No. DOC1066918-2

Operation Manual

PRODUCT NAME

Manifold Controller for electric actuators

MODEL / Series / Product Number

JXD1-M*

SMC Corporation

Table of Contents

JXD1-M∗/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 and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1:Robots
etc.

⚠ **Danger**	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ **Warning**	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ **Caution**	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate 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. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.
1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

JXD1-M∗/Controller
1. Safety Instructions

⚠ Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in a manufacturing industry.
Use in non-manufacturing industries is not covered.
Products SMC manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.
The new Measurement Act in Japan prohibits use of any units other than SI units.

Limited warranty and Disclaimer/Compliance Requirements

The product 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 occurs 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.

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 export of SMC products or technology from one country to another are governed by the relevant security laws and regulations 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.

2. Outline of Product

2.1 Features

Features of the controller.

●Up to 16 axes can be connected
By connecting driver units, actuators for up to 16 axes can be connected and controlled.

●Easy registration of connected actuators
The controller setup software "ACT-Connected" makes it easy to register initial settings for each actuator. Test operation and status monitoring are also available.

●Operating temperature range 0 to 55°C
The controller can be operated in an ambient temperature up to 55°C.

●Reduced footprint
Compared to the conventional single-axis controller (for 16 axes), the size has been reduced by approximately 80%.

●Fanless design (no cooling fan)
No fan replacement or maintenance is required.

●Cables, etc. can be attached from the front.
All connectors, connection screws, and controller body mounting screws (including DIN rail fixing screws) are accessible from the front of the controller, reducing setup and maintenance man-hours.

●Predictive maintenance function
A warning signal is output when the accumulated instruction count or travel distance reaches the specified value.

●Operation mode is selectable
Operation mode by I/O control, numerical control, etc. can be selected as required.

●Connects to host devices via various communication Protocols
The controller can be connected to a PLC with various communication Protocols to operate and read/write information.

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

●Specified force operation
Control the pushing force or the pressing force of the actuator.

●Separate Power Supply Inputs
The power input is separated into two systems: motor power and control power. When the control power is on while the motor power is off, the encoder can communicate with a PLC or a PC connected via USB without losing position information.

●Alarm detection function
Detects abnormal conditions and outputs them to a PLC or PC.
Alarms are stored in the controller internal memory.

●Positioning/Pushing operation is possible using step data indication or numerical indication
Actuators can be operated using step data instructions or numerical instructions from a PLC.
Step data-directed operation is a method of providing operation instructions by operating the memory corresponding to the input/output port of the DRIVE signal, INP signal, etc.
Numeric-directed operation is a method of providing motion instructions by specifying positions and speeds numerically.

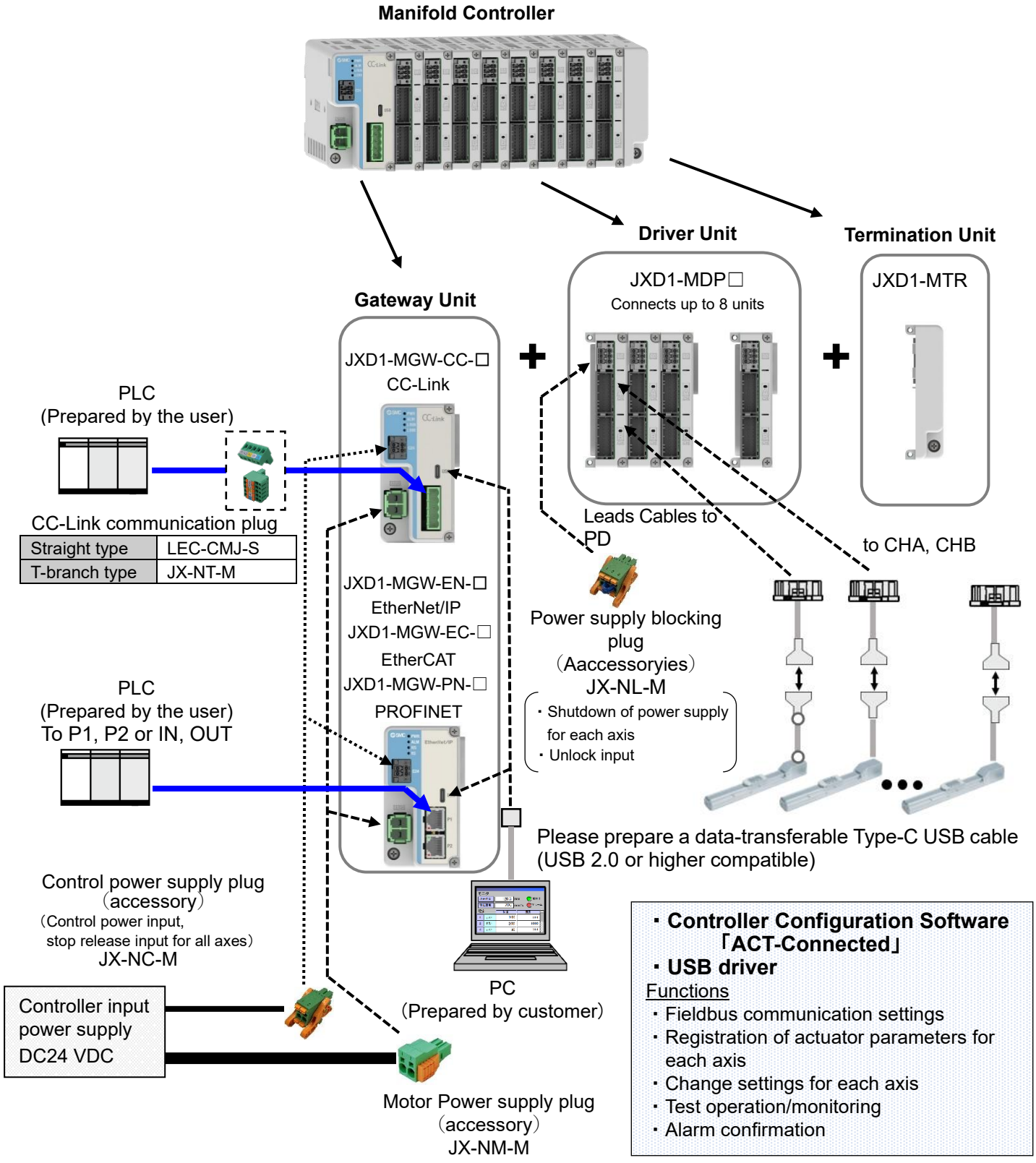
●Area output function

When the actuator position is within the position range specified by the step data "Area 1" and "Area 2," the memory corresponding to the area output signal of the host device turns ON.

⚠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, controller setting software at installation and fault finding. Keep this operation manual accessible for reference.

⚠Caution
Operating the product in a manner not described in the instruction manual may result in product failure, malfunction, or accident. Please confirm the contents of the instruction manual before operating this product.

2.2 Product configuration



- **Controller Configuration Software 「ACT-Connected」**
- **USB driver**

Functions

- Fieldbus communication settings
- Registration of actuator parameters for each axis
- Change settings for each axis
- Test operation/monitoring
- Alarm confirmation

The control power supply and motor power supply should be common and use a power supply with a capacity greater than the required power supply capacity. The control power supply current should be control power supply (C24) = 2 A or lessmax. and motor power supply (M24) = 38 A or lessmax., for a total of 40 A or lessmaximum.
Install an overcurrent protection device on the primary side of the 24 VDC controller input power supply in accordance with IEC 60204-1 (JIS B 9960-1).
For details, refer to section **3.6 Power Supply.**

To calculate the power and current consumption of the Manifold Controllers and actuators, and to download the configuration software, available on our website.
https://www.smcworld.com

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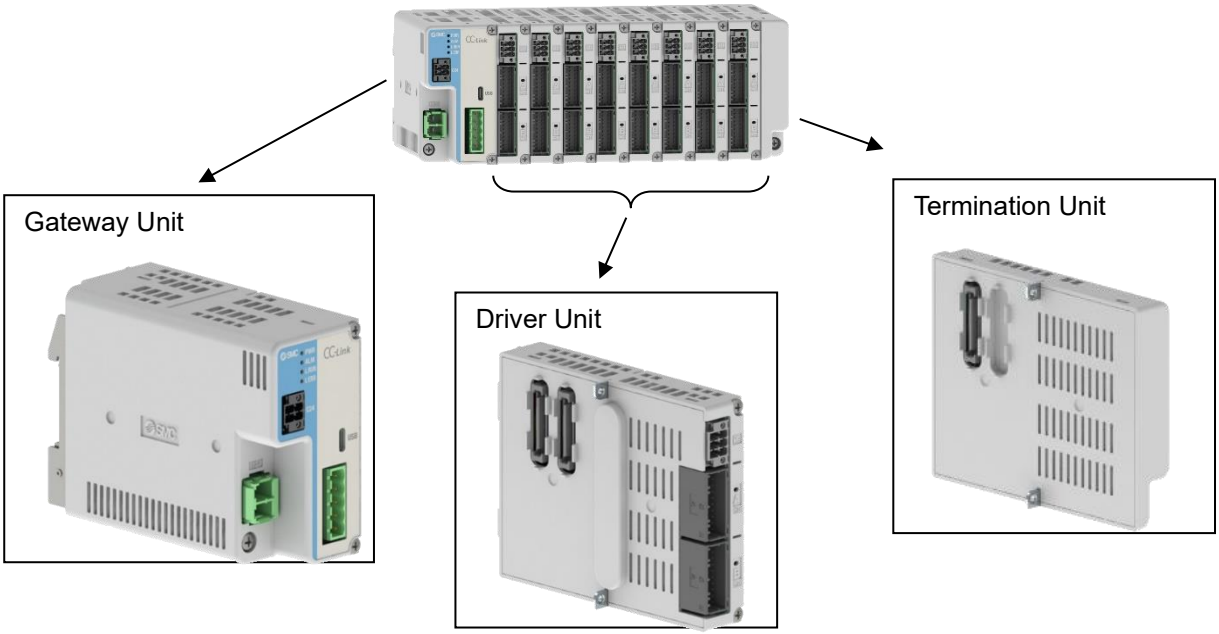
2.3 How to order

Describes how to indicate the type and number of units to make up the Manifold Controller.



■Gateway Unit

JXD1–MGW–□□-□ □ □ □

Communication Protocol

CC	CC-Link
EN	EtherNet/IP
EC	EtherCAT
PN	PROFINET

Mounting method

7	Direct mounting
8	DIN rail mounting

Communication port for setting

U	USB port (Type-C)

Termination Option

Nil	None
R	Termination unit included

Connector Option

Nil	None
S*	Straight type
T*	T-branch type

* CC-Link only

■Driver Unit

JXD1-MDP □

Number of axes

1	1 axis
2	2 axes

■Termination Unit

JXD1-MTR

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2.4 Accessories

Describes the accessories available.

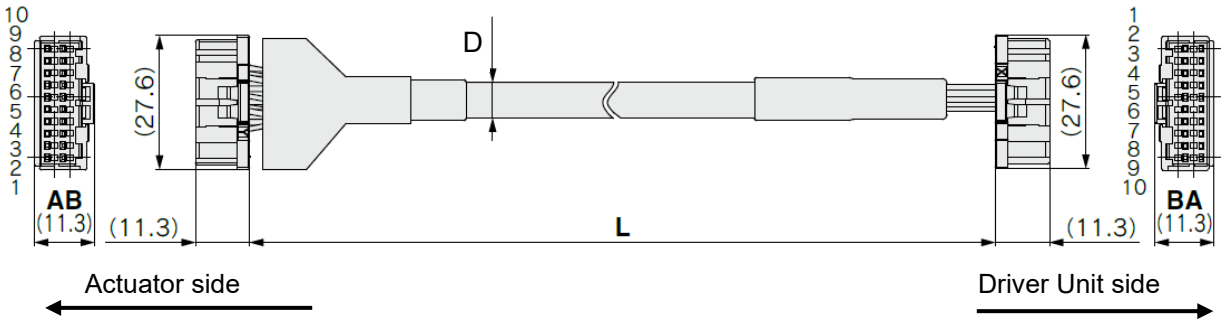
(1) Actuator cable (Common cable for actuator with/without lock)

JX – CP – D – □

Cable length (L)

Cable length(L)	L	D
1	1.5 m	8 mm
3	3 m	
5	5 m	
8	8 m	
A	10 m	
B*	15 m	11 mm
C*	20 m	

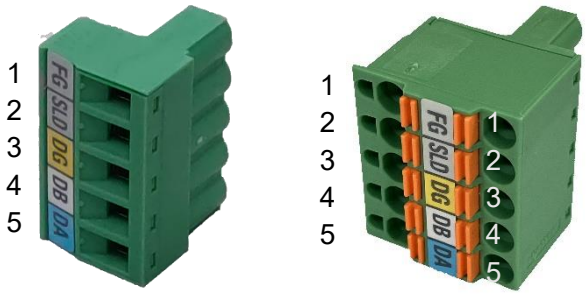
∗ Produced upon receipt of order



(2) CC-Link communication plug

Straight type
LEC-CMJ-S

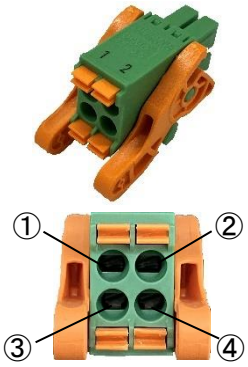
T-branch type
JX-NT-M



No.	Name	Function
1	FG	Frame Ground
2	SLD	CC-Link shield
3	DG	CC-Link Ground line
4	DB	CC-Link communication line B
5	DA	CC-Link communication line A

(3) Control power supply plug

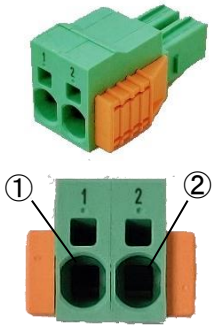
JX-NC-M



No.	Name	Function	Details
1	NC	Not used	Wiring prohibited
2	C24V	Control power supply (+)	(+) side of control power supply
3	FG	Frame Ground	Grounding terminal.
4	EMG	Release lock (+)	Connection terminal for external stop circuit for all-axes. ∗ When 24 VDC is input, stop of all axes is released. ∗ When open, stop all axes (deceleration).

(4) Motor power supply plug

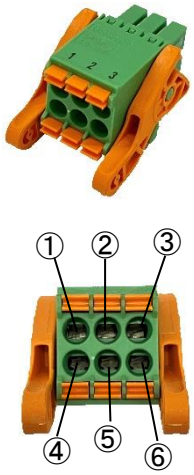
JX-NM-M



No.	Name	Function	Details
1	0V	Common power supply (-)	(-) side of M24V terminal / C24V terminal / EMG terminal (control power supply plug) / LKRLS terminal (motor power shutoff plug)
2	M24V	Motor power supply (+)	(+) side of Motor power supply

(5) Power supply blocking plug

JX-NL-M



No.	Name	Function	Details
1	LKRLS1	CH A Unlocking(+)	Connection terminal of lock release signal for CH A.
2	M24VIN1	Power supply input of CH A	Input terminal of Motor power supply for CH A. ∗ When open, Turns off the motor power supply for CH A
3	M24VOUT1	Power supply output of CH A	Output terminal of Motor power supply for CH A. ∗Connect to motor power input terminal for CH A and supply power to CH A.
4	LKRLS2	CH B Unlocking(+)	Connection terminal of lock release signal for CH B.
5	M24VIN2	Power supply input of CH B	Input terminal of Motor power supply for CH B. ∗ When open, Turns off the motor power supply for CH B
6	M24VOUT2	Power supply output of CH B	Output terminal of Motor power supply for CH B. ∗Connect to motor power input terminal for CH B and supply power to CH B.

∗Default of factory shipment

∗The following terminals of the Power supply blocking plug are connected as the default of factory shipment.
-Between M24VIN1 terminal (②) and M24VOUT1 terminal (③)
-Between M24VIN2 terminal (⑤) and M24VOUT2 terminal (⑥)

Please see **7.3 Details of power supply blocking plug** for details.

3. Specifications

3.1 Specifications

3.1.1 Basic product specifications

Item	Specifications
Power supply voltage	24 VDC ±10%
Current consumption *1)	Determined by unit configuration, actuator type and number of axes connected (refer to the "Electric Actuator Selection Software" on the SMC website)
Number of control axes	16 axes maximum (max. 8 driver units can be connected)
Applicable Encoders	Batteryless Absolute
Configuration Unit	Gateway unit, Driver unit (for 1 or 2 axes), Termination Unit
Communication with PC	USB (Type C)／Connected to gateway unit
Stop input	Gateway unit: Stop input for all axes Driver unit: power supply disconnect for each axis
Protection function	Overcurrent, overspeed, encoder disconnection, overload, temperature abnormality
Predictive maintenance function	Cumulative number of movement instructions, Cumulative distance travelled, Check life of electrolytic capacitors
Operating temperature range [°C]	0 to 55 (no freezing)
Operating humidity range [%RH]	35 to 85 (no condensation)
Insulation resistance	50 MΩ (500 VDC) between external terminals and case
Protection class	Equivalent to IP20
Cooling method	Air-cooled, no fan
Installation method	DIN rail (35 mm), Direct mounting

∗1) Lock current consumption is added to the motor power supply when a locking actuator is used.

3.1.2 Gateway Unit specifications

(1) Gateway Unit specifications (CC-Link)

Item			Specifications
Type			JXD1-MGW-CC-☐
Control power current consumption (gateway unit only) ∗1			Less than 350 [mA]
Communication	Applicable system	Protocol	CC-Link
		Version *1)	Ver 1.10、Ver2.00
	Communication speed		156k, 625k, 2.5M, 5M, 10M [bps]
	Configuration file *2)		CSP+ file
	Occupied area		2 stations, 4 stations
	Termination Resistor		Not included
LED indication			PWR, ALM, L RUN, L ERR
Accessories			Control power supply plug x1, Motor power supply plug x1
Weight			Less than 250 [g]

∗1) Please note that the version information is subject to change.

∗2) Configuration files can be downloaded from the SMC website. (**https://www.smcworld.com**)

(2) Gateway Unit specifications (EtherNet/IP)

Item			Specifications
Type			JXD1-MGW-EN-☐
Control power current consumption (gateway unit only)			Less than 350 [mA]
Communication	Applicable system	Protocol	EtherNet/IP™ *3)
		Version *1)	CT19
	Communication speed		10/100 [Mbps] (Auto-negotiation)
	Configuration file *2)		EDS file
	Occupied area		Input / Output : 18 bytes ～ 272 bytes (16 bytes + 2 bytes x 1axis ～ 16 bytes + 16 bytes x 16 axes)
LED indication			PWR, ALM, MS, NS
Accessories			Control power supply plug x1, Motor power supply plug x1
Weight			Less than 250 [g]

∗1) Please note that the version information is subject to change.
∗2) Configuration files can be downloaded from the SMC website. (**https://www.smcworld.com**)
∗3) For EtherNet/IP™, use shielded CAT5 cable or better.

■Regarding Trademarks
EtherNet/IP™ is a trademark of ODVA.

(3) Gateway Unit specifications (EtherCAT)

Item			Specifications
Type			JXD1-MGW-EC-☐
Control power current consumption (gateway unit only)			Less than 350 [mA]
Communication	Applicable system	Protocol	EtherCAT *3
		Version *1)	Conformance Test Record Ver.1.2.9
	Communication speed		100[Mbps] (Auto-negotiation)
	Configuration file *2)		ESI file
	Occupied area		Input / Output : 18 bytes ～ 272 bytes (16 bytes + 2 bytes x 1axis ～ 16 bytes + 16 bytes x 16 axes)
LED indication			PWR, ALM, ERR, RUN
Accessories			Control power supply plug x1, Motor power supply plug x1
Weight			Less than 250 [g]

∗1) Please note that the version information is subject to change.
∗2) Configuration files can be downloaded from the SMC website. (**https://www.smcworld.com**)
∗3) For EtherCAT, use shielded CAT5 cable or better.

