn ON "SETUP".
- (5) "BUSY" turns ON.
(The actuator starts the operation.)
After "BUSY" turns ON, "SETUP" will turn OFF.
- (6) "SETON" and "INP" will turn ON.
Return to origin is completed when "INP" turns ON.

- Timing chart -



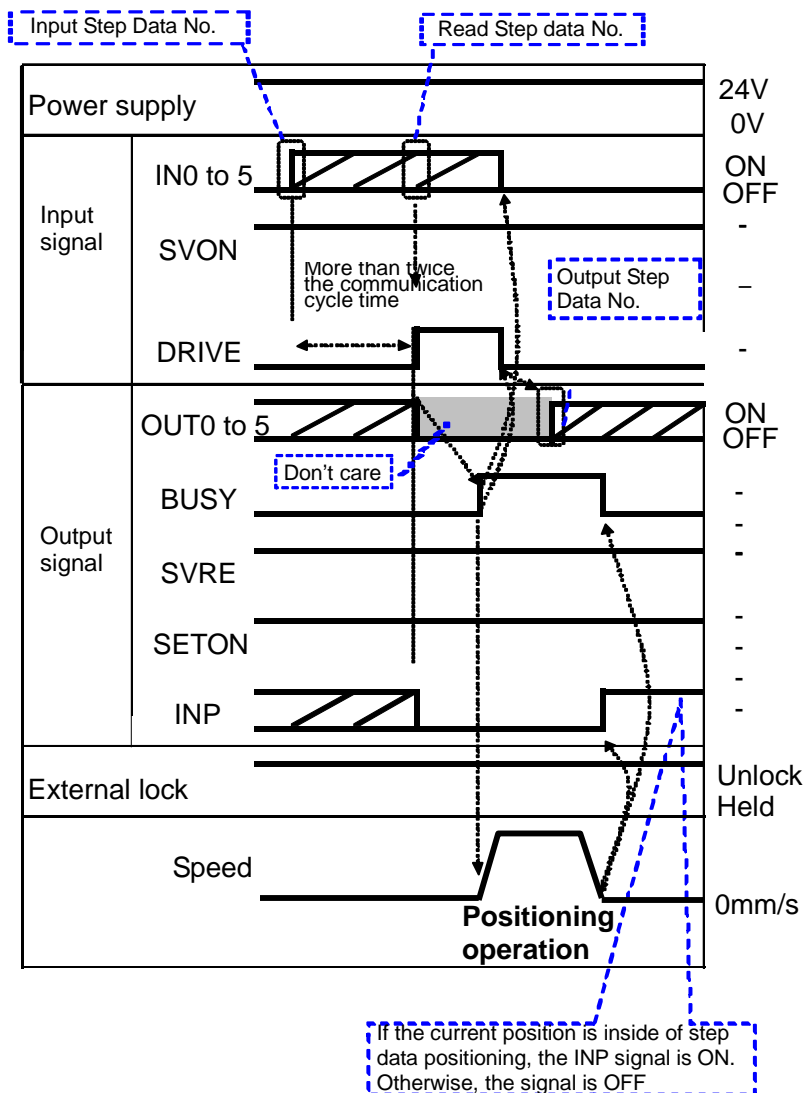
INP signal is ON when the current position is within the step data position range. Otherwise, the signal is OFF

[2] Positioning operation

- Procedure -

- (1) Input step data No. ("IN0" to "IN5")
- (2) Turn ON the "DRIVE".
("INP" turns OFF.)
Scan the specified step data number (from "IN0" to "IN5").
- (3) "BUSY" turns ON.
(and the positioning movement starts.)
* After "BUSY" turns ON, if "DRIVE" is turned OFF, the step data number will be output (from "OUT0" to "OUT5").
- (4) When "INP" turns ON and "BUSY" turns OFF, the positioning operation will be completed.

- Timing chart -

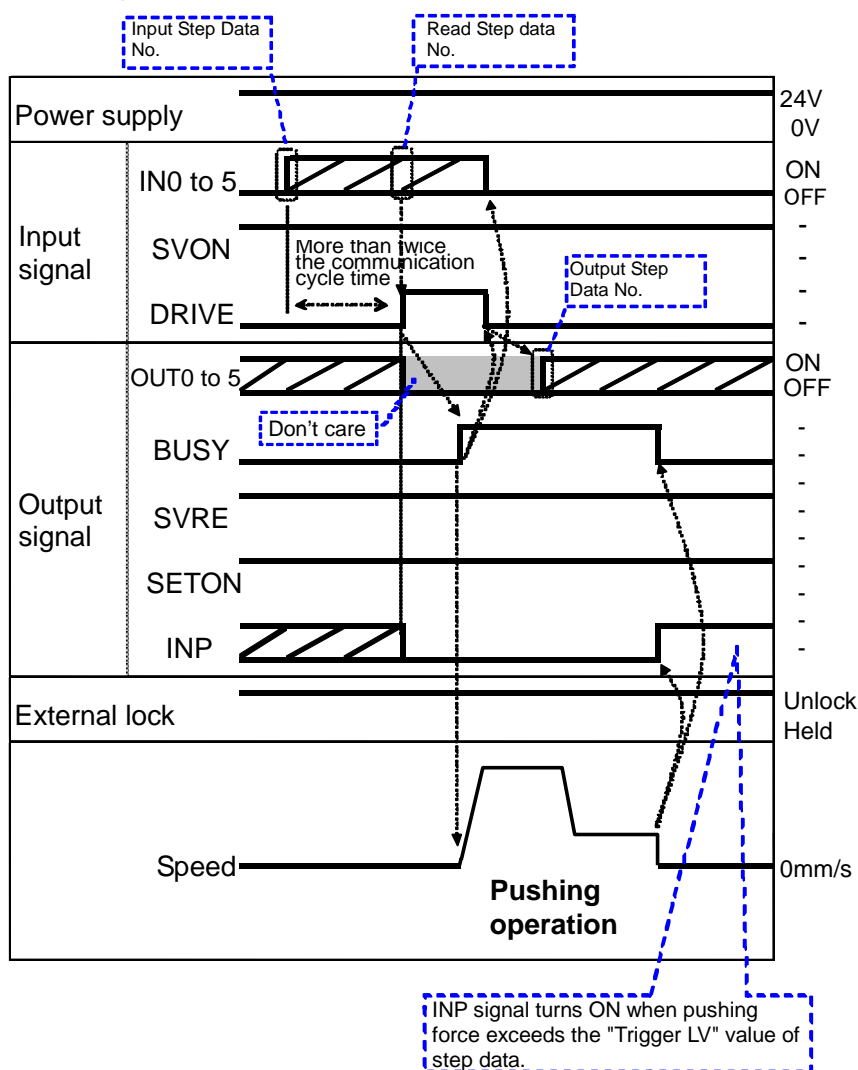


[3] Pushing Operation

- Procedure -

- (1) Input step data No.
("IN0" to "IN5")
- (2) Turn ON the "DRIVE".
("INP" turns OFF.)
→Scan the step data number
(from "IN0" to "IN5").
- (3) "BUSY" is ON when pushing starts.
* After "BUSY" turns ON, if
"DRIVE" is turned OFF, the
step data number will be
output (from "OUT0" to
"OUT5").
- (4) When "INP" turns ON and
"BUSY" turns OFF, the pushing
operation will be completed
(the actuator generates the
force larger than that specified
in "Trigger LV" of the step
data).

- Timing chart -

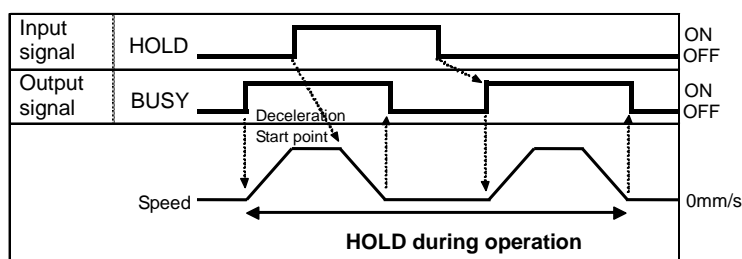


[4] HOLD

- Procedure -

- (1) During operation ("BUSY" is ON),
turn ON "HOLD".
- (2) "BUSY" turns OFF.
(The actuator stops.)
- (3) Turn OFF "HOLD".
- (4) "BUSY" turns ON.
(The actuator restarts.)

- Timing chart -

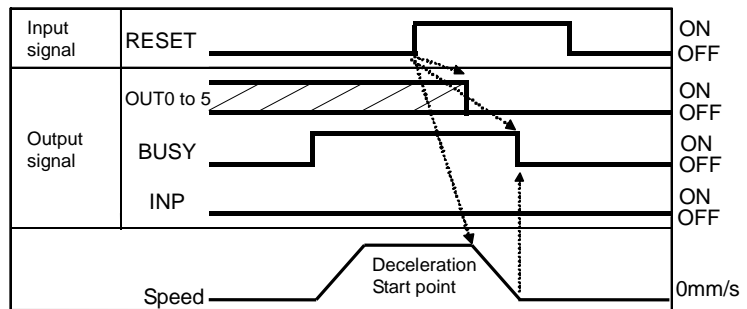


[5] Reset

-Procedure- [Driving reset]

- (1) During operation ("BUSY" is ON)
"RESET" is turned ON.
- (2) "BUSY" and "OUT0" to "OUT5" are OFF.
- (3) The actuator decelerates to stop
(controlled).

- Timing chart - Reset

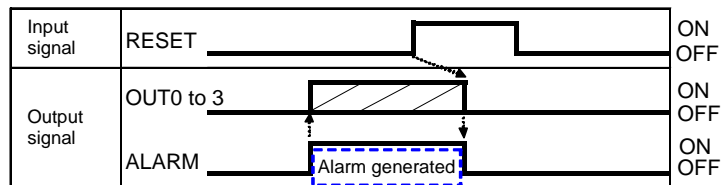


* INP is ON when stop position is within the positioning range.

-Procedure- [Alarm Reset]

- (1) Alarm generated
"ALARM" turns ON.
Alarm group is output to "OUT0" to "OUT3".
Alarm code is output.
For memory to be checked and detailed,
Please refer to **9. Memory map (P.31)**
15.1 Alarm group signals (P.64)
15.3 Alarms and countermeasures (P.66)

- Timing chart - Alarm Reset



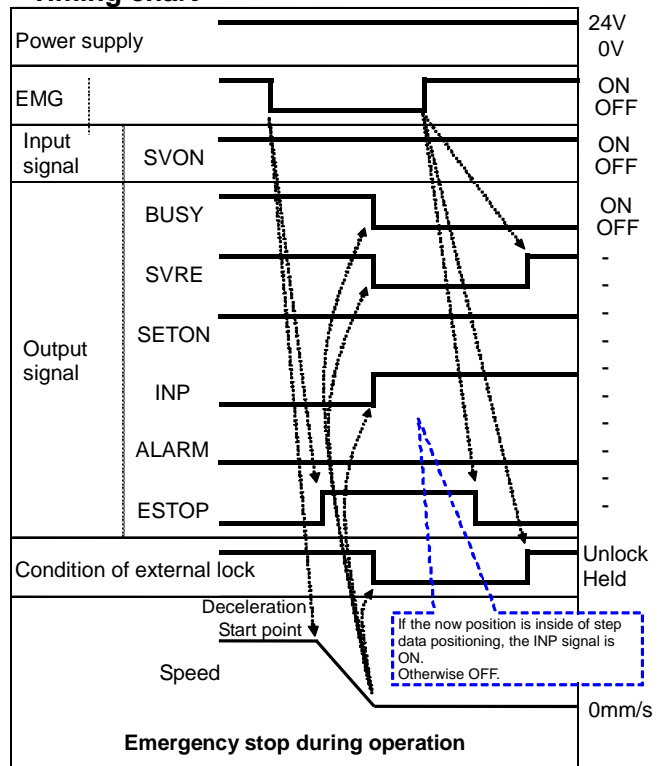
- (2) Turn ON "RESET".
- (3) "ALARM" turns OFF, OUT0 to OUT3 turn OFF. (The alarm is deactivated).

[6] Stop

- Procedure -

- (1) During operation ("BUSY" is ON),
turn OFF "EMG". (Stop command)
- (2) "ESTOP" turns ON.
- (3) "BUSY" turns OFF. (The actuator stops.)
"SVRE" turns OFF.
* The actuator with lock is locked.
- (4) Turn ON "EMG". (The stop release command)
- (5) "ESTOP" turns OFF.
"SVRE" turns ON.
* The actuator with lock is unlocked.

- Timing chart -



* When "EMG" is OFF, the stop is activated.

[7] Area output

- Procedure -

●Step data No.1 operation

(1) Input step data No.
("IN0" to "IN5")

(2) Turn "DRIVE" ON.
→ Receive the step data no.1
(from "IN0" to "IN5").

(3) "BUSY" turns ON.
(The actuator starts the operation.)
"INP" turns OFF.
* After "BUSY" turns OFF, if
the "DRIVE" is turned OFF,
the step data No.1 ("OUT0"
to "OUT5") will be output.

(4) "AREA" of step data No.1 turns
ON. (at 150mm from the origin
point)

(5) "BUSY" turns OFF.
(The actuator stops.)
"INP" turns ON.