■Regarding Trademarks
EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

(4) Gateway Unit specifications (PROFINET)

Item			Specifications
Type			JXD1-MGW-PN-☐
Control power current consumption (gateway unit only)			Less than 350 [mA]
Communication	Applicable system	Protocol	PROFINET *3
		Version *1)	Ver. 2.44
	Communication speed		100[Mbps] (Auto-negotiation)
	Configuration file *2)		GSDML file
	Occupied area		Input / Output : 18 bytes ～ 272 bytes (16 bytes + 2 bytes x 1axis ～ 16 bytes + 16 bytes x 16 axes)
LED indication			PWR, ALM, SF, BF
Accessories			Control power supply plug x1, Motor power supply plug x1
Weight			Less than 250 [g]

∗1) Please note that the version information is subject to change.
∗2) Configuration files can be downloaded from the SMC website. (**https://www.smcworld.com**)
∗3) For PROFINET, use shielded CAT5 cable or better.

■Regarding Trademarks
PROFINET is a registered trademark of PROFIBUS Nutzerorganisation e.V.

3.1.3 Driver Unit

Item	Specifications	
Type	JXD1-MDP1	JXD1-MDP2
Connecting actuator	LE2∗ Series	
Actuator cable length	Less than 20 [m]	
Control power consumption current (driver unit only)	Less than 200 [mA]	Less than 200 [mA]
Number of control axes	1 axis	2 axes
LED indication	Indicated by the servo motor is ON (green), ALARM (red) *1)	
Accessories	Power supply blocking plug x1	
Weight	Less than 180 [g]	Less than 200 [g]

∗1) 2-colour LED for each axis

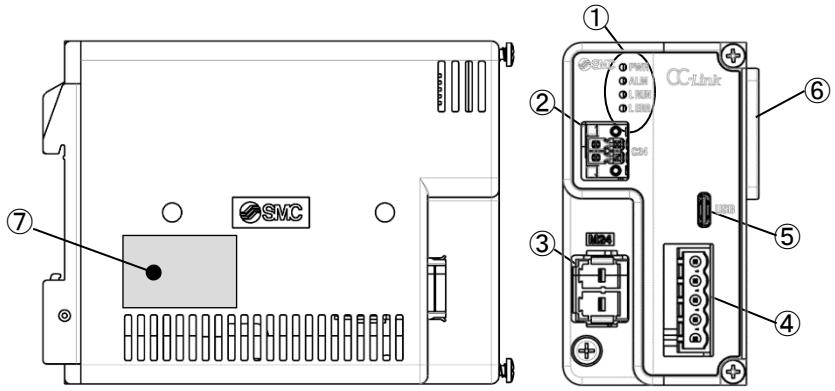
3.1.4 Termination Unit

Item	Specifications
Type	JXD1-MTR
Weight	Less than 100 [g]

3.2 Gateway Unit

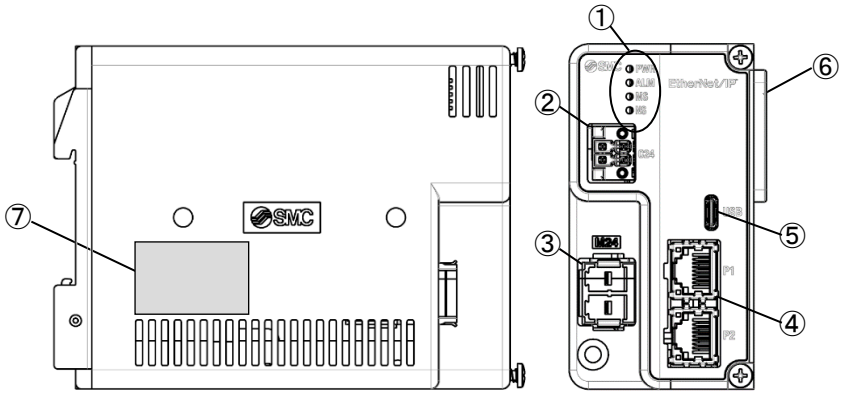
3.2.1 Details

(1) CC-Link



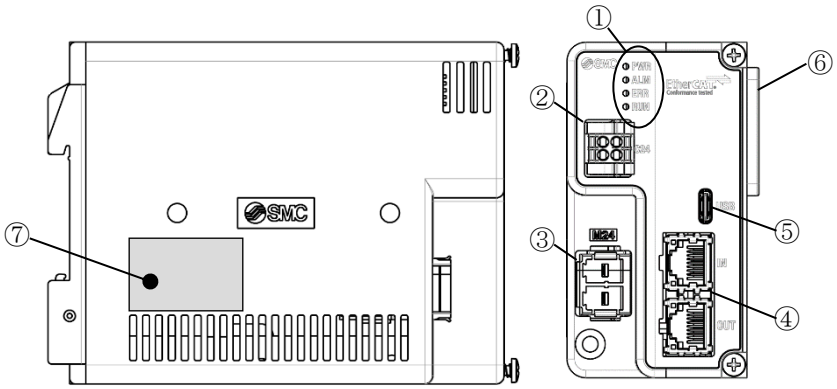
No.	Display	Name	Details
1	PWR	LED	Indicates Power-on and EEPROM write status
	ALM		Indicates Controller alarm status
	LRUN		Indicates CC-Link communication status
	LERR		Indicates CC-Link error status.
2	C24	Control power supply connector	Connector for the controller power supply.
3	M24	Motor power supply connector	Connector for the power supply of the actuator.
4	-	CC-Link communication connector	Connector for the CC-Link communication.
5	USB	USB connector	USB connector (Type-C) for connection to a PC.
6	-	Connector for unit-to-unit connection	Connectors between units.
7	-	Nameplate	A nameplate label with product information.

(2) EtherNet/IP



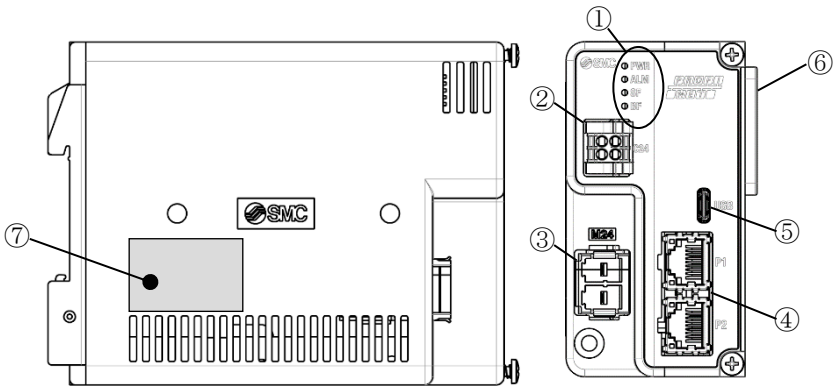
No.	Display	Name	Details
1	PWR	LED	Indicates Power-on and EEPROM write status
	ALM		Indicates Controller alarm status
	MS		Indicates EtherNet/IP controller status.
	NS		Indicates EtherNet/IP communication status.
2	C24	Control power supply connector	Connector for the controller power supply.
3	M24	Motor power supply connector	Connector for the power supply of the actuator.
4	P1	EtherNet/IP communication connector	Connector for the EtherNet/IP communication. 10 /100 Mbps With LED indicators.
	P2		
5	USB	USB connector	USB connector (Type-C) for connection to a PC.
6	-	Connector for unit-to-unit connection	Connectors between units.
7	-	Nameplate	A nameplate label with product information.

(3) EtherCAT



No.	Display	Name	Details
1	PWR	LED	Indicates Power-on and EEPROM write status
	ALM		Indicates Controller alarm status
	ERR		Indicates an EtherCAT error condition.
	RUN		Indicates EtherCAT communication status.
2	C24	Control power supply connector	Connector for the controller power supply.
3	M24	Motor power supply connector	Connector for the power supply of the actuator.
4	IN	EtherCAT communication connector	Connector for the EtherCAT communication. LEDs indicating Link/Activity are included.
	OUT		
5	USB	USB connector	USB connector (Type-C) for connection to a PC.
6	-	Connector for unit-to-unit connection	Connectors between units.
7	-	Nameplate	A nameplate label with product information.

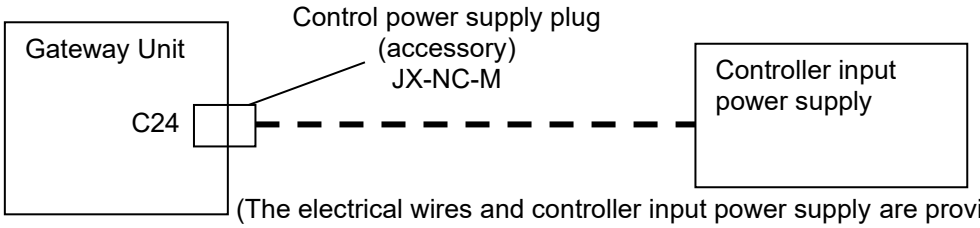
(4) PROFINET



No.	Display	Name	Details
1	PWR	LED	Indicates Power-on and EEPROM write status
	ALM		Indicates Controller alarm status
	SF		Indicates PROFINET controller status.
	BF		Indicates PROFINET communication status.
2	C24	Control power supply connector	Connector for the controller power supply.
3	M24	Motor power supply connector	Connector for the power supply of the actuator.
4	P1	PROFINET communication connector	Connector for the PROFINET communication. LEDs indicating Link/Activity are included.
	P2		
5	USB	USB connector	USB connector (Type-C) for connection to a PC.
6	-	Connector for unit-to-unit connection	Connectors between units.
7	-	Nameplate	A nameplate label with product information.

3.2.2 External Connections

(1) Control power supply connector
Connect using the plug supplied.



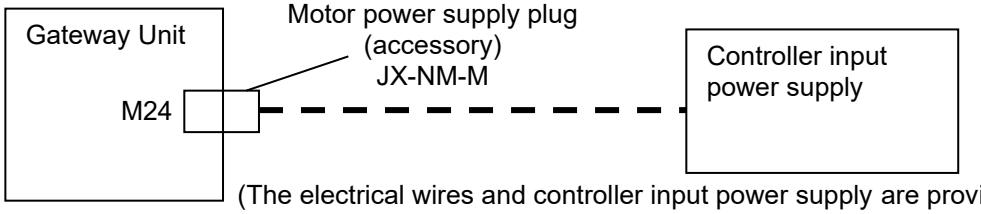
(The electrical wires and controller input power supply are provided by the user).

For more information, refer to section **7.1 Details of control power supply plug**.

⚠ Caution

Use a power supply other than the inrush current suppression type for the controller input power supply.
For details, refer to section **3.6 Power Supply.**

(2) Motor power supply connector
Connect using the plug supplied.



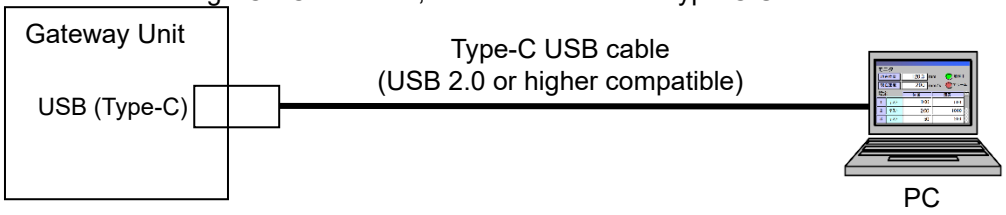
(The electrical wires and controller input power supply are provided by the user).

For more information, refer to section **7.2 Details of motor power supply plug**.

⚠ Caution

Use a power supply other than the inrush current suppression type for the controller input power supply.
For details, refer to section **3.6 Power Supply.**

(3) USB connector (USB Type-C)
When using ACT-Connected, a data-transferable Type-C USB cable can be used to connect to a PC.

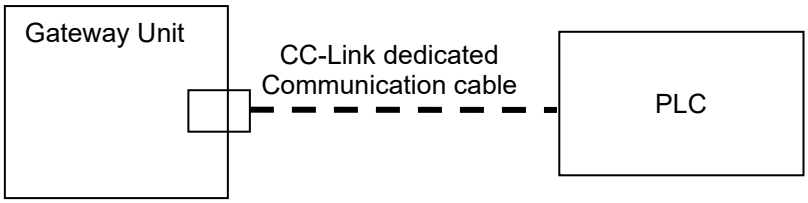


(The PC and USB cable should be provided by the user.)

⚠ Caution

When connecting cables, do not allow foreign objects to get caught in the connector insertion opening.
Please use a data-transferable Type-C USB cable.

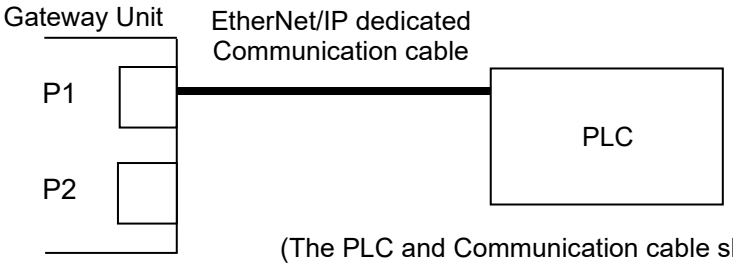
(4) CC-Link communication connector



(The PLC and Communication cable should be provided by the user).

For more information, refer to section **7.5 Details of CC-Link communication plug .**

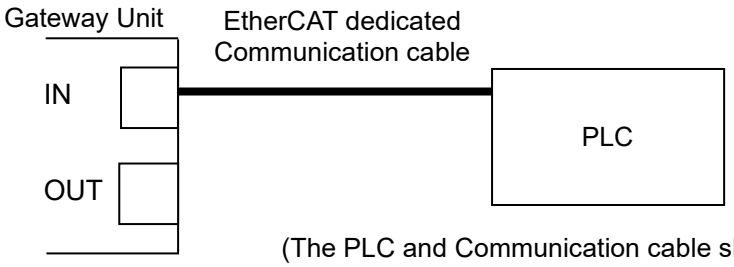
(5) EtherNet/IP communication connector



(The PLC and Communication cable should be provided by the user).

∗ Connections to P1 and P2 can be made either way round.
Follow the EtherNet/IP communication topology for details.

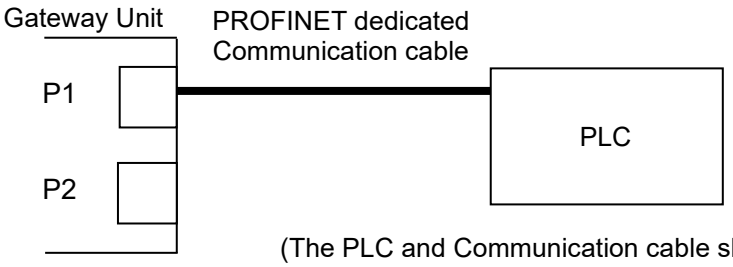
(6) EtherCAT communication connector



(The PLC and Communication cable should be provided by the user).

∗ Connect IN to the upper side (PC, PLC, etc.) and OUT to the lower side.
Follow the EtherCAT communication topology for details.

(7) PROFINET communication connector

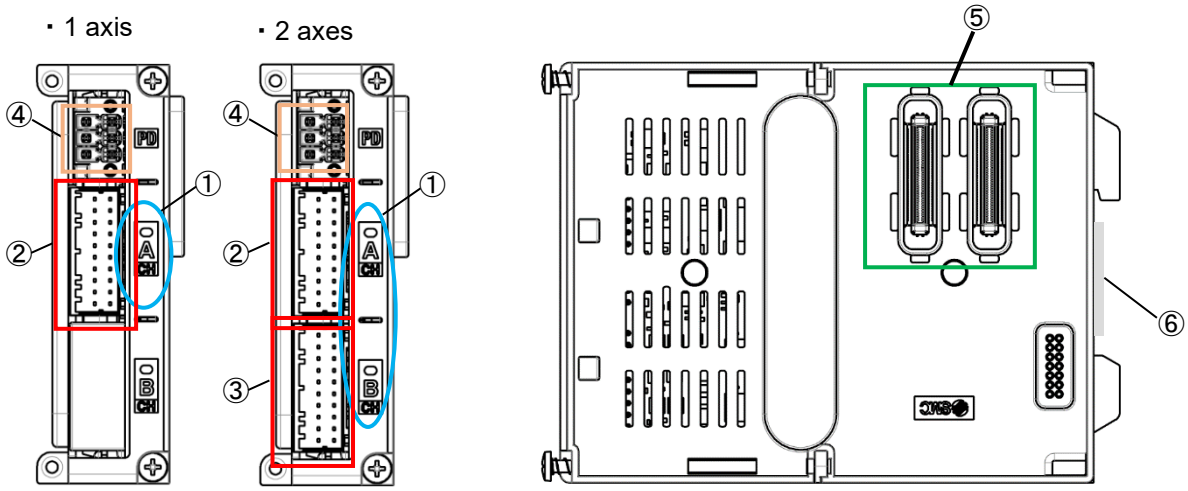


(The PLC and Communication cable should be provided by the user).

∗ Connections to P1 and P2 can be made either way round.
Follow the PROFINET communication topology for details.

3.3 Driver Unit

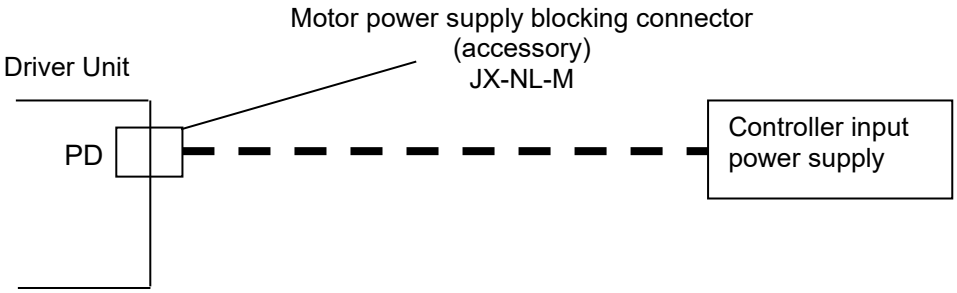
3.3.1 Details



No.	Display	Name	Details
1	CH A CH B	LED (Red / Green)	LED for status indication. A single two-colour LED indicates the servo motor is ON (green) and ALARM (red).
2	CH A	1st axis motor / Encoder connector	Connector for the actuator of the first axis.
3	CH B	2nd axis motor / Encoder connector	Connector for the actuator of the 2nd axis. (for 2-axis specification only).
4	PD	Motor power supply disconnect connector	Connector i used to connect the power supply shutdown contacts for each actuator. If necessary, connect a relay or other contact between the crossing wires.
5	-	Connector for unit-to-unit connection	Connectors between units.
6	-	Nameplate	A nameplate label with product information. (affixed on the back)

3.3.2 External Connections

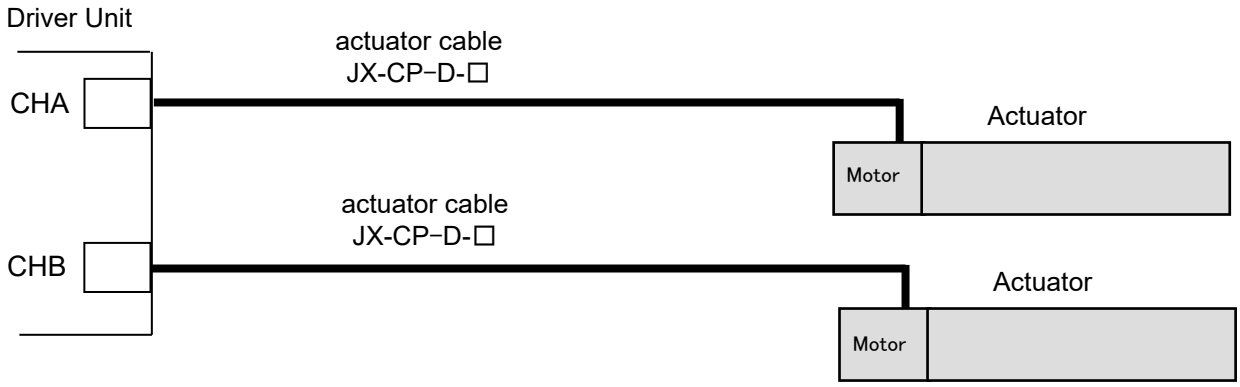
(1) Motor power supply blocking connector



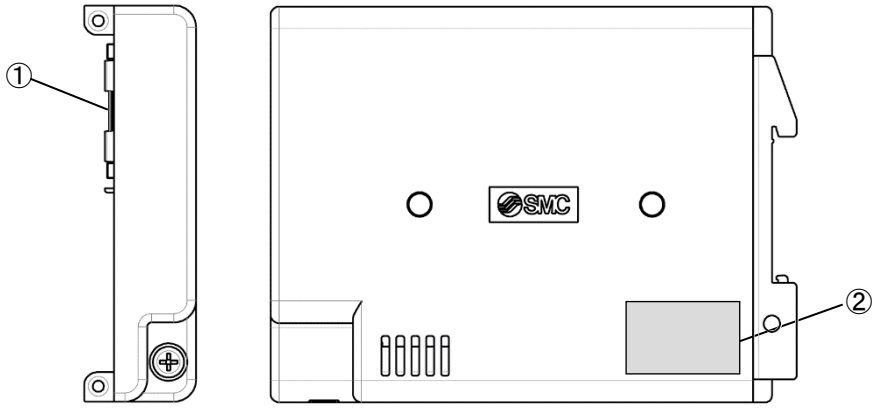
For more information, refer to section **7.3 Details of power supply blocking plug**.