●Step data No.2 operation

(6) Input step data No. ("IN0" to "IN5")

(7) Turn ON "DRIVE".
→ Read step data No. 2 ("IN0" to "IN5")

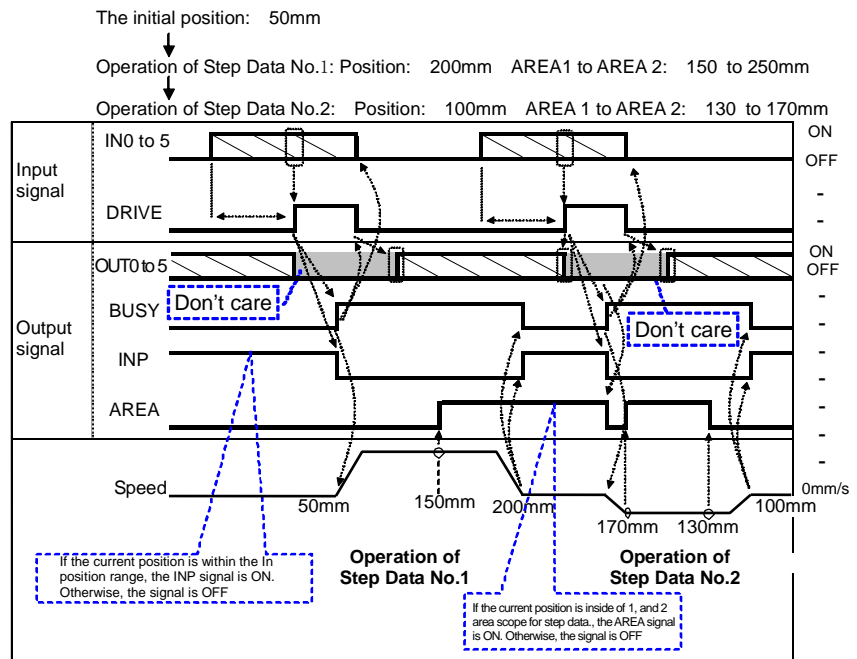
(8) "AREA" turns OFF.
"BUSY" turns ON. (The actuator starts the operation.)
"INP" turns OFF.
* After "BUSY" turns OFF, if "DRIVE" turns OFF, the step data No.2 ("OUT0" to "OUT5") will be output.

(9) "AREA" of step data No.2 turns ON. (at 170mm from the origin point)

(10) "AREA" of step data No.2 turns OFF. (at 130mm from the origin point)

(11) "BUSY" turns OFF. (The actuator stops.)
"INP" turns ON.

Timing chart



13.3 Operation procedure for Operation by numerical instruction

E.g.) Input 50.00 [mm] to the position parameter of the specified step data and start the actuator.

For parameters other than position which are numerically specified (speed, acceleration/deceleration), the values set for the specified step data are used.

Before starting the operation by numerical instruction, make sure that the servo is on and returning to origin has completed.

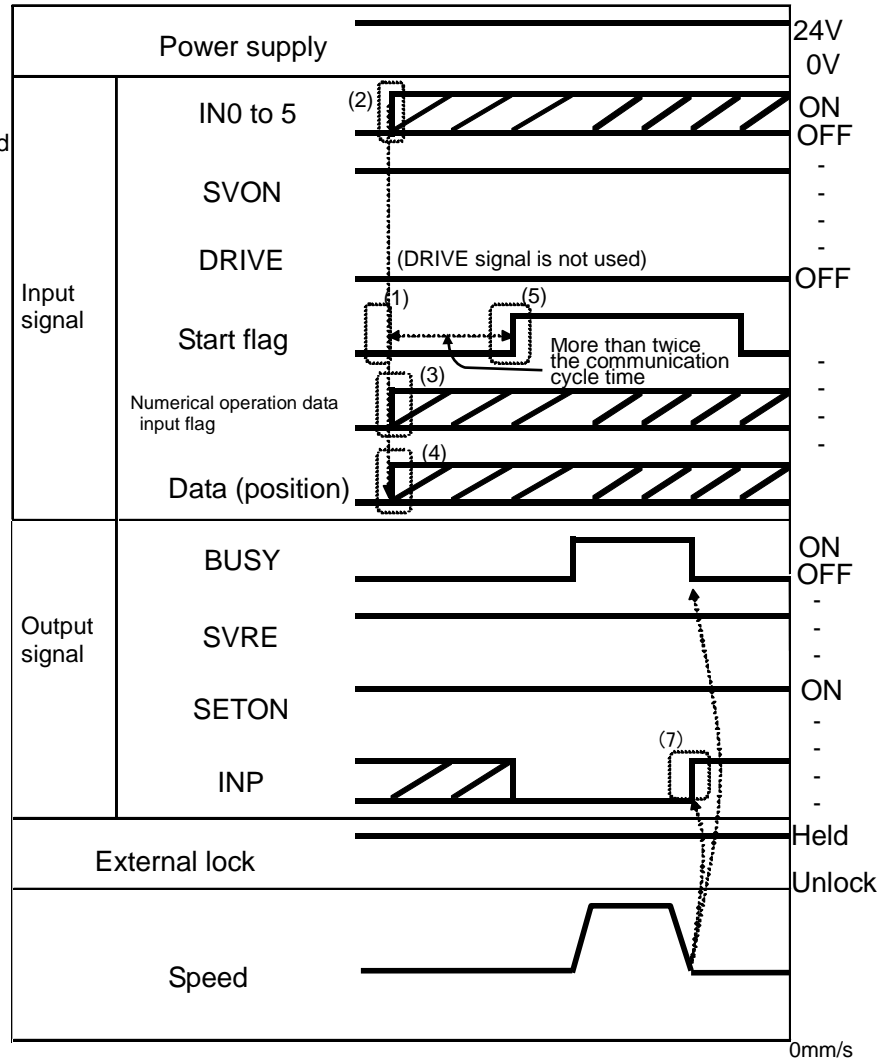
- (1) Confirm that Byte4, bit0: Start flag=OFF
Input Byte4, bit0: Start flag=OFF when it is ON.

- (2) Input the step data No. to be specified by Byte0, bit0-5: IN0-5
E.g.) Specify step data No.1
→Byte0, Bit0: IN0=ON
Byte0, bit1-5: IN1-5= OFF
This is the Base step No that will be used.

- (3) Specify the numerical operation input flags which control the numerical operation data to be entered, by Byte2, bit4-7, Byte3, bit0-7.
Turn ON the relevant flag which must be numerically input into the specified step data and turn OFF the relevant flag which is not required.
E.g.) Only [position] of the numerical operation data input flag must be specified.
→Byte2, bit6=ON,
Byte2, bit4-5=OFF
Byte3, bit0-7=OFF

- (4) Input Byte5, bit0-1: Movement mode and Byte6-35: Numerical operation data.
E.g.) Input [Position] 50.00 [mm].
5000[0.01mm]=(00001388)h
→Byte8: Position (HH)=(00) h
Byte9: Position (HL)=(00) h
Byte10: Position (LH)=(13) h
Byte11: Position (LL)=(88) h

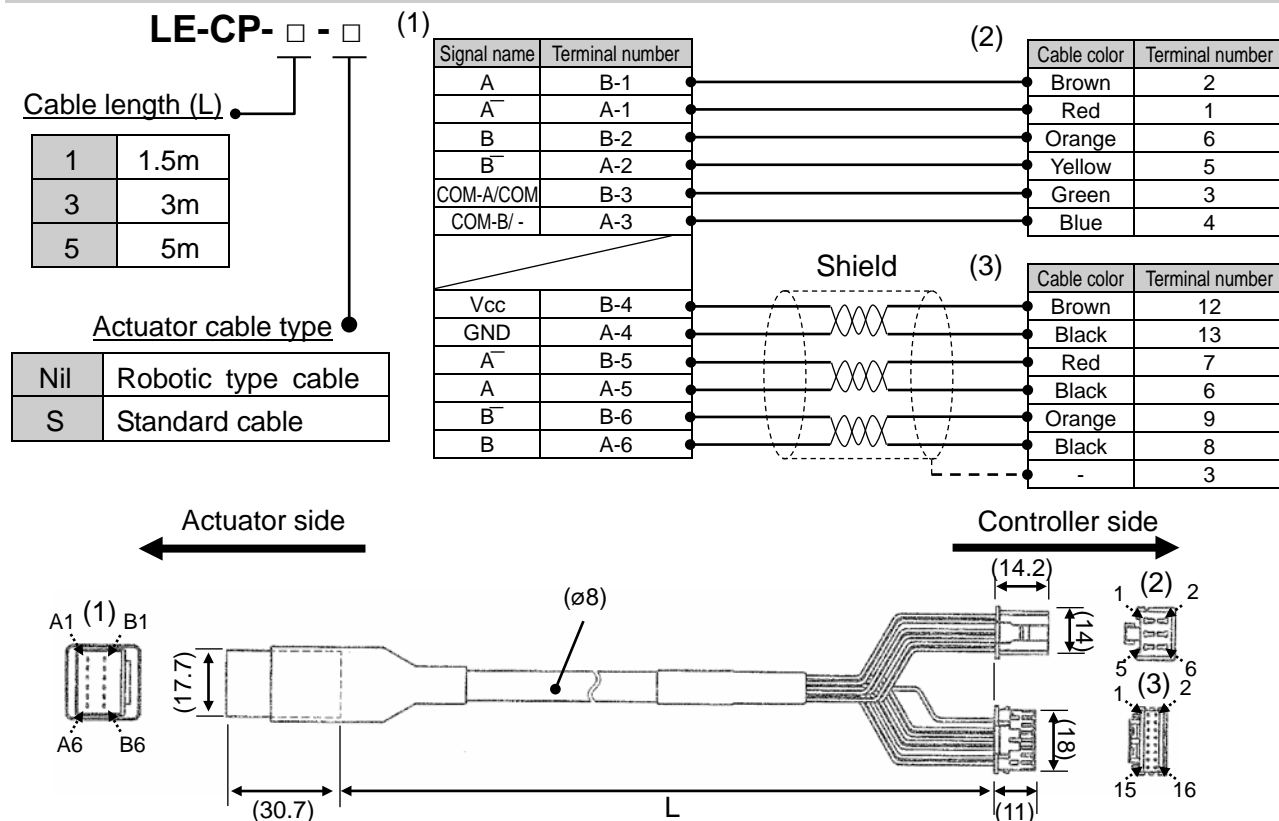
Timing chart/numerically instructed operation



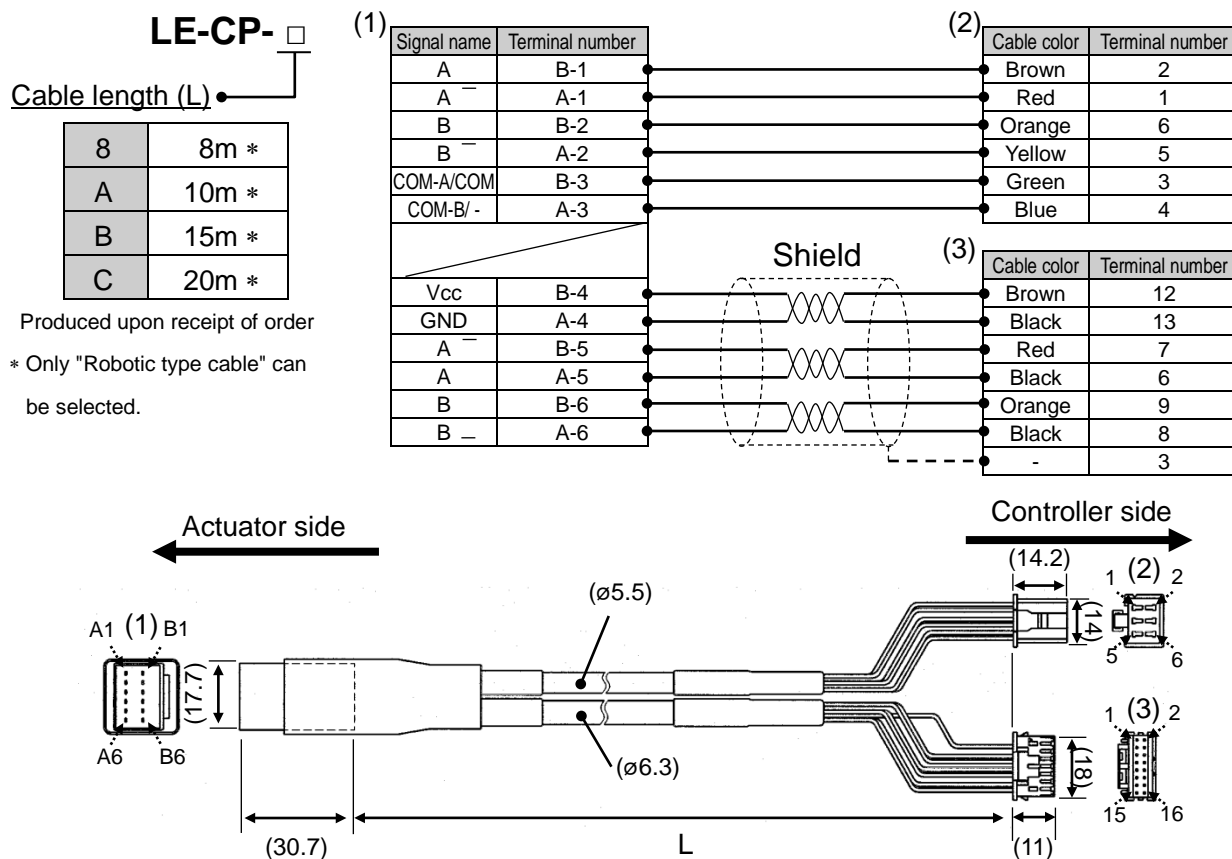
- (5) Input the numerical operation data input flag bit and numerical operation data, and then, input Byte4, bit0: Start flag= ON.
Operation instruction data will be transmitted when the start flag is ON.
- (6) When the actuator starts operating, Byte1, bit0: BUSY=ON will be output.
Then, input Byte4, bit0: Start flag=OFF.
- (7) When the actuator reached the target position, Byte1, bit3: INP=ON will be output.
(Refer to **"INP" section (P.33)** for signal ON conditions)
When the actuator operation completes, Byte1, bit0: BUSY=OFF is output.
The completion of the actuator operation is validated when both Byte1, bit3: INP=ON and Byte1, bit0: BUSY=OFF are established.