(2) Motor / Encoder connector

Connect the controller and actuator using an actuator cable JX-CP-D-☐.



3.4 Termination Unit



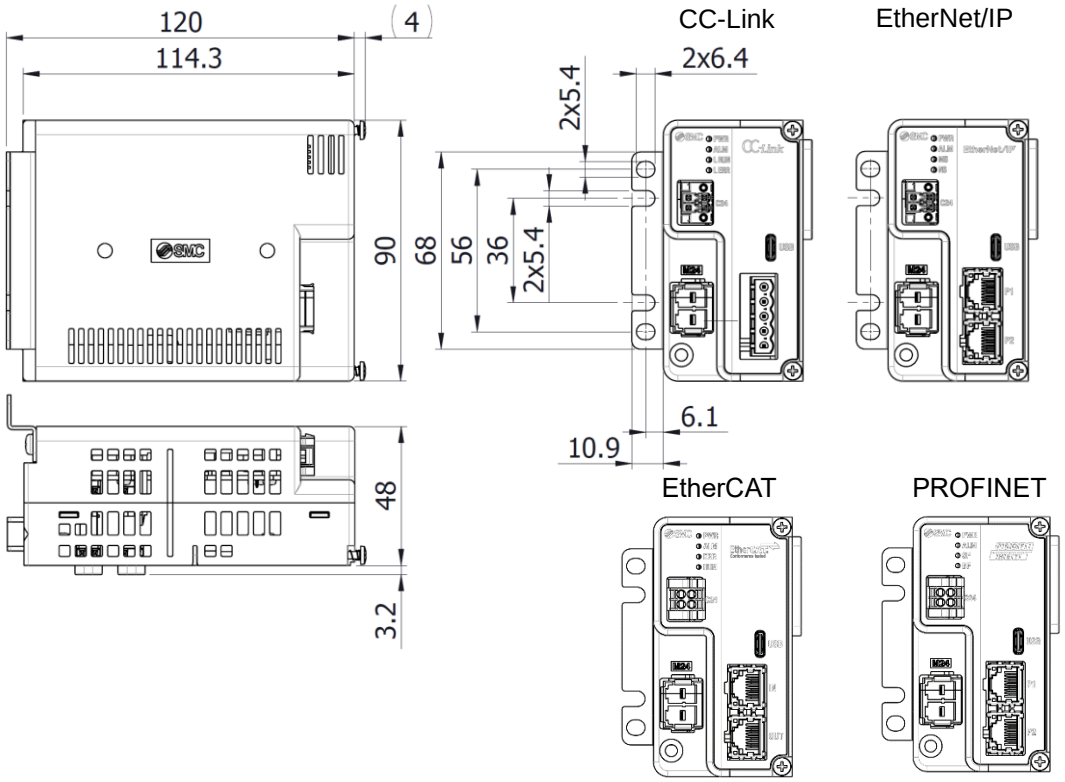
No.	Display	Name	Details
1	-	Connector for unit-to-unit connection	Connectors between units.
2	-	Nameplate	A nameplate label with product information.

3.5 Outline dimensions

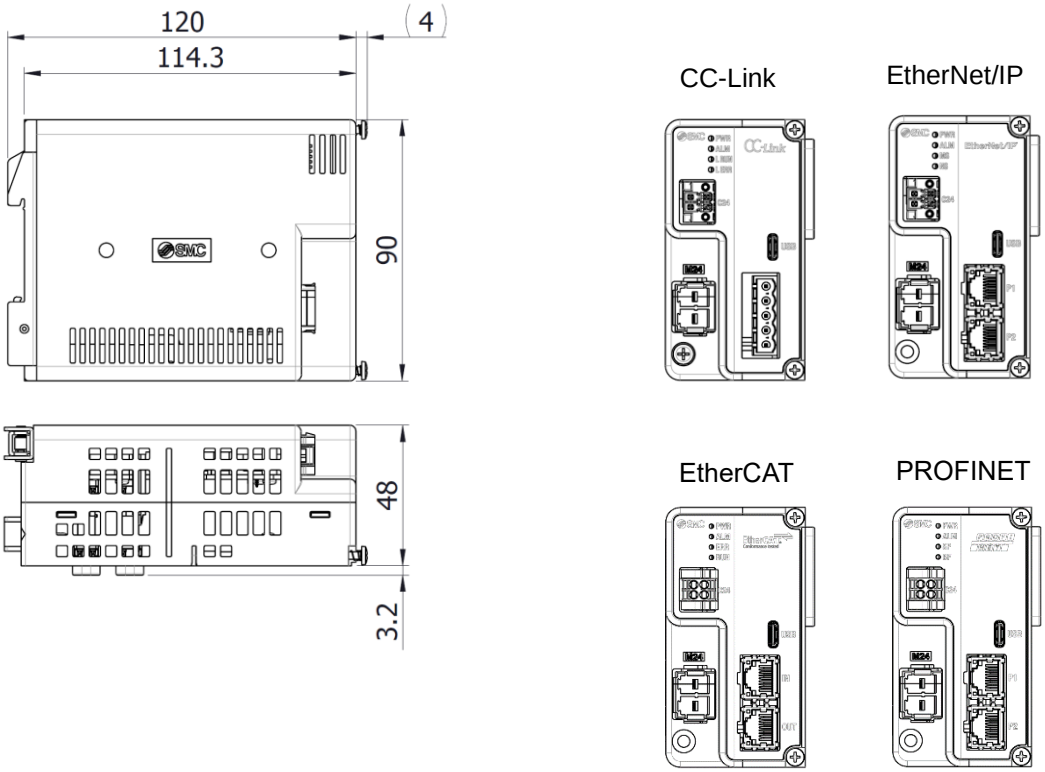
3.5.1 Unit dimensions

(1) Gateway Unit

●Direct mounting

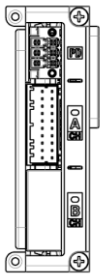


● DIN rail mounting

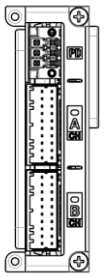


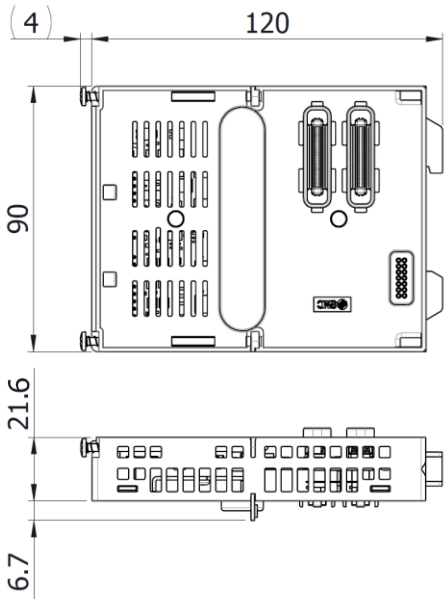
(2) Driver Unit

1 axis



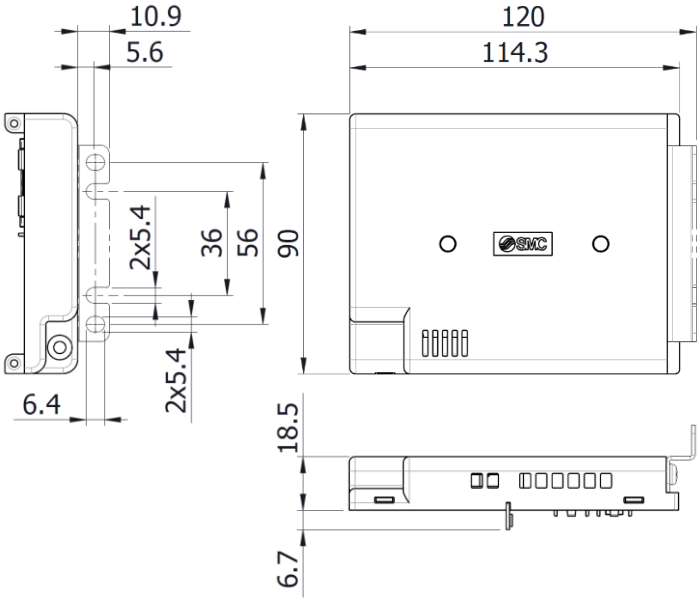
2 axes



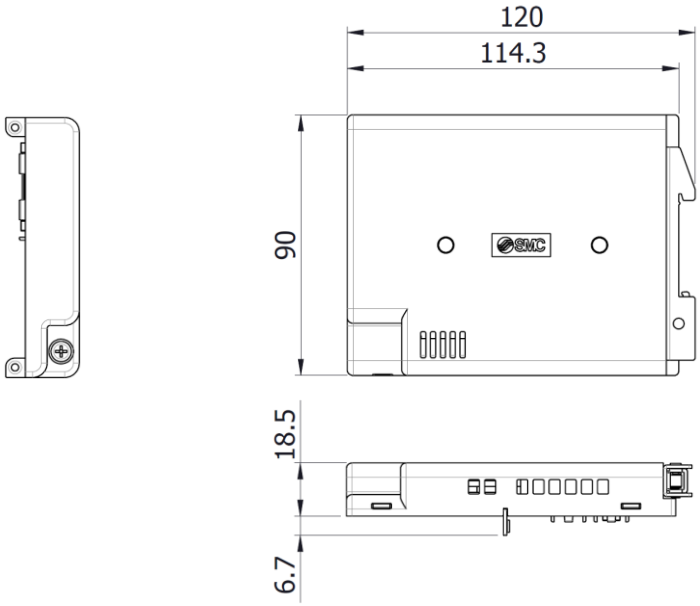


(3) Termination Unit

●Direct mounting

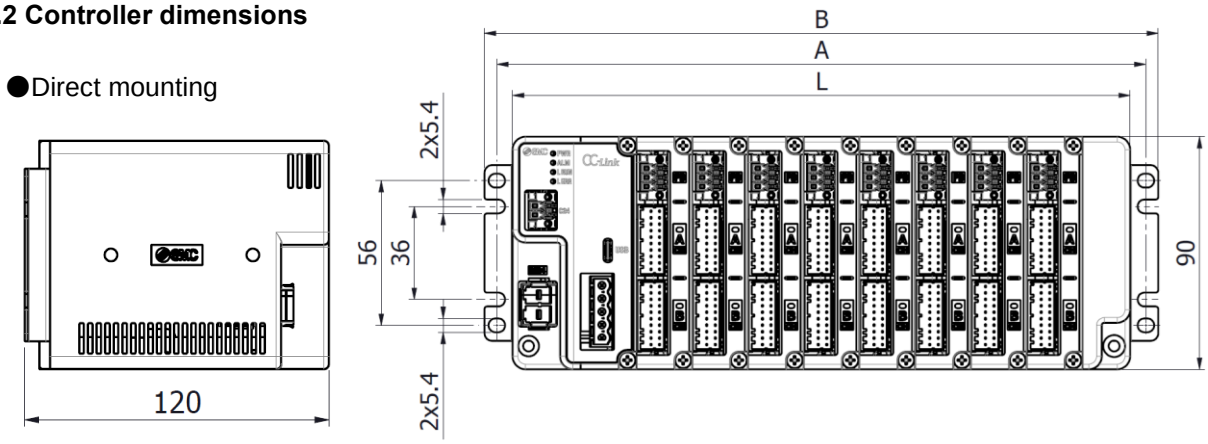


●DIN rail mounting

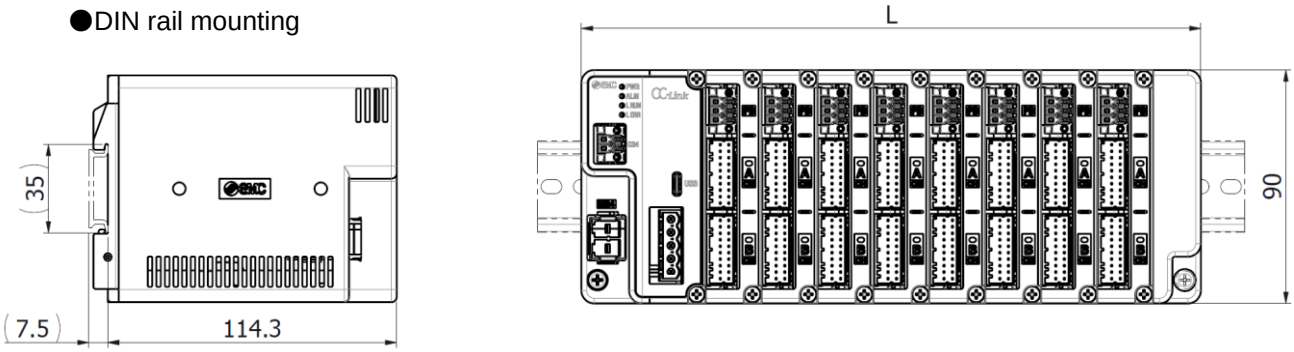


3.5.2 Controller dimensions

●Direct mounting



●DIN rail mounting



Number of Driver Units	1	2	3	4	5	6	7	8
L [mm]	88.1	109.7	131.3	152.9	174.5	196.1	217.7	239.3
A [mm]	100.3	121.9	143.5	165.1	186.5	208.3	229.9	251.5
B [mm]	109.9	131.5	153.1	174.7	196.3	217.9	239.5	261.1

3.6 Power supply

For controller power supply 24 VDC, use a power supply with a capacity greater than the required power supply capacity for both the control power supply and the motor power supply.
The required power supply capacity varies depending on the number of connected driver units and the number of connected axes.
When an actuator with a lock function is used, the required power supply capacity will increase due to the additional lock current consumption.

The current should be 40 A maximum for both control and motor power supplies.
(Control power supply (C24): 2 A max., power supply (M24): 38 A max.)

Please use a power supply unit other than the inrush current suppression type for the 24 VDC controller input power supply.

∗The Power consumption and current consumption can be checked using the "Electric Actuator Selection Software" on the SMC website.
https://www.smcworld.com

⚠ Warning

Install overcurrent protection equipment on the primary side of the power supply unit in accordance with IEC 60204-1 (JIS B 9960-1).

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.

4.1 Checking the package contents

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.

4.1.1 Gateway unit

Product name	Quantity
Gateway unit (JXD1-MGW-☐-☐)	1 pc.
Termination unit (JXD1-MTR) *1	1 pc.
Control power supply plug (JX-NC-M)	1 pc.
Motor power supply plug (JX-NM-M)	1 pc.
Straight type communication plug for CC-Link (LEC-CMJ-S) *1	1 pc.
T branch type communication plug for CC-Link (JX-NM-M) *1	
Direct mounting bracket (JX-SC-M) *1	2 pc.
DIN rail mounting bracket (JX-DR-M) *1	

*1 The accessories for the part number specified are included in the package.

Gateway unit

Termination unit

Control power supply plug

Motor power supply plug

Straight type communication plug for CC-Link

T branch type communication plug for CC-Link

4.1.2 Driver unit

Product name	Quantity
Driver unit (JXD1-MDP-☐)	1 pc.
Power supply blocking plug (JX-NL-M)	1 pc.

Driver unit

Power supply blocking plug

4.1.3 Options

Product name
DIN rail mounting bracket (JX-DR-M) *1
Direct mounting bracket (JX-SC-M) *1
Control power supply plug (JX-NC-M)
Motor power supply plug (JX-NM-M)
Power supply blocking plug (JX-NL-M)
Straight type communication plug for CC-Link (LEC-CMJ-S)
T branch type communication plug for CC-Link (JX-NM-M)
Actuator cable (JX-CP-D-☐)
Termination Unit (JXD1-MTR)

∗1 JX-DR-M and JX-SC-M is a part number for a set of two brackets with screws.

4.2 Unit Connection

Refer to section **5. Unit Connection** for instructions on how to assemble the controller.

4.3 Assembling the controller

Refer to section **6. Mounting** for instructions on how to assemble the controller.

4.4 Wiring the controller

Connect the cables to the controller.
Refer to section **7. Wiring** for the wiring of the connectors.

4.5 Connecting to the ACT-Connected software

Supply 24 VDC power (control and power supply).
Connect the controller to a PC.
Activate the ACT-Connected software.
After starting ACT-Connected, select "Setup" from the "Communication Port Selection" screen and write the parameters to the driver unit.
After setup is complete, go online.
When online, the controller's information is displayed in the list of connections.
∗Refer to the ACT-Connected instruction manual for setup procedures and online instructions.

⚠ Caution

After connecting an actuator, register the initial parameters of the actuator using the "ACT-Connected" configuration software.

4.6 Driver unit settings

4.6.1 Setting parameters

Set the parameters of the driver unit.
Refer to section **10. Driver unit settings**.

⚠ Caution

If the connection between the controller and actuator is not established, refer to section **15. Troubleshooting** to remove the cause of the problem.

4.7 Gateway unit settings

4.7.1 Setting parameters

Set the parameters of the gateway unit.
See below for information on setting parameters for each communication protocol.
●For CC-Link: section **9.2.1 Controller parameter setting**
●For EtherNet/IP: section **9.3.1 Controller parameter setting**
●For EtherCAT: section **9.4.1 Controller parameter setting**
●For PROFINET: section **9.5.1 Controller parameter setting**

4.7.2 PLC settings

Set the PLC parameters.
See below for PLC settings for each communication protocol.
●For CC-Link: section **9.2.2 Setting PLC parameters**
●For EtherNet/IP: **9.3.2 Hardware configuration**
●For EtherCAT: **9.4.2 Hardware configuration**
●For PROFINET: **9.5.2 Hardware configuration**

4.7.3 Operation mode setting

Set the operation mode related to the operation of the actuator.
Refer to section **9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)**.

⚠ Caution

If communication between the PLC and the controller is not established,
refer to section **15. Troubleshooting** to remove the cause of the problem.