14. Options

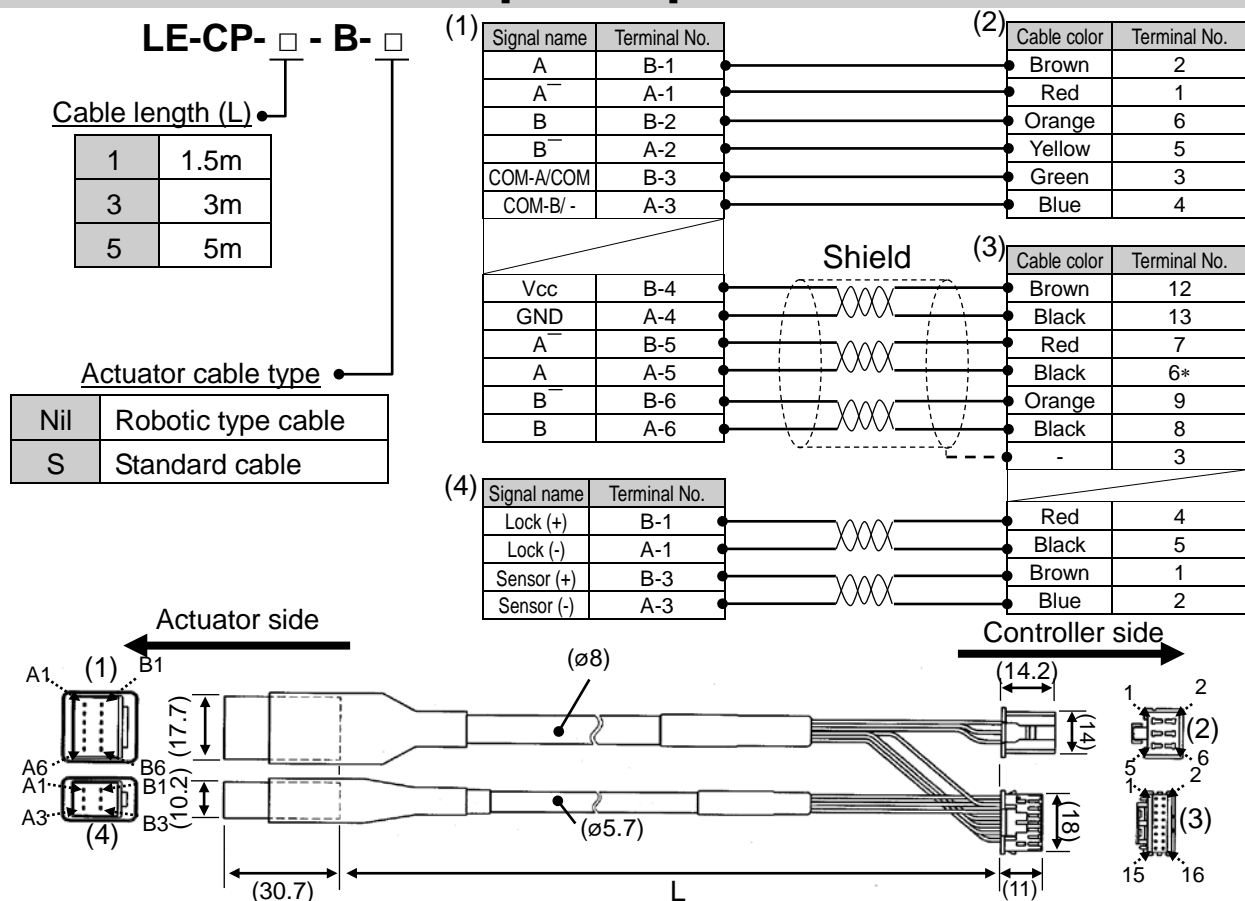
14.1 Actuator cable [5m or shorter]



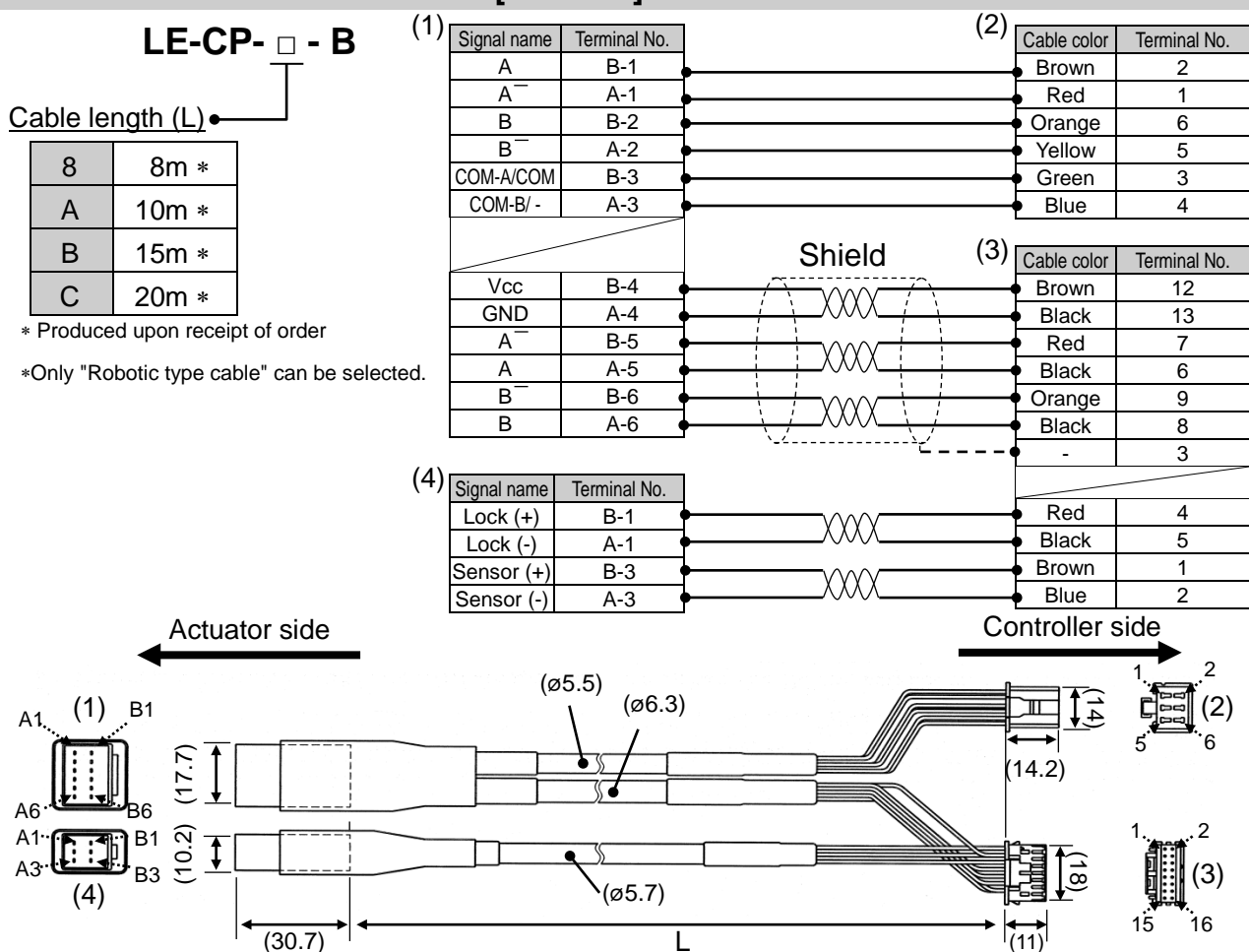
14.2 Actuator cable [8 to 20m]



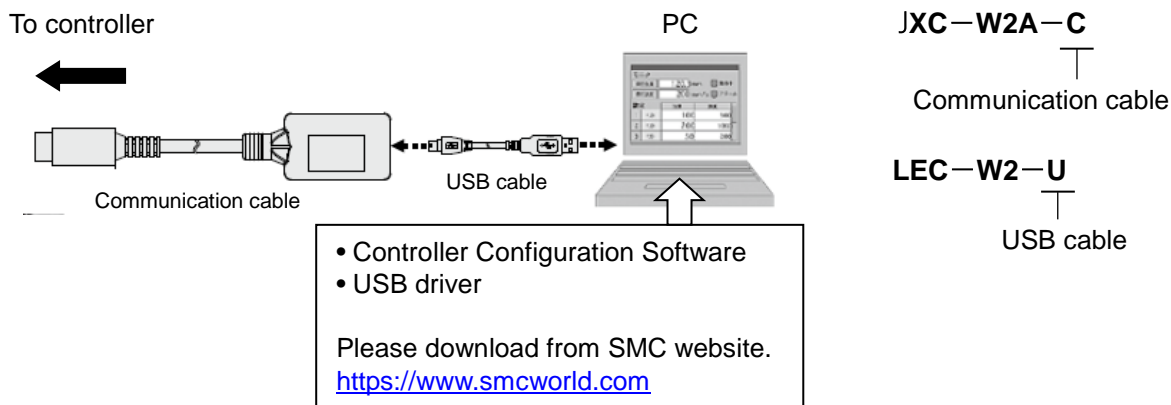
14.3 Actuator cable for with lock [5m or less]



14.4 Actuator cable for with lock [8 to 20m]



14.5 Controller Communication Cable



Operating environment

| | |
|-------------------------|-----------------------------------|
| OS | Window®7, Windows®8.1, Windows®10 |
| Communication interface | USB1.1 or USB2.0 port |
| Display | 1024×768 or more |

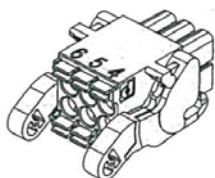
Windows®7, Windows®8.1, and Windows®10 are registered trademarks of United States Microsoft Corporation.

Caution

The latest version of the controller setting software must be used.
Upgrade software can be downloaded from SMC website. <https://www.smcworld.com>

14.6 Power supply plug

JXC-CPW



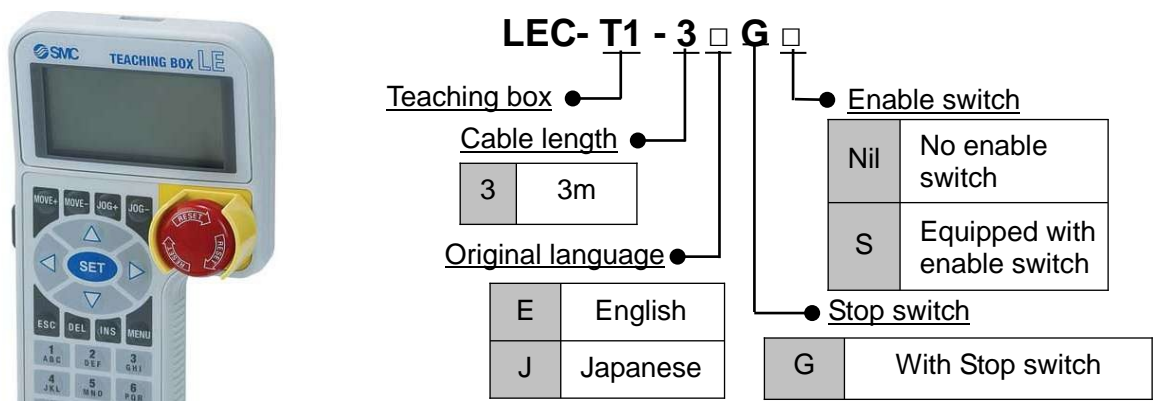
| | | |
|---|---|---|
| ⑥ | ⑤ | ④ |
| ③ | ② | ① |

① C24V ④ 0V
② M24V ⑤ N.C.
③ EMG ⑥ LK RLS

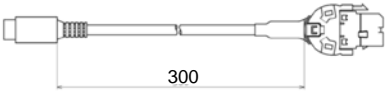
Detail of Power supply plug

| No. | Terminal | Function | Functional explanation |
|-----|----------|------------------|--|
| 1 | C24V | Power supply (+) | The positive control power. |
| 2 | M24V | Motor power (+) | The positive power for the actuator motor to be supplied via the controller. |
| 3 | EMG | Stop (+) | The positive power for Stop signal |
| 4 | 0V | Common power (-) | The negative common power for M24V, C24V, EMG and LK RLS. |
| 5 | - | NC | |
| 6 | LK RLS | Unlocking (+) | The positive power for lock release. |