4.8 Test run

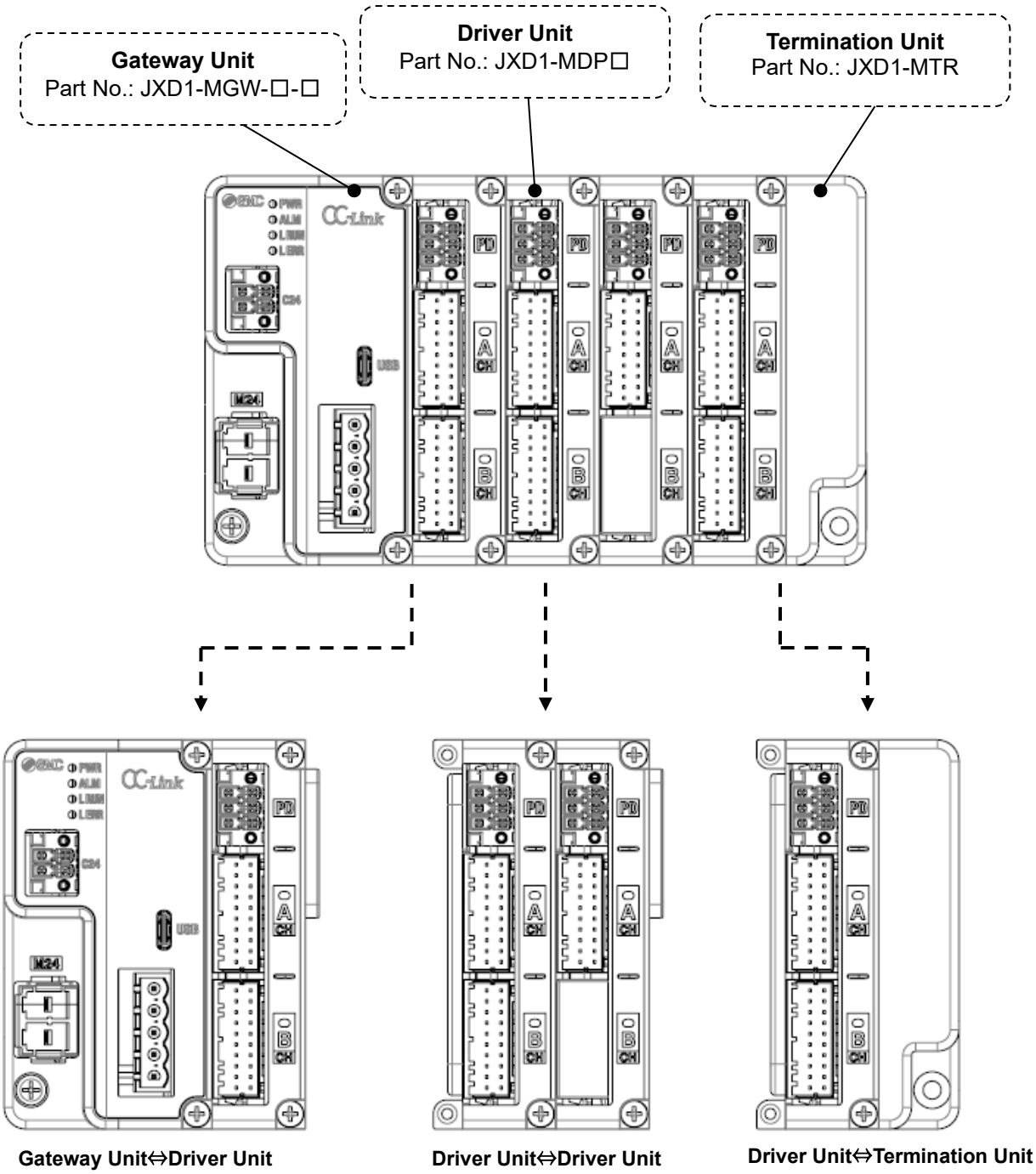
Input signals from the PLC for checking the operation.
For data area allocation, see below.
●Section **9.6.4 Data area of the PLC⇔Gateway Unit**
●Section **9.6.5 Data assignment details for each operation mode(CC-Link, EtherNet/IP, EtherCAT)**
●Section **9.6.6 Data assignment details for each operation mode(PROFINET)**

Refer to section **12. Operating Procedure** for the operation.

5. Unit Connection

5.1 Overview

This controller must comprise of three different units, a gateway unit, driver unit and termination unit.
The method of unit connection is identical regardless of the type of unit.
The configuration of the units in the controller is as follows.
1) Up to 8 driver units maximum.
2) Only one gateway unit and one termination unit.

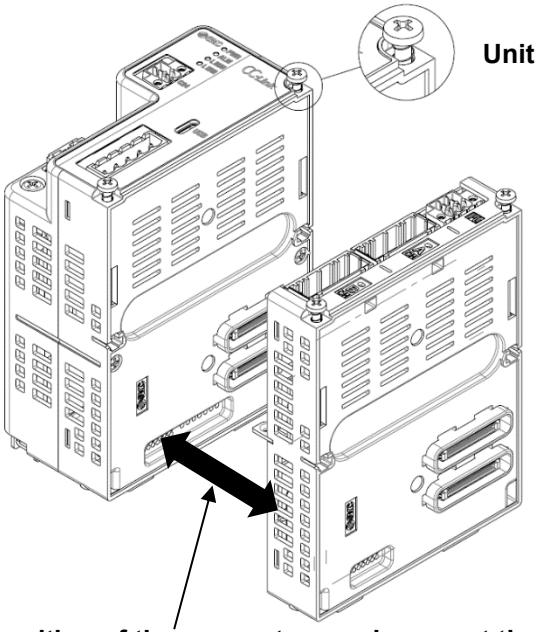


⚠ Warning
(1) When connecting the units, do not engage foreign objects. (2) Do not touch the connectors between units. (3) Do not connect or disconnect any units when the controller power is on.

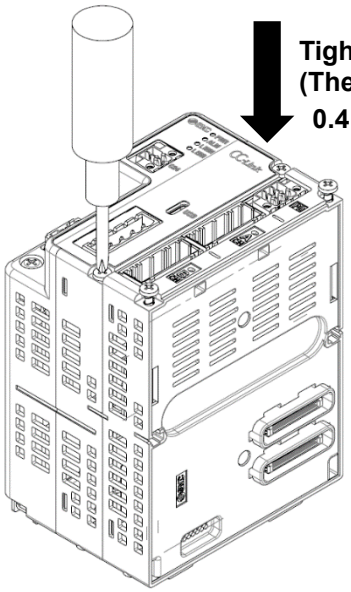
5.2 Connection Method

This controller connects units together in the same way, regardless of the type of unit.
The following is an example of a unit-to-unit connection when connecting a gateway unit ⇔ driver unit.

(1) After checking that the unit connection screws (2 places) are up, connect the units together while aligning the connectors.



(2) While pressing down the unit connection screws (2 places) from above, tighten the screws.



⚠ Caution

Please make sure that the screws have not been forgotten to be tightened after unit connection.
If the unit connection screws are not tightened correctly, the unit may be damaged by vibration.

If you forget to tighten the unit connecting screw, the unit connecting screw will be in a floating state.

If the unit connecting screw is correctly tightened, the unit connecting screw will be in the lowered position.

6. Mounting

6.1 Mounting

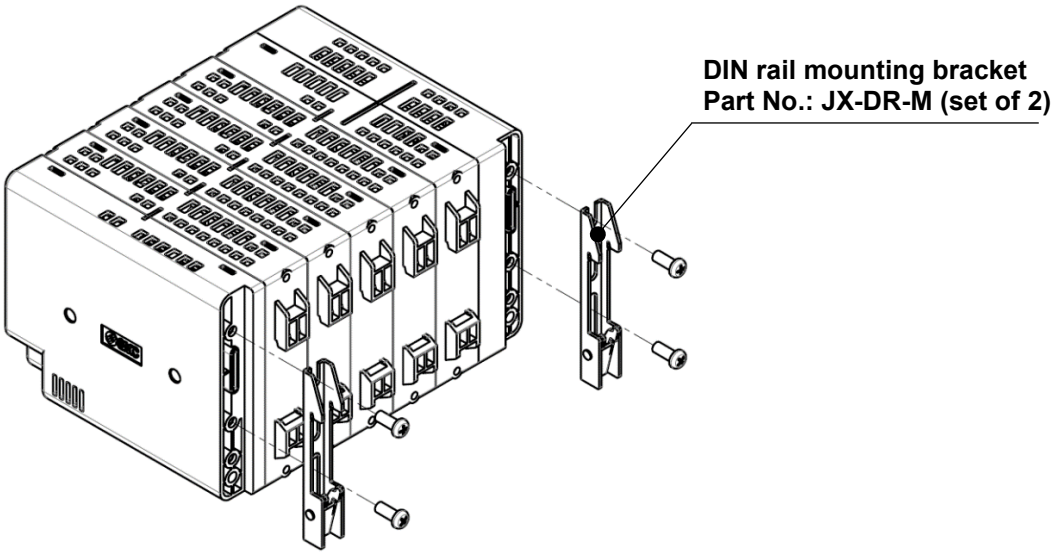
The controller can be Direct mounted using screws or mounted on a DIN rail.
Details of the controller mounting options are shown below.

6.1.1 DIN rail mounting

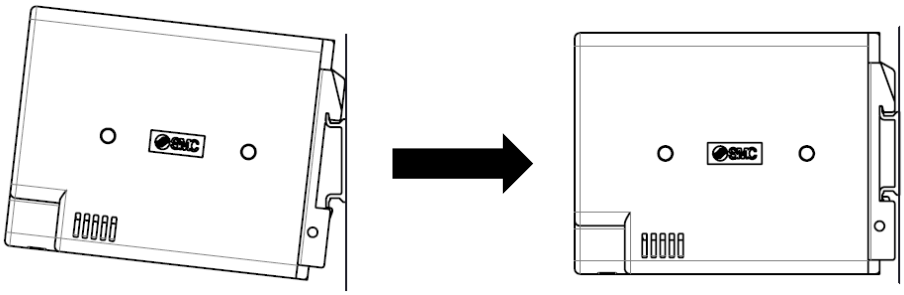
Attach DIN rail mounting brackets to the rear of the Gateway unit and the Termination unit so that the controller can be mounted on a DIN rail.

∗When DIN-rail mounting this product, be sure to use the screws supplied.

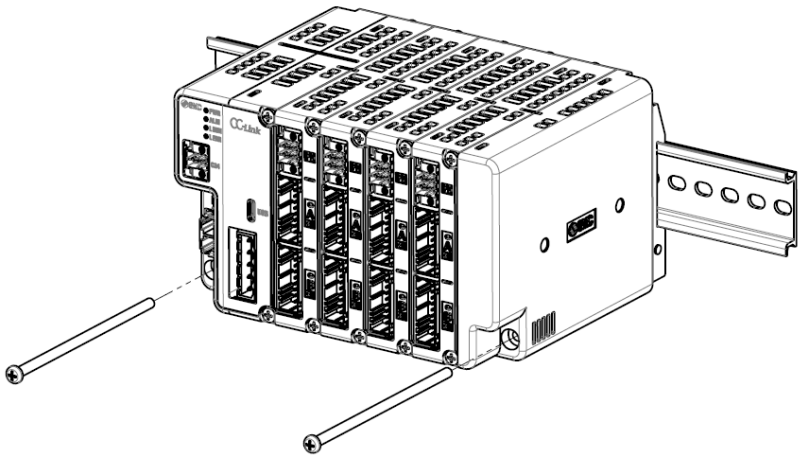
(1) Attach the DIN rail mounting bracket to the gateway unit and the termination unit using four M4×10L self-tapping screws. (The recommended tightening torque is **1.4 N·m ± 10%**)



(2) Mount on to the DIN rail as follows.



(3) Fix the controller to the DIN rail using two M4×95 screws.
(The recommended tightening torque is **1.4 N·m ± 10%**.)

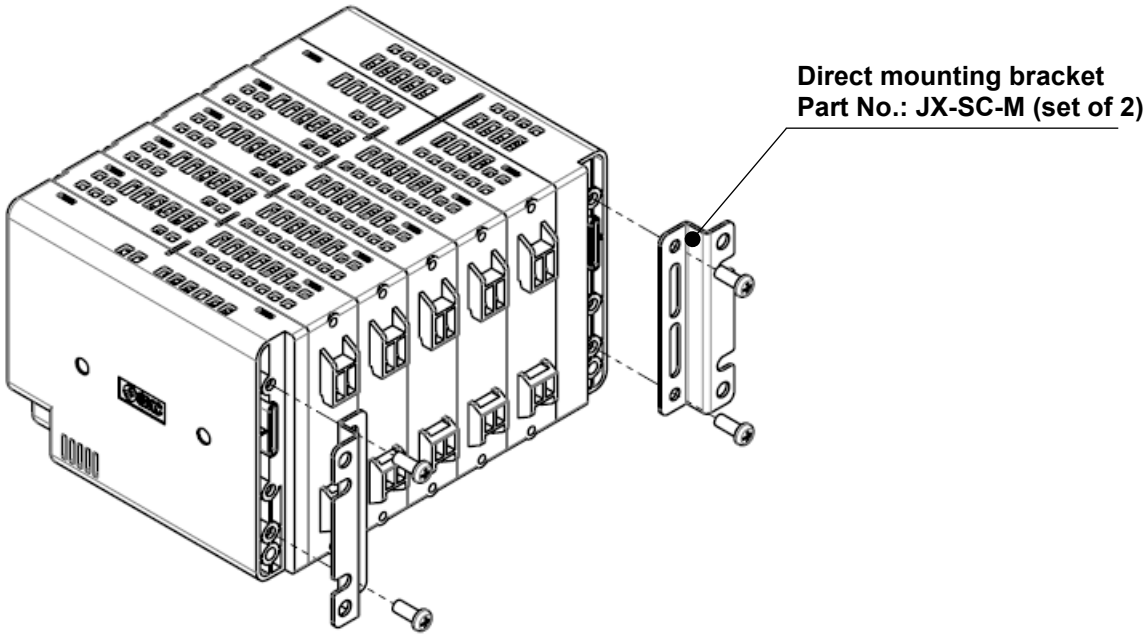


6.1.2 Direct mounting

Attach the direct mounting brackets to the rear of the Gateway unit and the Termination unit so that the controller can be mounted directly to a panel or similar using screws.

∗When DIN-rail mounting this product, be sure to use the screws supplied.

Attach the direct mounting brackets to the gateway unit and termination unit using four M4×10L Tapping Screws. (The recommended tightening torque is **1.4 N·m ± 10%**)



6.2 Grounding

The controller allows the connection of a ground wire via the Control power supply plug.

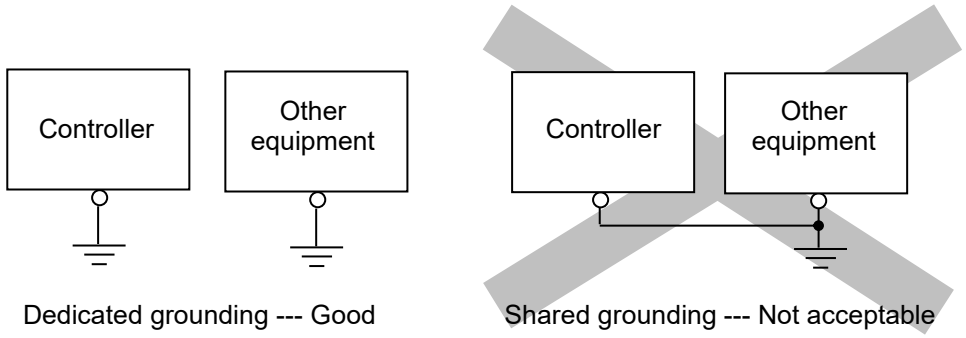
For wiring of the Control power supply plug, refer to section 7.1 Details of control power supply plug.

⚠Caution

(1) A dedicated Ground connection must be used. Grounding should be provided to improve noise immunity and prevent noise propagation.

(2) The grounding point should be as near as possible to the controller. Keep the grounding cable as short as possible.

(3) For the thickness of the grounding wire, use AWG20 (0.5 mm^2) and a sheath outer diameter of 2.5 mm max.



Dedicated grounding --- Good

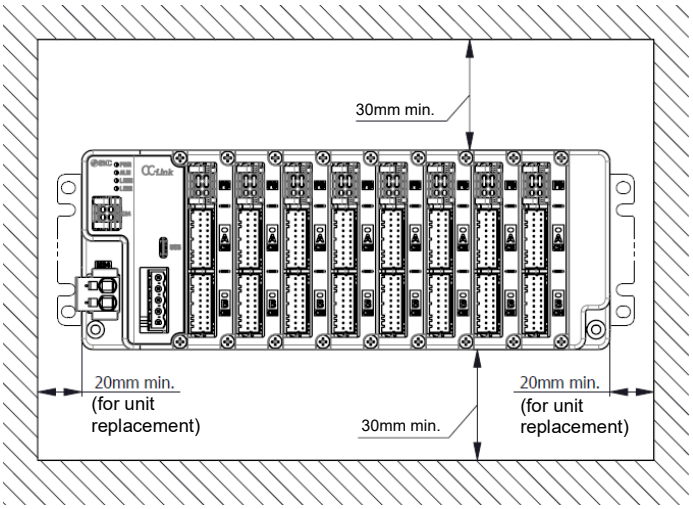
Shared grounding --- Not acceptable

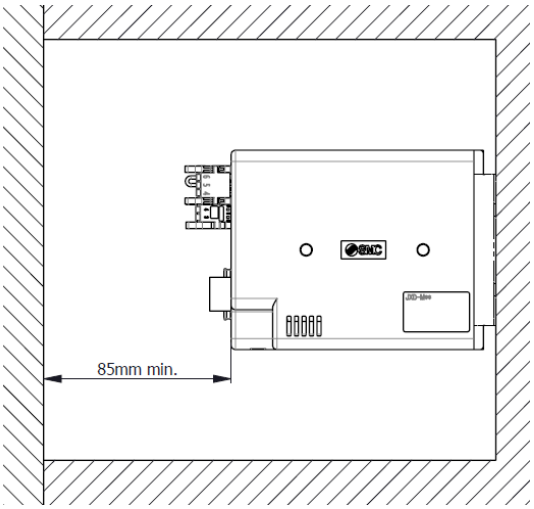
6.3 Mounting location

Design the size and mounting location of the control cabinet so that it is within the operating temperature range of the controller.

Mount this controller vertically on the wall as follows:

1) In the vertical direction, provide sufficient clearance from other equipment and wiring ducts in order to secure ventilation space. (Distance: 30 mm min).
2) In the horizontal direction, provide a clearance of 20 mm or more from the sides of the panel and wiring ducts to allow for unit replacement.
3) Allow at least 85 mm space between the front of the controller and the door (lid) so that the connectors can be attached and detached.





4) Do not install at the top where air stagnates in the panel.
5) Do not install directly above equipment with high heat generation, such as heaters, transformers, etc.
6) Do not install the unit in an orientation other than that specified, such as vertically, on the floor or upside down, as this may cause abnormal heat generation.
7) Vibration sources such as large electromagnetic contactors and no-fuse circuit breakers should be installed in separate panels or away from each other to avoid co-location.

⚠ Caution

If the mounting surface for the controller is not flat or is uneven, excessive stress may be applied to the enclosure, which can cause failure. Be sure to mount the controller on a flat surface.

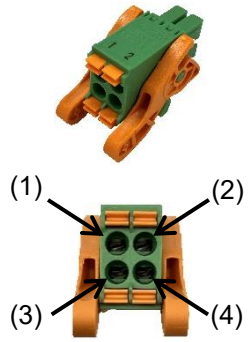
7. Wiring

7.1 Details of control power supply plug

7.1.1 Control power supply plug specifications

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

Control power supply plug

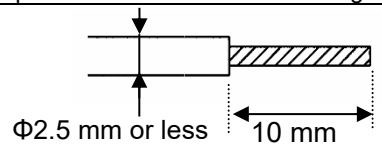


Pin No.	Terminal	Function	Functional explanation
1	NC	Not used	Wiring prohibited
2	C24V	Control power supply (+)	The positive control power.
3	FG	Frame Ground	Grounding terminal.
4	EMG	Release lock (+)	Connection terminal for external stop circuit for all axes. ∗When 24 VDC is input, stop of all axes is released. ∗When open, stop all axes (deceleration).

∗ Do not insert or remove the control power supply plug when the power is energized.

7.1.2 Wire specifications for control power supply plug

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

Item	Specifications
Applicable wire size	Single, stranded wire → AWG 20 (0.5 mm^2) The rated temperature of the insulation coating should be 60 °C or more.
Stripped wire length	

⚠ Caution

Do not connect multiple wires to one terminal.
Arrange wiring so that conductors of each terminal do not contact other lines.

7.1.3 Control power supply plug wiring

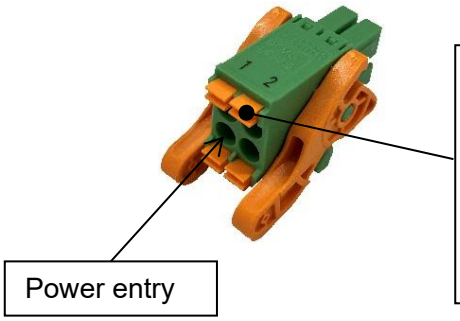
Refer to (1) through (3) below for wiring of the control power supply plug.
After wiring, connect the control power supply plug to the controller 24 VDC input power supply and insert it into the control power supply connector of the controller.

Control power supply plug

Insert the control power supply plug into the control power supply connector (C24V).

(1) Wiring of power supply (C24V)

Connect the (+) side of the controller input power supply 24 VDC to the C24V terminal of the control power supply plug.



■Open/close lever

Press the open/close lever with a dedicated screwdriver and insert the wire into the wire entry.

●Dedicated screwdriver (Recommended)

Phoenix Contact

(Product SZS 0,4X2,5 VDE)

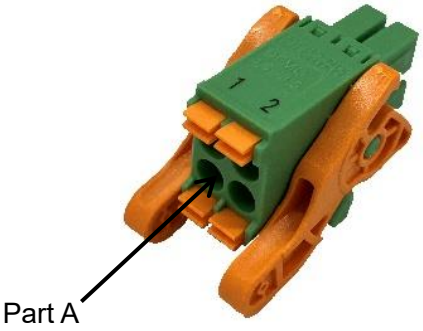
(2) Wiring of the stop switch (EMG)

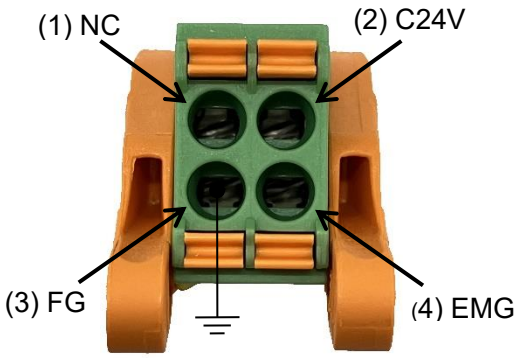
A stop switch must be installed by the user to stop the actuator in abnormal situations.

For wiring, refer to **7.4 (1) Example of recommended circuit** and **7.4 (2) EMG stop (relay contact (1))**.

(3) Wiring of Frame Ground (FG)

Connect a Ground wire to the FG terminal of the control power supply plug and connect it to Ground.





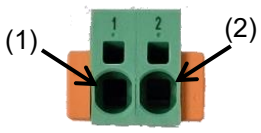
Enlarged view of part A

7.2 Details of motor power supply plug

7.2.1 Motor power supply plug specifications

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

Motor power supply plug

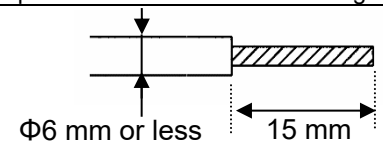


Pin No.	Terminal	Function	Functional explanation
1	0V	Common power supply (-)	Negative common power supply. M24V terminal / C24V terminal / EMG terminal (Control power supply plug) LKRLS terminal (Power supply blocking plug)
2	M24V	Motor power supply (+)	Positive power for the actuator motor to be supplied via the controller.

∗ Do not insert or remove the control power supply plug when the power is energized.

7.2.2 Wire specifications for motor power supply plug

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

Item	Specifications
Applicable wire size	Single strand wire → AWG 22 ~ 8 (0.3 ~ 10 mm^2) Stranded wire → AWG 22 ~ 10 (0.3 ~ 6 mm^2) The rated temperature of the insulation coating should be 60 °C or more.
Stripped wire length	

⚠ Caution

Do not connect multiple wires to one terminal.
Arrange wiring so that conductors of each terminal do not contact other lines.
Select a wire size with a higher allowable current than the current used by the product. The current used by the product depends on the operating conditions of the connected actuator . Please check the current for the product using the Electric Actuator Selection Software on the SMC website.
(URL: **https://www.smcworld.com**)

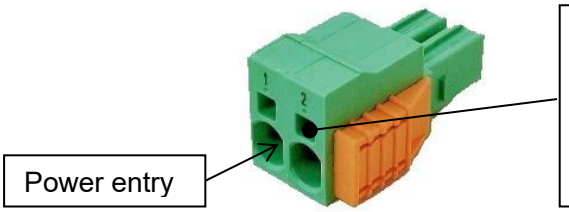
7.2.3 Motor power supply plug wiring

For wiring the motor power supply plug, refer to (1) below.
After wiring, connect the motor power supply plug to the controller 24 VDC input power supply and insert it into the motor power supply connector (M24) of the controller.

Motor power supply plug

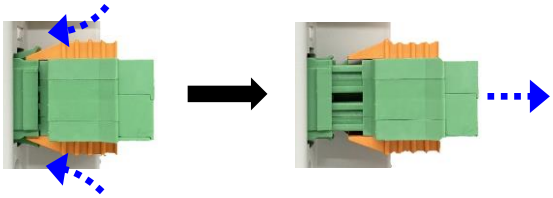
Insert the motor power supply plug into the motor power supply connector (M24).

(1) Wiring of power supply (M24V, 0V)
The motor power supply plug is connected to the controller power supply 24 VDC.
The M24V connects to the (+) side of the controller power supply.
The 0V connects to the (-) side of the controller power supply.



■Open/close lever
Press the open/close lever with a dedicated screwdriver and insert the wire into the wire entry.
●Dedicated screwdriver (recommended)
Phoenix Contact (Product SZF 1-0,6X3,5)

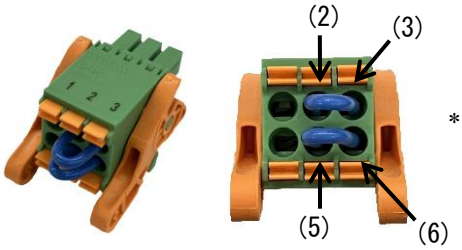
(2) Disconnecting the motor power supply plug
How to disconnect the motor power supply plug.



7.3 Details of power supply blocking plug

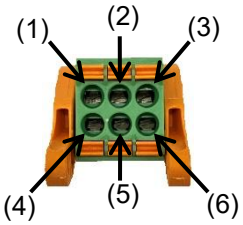
7.3.1 Power supply blocking plug specifications

The specifications of the power supply blocking plug supplied with the controller are shown below.
The power supply blocking plug at the time of shipment has the following terminals connected.
●Between M24VIN1 (2) and M24VOUT1 (3)
●Between M24VIN2 (5) and M24VOUT2 (6)



∗ The terminals (2) and (3) and (5) and (6) are connected using lead wires as standard.

Power supply blocking plug

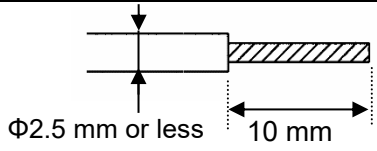


Pin No.	Terminal	Function	Functional explanation
1	LKRLS1	CH A Unlocking (+)	Connection terminal of lock release signal for CH A.
2	M24VIN1	Motor power supply input of CH A	Input terminal of motor power supply for CH A. ∗ When open, turns off motor power supply for CH A.
3	M24VOUT1	Motor power supply output of CH A	Output terminal of motor power supply for CH A. ∗ Connect to motor power input terminal for CH A and supply power to CH A.
4	LKRLS2	CH B Unlocking (+)	Connection terminal of lock release signal for CH B.
5	M24VIN2	Motor power supply input of CH B	Input terminal of motor power supply for CH B. ∗ When open, turns off motor power supply for CH B.
6	M24VOUT2	Motor power supply output of CH B	Output terminal of motor power supply for CH B. ∗Connect to motor power input terminal for CH B and supply power to CH B.

∗ Do not insert or remove the control power supply plug when the power is energized.

7.3.2 Wire specifications for Power supply blocking plug

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

Item	Specifications
Applicable wire size	Single, stranded wire → AWG 22 ~ 20 (0.3 ~ 0.5 mm^2) The rated temperature of the insulation coating should be 60 °C or more.
Stripped wire length	

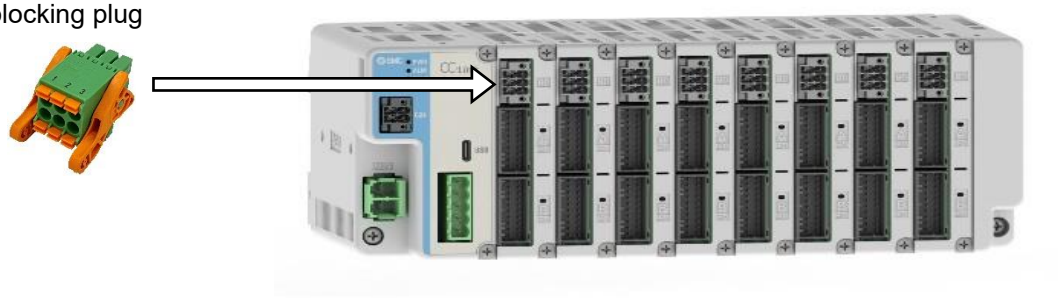
⚠ Caution

Do not connect multiple wires to one terminal.
Arrange wiring so that conductors of each terminal do not contact other lines.

7.3.3 Power supply blocking plug wiring

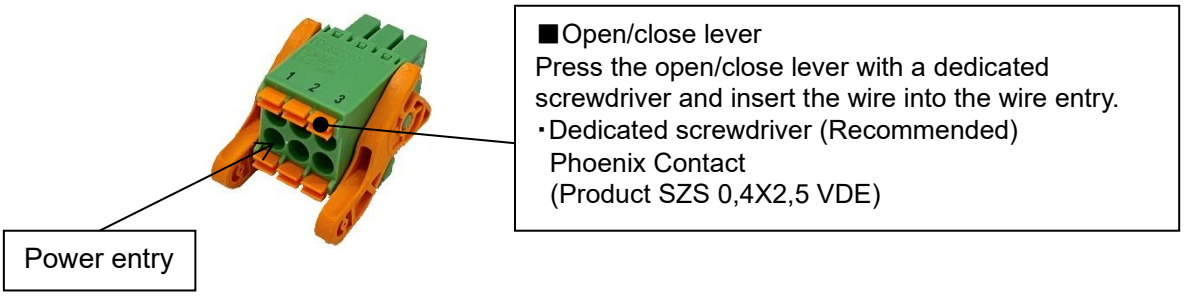
Refer to (1) through (3) below for wiring the motor power blocking plug.
After wiring, insert the motor power blocking plug into the motor power blocking connector of the controller.

Power supply blocking plug



Insert the motor power blocking plug into the motor power blocking connector (PD).

(1) Wiring of power supply (M24VIN, M24VOUT)
The wiring of the power supply in the power supply blocking plug is connected using lead wires at the time of shipment.
To operate the actuator connected to CH A, connect M24VIN1 and M24VOUT1 of the power supply blocking plug.
To operate the actuator connected to CH B, connect M24VIN2 and M24VOUT2 of the power supply blocking plug.



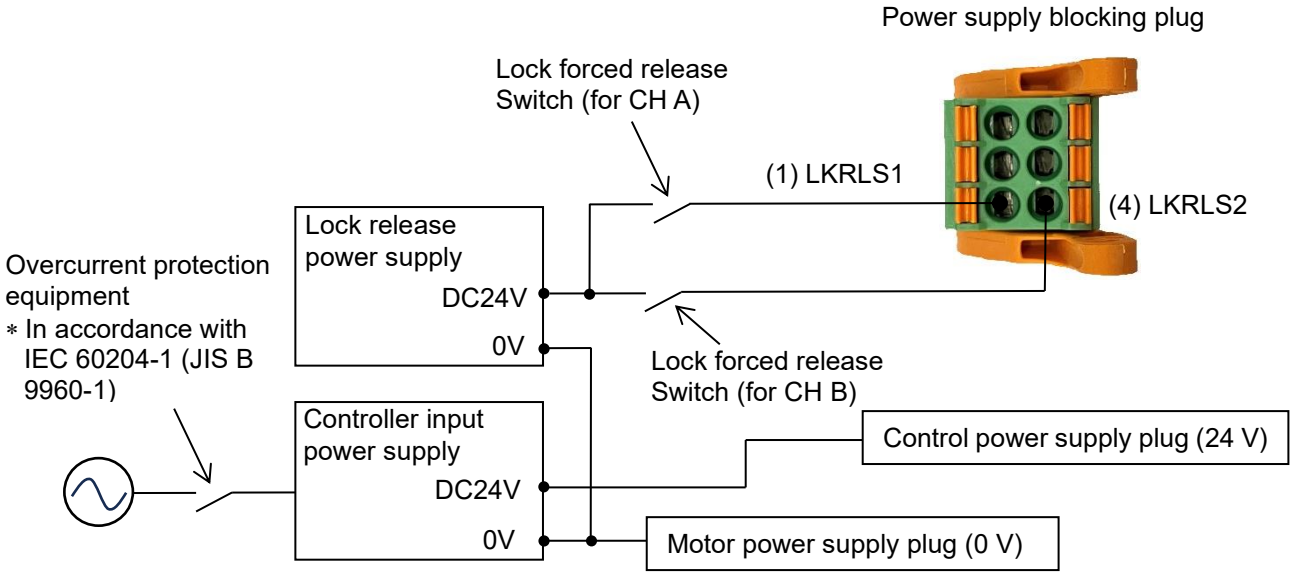
(2) Wiring of the stop switch (motor power supply blocking)
A stop switch must be installed by the user to stop the actuator in abnormal situations.
If stop instructions for each axis are required, provide a stop switch.
For wiring, refer to **7.4 (3) Shutdown of motor power supply (relay contact (2))**.

(3) Wiring for lock force release switch (LKRLS)

The controller has Short Brake Function, which makes it difficult for the actuator mover to move while the control input power supply (C24V) is being supplied. If the electric actuator mover is intentionally moved by external force (e.g. spring, human force, etc.), provide the switch and power supply to forcibly release the locking mechanism of the actuator with lock.

* Lock forced release Switch (24 VDC, contact capacity of 0.5 A or more) must be provided by the user.
* Lock release power supply (24 VDC, rated current 0.5 A x number of connected axes or more) must be provided by the user.

The (-) side of the Lock release power supply is connected to the (-) side of the controller input power supply. One side of the lock forced release switch is connected to the (+) side of the lock release power supply and the other side to the LKRLS1 and LKRLS2 terminals of the power supply blocking plug. Closing the switch and shutting off the overcurrent protection equipment (primary side of the controller input power supply) forces the locking mechanism to release, allowing the actuator mover to be moved by external force.



⚠ Caution

(1) If the electric actuator mover is intentionally moved by external force (e.g. spring, human power, etc.), primary side of the controller input power supply must be cut off before doing that.
The controller has Short Brake Function, which makes it difficult for the actuator mover to move while the control input power supply (C24V) is being supplied.

(2) If the mover is moved while the electric actuator is connected to the controller, the motor induced voltage will be passed around the controller.
Therefore, if the actuator is moved at high speed and frequency, this induced voltage may cause the controller to break down.

(3) It is not necessary to connect the LKRLS terminal when the actuator does not have a lock mechanism.

(4) If the mover of electric actuator with lock is intentionally moved by external force (e.g. spring, human power, etc.), supply 24 V DC of the lock release power supply to the LKRLS1 and LKRLS2 terminals of the power supply blocking plug after the controller input power supply primary side is shut off.
Note that if the actuator is moved without releasing the lock, wear of the lock sliding parts will be accelerated, resulting in a decrease in holding force and a decrease in the life of the lock mechanism.

(5) Do not constantly energize LKRLS1 and LKRLS2.
The LKRLS1 and LKRLS2 are only used for adjustment and emergency return. Be sure to stop supplying 24 VDC power to LKRLS1 and LKRLS2 during normal operation.
If power is still supplied to LKRLS1 and LKRLS2, the lock is forcibly released.
Therefore, the workpiece may fall under its own weight when the servo is turned off, which may result in equipment failure.

7.4 Wiring of stop circuits

This controller is designed to stop the actuator operation using the following method.

●Operation stops after deceleration of all axes due to the control power supply plug EMG terminal and the disconnect of the controller power supply 24 VDC.

●Operation stops after deceleration for each axis by turning off between M24VIN1 and M24VOUT1 (For CH A) and between M24VIN2 and M24VOUT2 (For CH B) of the power supply blocking plug.

Refer to (1) through (3) below to wire the stop circuit.

(1) Example of recommended circuit

Connect an external stop switch to the following location.

●Between the control power supply plug EMG terminal and the controller power 24 VDC.

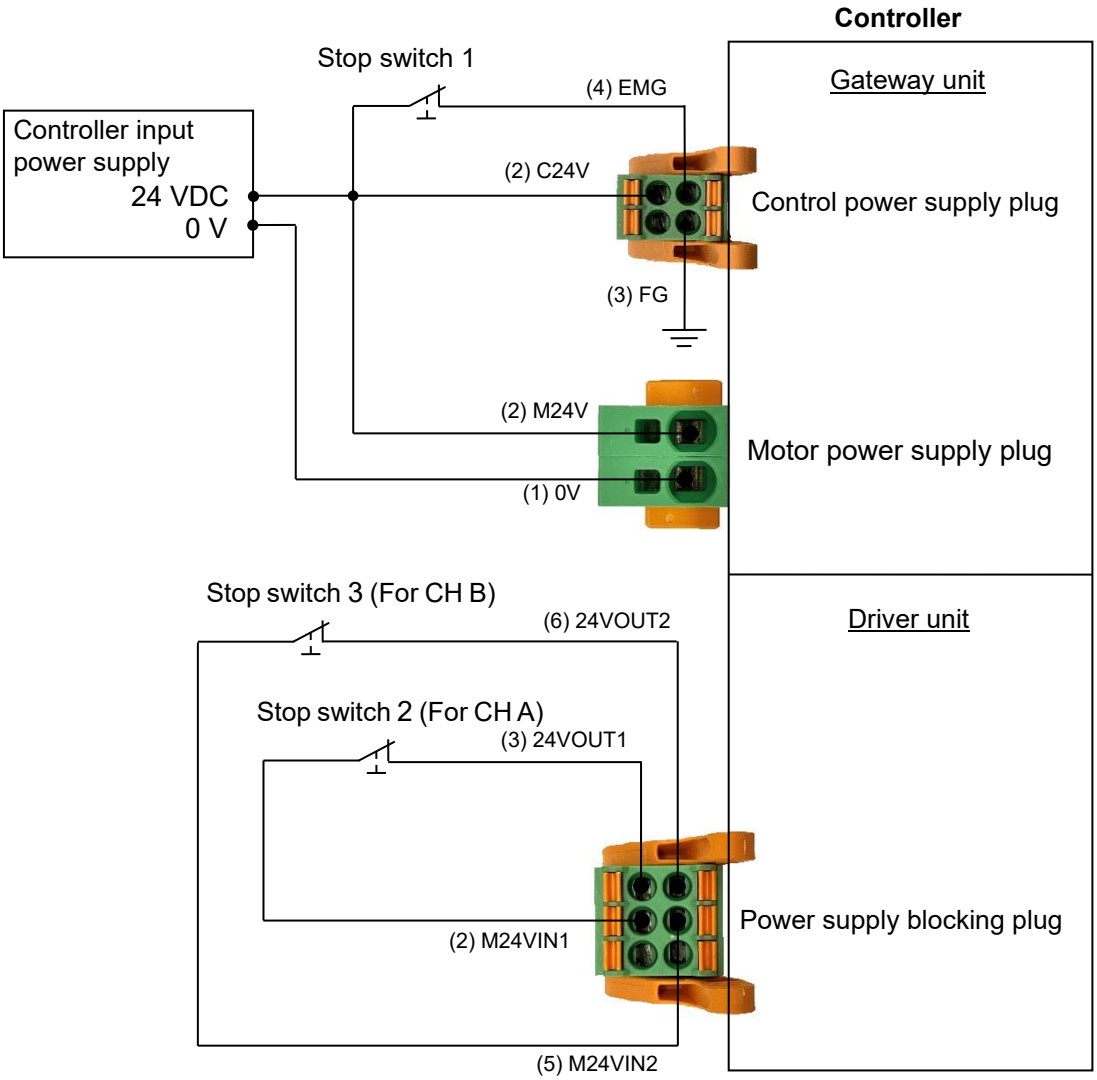
∗ Stop switch 1 (24 VDC, contact capacity 0.5 A minimum)

●Between M24VIN1 and M24VOUT1 of the power supply blocking plug.