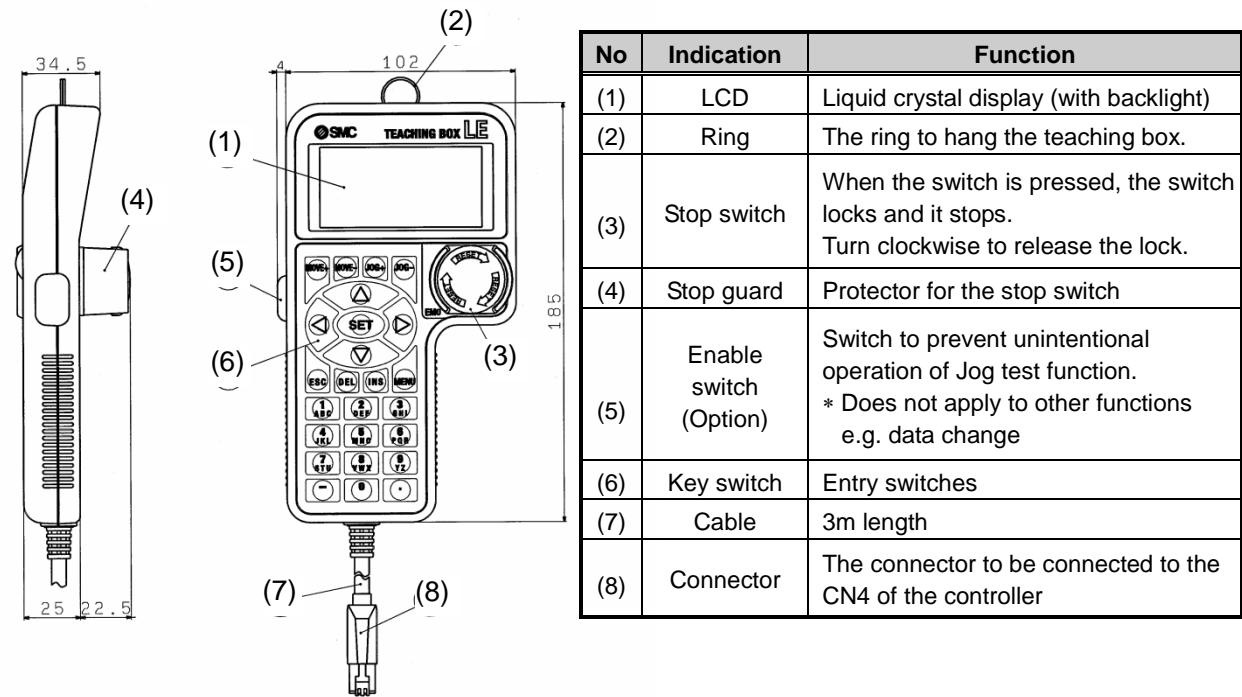
14.7 Teaching box



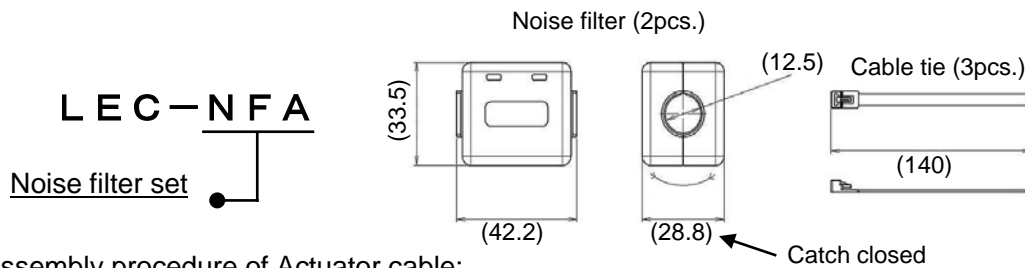
Conversion Cable
P5062-5 (Cable length: 0.3m)
*This cable is necessary only when connecting the teaching box to the JXC controller



Dimensions

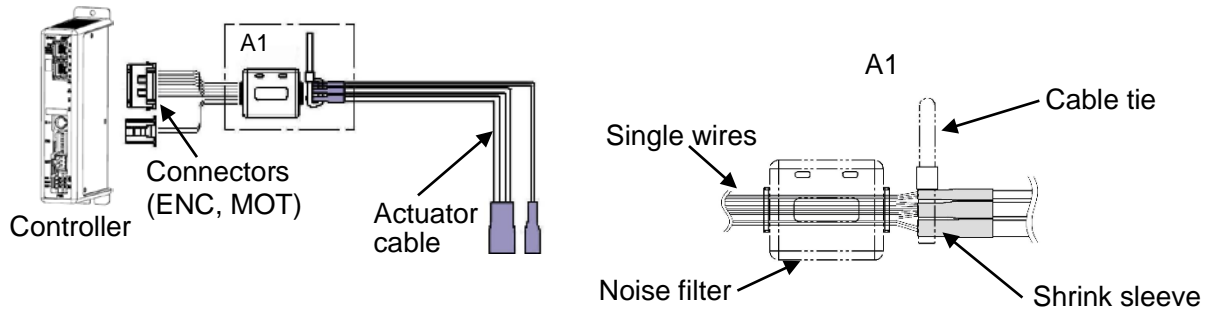


14.8 Noise filter set



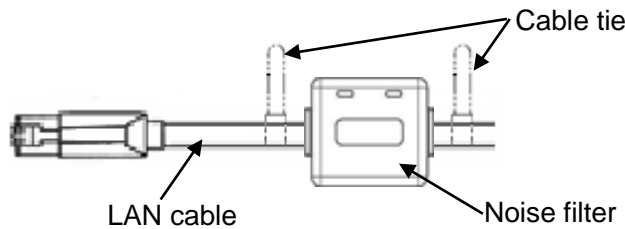
Assembly procedure of Actuator cable:

- 1) Mount a noise filter around the single wires of the actuator cable close to the controller connectors. Next, fasten a cable tie to the shrink sleeve as shown (refer to A1).
- 2) Mount a noise filter to the motor cable, and fasten with a cable tie at both ends.



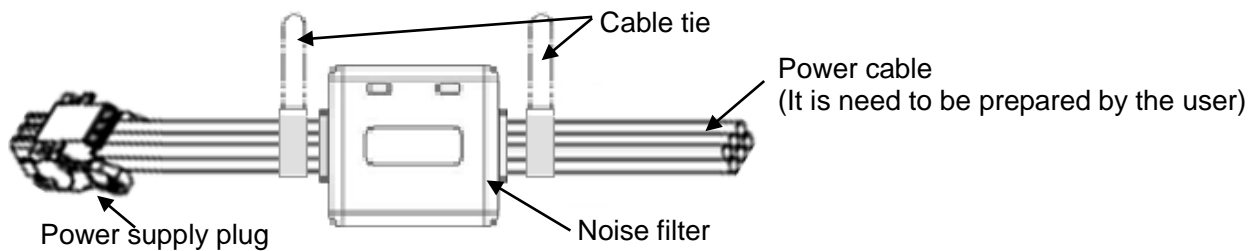
Assembly procedure of LAN cable:

- 1) Mount a noise filter around the LAN cable close to the controller insertion side connector.
- 2) Fasten with the cable ties at both ends to prevent the noise filter from moving.



Assembly procedure of Power cable:

- 1) Mount a noise filter around the power cable close to the power supply plug.
- 2) Fasten with the cable ties at both ends to prevent the noise filter from moving.



⚠ Caution

When installing a noise filter on the actuator cable and the power cable, bundle all of the single wires together and then house them inside the noise filter case. When locking the noise filter, make sure not to damage the wires.

Attach the noise filter at the root of the cable immediately next to the connector.

When unplugging the actuator cable connectors CN2 and CN3 from the driver, remove the cable tie and move the noise filter towards the shrink sleeve. After re-mounting, return the noise filter to its original position and re-fasten the cable tie.

15. Alarm for Motor Control

The details of the alarm for motor control can be checked using a PC (the controller setting software) or the teaching box.

* Please refer to the manuals of the controller setting software or the teaching box for details of the alarms.

When an alarm is generated, deactivate the alarm after troubleshooting and correcting the error with reference to chapter "**15.3 Alarms and countermeasures**" (P.66).

Alarms are divided into two types. One is an alarm group B to D which can be cleared by turning ON "RESET". The other is group E which cannot be cleared unless the power supply control (24 VDC) is turned OFF once.

15.1 Alarm group signals

This product outputs a signal to distinguish the type of the alarm when an alarm is generated.

Alarms are classified into 5 groups. When an alarm is generated, it is output in "OUT0" to "OUT3".

Table below shows the combination of the alarm group and remote IO signal output ("OUT0" to "OUT3").

| Alarm group | Signal | | | | |
|---------------|--------|------|------|------|------|
| | ALARM | OUT0 | OUT1 | OUT2 | OUT3 |
| Alarm group B | ON | OFF | ON | OFF | OFF |
| Alarm group C | ON | OFF | OFF | ON | OFF |
| Alarm group D | ON | OFF | OFF | OFF | ON |
| Alarm group E | ON | OFF | OFF | OFF | OFF |

After generation of the alarm, SVRE or SETON are output according to the contents of the alarm as shown below.

| Alarm group | Signal | | How to restart |
|---------------|-----------|-----------|--|
| | SVRE | SETON | |
| Alarm group B | No change | No change | Turn ON "RESET" |
| Alarm group C | No change | No change | Turn ON "RESET" |
| Alarm group D | OFF | No change | Turn ON "RESET", then turn ON "SVON". |
| Alarm group E | OFF | OFF | Power supply for control is turned OFF → Supply power again |

- Procedure to restart operation when alarm group D is generated -

Procedure 1: Alarm group D is generated → "SVRE" changes to OFF (Servo is OFF)

Procedure 2: Turn ON RESET → (The alarm is cancelled)

→ After turning ON "SVON", "SVRE" turns ON (Servo is ON).

15.2 Reading PROFINET Diagnostics from the JXCPH

When an alarm is generated in the JXCPH, a PROFINET alarm is also sent to the PLC. The SF LED on the PLC will be solid red to indicate a problem has occurred within the JXCPH. However it is possible to determine the exact cause of the problem by using TIA PORTAL to read diagnostic information from the JXCPH.

- (1) Select the JXCPH and display the Device overview screen.
 - (2) Press "Go online" button.
 - (3) The area where the diagnosis is occurring will be displayed in red.
- By double-clicking on the red part, the contents of the diagnosis error will be displayed.

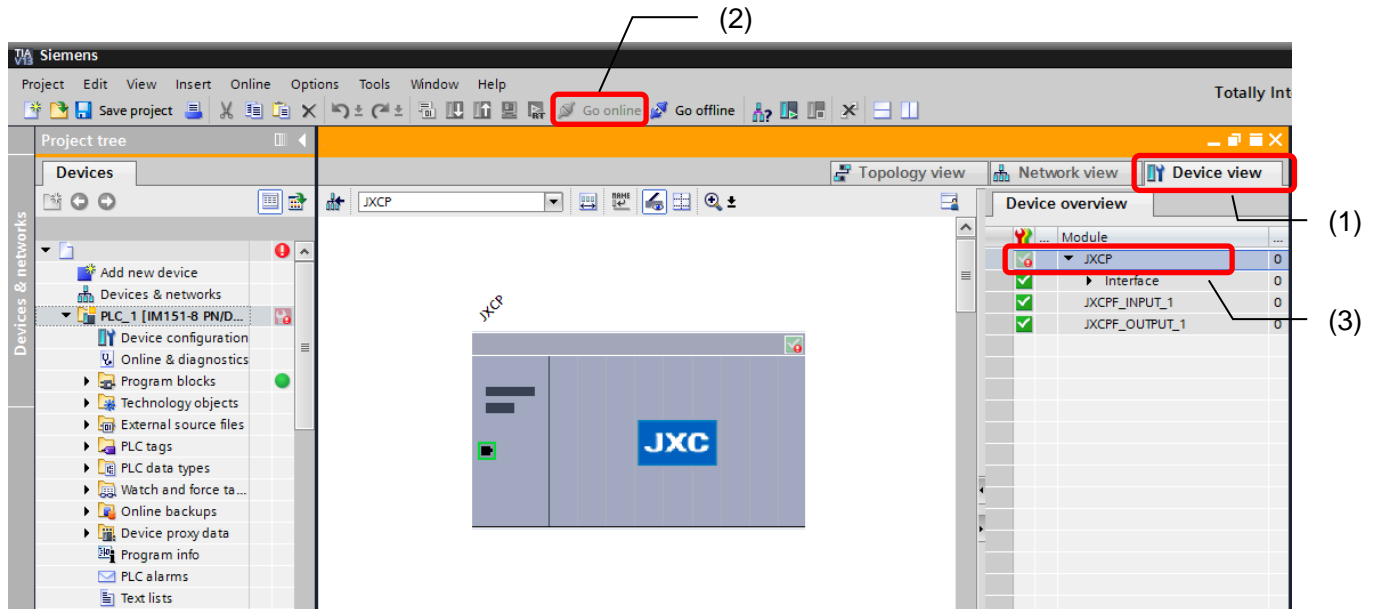


Fig.15.1 Display of when an alarm is generated

- (4) Select "Diagnostics status" to display the contents of the alarm.
- (5) It is possible to check the detailed contents of the alarm in the "Standard diagnostics". (The numbers displayed in brackets correspond to the alarm codes shown in **"15.3 Alarms and countermeasures" (P.66).**)

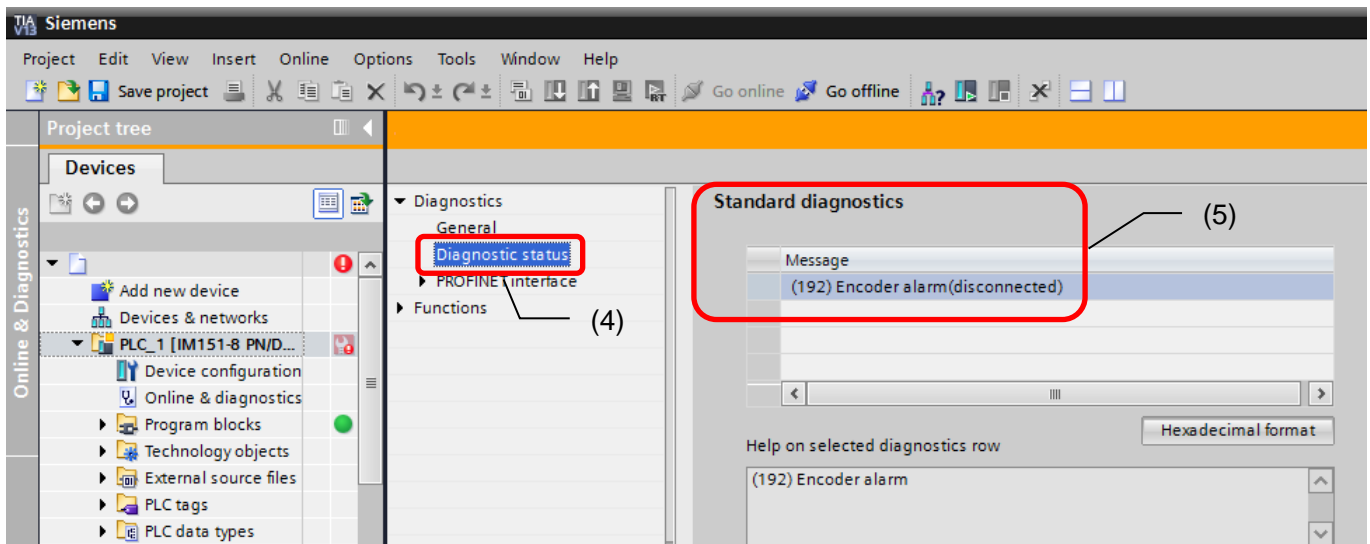


Fig.15.2 Display of [Diagnostics] screen

15.3 Alarms and countermeasures

| Controller setting software (code) *1 | Teaching box | Group | How to deactivate | Alarm contents/Countermeasure |
|---|----------------|-------|-------------------|--|
| Drive data value is wrong (01-048) | Step data ALM1 | B | RESET | <p><Condition>The step data is incorrect for the following conditions (Settable range)</p> <ol style="list-style-type: none"> (1) Area1 <Area2 (If both Area1 and Area2 is 0, the alarm will not be activated.) (2) Trigger LV ≤ Pushing force (3) Minimum speed of actuator ≤ Pushing speed ≤ Speed (4) Pushing speed ≤ Maximum pushing speed of actuator (5) Pushing force ≤ Minimum pushing force of actuator (6) Basic parameter "Maximum pushing force" ≥ Minimum pushing force of the actuator (7) Basic parameters "Max pushing force" ≥ Threshold <p><Countermeasure> Modify the step data and basic parameters setting</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">⚠ Caution</p> <p>Please refer to the manual or the catalogue of the actuator for the max/min pushing force/speed for the actuator.</p> </div> |
| Parameter value is wrong (01-049) | Parameter ALM | B | RESET | <p><Contents> The basic parameter is not correct for the following condition: (Settable range)</p> <ol style="list-style-type: none"> (1) Stroke(-) < Stroke (+) (2) W-Area 1 < W-Area 2 (* If both W-Area1 and W-Area2 is 0, the alarm will not be activated.) (3) Maximum pushing force < Maximum pushing force of actuator <p><Countermeasure> Modify the basic parameter setting.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">⚠ Caution</p> <p>Please refer to the manual or the catalogue of the actuator for the maximum pushing force for the actuator.</p> </div> |
| Set step data is not registered on list. (01-051) | Step data ALM2 | B | RESET | <p><Contents> For an operation for a specific step data no., the requested number of the step data is not registered. (When operation is commanded through PLC, this alarm will be generated depending on the signal interval and the holding time of signals)</p> <p>< Countermeasure ></p> <ol style="list-style-type: none"> (1) Make sure that the "Movement MOD" in the step data is not "Blank (Disabled)" and that numbers [1(ABS)] and [2(INC)] or input in the numerical instruction operation. (2) Set the interval time between signals to more than twice the communication cycle time, when signals are to be continuously input, because PLC processing delays and controller scanning delays can occur. <p>Refer to 13.2[2] Positioning operation (P.54)</p> |
| Set stroke is outside the stroke limit. (01-052) | Stroke limit | B | RESET | <p><Contents> The actuator goes outside the stroke limit specified by the basic parameters, "Stroke (+)" and "Stroke (-)" if it performs the requested operation. (Including JOG operation after return to origin)</p> <p><Countermeasure> Make sure that the basic parameters, "Stroke (+)" and "Stroke (-)" are consistent with the distance of actuator movement specified in the step data.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">⚠ Caution</p> <p>If the operation method of step data is "relative coordinated movement", note the location where the operation starts and the distance traveled. If the location is out of the stroke range when the power is supplied, this alarm is generated. Move the table within stroke range, and supply power.</p> </div> |

| | | | | |
|---|----------------|---|-------|--|
| Alarm _Comment _058 (01-058) | 3A | B | RESET | <p><Content> This alarm occurs when the following parameter is outside of the settable range during the numerical instruction operation. (Settable range)</p> <p>(1) Area1 < Area2 (If both Area1 and Area2 is 0, the alarm will not be activated.)</p> <p>(2) Trigger LV ≤ Pushing force</p> <p>(3) Minimum speed of actuator ≤ Pushing speed ≤ Speed</p> <p>(4) Pushing speed ≤ Maximum pushing speed of actuator</p> <p>(5) Pushing force ≤ Minimum pushing force of actuator</p> <p>(6) Basic parameter "Maximum pushing force" ≥ Minimum pushing force of the actuator</p> <p>(7) Basic parameters "Max pushing force" ≥ Switch point</p> <hr/> <p><Countermeasure> Modify the basic parameter setting.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">⚠ Caution</p> <p>Please refer to the operation manual or catalog of the actuator for the maximum pushing speed, minimum pushing force, and minimum speed for the actuator.</p> </div> |
| Alarm _Comment _061 (01-061) | 3D | B | RESET | <p><Content> This alarm occurs when specifying step data based on the unregistered No. of the step data or when the numbers of the Movement MOD specify outside of range during numerical instruction operation. (When operation is commanded through PLC, this alarm will be generated depending on the signal interval and the holding time of signals)</p> <hr/> <p><Countermeasures></p> <p>(1) Make sure that the "Movement MOD" in the step data is not "Blank (Disabled)" and that numbers [1(ABS)] or [2(INC)] are input in the numerical instruction operation.</p> <p>(2) Set the interval time between signals to more than twice the communication cycle time, when signals are to be continuously input, because PLC processing delays and controller scanning delays can occur.</p> <p><u>Refer to 13.2[2] Positioning operation (P. 54)</u></p> |
| Alarm _Comment _062 (01-062) | 3E | B | RESET | <p><Content> The actuator goes outside the stroke limit specified by the basic parameters, "Stroke (+)" and "Stroke (-)" if it performs the requested operation during numerical instruction operation.</p> <hr/> <p><Countermeasure> Make sure the basic parameters, "Stroke (+)" and "Stroke (-)" are consistent with the distance of actuator movement specified in the step data.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">⚠ Caution</p> <p>If the operation method of step data is "relative coordinated movement", note the location where the operation starts and the distance traveled.</p> <p>If the location is out of the stroke range when the power is supplied, this alarm is generated. Move the table within stroke range, and supply power.</p> </div> |
| Reacting force is outside limit when pushing. Position is unstable. (01-096) | Pushing ALM | C | RESET | <p><Contents> In the pushing operation, the actuator is pushed back from the pushing operation origin position.</p> <hr/> <p><Countermeasure> Increase the distance from the pushing operation origin position to the object being pushed. Or, increase the pushing force.</p> |

| Return to ORIG did not complete in the set time. (01-097) | ORIG ALM | C | RESET | <div><Contents> Return to origin is not completed within the set time.</div> <div><Countermeasure> Make sure there are no obstructions that interfere with the actuator movement.</div> | | | | | | | | | | | | |
|---|------------------------------------|---|-------------|--|--|------------------------------------|--|--|-----------------------|-------------|---|---------------------------------|------------------------|---|------------------------------|---|
| Drive is ON when SVRE is OFF (01-098) | Servo OFF ALM | C | RESET | <div><Contents> While the servo motor is OFF, the return to origin operation, positioning operation, pushing operation or JOG operation is requested.</div> <div><Countermeasure> Modify the setting so that those operations will be requested while the servo motor is ON ("SVRE" is ON).</div> | | | | | | | | | | | | |
| Drive is ON when SETON is OFF (01-099) | Drive ALM | C | RESET | <div><Contents> A positioning operation or pushing operation is requested before the return to origin position is completed.</div> <div><Countermeasure> Modify the setting so that these operations will be requested after the return to origin position is completed.</div> | | | | | | | | | | | | |
| Did not detect sensor when returning to ORIG. (01-103) | ORIG Sens ALM | C | RESET | <div><Contents> Alarm is generated when return parameter has the conditions 1, 2 shown below.</div> <table><tr><th></th><th colspan="2">Return to origin parameter setting</th></tr><tr><th></th><th>Return to origin mode</th><th>ORIG sensor</th></tr><tr><td>1</td><td>Pushing origin operation [Stop]</td><td>•Sensor N.O type [N.O]</td></tr><tr><td>2</td><td>Limit switch origin [Sensor]</td><td>•The origin sensor is not effective. [Disabled] or •Sensor N.O type [N.O]</td></tr></table> <div>* Alarm is generated with the conditions above when the sensor is not mounted to the actuator.</div> <div><Countermeasure> Check the sensor installation and settings of the return to origin parameter.</div> | | Return to origin parameter setting | | | Return to origin mode | ORIG sensor | 1 | Pushing origin operation [Stop] | •Sensor N.O type [N.O] | 2 | Limit switch origin [Sensor] | •The origin sensor is not effective. [Disabled] or •Sensor N.O type [N.O] |
| | Return to origin parameter setting | | | | | | | | | | | | | | | |
| | Return to origin mode | ORIG sensor | | | | | | | | | | | | | | |
| 1 | Pushing origin operation [Stop] | •Sensor N.O type [N.O] | | | | | | | | | | | | | | |
| 2 | Limit switch origin [Sensor] | •The origin sensor is not effective. [Disabled] or •Sensor N.O type [N.O] | | | | | | | | | | | | | | |
| Alarm_Comment_11 (01-111) | 6F | C | RESET Input | <div><Contents> Power supply circuit in the controller is not operating properly.</div> <div><Countermeasure> If the alarm is still generated when the power is re-applied, please contact SMC.</div> | | | | | | | | | | | | |
| Speed exceeded set value (01-144) | Over speed | D | RESET SVON | <div><Contents> The motor speed exceeds a specific level due to an external force, etc.</div> <div><Countermeasure> Make improvements so that the motor speed will not exceed the maximum speed of the actuator.</div> <div><div>⚠ Caution</div><div>Please refer to the manual or the catalogue of the actuator for the maximum speed of the actuator.</div></div> | | | | | | | | | | | | |
| Motor power supply voltage is outside set range. (01-145) | Over motorVol | D | RESET SVON | <div><Contents> The motor power supply voltage is out of range during [SVON].</div> <div><Countermeasure> Make sure that the voltage supplied to the motor power (M24V) of the controller is within specification.</div> <div><div>⚠ Caution</div><div>If the power supply is "inrush-current control type", a voltage drop may cause an alarm during acceleration/deceleration.</div></div> <div><Contents> The alarm may be caused by regenerative power depending on the method of operation of the actuator.</div> <div><Countermeasure> Make sure that the operating conditions are within the specifications.</div> <div><div>⚠ Caution</div><div>Please refer to the manual or the catalogue of the actuator for the method of operation of the actuator.</div></div> | | | | | | | | | | | | |

| | | | | |
|--|--------------------|---|---|---|
| Controller temperature exceeded set range. (01-146) | Over Temp | D | RESET SVON | <p><Details> The temperature around the power element of the controller is too high.</p> <p><Countermeasures> Make improvements so that the temperature around the controller is kept appropriate.</p> |
| Controller supply voltage is outside set range. (01-147) | Over CrtlVol | D | RESET SVON | <p><Contents> The control power supply voltage within the controller is outside the set range.</p> <p><Countermeasure> Make sure that the voltage supplied to the control power (C24V) of the controller is appropriate.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">⚠ Caution</p> <p>If a single power supply is used for both the control power and the motor power, or the power supply is "inrush-current control type", a power voltage drop may be caused due to a voltage drop during acceleration/deceleration.</p> </div> |
| Current limit is exceeded (01-148) | Over load | D | RESET SVON | <p><Contents> The output current accumulated value exceeds the specified value.</p> <p><Countermeasure> Make sure there are no obstructions that interfere with the actuator movement. Also, make sure that the load, speed, acceleration and deceleration are within the range of the actuator.</p> |
| The target position was not reached within the set time limit (01-149) | Posn failed ALM | D | RESET SVON | <p><Content> Failed to reach the set position within the set time limit.</p> <p><Countermeasure> Make sure there are no obstructions that interfere with the actuator movement. Also, make sure that the load, speed, acceleration and deceleration are within the range of the actuator.</p> |
| Alarm _Commen t_159 (01-159) | 9F | D | Turn ON RESET SVON and SETUP | <p><Contents> The temperature around the regenerative circuit of the controller is too high.</p> <p><Countermeasures> Check if the operating condition of the electric actuator is within the specification range.</p> |
| Communication error. (01-150) | Ctrl Comm ALM | D | RESET SVON | <p><Contents> The connection with the higher-level devices (such as the PC and teaching box) is disconnected.</p> <p><Contents> The connection with the higher-level devices (such as the PC and teaching box) is disconnected. In case of the communication failure of PC or teaching box, resetting of alarm by PC or teaching box is possible after connecting again.</p> |
| Encoder error (01-192) | Encoder ALM | E | Turn OFF and ON the power supply for the controller | <p><Contents> Abnormality in communication with the encoder.</p> <p><Countermeasure> Check the connection of the actuator cable.</p> |
| Unable to find motor phase in set time. (01-193) | Polarity not found | E | Turn OFF and ON the power supply for the controller | <p><Contents> Unable to find the motor phase within the set time. (When the servo motor is turned ON ("SVON" turns ON) for the first time after the power is applied, the actuator needs to move a little to find the motor phase. However, if this actuator movement is prevented, this alarm will be activated.)</p> <p><Countermeasure> Make sure there are no obstructions that interfere with the actuator movement and then turn ON the servo motor ("SVON" turns ON).</p> |

| | | | | |
|---|--------------|---|---|--|
| Output current limit is exceeded set value (01-194) | Over current | E | Turn OFF and ON the power supply for the controller | <p><Contents> The output current of the power circuit is abnormally high.</p> <p><Countermeasure> Make sure that there are no short circuits of actuator cables, connectors, etc. In addition, make sure that the actuator is compatible with the controller.</p> |
| I sens ALM (1-195) | I sens ALM | E | Turn OFF and ON the power supply for the controller | <p><Contents>An abnormality is detected by the current sensor that is checked when the controller is reset.</p> <p><Countermeasure>Make sure that the electric actuator conforms to the controller. When a command to turn on servo is given, check if LK RLS is energized by installing the electric actuator vertically in order to check if the motor is driven by an external force.Even after this measure, if the alarm regenerates when the power is reapplied, please contact SMC.</p> |
| Error counter overflowed (01-196) | Err overflow | E | Turn OFF and ON the power supply for the controller | <p><Contents> An overflow of the position error counter inside of the controller has occurred.</p> <p><Countermeasure> Make sure there are no obstructions that interfere with the actuator movement. Also, make sure that the load, speed, acceleration and deceleration are within the range of the actuator.</p> |
| Memory Abnormality has occurred (01-197) | Memory ALM | E | Turn OFF and ON the power supply for the controller | <p><Contents> An error of the EEPROM has occurred.</p> <p><Countermeasure> Please contact SMC. (The write limit of the EEPROM is roughly 100,000 times)</p> |
| CPU error (01-198) | CPU failure | E | Turn OFF and ON the power supply for the controller | <p><Contents> The CPU is not operating normally. (It is possible that the CPU or surrounding circuits has failed, or the CPU is malfunctioning due to electrical noise).</p> <p><Countermeasure> If the alarm cannot be deactivated even after the power is reapplied, please contact SMC.</p> |

*1 When alarm is generated, 3-digit numbers after [-] in this table [(code)] are stored to [Alarm code] of Byte16-19 in the input area of the memory map. The numbers of the alarm code indicated in this table are expressed as decimal numbers.