∗ Stop switch 2 (24 VDC, contact capacity 5 A minimum)

●Between M24VIN2 and M24VOUT2 of the power supply blocking plug.

∗ Stop switch 3 (24 VDC, contact capacity 5 A minimum)

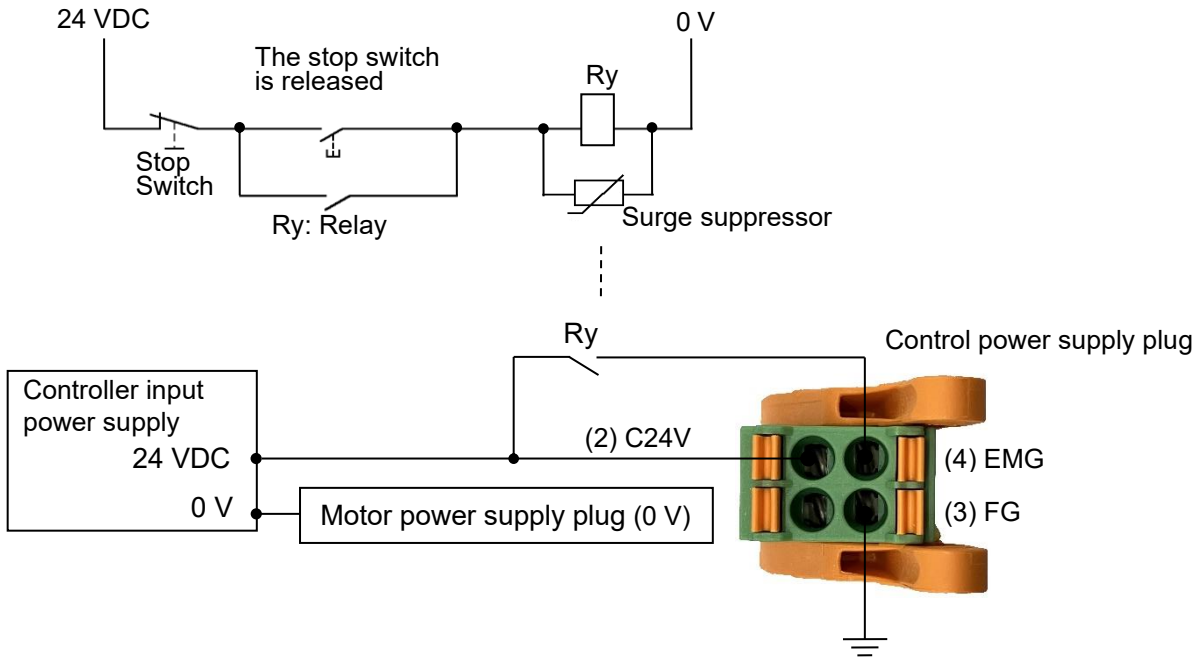


⚠ Caution

(1) When the Control power supply plug is disconnected between the EMG terminal and the controller power supply 24VDC, the actuator stops at the maximum deceleration for all axes. All actuators will then be in a servo-off state and "ESTOP" signal will turn ON.
(2) When the power supply blocking plug is disconnected between the M24VIN1 and M24VOUT1 terminals or between the M24VIN2 and M24VOUT2 terminals, the actuator stops at the maximum deceleration for the blocked axis. The blocked axis will then be in a servo-off state and "ESTOP" signal will turn ON.
(3) Note that if LKRLS1 and LKRLS2 of the motor power blocking plug are energized, the locking mechanism of the electric actuator will be forcibly released.
(4) When returning from a stop, the power supply should be turned on again for each axis for safety. Reapplying power to all axes at the same time may damage the product.

(2) EMG stop (relay contact (1))
If there is a separate stop circuit for the entire device or if there are multiple controllers with different power supplies, connect a relay contact (24 VDC, contact capacity 0.5 A minimum) between the 24 VDC controller power supply and the control power supply plug EMG terminal.

(Circuit example)

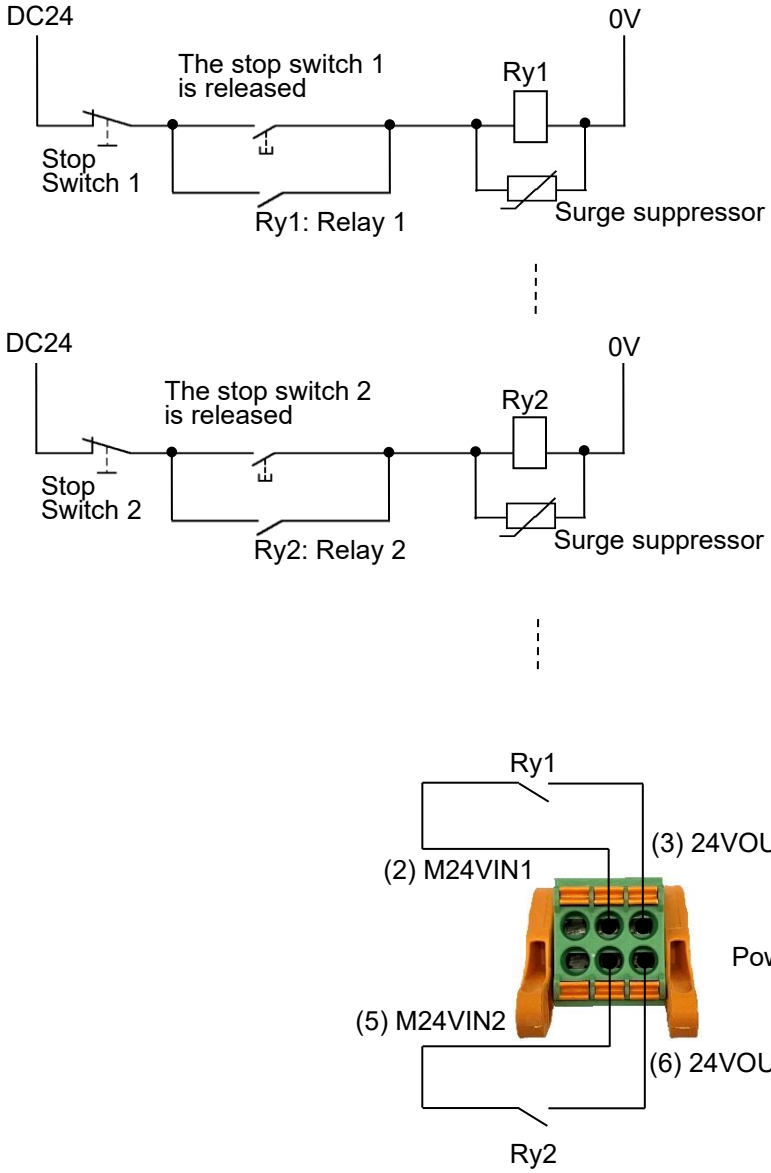


⚠ Caution

(1) When stopped using EMG, the actuator stops at the maximum deceleration for all axes. All actuators will then be in a servo-off state and "ESTOP" signal will turn ON. For more information on "ESTOP"signal, please see below.
●Section **9.6.5 Data assignment details for each operation mode(CC-Link, EtherNet/IP, EtherCAT)**
●Section **9.6.6 Data assignment details for each operation mode(PROFINET)**
(2) Note that if LKRLS1 and LKRLS2 of the motor power blocking plug are energized when the servo is off, the locking mechanism of the electric actuator will be forcibly released.

(3) Shutdown of motor power supply (relay contact (2))
If external operation is required to disconnect the motor power supply, connect a relay contact (24 VDC, contact capacity 5 A minimum) between M24VIN1 and M24VOUT1(For CH A) and between M24VIN2 and M24VOUT2 (For CH B) on the power supply blocking plug.

(Circuit example)



⚠ Caution

(1) When stopped via power supply blocking plug, the actuator stops at the maximum deceleration for all axes. All actuators will then be in a servo-off state and "ESTOP" signal will turn ON. For more information on "ESTOP"signal, please see below.
●Section **9.6.5 Data assignment details for each operation mode(CC-Link, EtherNet/IP, EtherCAT)**
●Section **9.6.6 Data assignment details for each operation mode(PROFINET)**
(2) Note that if LKRLS1 and LKRLS2 of the motor power blocking plug are energized when the servo is off, the locking mechanism of the electric actuator will be forcibly released.
(3) When returning from a stop, the power supply should be turned on again for each axis for safety. Reapplying power to all axes at the same time may damage the product.

(4) Short brake function release

This controller has a short brake function, which makes it difficult for the actuator mover to move while the control power (C24V) is being supplied. When the electric actuator mover is intentionally moved by external force (spring, human force, etc.), it is recommended for safety reasons that the primary side of the controller input power supply be turned off before doing so.

When the primary side of the controller input power supply is being supplied and the electric actuator mover is intentionally moved by external force (spring, human force, etc.), the short brake function can be released if the following conditions are met.

1) Change the "Short brake release" parameter to "Enable".
   For details on the "Short brake release" parameter, please refer to "**10.3.2 (3) Drive parameters**.
   For details on how to change the parameters, please refer to the operation manual for the "ACT-Connected" controller setting software.

2) Turn ON the Lock-force release signal (LKRL) from an upper level device (PLC, etc.).
   Even when using an actuator without lock, it is possible to indicate ON/OFF of the lock-force release signal.

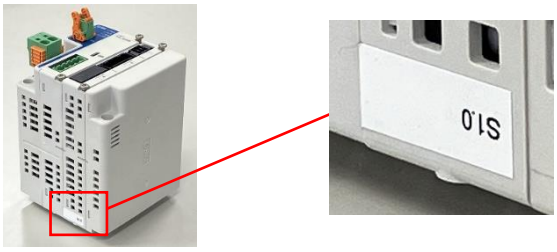
When 1) and 2) above are satisfied, the short brake function will be released, and the electric actuator mover can be moved by an external force.

⚠ Caution

(1) When moving the electric actuator mover by external force while the short brake function is deactivated, please take care to move it at a low speed. If the mover is moved at high speed while the short brake function will be deactivated, an alarm No. 145 " Motor power supply voltage is outside set range " will be occurred, and the short brake function will be activated in order to protect the controller from the induced voltage generated.

(2) When alarm No. 145 " Motor power supply voltage is outside set range " and alarm No. 196 " Error counter overflowed" occur, the release of the short brake function is not applied.

(3) The short brake function release is an effective function with driver unit software version S1.1 or later.
How to check the software version:



The software version can also be checked from the controller setting software ACT-Connected.
Please refer to the ACT-Connected operation manual for details.

(4) If the software version of the driver unit is S1.0, the short brake function cannot be released even if the "Short brake release" parameter is set to enable.

7.5 Details of CC-Link communication plug

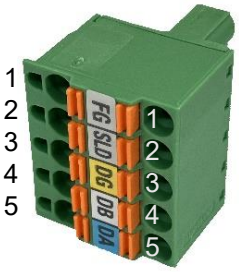
7.5.1 Specifications of CC-Link communication plug

The communication plug connector specification is shown below.

Straight type

LEC-CMJ-S

T-branch type

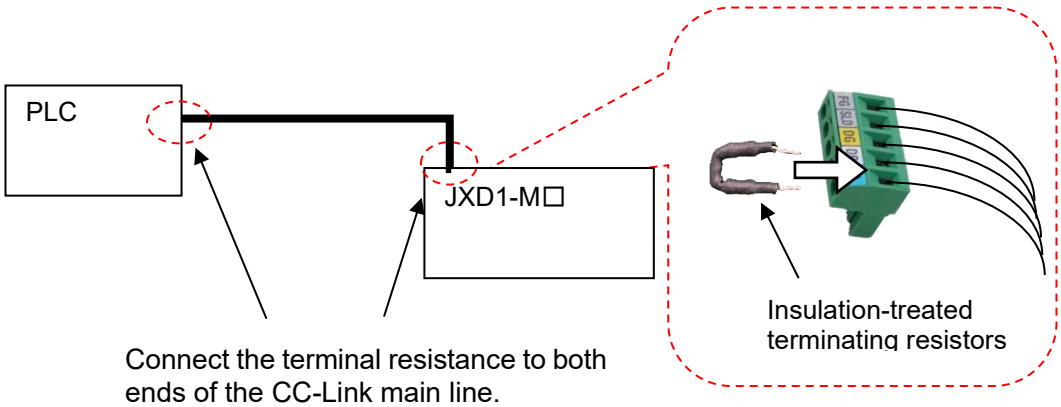


JX-NT-M

No	Designation	Description
1	FG	Frame Ground
2	SLD	CC-Link shield
3	DG	CC-Link Ground line
4	DB	CC-Link communication line B
5	DA	CC-Link communication line A

In the CC-Link system, a terminating resistor is connected between terminals 4 and 5.
The terminating resistor to be connected differs depending on the cable used.
Prepare a terminating resistor to suit your application.

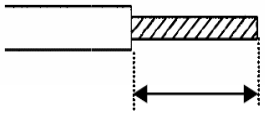
Type of cable	Resistance
Communication cable for CC-Link	110Ω ±5% 1/2 W
CC-Link dedicated high-performance cable	130Ω ±5% 1/2 W



⚠ Caution

(1) When connecting a terminating resistor, insulate the resistor leads so that they do not come into contact (short circuit).
(2) Incorrect termination resistor values or connection methods may result in communication errors.

7.5.2 Wire specifications for CC-Link communication plug

Item	Specifications
Applicable wire size (Single line, stranded wire)	AWG 24 to 12 (0.2 to 2.5 mm^2) The rated temperature for the insulation coating: 60°C or more
Stripped section length	 Straight type:7 mm branch type:10 mm

7.5.3 Wiring for CC-Link communication plug

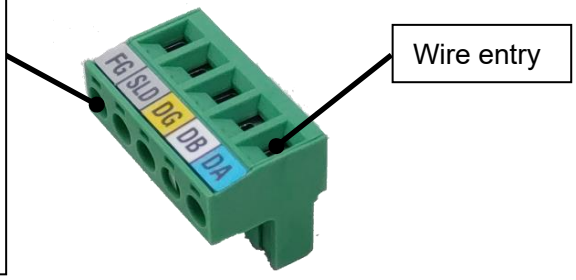
Wire the CC-Link communication line to the communication plug and insert it into the communication connector of the gateway unit.

● Screw connection type

Turn the screw using a special screwdriver, etc. and insert the wires into the wire entries.

- Special screwdriver (recommended)
  Part no: SZS0.6×3.5
  (manufactured by Phoenix Contact)
- Screw: M2.5
- Tightening force: 0.5 to 0.6 N.m

Straight type

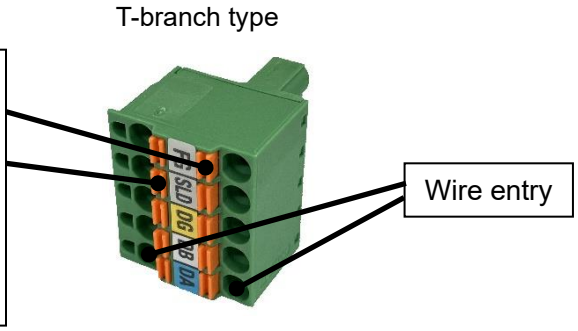


● Push-in release type

Push in the release lever using a special screwdriver, etc. and insert the wires into the wire entries.

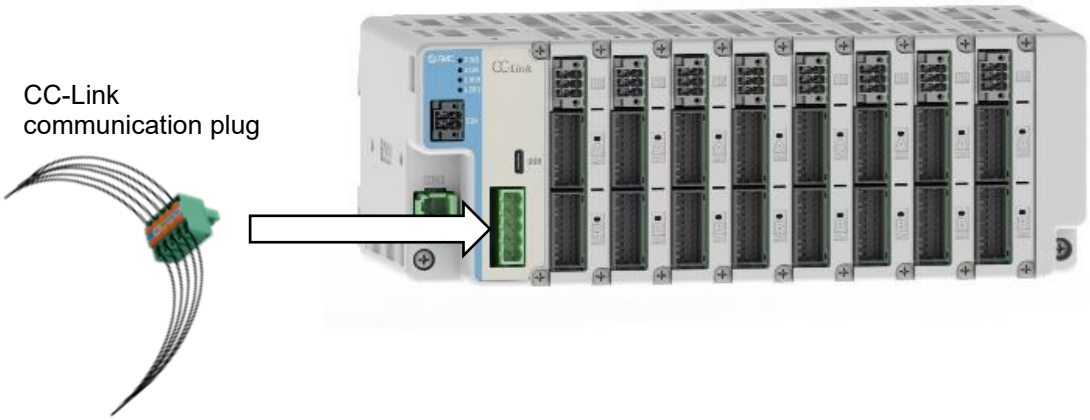
- Special driver (recommended)
  Part no: SZS0.6×3.5
  (manufactured by Phoenix Contact)

T-branch type



Controller

CC-Link
communication plug



8. LED display details

8.1 Gateway Unit (CC-Link)

This product can be operated using either the step number instruction method, which selects pre-set data to instruct the operation, or the numerical instruction method, which directly changes parameters on the pre-set step data number.

8.1.1 LED display contents

Details of the LED indications are shown below.

LED Name	Contents
PWR	Indicates power-on status and EEPROM write status.
ALM	Indicates the alarm status of the controller.
L RUN	Indicates the CC-Link communication status.
L ERR	Indicates CC-Link error status.

8.1.2 Gateway unit status and LED indications

The controller status and LED indications are shown below.

Gateway unit status		LED Names and Indications			
		PWR	ALM	L RUN	L ERR
Power-on		-	-	OFF	OFF
Abnormal check of ROM and RAM of CPU for CC-Link communication		-	-	Green light ON	Red light ON
During normal CC-Link communication		-	-	Green light on	OFF
Address setting changes during power-on		-	-	OFF	Red light ON
CC-Link communication	CC-Link communication stopped	-	-	OFF	OFF
	CC-Link CRC error	-	-	OFF	Red light ON
	Incorrect station number error	-	-	Flashing green (0.5s)	Red light ON
	Communication speed error (unused range)	-	-	Green light ON	Flashing red (0.5s)
	WDT timeout error	-	-	Flashing green (0.5s)	Flashing red (0.5s)
System error has occurred (microcontroller peripheral initialization failure)		Green light ON	Red light ON	-	-
Alarm in progress		OFF	Red light ON	-	-
Normal operation		Green light ON	OFF	-	-
Driver unit unconnected		Flashing green (1s)	Flashing red (1s)	-	-
Writing to EEPROM in progress.		Flashing green (1s)	-	-	-

-: indicates that the LED display is not relevant.