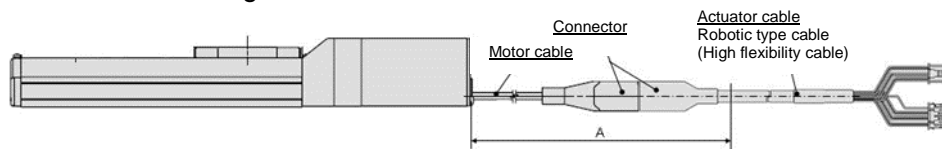
16. Precautions for wiring and cable

Warning

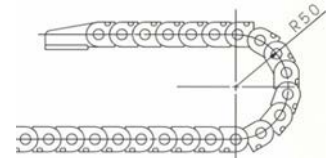
- (1) **Adjusting, mounting or wiring change should never be done before shutting OFF the power supply to the product.**
Electric shock, malfunction and damage can result.
- (2) **Do not disassemble the cable. Use only specified cables.**
- (3) **Do not connect or disconnect the cable or connector with the power on.**

Caution

- (1) **Wire the connector securely. Do not apply any voltage to the terminals other than those specified in the Operation Manual.**
- (2) **Wire the connector securely.**
Check for correct connector wiring and polarity.
- (3) **Take appropriate measures against noise.**
Noise in a signal line may cause malfunction.
As a countermeasure, high voltage and low voltage cables should be separated, and keep wiring lengths short, etc.
- (4) **Do not route wires or cables together with power or high voltage cables.**
The product may malfunction due to interference and surge voltages. Route the wires of the product separately from power or high voltage cables.
- (5) **Take care that actuator movement does not damage cables.**
- (6) **Operate with cables secured. Avoid bending cables at sharp angles where they enter the product.**
- (7) **Avoid twisting, folding, rotating or applying an external force to the cable. Also avoid operating at sharp angles.**
Risk of electric shock, broken wires, contact failure and loss of control of the product can occur.
- (8) **Fix the motor cable protruding from the product in place before using.**
The motor cable is not robotic type cable and can be damaged when moved.
Do not place Part A in the diagram below in a flexible cable duct.



- (9) **Select "Robotic type cables" when deflecting actuator-cables repeatedly. Do not put cables into a flexible moving tube with a radius smaller than the specified value (minimum 50mm).**
Risk of electric shock, wire damage, contact failure and loss of control of the product can occur if "Standard cables" are used in case of inflecting the cables repeatedly.



- (10) **Confirm proper wiring of the product.**
Insulation failure (interference with another circuit, poor insulation between terminals etc.) could introduce excessive voltage or current to the controller or its peripheral devices and damage them.
- (11) **The Speed/pushing force may vary, depending on the cable length, load and mounting conditions etc.**
If the cable length exceeds 5m, the speed/pushing force will be reduced 10% per 5 m maximum.
(If cable length is 15m, 20% reduction maximum.)

Transport

Caution

- (1) **Do not carry or swing the product by the motor or the cable.**

17. Electric Actuators/Common Precautions

17.1 Design and selection

Warning

(1) Read the Operation Manual before using the product.

Handling or usage/operation other than that specified in the Operation Manual may lead to breakage and product failure.

Any damage attributed to use beyond the specifications is not guaranteed.

(2) There is a possibility of dangerous sudden action by the product if sliding parts of machinery are twisted due to external forces etc.

In such cases, human injury may occur, such as catching hands or feet in the machinery, or damage to the machinery itself may occur. The machinery should be designed to avoid such dangers.

(3) A protective cover is recommended to minimize the risk of personal injury.

If a driven object and moving parts of the product are in close proximity, personal injury may occur. Design the system to avoid contact with the human body.

(4) Securely tighten all stationary parts and connected parts so that they will not become loose.

When the product operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

(5) Consider a possible loss of power source.

Take measures to prevent injury and equipment damage in the case of a power supply failure.

(6) Consider the behavior of an emergency stop of the whole system.

Design the system so that human injury and/or damage to machinery and equipment will not be caused, when it is stopped by a safety device for abnormal conditions such as a power outage or a manual emergency stop of the whole system.

(7) Consider the action when operation is restarted after an emergency stop or abnormal stop of the whole system.

Design the system so that human injury or equipment damage will not occur upon restart of operation of the whole system.

(8) Disassembly and modification is prohibited.

Do not disassemble the product or make any modifications, including additional machining. This may cause human injury and/or an accident.

(9) Do not use the stop signal, "EMG" of the controller and stop switch on the teaching box as the emergency stop for the system.

The stop signal, "EMG" of the controller and the stop switch on the teaching box are for decelerating and stopping the actuator. Design the system with an emergency stop circuit which is applied to the relevant safety standard separately.

(10) When using for vertical applications, it is necessary to build in a safety device.

The rod may fall due to the weight of the work.

The safety device should not interfere with normal operation of the machine.

Caution

(1) Use the product for the maximum usable stroke.

The product will be damaged if it is used with a stroke exceeding the maximum stroke. Refer to the specifications of the product.

(2) When the product repeatedly cycles with partial strokes, operate it at a full stroke at least once a day or every 1,000 strokes.

Otherwise, lubrication can be lost.

(3) Do not use the product in applications where excessive external force or impact force is applied to it.

The product can be damaged. Components, including the motor, are manufactured to precise tolerances, so the slight test deformation may cause faulty operation or seizure.

(4) Return to origin cannot be carried out during operating.

This function cannot be carried out during positioning operation or pushing operation.

- (5) Refer to a common auto switch (Best Pneumatics No 2), when an auto switch is built and used within the system.

17.2 Mounting

Warning

- (1) **Install and operate the product only after reading the Operation Manual carefully and understanding its contents.**
Keep the manual in a safe place for future reference.
- (2) **Tighten threads with the proper tightening torque.**
Tighten the screws to the recommended torque for mounting the product.
- (3) **Do not make any alterations to this product.**
Alterations made to this product may lead to a loss of durability and damage to the product, which can lead to human injury and damage to other equipment and machinery.
- (4) **When using an external guide, the guide axis should be parallel to the actuator axis.**
There will be damage/excessive wear on the lead screw if the external guide is not parallel.
- (5) **When an external guide is used, connect the moving parts of the actuator and the load in such a way that there is no interference at any point within the stroke.**
Do not scratch or dent the sliding parts of the actuator tube or piston rod etc., by striking them with other objects. Components are manufactured to precise tolerances, so the slightest deformation may cause faulty operation.
- (6) **Prevent the seizure of rotating parts (pins, etc.) by applying lubricating grease.**
- (7) **Do not use the product before verifying that the equipment can operate properly.**
After mounting or repair, connect the power supply to the product and perform appropriate functional inspections to check it is mounted properly.
- (8) **Cantilever**
When the actuator is operated at high speeds while it is fixed at one end and free at the other end (flange type, foot type, double clevis type, direct mount type), a bending moment may act on the actuator due to vibration generated at the stroke end, which can damage the actuator. In such a case, install a support bracket to suppress the vibration of the actuator body or reduce the speed so that the actuator does not vibrate. Use a support bracket also when moving the actuator body or when a long stroke actuator is mounted horizontally and fixed at one end.
- (9) **When mounting the actuator or attaching to the work piece, do not apply strong impact or large moment.**
If an external force over the allowable moment is applied, it may cause looseness in the guide unit, an increase in sliding resistance or other problems.
- (10) **Ensure sufficient space for maintenance activities.**
Allow sufficient space for maintenance and inspection.

17.3. Handling Precautions

Warning

- (1) **Do not touch the motor while in operation.**
The surface temperature of the motor can increase to approx. 90°C to 100°C due to operating conditions. Energizing alone may also cause this temperature increase. Do not touch the motor when in operation as it may cause burns.
- (2) **If abnormal heating, smoking or fire, etc., occurs in the product, immediately shut OFF the power supply.**
- (3) **Immediately stop operation if abnormal operation noise or vibration occurs.**
If abnormal operation noise or vibration occurs, the product may have been mounted incorrectly. Unless operation of the product is stopped for inspection, the product can be seriously damaged.
- (4) **Never touch the rotating part of the motor or moving part of the actuator while in operation.**
- (5) **When installing, adjusting, inspecting or performing maintenance on the product, controller and related equipment, shut OFF the power supply to each of them. Then, lock it so that no one other than the person can turn the power on, or implement measures such as a safety plug.**
- (6) **In the case of the actuator with a servo motor (24VDC), the "motor phase detection step" is done by turning ON "SVON" just after the controller power is turned ON. The "motor phase detection step" moves the table/rod for the distance of one screw-lead maximum. (The motor rotates in the reverse direction if the table hits an obstacle such as the end stop damper.) Take the "motor phase detection step" into consideration for the installation and operation of this actuator.**

Caution

- (1) **Keep the controller and actuator combination as delivered for use.**
The product parameters are set before shipment. If the controller is combined with a different actuator, failure can result.
- (2) **Check the product for the following points before operation.**
 - a) Damage to power supply line and signal line
 - b) Looseness of the connector to the power and signal lines
 - c) Looseness of the actuator/cylinder and controller/driver mounting
 - d) Abnormal operation
 - e) Emergency stop of the whole system
- (3) **When more than one person is performing work, decide on the procedures, signals, measures for emergency and how to start the operation after the measures taken. Also, designate a person to supervise work other than those performing work.**
- (4) **Actual speed of the product will be changed by the workload.**
Before selecting a product, check the catalog for the instructions regarding selection and specifications.
- (5) **Do not apply a load, impact or resistance, in addition to a transferred load during the "Return to Origin" operation.**
When performing return to origin by pushing force, additional force will cause displacement of the origin position since it is based on detected motor torque.
- (6) **Do not remove the name plate.**
- (7) **An operation test should be carried out using a low speed. Start operation using the predefined speed after confirming there are no problems.**

[Grounding]

Warning

- (1) **Provide a good earth connection to the actuator.**
- (2) **The earth should be a dedicated earth connection. Class D dedicated grounding should be used. (Ground resistance 100Ω or less)**
- (3) **The earth cable length should be as short as possible.**

[Unpacking]

Caution

- (1) **Check that the received product is as ordered.**
If a different product is installed, other than that ordered, injury or damage can result.

17.4 Operating environment

Warning

(1) Avoid use in the following environments.

1. Locations where a large amount of dust and cutting chips are airborne.
2. Locations where the ambient temperature is outside the range of the temperature specification (refer to specifications).
3. Locations where the ambient humidity is outside the range of the humidity specification (refer to specifications).
4. Locations where corrosive gas, flammable gas, seawater, water and steam are present.
5. Locations where strong magnetic or electric fields are generated.
6. Locations where direct vibration or impact is applied to the product.
7. Areas that are dusty, or are exposed to splashes of water and oil drops.
8. Areas exposed to direct sunlight (ultraviolet rays).
9. Environment at an altitude of 1000 meters or higher Heat dissipation and withstand voltage will decrease.

Contact your SMC representative for details.

(2) Do not use in an environment where the product is directly exposed to liquid, such as cutting oils.

If cutting oils, coolant or oil mist contaminates the product, failure or increased sliding resistance can result.

(3) Install a protective cover when the product is used in an environment directly exposed to foreign matter such as dust, cutting chips and spatter.

Play or increased sliding resistance can result.

(4) Shade the sunlight in the place where the product is applied with direct sunshine.

(5) Shield the product if there is a heat source nearby.

When there is a heat source surrounding the product, the radiated heat from the heat source can increase the temperature of the product beyond the operating temperature range. Protect it with a cover, etc.

(6) Grease oil can be reduced due to the external environment and operating conditions. The lubrication performance may deteriorate and shorten the life of the product.

[Storage]

Warning

(1) Do not store the product with direct contact to rain or water drops. Do not store the product where it is exposed to harmful gases or liquid.

(2) Store in an area that is shaded from direct sunlight and has a temperature and humidity within the specified range (-10°C to 60°C and up to 85%. No condensation or freezing.)

(3) Do not apply vibration and impact to the product during storage.

17.5 Maintenance Precautions

Warning

- (1) **Do not disassemble or repair the product.**
Fire or electric shock can result.
- (2) **Before modifying or checking the wiring, the voltage should be checked with a tester 5 minutes after the power supply is turned OFF.**
Electric shock can result.

Caution

- (1) **Maintenance should be performed according to the procedure indicated in the Operating Manual.**
Incorrect handling can cause injury, damage or malfunction of equipment and machinery.
- (2) **Removal of product**
When equipment is serviced, first confirm that measures are in place to prevent dropping of work pieces and run-away of equipment, etc, then cut the power supply to the system. When machinery is restarted, check that operation is normal with actuators in the proper positions.
- (3) **When moving the electric actuator slider manually by hand, please disconnect the electric actuator cable.**
The electric actuator cannot be moved smoothly by the induced voltage of the motor when the electric actuator slider is moved while connected to the controller. Moreover, the controller might be damaged by the induced voltage when moving the electric actuator slider at high frequency.

[Lubrication]

Caution

- (1) **The product has been lubricated for life at the manufacturer's and does not require lubrication in service.**
Contact SMC if lubrication is to be applied.

17.6 Precautions for actuator with lock

Warning

- (1) **Do not use the lock as a safety lock or a control that requires a locking force.**
The lock used for the product with a lock is designed to prevent dropping of work pieces.
- (2) **For vertical mounting, use the product with a lock.**
If the product is not equipped with a lock, the product will move and drop the work piece when the power is removed. If the actuator with lock is not used, preventive measures should be taken in the design of the equipment.
- (3) **"Measures against drops" means preventing a work piece from dropping due to its weight when the product operation is stopped and the power supply is turned OFF.**
- (4) **Do not apply an impact load or strong vibration while the lock is activated.**
If an external impact load or strong vibration is applied to the product, the lock will lose its holding force and damage to the sliding part of the lock or reduced lifetime can result. The same situations will happen when the lock slips due to a force over the thrust of the product, as this accelerates the wear to the lock.
- (5) **Do not apply liquid or oil and grease to the lock or its surrounding.**
If liquid or oil and grease is applied to the sliding part of the lock, its holding force will reduce significantly.
- (6) **Take measures against drops and check that safety is assured before mounting, adjustment and inspection of the product.**
If the lock is released with the product mounted vertically, a work piece can drop due to its weight.
- (7) **When the actuator is operated manually (when "SVRE" signal is OFF), supply 24VDC to the [LK RLS] terminal of the power supply connector.**
If the product is operated without releasing the lock, wear of the lock sliding surface will be accelerated, causing a reduction in the holding force and the life of the locking mechanism.

(8) Do not supply 24VDC power supply constantly to the [LK RLS].

Only supply 24VDC power supply to the [LK RLS(Lock release)] terminal during normal operation. If power is supplied to the [LK RLS] terminal continuously, the lock will be released, and workpieces may be dropped at stop (EMG).

/For details of wiring please refer to the operation manual for the controller (JXC series).

18. Controller and Peripheral Devices/Specific Product Precautions

18.1 Design and selection

⚠Warning

(1) Use the specified voltage.

Otherwise, malfunction and damage to the controller may result.

If the applied voltage is lower than the specified voltage, it is possible that the load cannot be moved due to an internal voltage drop. Check the operating voltage before use.

(2) Do not operate beyond the specifications.

Fire, malfunction or actuator damage can result. Check the specifications before use.

(3) Install an emergency stop circuit.

Install an emergency stop outside of the enclosure so that it can stop the system operation immediately and intercept the power supply.

(4) In order to prevent danger and damage due to the breakdown and the malfunction of this product, which may occur at a certain probability, a backup system should be established in advance by giving a multiple-layered structure or a fail-safe design to the equipment, etc.

(5) If fire or personal injury is expected due to abnormal heat generation, ignition, smoking of the product, etc., cut OFF the power supply for this product and the system immediately.

(6) The upper limit of writing cycle to EEPROM of the JXCPH controller is 100,000 cycles.

If the upper limit of writing cycle is exceeded, the writing will not be performed correctly.

18.2 Handling Precautions

Warning

- (1) **The inside of the controller and its connector should not be touched.**
It may cause an electric shock or damage to the controller.
- (2) **Do not perform operation or setting of this equipment with wet hands.**
It may cause an electric shock.
- (3) **A product that is damaged or missing any components should not be used.**
Electric shock, fire, and injury can result.
- (4) **Use only the specified combination of controller and electric actuator.**
It may cause damage to the controller or the actuator.
- (5) **Be careful not to be caught or hit by the workpiece while the actuator is moving.**
It may cause an injury.
- (6) **Do not connect the power supply to the product until it is confirmed that the workpiece movement area is safe.**
The movement of the workpiece may cause an accident.
- (7) **Do not touch the product when it is energized and for some time after power has been disconnected, as it can be very hot.**
It may cause burns due to the high temperature.
- (8) **Check for voltage using a tester at least 5 minutes after power-OFF when performing installation, wiring and maintenance.**
Electric shock, fire, and injury can result.
- (9) **Do not use the product in an area where it could be exposed to dust, metallic powder, machining chips, or splashes of water, oil or chemicals.**
A failure or malfunction can result.
- (10) **Do not use the product in an area where a magnetic field is generated.**
It will cause failure or malfunction.
- (11) **Do not install the product in an environment where flammable gas, explosive or corrosive gas, liquids or other substances are present.**
It could lead to fire, explosion and corrosion.
- (12) **Avoid radiant heat from large heat sources such as direct sunlight or hot furnaces.**
It will cause failure of the controller or its peripheral devices.
- (13) **Do not use the product in an environment subjected to cyclic temperature changes.**
It will cause failure of the controller or its peripheral devices.
- (14) **Do not use in a location where surges are generated.**
When there are units that generate a large amount of surge around the product (for example solenoid type lifters, high frequency induction furnaces, motors, etc.), this may cause deterioration or damage to the product's internal circuit. Avoid surge generation and crossed lines.
- (15) **Do not install the product in an environment subjected to vibration and impact.**
It will cause failure or malfunction.
- (16) **If this product is used in conjunction with a relay or solenoid valve, use a type with a surge absorbing element built-in.**

18.3 Mounting

Warning

- (1) **The controller and its peripheral devices should be installed on a fire-proof material.**
Direct installation on or near a flammable material may cause fire.
- (2) **Do not install this product in a location subject to vibration and impact.**
A failure and malfunction can result.
- (3) **Take measures so that the operating temperature of this controller and its peripheral devices are within the range of the specifications.**
Also, this controller should be installed with at least 50mm space between each side of it and other structures or components.
It may cause a malfunction of the controller and its peripheral devices and a fire.
- (4) **Do not mount the controller and its peripheral devices near a large electromagnetic contactor or no-fuse breaker which generates vibration on the same panel. Mount them on different panels, or keep the controller and its peripheral devices away from such a vibration source.**
- (5) **The controller and its peripheral devices should be installed on a flat surface.**
If the mounting surface is distorted or not flat, excessive force may be applied to the housing, etc. causing malfunction.

18.4 Wiring

Warning

- (1) **Do not damage the cable or apply a heavy object or pinch the cable. Avoid repeatedly bending or stretching the cable.**
It may cause an electric shock, fire, or breaking of wire.
- (2) **Wire correctly.**
Incorrect wiring could damage the controller or its peripheral devices depending on the seriousness.
- (3) **Do not perform wiring while the power is on.**
It can damage the controller or its peripheral devices could be damaged, causing malfunction.
- (4) **Do not carry this product by holding its cables.**
It may cause an injury or damage to the product.
- (5) **Do not route wires or cables together with power or high voltage cables.**
The wires to the controller or its peripheral devices can be interrupted with noise or induced surge voltage from power lines or high-voltage lines, causing malfunction.
Route the wires of the product separately from power or high voltage cables.
- (6) **Verify the insulation of wiring.**
Insulation failure (interference with another circuit, poor insulation between terminals etc.) could introduce excessive voltage or current to the controller or its peripheral devices and damage them.

18.5 Power supply

Caution

- (1) **Use a power supply with low noise between lines and between power and ground.**
In cases where noise is high, use an isolation transformer.
- (2) **The power supplies for the controller power and the I/O signal power should be separate, and both Power supplies should not be of the "in-rush current limiting type".**
If the power supply is of the "in-rush current limiting type", a voltage drop may occur during the acceleration of the actuator.
- (3) **Take appropriate measures to prevent lightning surges. Ground the surge absorber for lightning separately from the ground connection for the controller and its peripheral devices.**

18.6 Grounding

Warning

- (1) **Ensure that the product is grounded to allow the noise tolerance of the controller.**
Otherwise it may cause an electric shock or fire.
- (2) **A dedicated Ground connection must be used.**
Grounding should be to a D-class ground connection. (Ground resistance 100Ω or less)
- (3) **The grounding point should be as near as possible to the controller to keep the cable length short.**
- (4) **In the unlikely event that malfunction is caused by the ground connection, it may be disconnected.**

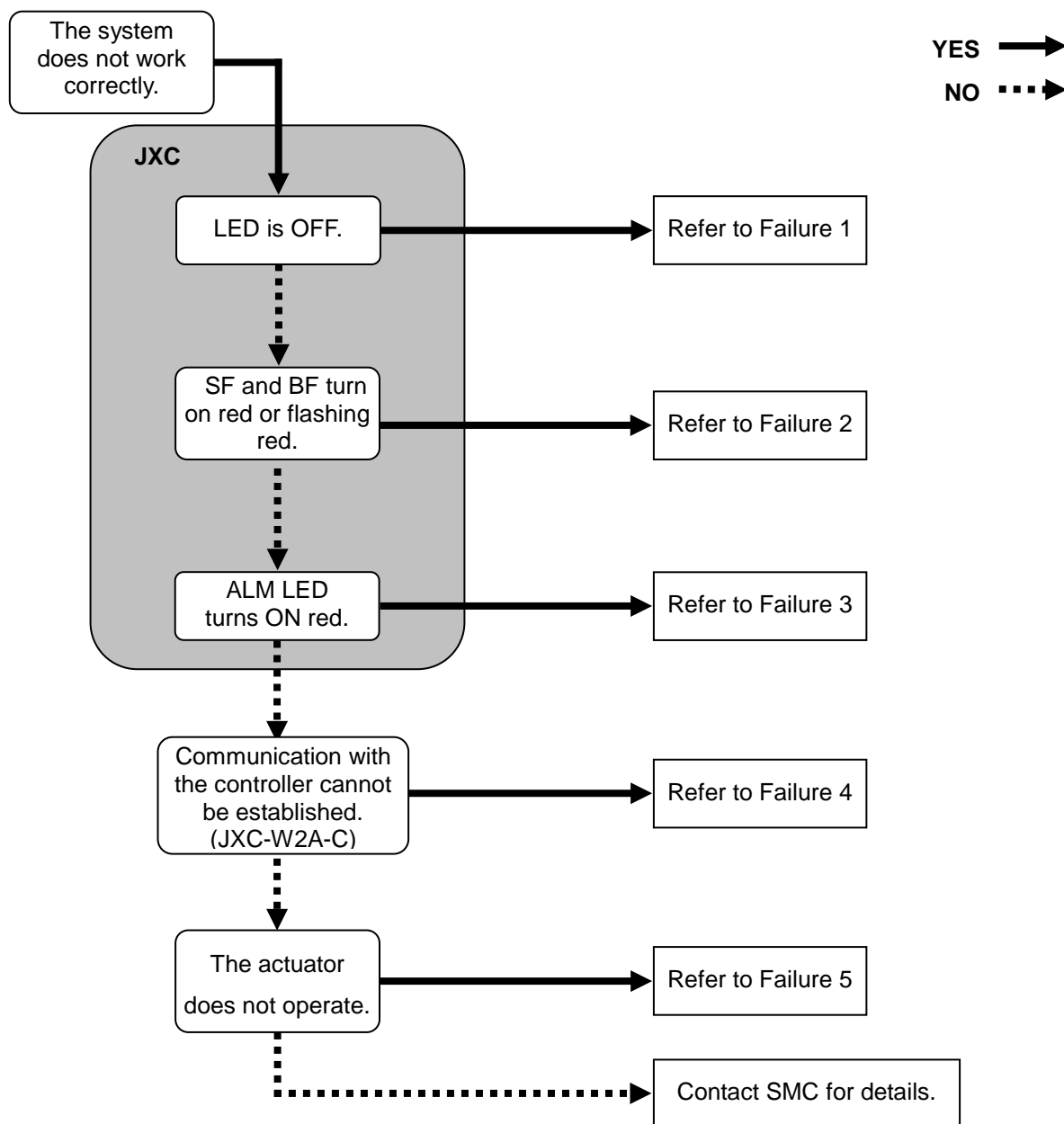
18.7 Maintenance

Warning

- (1) **Perform maintenance checks periodically.**
Confirm wiring and screws are not loose.
Loose screws or wires may cause unexpected malfunction.
- (2) **Conduct an appropriate functional inspection and test after completing maintenance.**
In case of any abnormalities (if the actuator does not move, etc.), stop the operation of the system.
Otherwise, an unexpected malfunction may occur and it will become impossible to ensure safety.
Give an emergency stop instruction to confirm safety.
- (3) **Do not disassemble, modify or repair this controller or the peripheral devices.**
- (4) **Do not put anything conductive or flammable inside of the controller.**
Fire or explosion can result.
- (5) **Do not perform an insulation resistance test or insulation withstand voltage test.**
- (6) **Ensure sufficient space for maintenance.**
Design the system to allow the required space for maintenance.