⚠ Caution

Do not turn off the controller input power supply or disconnect the cable during EEPROM writing. Data (parameters) may not be written correctly.

8.2 Gateway unit (EtherNet/IP)

8.2.1 LED display contents

Details of the LED indications are shown below.

LED Name	Contents		
PWR	Indicates power-on status and EEPROM writing status.	OFF	Power not supplied
		Green light ON	Power supplied
		Flashing green	Writing to EEPROM in progress.
ALM	Indicates an alarm condition on the gateway unit.	OFF	Normal operation
		Red light ON	Alarm in progress
MS	Indicates the status of the gateway unit.	OFF	Power is off
		Green light ON	Normal operation
		Flashing green	Incorrect communication settings or the scanner is idle
		Flashing red	Recoverable internal errors
		Red light ON	Non-recoverable internal error
NS	Indicates the communication status of EtherNet/IP.	OFF	Power off or IP address not configured
		Green light ON	EtherNet/IP connection being established.
		Flashing green	EtherNet/IP connection not established
		Flashing red	EtherNet/IP connection timeout
		Red light ON	IP address duplication detected
P1 / P2	Indicates the status of the EtherNet/IP communication connector.	OFF	link not established
		Green light ON	Link (100 Mbps) established
		Flashing green	Link (100 Mbps) established and data being sent/received
		Orange light ON	Link (10 Mbps) established
		Flashing orange	Link (10 Mbps) established and data being sent/received

8.2.2 Gateway unit status and LED indications

The controller status and LED indications are shown below.

Gateway unit status	LED Names and Indications			
	PWR	ALM	MS	NS
Normal communication in EtherNet/IP	-	-	Green light ON	Green light ON
System error has occurred (microcontroller peripheral initialization failure)	Green light ON	Red light ON	-	-
Alarm in progress	OFF	Red light ON	-	-
Normal operation	Green light ON	OFF	-	-
Driver unit unconnected	Flashing green (1s)	Flashing red (1s)	-	-
Writing to EEPROM in progress.	Flashing green (1s)	-	-	-

-: indicates that the LED display is not relevant.

⚠ Caution

Do not turn off the controller input power supply or disconnect the cable during EEPROM writing. Data (parameters) may not be written correctly.

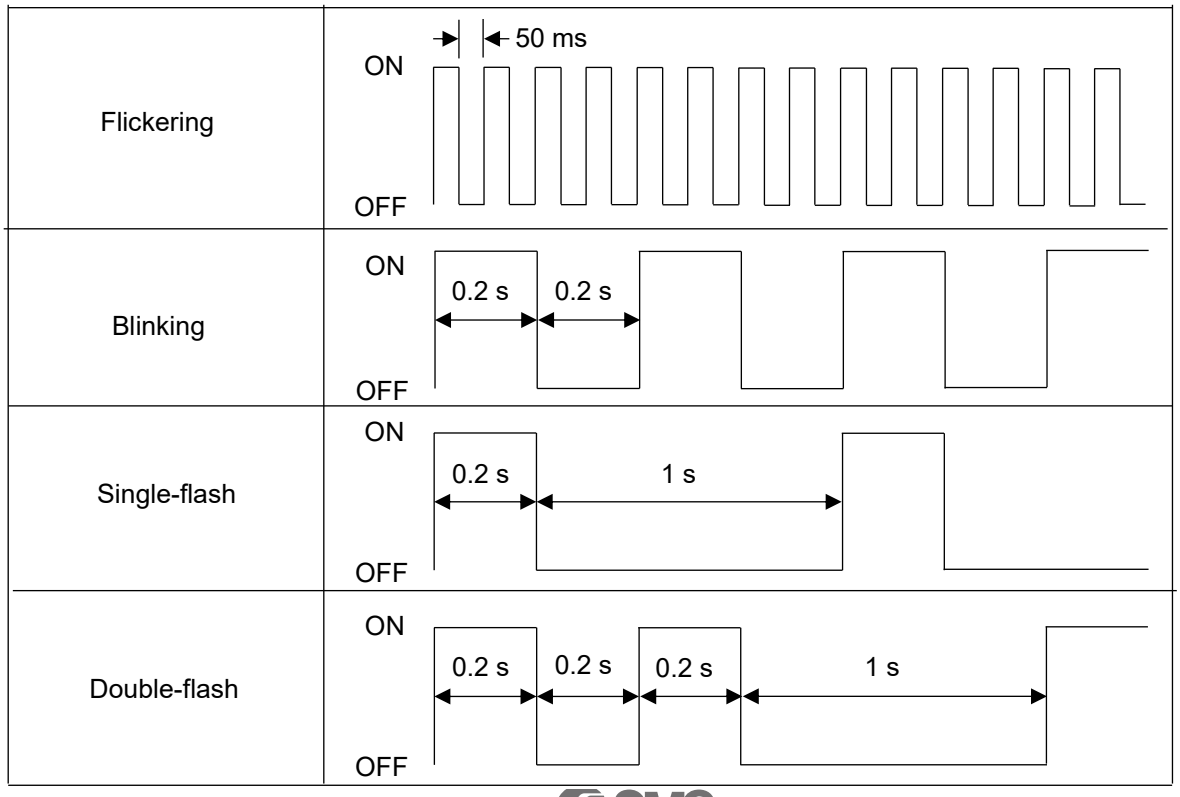
8.3 Gateway unit (EtherCAT)

8.3.1 LED display contents

Details of the LED indications are shown below.

LED Name	Contents		
PWR	Indicates power-on status and EEPROM writing status.	OFF	Power not supplied
		Green LED ON	Power supplied
		Green flashing	Writing to EEPROM in progress.
ALM	Indicates an alarm condition in the gateway unit.	OFF	Normal operation
		Red LED ON	Alarm in progress
ERR	Indicates the EtherCAT error status	OFF	No error in EtherCAT communication
		Red LED is blinking *1	Error in the setting of EtherCAT communication
		Red LED is single flashing*1	Abnormal synchronization, abnormal EtherCAT communication data
		Red LED is double flashing*1	Error in the setting of EtherCAT communication (application watch dog timeout)
		Red LED is ON	Non-recoverable internal error (RUN also lights up red).
RUN	Indicates the EtherCAT communication status.	OFF	Init state
		Green LED is flickering *1	Bootstrap state
		Green LED is blinking *1	Pre-Operational state
		Green LED is single flashing*1	Safe-Operational state
		Green LED is ON	Operational state
		Red LED is ON	Non-recoverable internal error (ERR also lights up red).
IN/OUT	Indicates the status of the EtherCAT communication connector.	OFF	Link not established
		Green LED ON	Link (100 Mbps) established
		Green flickering	Link (100 Mbps) established, and data being sent/received

*1 Refer to the following for the cycle when LED is flashing with blinking, flickering, single-flash and double-flash.



8.3.2 Gateway unit status and LED indications

The controller status and LED indications are shown below.

Gateway unit status	LED Names and Indications			
	PWR	ALM	ERR	RUN
Normal communication in EtherCAT	-	-	OFF	Green light ON
System error has occurred (microcontroller peripheral initialization failure)	Green LED ON	Red LED ON	-	-
Alarm in progress	OFF	Red LED ON	-	-
Normal operation	Green LED ON	OFF	-	-
Driver unit unconnected	Flashing green (1s)	Flashing red (1s)	-	-
Writing to EEPROM in progress.	Flashing green (1s)	-	-	-

-: indicates that the LED display is not relevant.

⚠ Caution

Do not turn off the controller input power supply or disconnect the cable during EEPROM writing. Data (parameters) may not be written correctly.

8.4 Gateway unit (PROFINET)

8.4.1 LED display contents

Details of the LED indications are shown below.

LED Name	Contents		
PWR	Indicates power-on status and EEPROM writing status.	OFF	Power not supplied
		Green LED ON	Power supplied
		Green flashing	Writing to EEPROM in progress.
ALM	Indicates an alarm condition in the gateway unit.	OFF	Normal operation
		Red LED ON	Alarm in progress
SF	Indicates the status of the gateway unit.	OFF	Power is off
		Green LED ON	Normal operation
		Red LED ON	Non-recoverable internal error (BF also lights up red).
BF	Indicates the PROFINET communication status.	OFF	Power OFF or PROFINET connection not established
		Green LED ON	PROFINET connection being established. Controller is in RUN state.
		Green LED is single flashing	PROFINET connection being established. Controller is in STOP state.
		Red LED is single flashing	Device Name error
		Red LED is double flashing	IP address error
		Red LED is triple flashing	Configuration error
		Red LED ON	Non-recoverable internal error (SF also lights up red).
P1 / P2	Indicates the status of the PROFINET communication connector.	OFF	link not established
		Green LED ON	Link (100 Mbps) established
		Green flickering	Link (100 Mbps) established, and data being sent/received

8.4.2 Gateway unit status and LED indications

The controller status and LED indications are shown below.

Gateway unit status	LED Names and Indications			
	PWR	ALM	SF	BF
Normal communication in PROFINET	-	-	Green LED ON	Green LED ON
System error has occurred (microcontroller peripheral initialization failure)	Green LED ON	Red LED ON	-	-
Alarm in progress	OFF	Red LED ON	-	-
Normal operation	Green LED ON	OFF	-	-
Driver unit unconnected	Flashing green (1s)	Flashing red (1s)	-	-
Writing to EEPROM in progress.	Flashing green (1s)	-	-	-

-: indicates that the LED display is not relevant.

⚠ Caution

Do not turn off the controller input power supply or disconnect the cable during EEPROM writing. Data (parameters) may not be written correctly.

8.5 Driver units

8.5.1 LED display details

Details of the LED indications are shown below.

LED Name	Contents
CH A	Axis 1 servo ON / alarm LED
CH B	Axis 2 servo ON / alarm LED

8.5.2 Driver unit status and LED indications

The driver unit status and LED indications are shown below.

Driver unit status		Driver unit LED status		
		Green	Red	Orange
RAM memory error (only at power-on)		Flashing (0.2 s)	Flashing (0.2 s)	OFF
Alarmed	Servo OFF	OFF	light ON	OFF
	Servo ON	OFF	light ON	OFF
No alarm	Servo OFF	Flashing (2 s)	OFF	OFF
	Servo ON	light ON	OFF	OFF
	EMG stopped state (ESTOP ON)	OFF	OFF	OFF
Writing to EEPROM in progress.	No alarm	Flashing (0.4 s)	OFF	OFF
	Alarmed	OFF	Flashing (0.4 s)	Flashing (0.4 s)

∗The LEDs (CH A or CH B) of axes that have been disabled in "Axis Activation" using ACT-Connected are turned off. Refer to **10.2 Enabling and disabling axes** for information on how to enable/disable the axes.

⚠ Caution

Do not turn off the controller input power supply or disconnect the cable during EEPROM writing. Data (step data, parameters, alarms, records relating to predictive maintenance functions) may not be written correctly.

9. Configuration of Gateway unit

9.1 List of Gateway unit special setting parameters

Please use the ACT-Connected software to set the gateway unit special setting parameters.

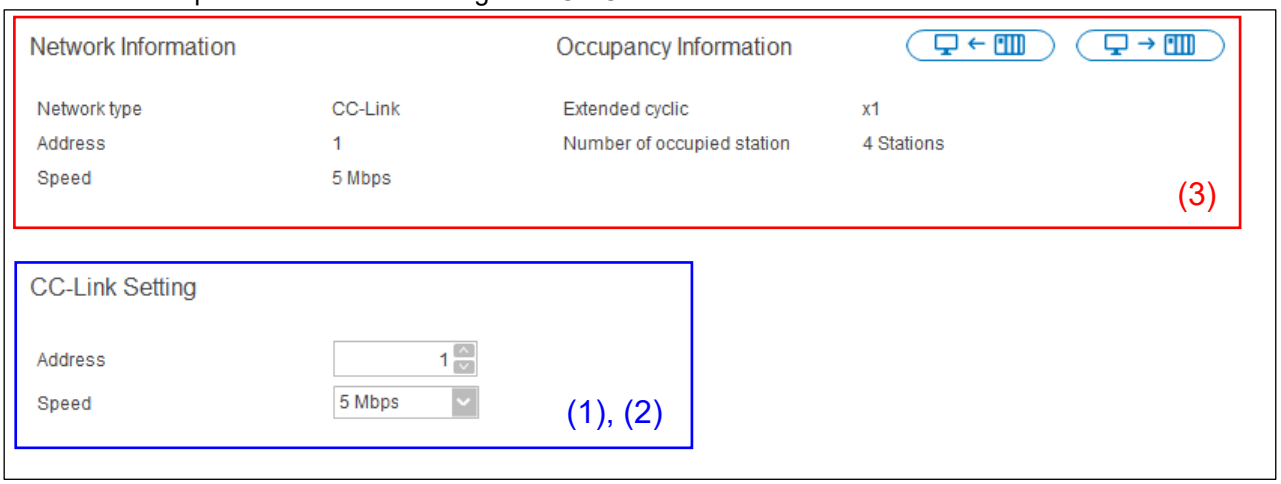
Name	Contents
Enable / disable PLC commands	It is possible to select the use of the GWMON signal, which operates the enable / disable of commands from a PLC or other higher-level communication device to the gateway unit.
Byte swap of transmitted and received data	This setting allows the upper and lower levels of transmitted and received of all operational data to be swapped byte by byte with higher-level communication equipment such as a PLC.
DWORD swap of transmitted and received data	This setting allows the upper and lower levels of transmitted and received data of double word size operational data to be swapped in word units with a higher-level communication device such as a PLC.

∗ DWORD size operation data are "Target position", "Positioning width" and "Current position".

9.2 Gateway units (CC-Link)

9.2.1 Controller parameter setting

The controller parameters are set using the ACT-Connected software.



The settings for each parameter are shown below.

(1) Address

Name	Range	Description
Address	1～62	Set the controller address (station number)

∗The settable range varies depending on the combination of operating mode and number of axes connected.

(2) Communication speed

Name	Range	Description
Communication speed	10 Mbps	Set the PLC communication speed.
	5 Mbps	
	2.5 Mbps	
	625 kbps	
	156 kbps	

∗The default value is 156 kbps.

(3) Parameters automatically calculated by ACT-Connected

The number of occupied stations, the number of extended cycles and the CC-Link version depend on the data length. The data length is indicated by a combination of the number of connected axes and the operating mode of each axis. (Automatically calculated by ACT-Connected setting software). Based on the results of ACT-Connected's automatic calculations, the most suitable parameters are set for the controller from a list of parameters (number of occupied stations, number of extended cyclic and CC-Link version) consisting of a total of four patterns. The number of occupied stations and the number of extended cycles set for the controller are displayed in ACT-Connected.

Set the number of occupied stations, number of extended cycles and CC-Link version shown in ACT Connected.

Data length per operating mode

Operating mode name	Data length
Step instruction mode	8 bytes
IO mode	2 bytes
Simple direct value mode	8 bytes
Direct numerical setting mode	16 bytes

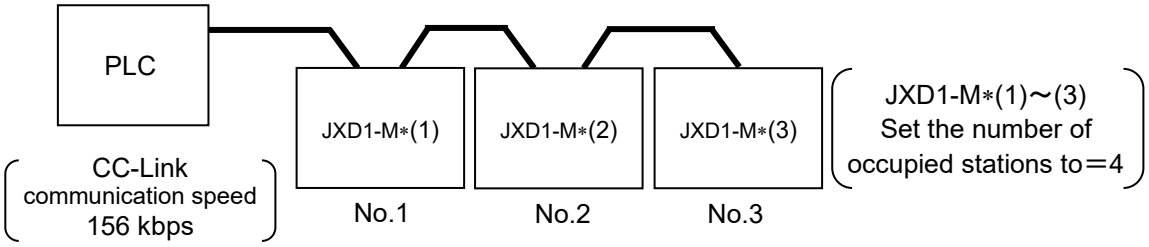
For more information on operating modes, refer to section 9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)

The following list of parameters is set by automatic calculation. (Total 4 patterns)

Data length (BYTE)	Number of occupied stations	Expanded cyclic number	CC-Link version
32 or less	4	1	Ver.1(1.1)
33～64	2	4	Ver.2
65～128	2	8	Ver.2
129～256	4	8	Ver.2

∗Gateway control/response area data (16 BYTE) is not included in the data length.

Example) When 3 controllers are connected as follows occupying 4 stations (The communication speed of CC-Link is 156 kbps)



(1) Since the CC-Link communication speed of the PLC is 156 kbps, set the B RATE switch for all controllers to 4 (156 kbps).

(2) Set the controller STATION NO. (for the PLC, set the CC-Link station No. address to 0.)

Controller 1 : For JXD1-M∗(1), set the CC-Link station No. address = 1.

Controller 2 : For JXD1-M∗(2), set the CC-Link station No. address = 1, which is calculated by adding 4 to the CC-Link station No. address of JXD1-M∗(2) (= 5).

Controller 3 : For JXD1-M∗(3), set the CC-Link station No. address = 5, which is calculated by adding 4 to the CC-Link station No. address (= 9).

⚠Caution

If a CC-Link communication error occurs, the unit will operate to the target position indicated at the time. If a forced stop is required, install a forced stop circuit. For details on the forced stop circuit, refer to section **7.4 Wiring the stop circuit**.

9.2.2 Setting PLC parameters

Configure the PLC settings.
Use a PLC compatible with CC-Link Ver. 1.10 or Ver. 2.00.

The following is an example of a setting when using a Mitsubishi CC-Link system master and local unit (Q series). PC series: QCPU (Q mode) PC type: Q00UJ

First address of remote I/O (Rx, Ry), remote registers (RWr, RWw), etc.
The PLC memory address shown in section **9.6.4 Data area of PLC⇔gateway unit** is the address when the settings in the table below are made.
Please configure the settings to suit your environment.

Example of first address setting

	Leading address
Remote input (Rx)	X1000
Remote output (Ry)	Y1000
Remote register (RWr)	W0
Remote register (RWw)	W1000
Special relay (SB)	SB0
Special register (SW)	SW0

●Station Information Setting
Sets the number of occupied stations of the JXD1-M∗ connected to the PLC.

Please set the number of occupied stations to the PLC as indicated by the automatic calculation in section **9.2.1 (3) Parameters automatically calculated by ACT-Connected.**

●Extended cyclic count
Please set the number of extended cycles to the PLC as indicated by the automatic calculation in section **9.2.1 (3) Parameters automatically calculated by ACT-Connected.**

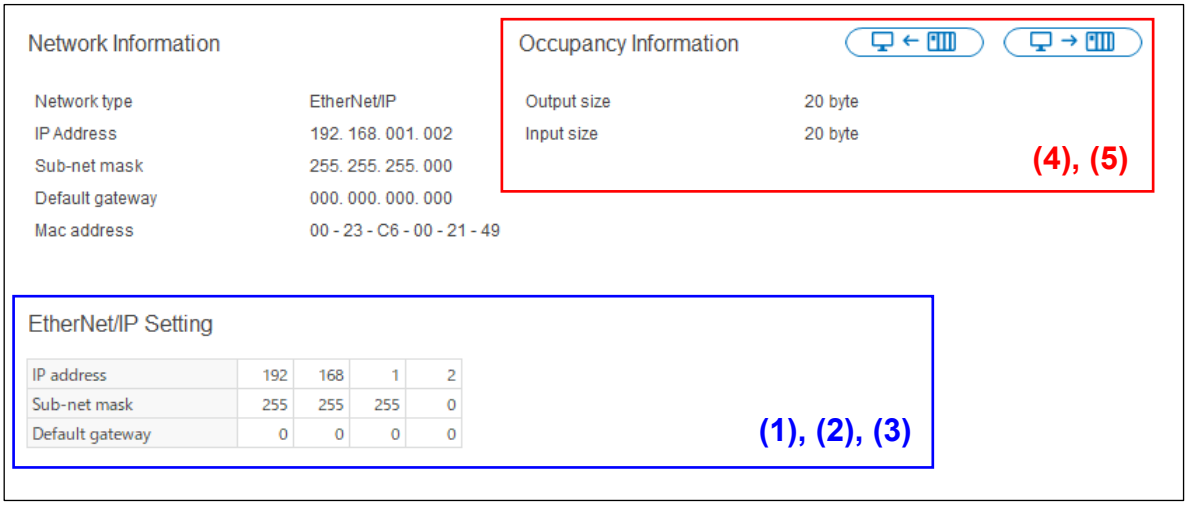
●Mode setting
Please set the CC-Link version to the PLC as indicated in the automatic calculation in section **9.2.1 (3) Parameters automatically calculated by ACT-Connected.**

●Communication speed
Please set the communication speed to the PLC as set in section **9.2.1 Controller parameter setting.** For details on the settings, please refer to the PLC instruction manual.