19. Troubleshooting

When any failure occurs with this product, the following chart can be used to identify the cause of the failure. When none of the causes in the troubleshooting can be confirmed, it is presumed that the product is faulty and normal operation can only be recovered by the replacement of a part. It is possible that this product may be damaged due to the operating conditions (applications). Please contact SMC to discuss appropriate measures.



| Problem No. | Problem | Possible causes | Investigation method and location of possible causes | Countermeasures |
|-------------|---------------------|---|---|--|
| 1 | LED is OFF. | Power fault | Check that PWR (green) of the controller turns OFF at either of when power is supplied, SVON ON is instructed or the actuator is operating. | Use an appropriate voltage and power supply capacity in reference to the operation manual of the actuator and controller connected. → 3. Specifications (P.12) |
| | | Incorrect wiring | Check the incorrect wiring, broken wire and short circuit of the power supply plug. | Please correct the wiring in reference to Controller Operation Manual. → 5. External Connections (P.22) → 6. Details of Power Supply Plug (P.24) |
| 2 | BF Red LED is ON. | Communication data has not been received. | Check the communication cable in accordance with the items below. - The communication cable should be connected from the PLC to this controller. - The PLC communication speed should be appropriate. - There should be no broken wire or short circuit. - There should be no loosening at the connection. - There should be no repeated bending stresses or pulling forces. | Correct the wiring or connection of the communication cable or replace them in reference to the controller Operation Manual. → 5. External Connections (P.22) If the PLC communication speed setting is abnormal, correct the setting in reference with the PLC Operation Manual. |
| | | | Check that there is no equipment or high voltage cables which generates noise around the communication and power supply cables. | Please keep the communication and power cables away from the noise source or cover them. |
| | | | Check that there is no abnormality on the PLC power supply condition. | Please correct the power supply and power supply cables in reference to the PLC Operation Manual. |
| | BF Red LED flashes. | PROFINET communication is abnormal (Bus Fault). | Check that Device name is correctly set. | Set the Device name so that there is no duplication. |
| | | | Check the communication cable in accordance with the items below. - The communication cable should be connected from the PLC to this controller. - The PLC communication speed should be appropriate. - There should be no broken wire or short circuit. - There should be no loosening at the connection. - There should be no repeated bending stresses or pulling forces. | Correct the wiring or connection of the communication cable or replace them in reference to the controller Operation Manual. → 5. External Connections (P.22) If the PLC communication speed setting is abnormal, correct the setting in reference with the PLC Operation Manual. |
| | | | Check that there is no equipment or high voltage cables which generates noise around the communication and power supply cables. | Please keep the communication and power cables away from the noise source or cover them. |
| | | | Check that there is no abnormality on the PLC power supply condition. | Please correct the power supply and power supply cables in reference to the PLC Operation Manual. |
| | SF Red LED is ON. | Alarm generated | Check the content of alarm | Please take appropriate countermeasures in accordance with alarm content in reference to the controller Operation Manual. → 15. Alarm for Motor Control (P.64) |
| | | | | |
| | ALM is on | Alarm generated | If it is, check the type of alarm referring to this manual. | Refer to the controller operation manual and take appropriate measures. → 15. Alarm for Motor Control (P.64) |
| | | | | |
| 3 | ALM is on | Alarm generated | If it is, check the type of alarm referring to this manual. | Refer to the controller operation manual and take appropriate measures. → 15. Alarm for Motor Control (P.64) |

| | | | | |
|---|---------------------------------|---------------------------------|--|---|
| 4 | Communication fault (JXC-W2A-C) | The USB driver is not installed | Check that the USB driver for the conversion unit is installed. | Please install the USB driver of the communication unit. The USB driver's installation starts when the communication unit is connected with PC. Details of the installation procedure are shown in "Installation procedure of the JXC-W2 setting software". |
| | | Incorrect COM port setting | Please confirm if the correct COM port is set to the ACT Controller. | The COM port allocated to the controller is different for different PC's. Check and confirm the COM port number with the controller connected to the PC. The COM port number can be checked using the Device Manager of the PC. For details of the COM port checking and setting methods refer to the "JXC-W2 Controller Setting Software Installation Manual". |
| | | Connection failure | Please confirm the connection status. | Please confirm motor controller (JXC) = communications cable = communication unit = USB cable = PC is connected. For example, communication cannot be established if the connector has been damaged. Please confirm the power supply of motor controller (JXC) has been turned ON. Communication cannot be established if the power supply is OFF. If equipment other than the motor controller (JXC) (PLC and measurement equipment) is connected with PC, remove these before checking. (There is a possibility that the communication with other equipment interferes in PC.) |
| 5 | Does not operate at all. | Lock release error | When the unlock switch is turned ON or OFF there is an unlocking sound made. | If there is no sound of lock release, the lock brake may be broken. → If the problem persists, please contact SMC. |
| | | External equipment failure | Check that the PLC connected to the controller operates correctly. Test operation of the controller on its own. | Refer to the controller operation manual and take appropriate measures. → 9.1 Memory allocation (P.31) |
| | | Unsuitable spec. | Check if the controller's specifications are appropriate, the power supply is suitable and the controller is compatible with the actuator. | Take appropriate measures according to this manual. → 3. Specifications (P.12) |
| | | Stop command | If it is not energized, the servo will be OFF and does not operate. Check if a voltage of 24 VDC is applied to the EMG terminal. | Apply 24 VDC to the EMG terminal. |

| | | | |
|--------------------------------|-------------------------------|--|---|
| Operation stops intermittently | Incorrect wiring | Is the wiring connected correctly? Refer to the controller operation manual to confirm wiring, and check for broken wires and short-circuits. | Correct the wiring so that the input/output of each signal is performed appropriately. → 5. External Connections (P.22) → 9.1 Memory allocation (P.31) |
| | Electric noise | Connect to Ground correctly. Avoid bundling the cables. | Refer to the controller operation manual and take appropriate measures. → 3.4 Mounting (P.16) |
| | Incorrect parameters | Check that the parameter values are correct. Also, check the cables are not bundled. | Take appropriate measures according to this manual. → 10. Settings and Data Entry (P.42) |
| | Voltage drop | Check for a temporary voltage drop in the power supply? (If there is a temporary voltage drop in the power supply, the "EMG" signal from the PWR connector will turn OFF so the actuator will stop. However, this stop will be released when the voltage recovers.) | There is a possibility of a momentary voltage drop because the capacity of the power supply is insufficient, or if the power supply is "inrush-current control" type. If necessary, replace the power supply. → 3. Specifications (P.12) |
| | Failure of pushing operation. | Check that "INP" turns ON during a pushing operation. (If completion of the pushing operation is detected by "INP", the PLC cannot confirm completion) | Check "INP" signal before the energy saving mode is turned ON. → 9.1 Memory allocation (P.31) |
| | Unsuitable spec. | Check if the controller's specifications are appropriate, the power supply is suitable and the controller is compatible with the actuator. | Take appropriate measures according to this manual. → 3. Specifications (P.12) |
| | Signal timing | Check the timing of the signal from the PLC to the controller. | Set the interval time between signals to more than twice the communication cycle time, when the signals are to be continuously input, because PLC processing delays and controller scanning delays can occur. → 11.4 Controller input signal response time (P.50) |
| | SVON time | Check if the electric actuator is operated when the SVRE output is turned on after the SVON input is turned on. | When power is applied, it may take up to 10 seconds (max. 20 sec.) from SVON input to SVRE output depending on the electric actuator position. Command an operation after SVRE output is turned ON. |
| | Alarm condition | Is controller alarm generated? | Refer to the controller operation manual, and take appropriate measures based on the operation manual. → 15. Alarm for Motor Control (P.64). |

| | | | |
|---|------------------------------------|---|--|
| The actuator does not move to the correct position. | Incorrect origin position | If it is a pushing operation, repeat return to origin operations several times to check if the actuator returns to the origin correctly. Perform the Return to Origin position operation several times to check the Origin position. | Take measures to make the actuator operate normally (remove foreign matter that interferes with the actuator movement, etc.) |
| | Incorrect parameters | Check that the parameter values are appropriate and the program is correct. Review the maximum speed, the maximum acceleration and the maximum deceleration of the actuator. | Modify the parameters and test the operation. → <u>10. Settings and Data Entry (P.42)</u> |
| | Unsuitable specification | Check if the controller's specifications are appropriate, the power supply is suitable and the controller is compatible with the actuator. | Take appropriate measures according to this manual. → <u>3. Specifications (P.12)</u> |
| The actuator does not move correctly. | Incorrect wiring | Is the wiring connected correctly? Refer to the controller operation manual to confirm wiring, and check for broken wires and short-circuits. | Correct the wiring so that the input/output of each signal is performed appropriately. → <u>5. External Connections (P.22)</u> → <u>9.1 Memory allocation (P.31)</u> |
| | Unsuitable specification | Check if the controller's specifications are appropriate, the power supply is suitable and the controller is compatible with the actuator. | Take appropriate measures according to this manual. → <u>3. Specifications (P.12)</u> |
| | Signal timing | Check the timing of the signal from the PLC to the controller. | Set the interval time between signals to more than twice the communication cycle time, when the signals are to be continuously input, because PLC processing delays and controller scanning delays can occur. → <u>11.4 Controller input signal response time (P.50)</u> |
| | Data not stored correctly | Check whether data (step data, parameter) is written correctly. Do not turn OFF the controller input power or remove the cable while data is being written (green light flashing). | Input correct data (step data, parameter) again and confirm operation. → <u>3.2 Parts Description (P.13)</u> → <u>10. Settings and Data Entry (P.42)</u> |
| Speed not achieved | Incorrect parameters | Check that the parameter values are correct. Review the maximum speed and the maximum acceleration of the actuator. | Modify the values of the parameters and test the operation. → <u>10. Settings and Data Entry (P.42)</u> |
| | Operation pattern is not suitable. | Check if a trapezoidal acceleration/deceleration is programmed for the actuator operation. In case of such operation, the actuator may start slowing down before it reaches the maximum speed. | Modify the setting to make the moving distance longer or the acceleration larger. → <u>10. Settings and Data Entry (P.42)</u> |

| | | | | |
|---|--------------------|--------------------------|--|--|
| 5 | Speed not achieved | Unsuitable specification | Check if the controller's specifications are appropriate, the power supply is suitable and the controller is compatible with the actuator. | Take appropriate measures according to this manual. → <u>3. Specifications (P.12)</u> |
| | | Voltage drop | Check for a temporary voltage drop in the power supply? (If there is a temporary voltage drop in the power supply, the EMG terminal of CN1 power connector will turn OFF so the actuator will stop. However, this stop will be released when the voltage recovers.) | There is a possibility of a momentary voltage drop because the capacity of the power supply is insufficient, or if the power supply is "inrush-current control" type. If necessary, replace the power supply. → <u>3. Specifications (P.12)</u> |

20. Handling of sent/received data

There are three types of data, 1byte data, 2bytes data and 4bytes data.

Specifically, handling of 2bytes data, 4bytes data and negative data is explained below.

(1) 2bytes data

Please note following examples for 2 bytes data including speed, acceleration, and deceleration.

E.g.) Output data "speed": When inputting 100mm/s data to Byte6 and Byte7.

100mm/s is 0064h in hexadecimal.

00 64 h data is as shown below.

| Speed | |
|-------|------|
| Byte6 | 00 h |
| Byte7 | 64 h |
| Bit7 | Bit0 |

(2) 4bytes data

"Please note following example for 4 bytes data including position.

E.g.) Output data "position": When inputting 700.00mm data to Byte8 to Byte11.

"Position" is based on the unit by 0.01mm.

The value to express 700.00 mm is 70000 in decimal number, and 00011170h in hexadecimal.

Sending of **00 01 11 70 h** data is as shown below.

| Position | |
|----------|------|
| Byte8 | 00 h |
| Byte9 | 01 h |
| Byte10 | 11 h |
| Byte11 | 70 h |
| Bit7 | Bit |

(3) Negative value data

"Please note following example for negative value data.

In the example, 4bytes negative value data is explained.

E.g.) Output data "position": When inputting -700.00mm (negative value) to Byte8 to Byte11.

"Position" is based on the unit by 0.01mm.

Negative values are expressed using two's complement notation.

The value to express -700.00mm is -70000 in decimal number, and FFFEEE90h in hexadecimal.

Sending of **FF FE EE 90 h** data is as shown below.

| Position | |
|----------|------|
| Byte8 | FFh |
| Byte9 | FEh |
| Byte10 | EEh |
| Byte11 | 90 h |
| Bit7 | Bit0 |

21. Definitions and terminology

The major terminology used in this Operation Manual is stated below.

| | Terminology | Definition |
|---|--------------------------|---|
| C | Communication speed | Data transmission speed of a network such as a Fieldbus network. The speed is determined by upper devices (PLC etc.). The unit is bit per second (bps). |
| | Communication cycle time | This is a cycle of sending data from masters to slaves (JXCPH controller). |
| D | Device name | An arbitrary name assigned by the user to the PROFINET slave. Every node on the PROFINET network should have a unique name. |
| E | Ethernet | The most commonly used LAN technology that was standardized by IEEE802.3 |
| F | Fieldbus | An industrial communication system, which uses a defined protocol to transfer data between devices on a network. A typical automation system will use a fieldbus network to exchange data between a PLC master and the actuators/sensors. |
| G | GSDML file | Allows a device to be configured for a PROFINET network, using PLC setting software. The file describes data exchange, device information and supported PROFINET features. |
| I | IP address | A unique address that identifies a device on a network. It is referred to as a logical address while the MAC address is known as a physical address. |
| M | MAC address | This is a physical address, which is uniquely assigned to any hardware device on a network. This address is permanently written to the device before shipment. |
| | MRP | Media Redundancy Protocol Performs fast switching to a redundant communication route, when a problem occurs within a Ring network. |
| P | PLC | Abbreviation of Programmable Logic Controller, a digital computer used for automation of electromechanical processes. |
| T | Topology | Connection configuration of the Fieldbus network Expresses how each terminal and control components are connected. The typical topology is star type, linear type and ring type. |

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| Revision history |
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