9.3 Gateway units (EtherNet/IP)

9.3.1 Controller parameter setting

The controller parameters are set using the ACT-Connected software.



The settings for each parameter are given below.

(1) IP address
Set the IP address within the range 0.0.0.0 to 255.255.255.255.
∗When the IP address is set to 0.0.0.0, the IP address is obtained from a DHCP server. The acquired IP address will be lost when the power is turned off.

(2) Subnet mask.
Set the subnet mask within the range 0.0.0.0 to 255.255.255.255.

(3) Default gateway.
Set the default gateway within the range 0.0.0.0 to 255.255.255.255.

(4) Output size.
The data length determined by the number of axes connected and the operating mode combination of each axis is shown. Use this value when setting up the PLC connection.
*Please note that if the termination unit is not connected, the display will not be correct.

(5) Input size.
The data length determined by the number of axes connected and the operating mode combination of each axis is shown. Use this value when setting up the PLC connection.
*Please note that if the termination unit is not connected, the display will not be correct.

9.3.2 Hardware Configurations

■Using EDS file and icon

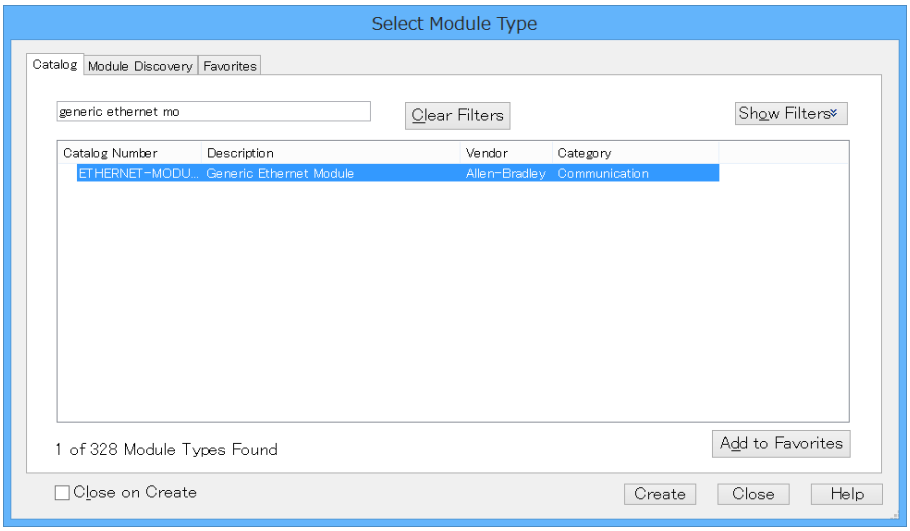
The controller can be configured using dedicated EDS file and icon. The EDS file and icon can be downloaded from the SMC website.
URL **https://www.smcworld.com**

EDS file: JXD1-MGW-EN_v10.eds
Icon: JXD1-MGW-EN.ico

■Using general-purpose Ethernet Module

The controller can be used as a general-purpose Ethernet Module by configuring it with e.g. Logix Designer™ software made by Rockwell Automation.
Refer to the manual of software you are using for a detailed manner of operation.
The following example shows the case of using Generic Ethernet Module by configuring Logix Designer™.

・Right-click on the selection [Ethernet] in the [I/O Configuration] folder, and select [New Module].
・The [Select Module Type] screen is displayed. Select [Generic Ethernet Module] and select [Create].



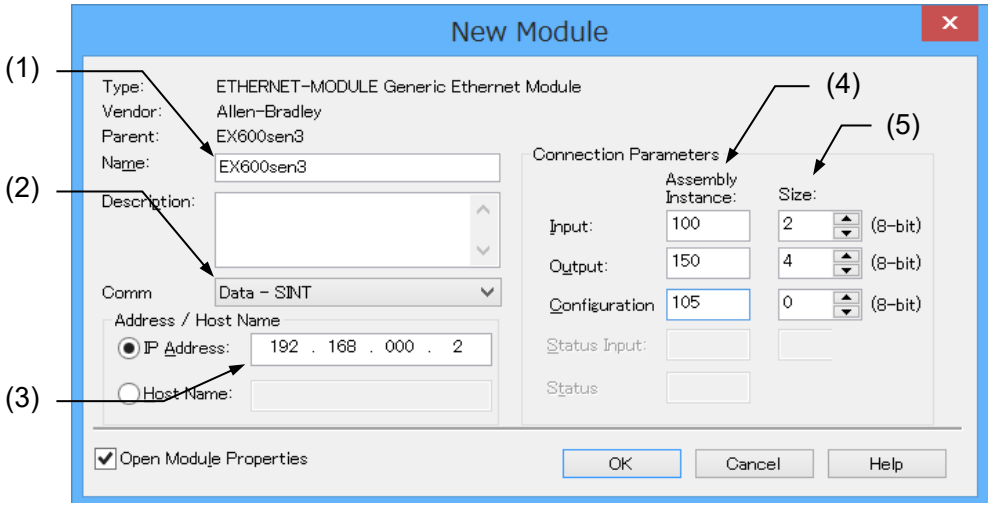
・The [Module Properties] screen is displayed, to perform setup.
(1) Name: Enter the required unit name.
(2) Select the data format of Comm: Connection Parameters.
(3) IP Address: Enter the IP address setting for the SI unit.
(4) Assembly Instance: Perform setting as shown below.

Description	Decimal
Common Format	"Data-SINT"
Input	100
Output	150
Configuration	105

(5) Size: Perform setting as shown below.

Description	Decimal
Common Format	"Data-SINT"
Input *	MIN. 18 byte MAX.272 byte
Output *	MIN. 18 byte MAX.272 byte
Configuration	0 byte

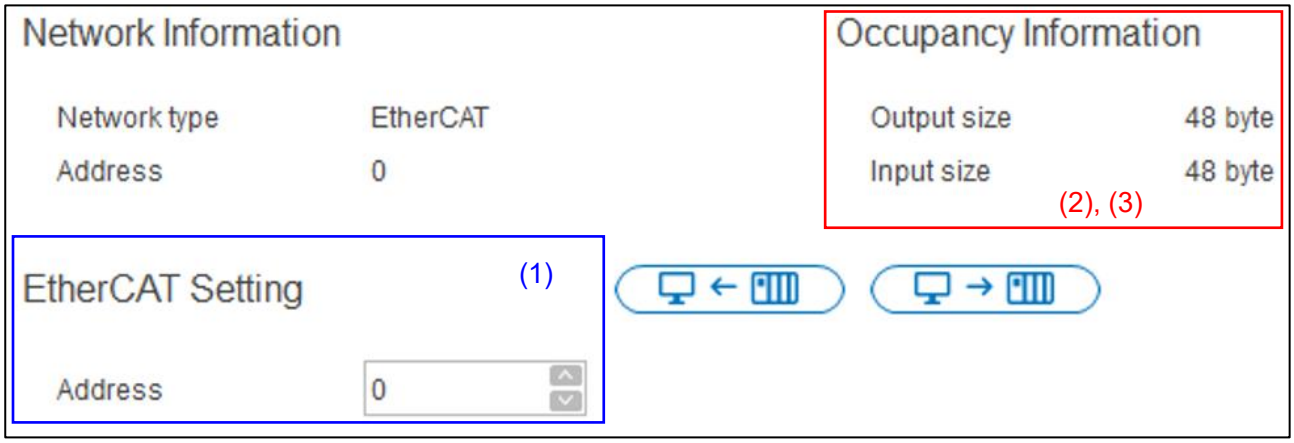
*The Input/Output size is determined by a combination of the number of connected axes and the operating mode of each axis. (Automatically calculated by ACT-Connected setting software). For details, refer to **9.3.1 Controller parameter setting**.



9.4 Gateway units (EtherCAT)

9.4.1 Controller parameter setting

The controller parameters are set using the ACT-Connected software.



The settings for each parameter are given below.

(1) Address
Set the node address of the controller in the range 0 to 65535.
If the address is set to '0' in ACT-Connected, the value set by the EtherCAT master is valid as the node address of this controller.
For information on how to set the node address of this controller by the EtherCAT master, please refer to the instruction manual of the EtherCAT master used. (Initial value is '0')

*If an address other than 0 is set in ACT-Connected after an address other than 0 from the EtherCAT master has already been set, a transition from the Init state to the Pre-Operational state may occur, resulting in a fieldbus-specific alarm. (Please refer to **13.1.2 (3) Alarm details and countermeasures for EtherCAT communication** for details)
(The Init and Pre-Operational states are EtherCAT States).
The error is reset by returning the controller to the Init state or by reconnecting the power supply.

(2) Output size.
The data length determined by the number of axes connected and the operating mode combination of each axis is shown. Use this value when setting up the PLC connection.
*Please note that if the termination unit is not connected, the display will not be correct.

(3) Input size.
The data length determined by the number of axes connected and the operating mode combination of each axis is shown. Use this value when setting up the PLC connection.
*Please note that if the termination unit is not connected, the display will not be correct.

9.4.2 Hardware Configurations

(1) Using EDS file and icon
The controller can be configured using dedicated ESI file. The ESI file can be downloaded from the SMC website.
URL **https://www.smcworld.com**

ESI file : SMC_JXD1-M_V10.xml

(2) JXD1-MGW-EC input/output module configuration

The following shows how to set up the JXD1-MGW-EC input/output module to connect the controller to a Beckhoff Automation PLC.

For detailed operating instructions, please refer to the Beckhoff Automation instruction manual.

*The screen shown is the Beckhoff Automation software TwinCAT3 XAE.

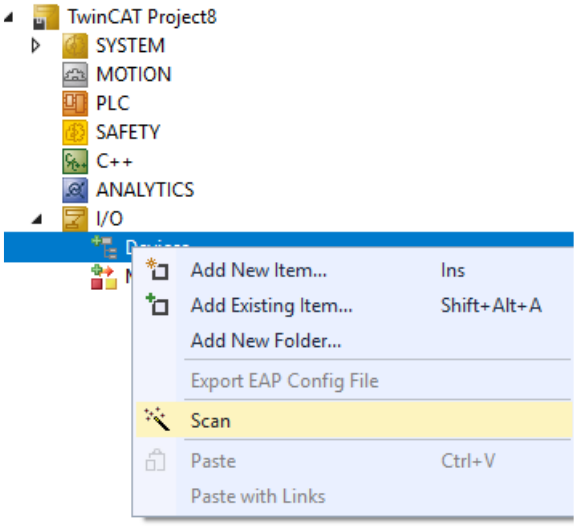
Please refer to the manual of the relevant configuration software for the setting method.

(1) Install the ESI file.

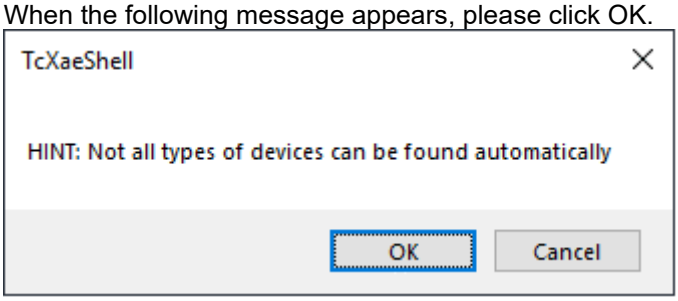
Please copy the ESI file for this product to the following folder

C:¥TwinCAT¥3.1¥Config¥Io¥EtherCAT

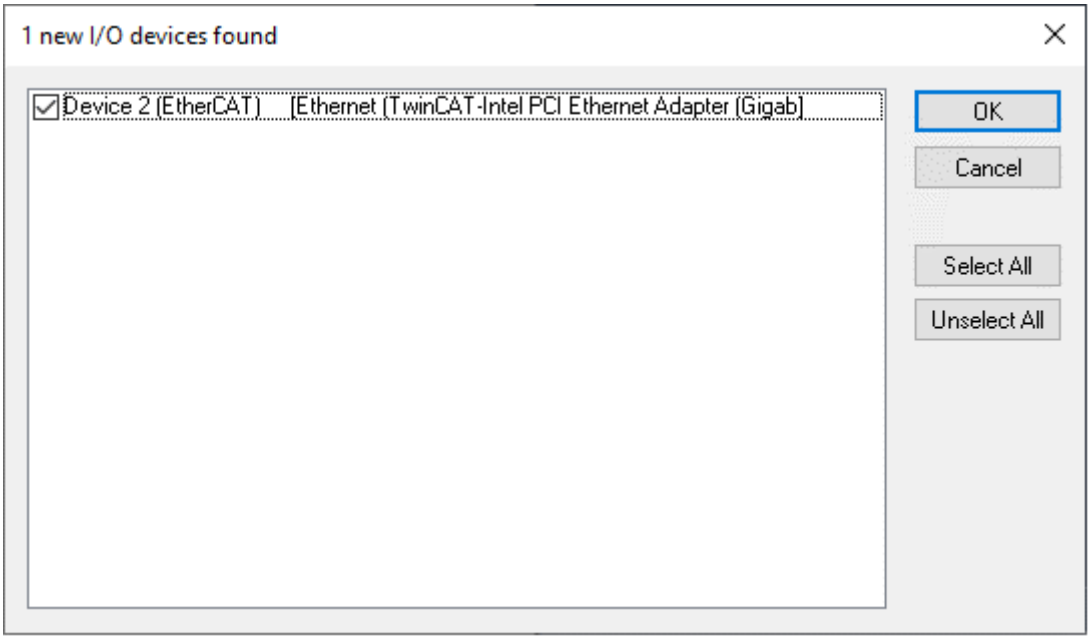
(2) Right-click on [Devices] and select [Scan].



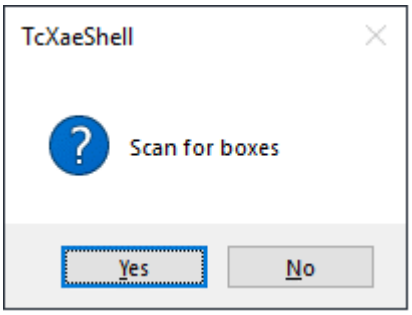
(3) When the following message appears, please click OK.



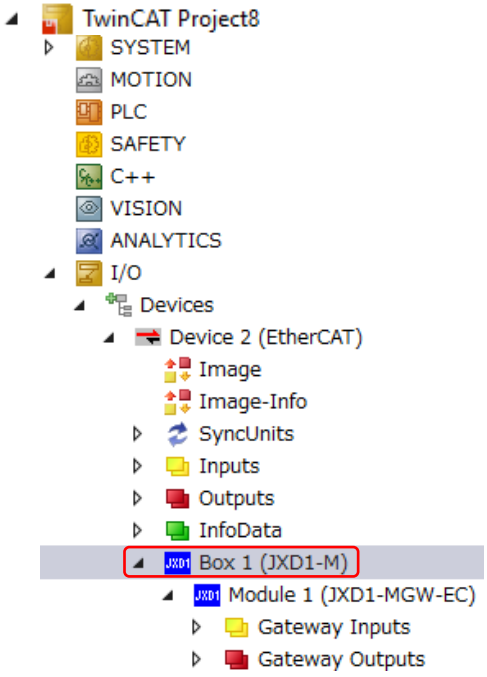
(4) Please Select the check box and click OK.



(5) When the window to “Scan for boxes” appears, please click Yes.



(6) If the network scan is completed successfully, Box 1 (JXD1-M) is displayed.



■To manually set up input/output modules

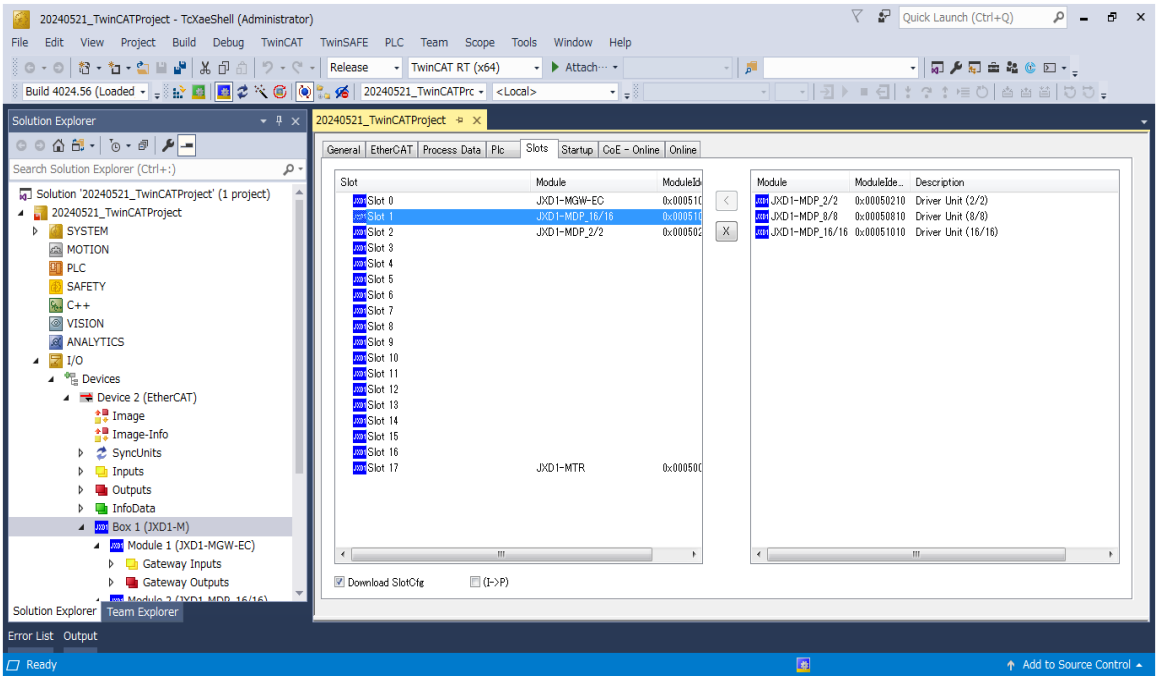
Please add modules from [Slots] in Box 1 (JXD1-M) according to the operating mode set in ACT-Connected.

Modules of [Slots]

Module	Data length [byte]	Used operating mode	Description
JXD1-MGW-EC	16	-	Gateway Unit Only Slot 0 is permitted.
JXD1-MDP_2/2	2	IO mode	Driver Unit (2/2) Only Slot 1 to 16 is permitted.
JXD1-MDP_8/8	8	Step instruction mode Simple direct value mode	Driver Unit (8/8) Only Slot 1 to 16 is permitted.
JXD1-MDP_16/16	16	Direct numerical setting mode	Driver Unit (16/16) Only Slot 1 to 16 is permitted.
JXD1-MTR	0	-	Termination Unit Only Slot 1 to 17 is permitted.

e.g.) Axis 0: Direct numerical setting mode, Axis 1: IO mode

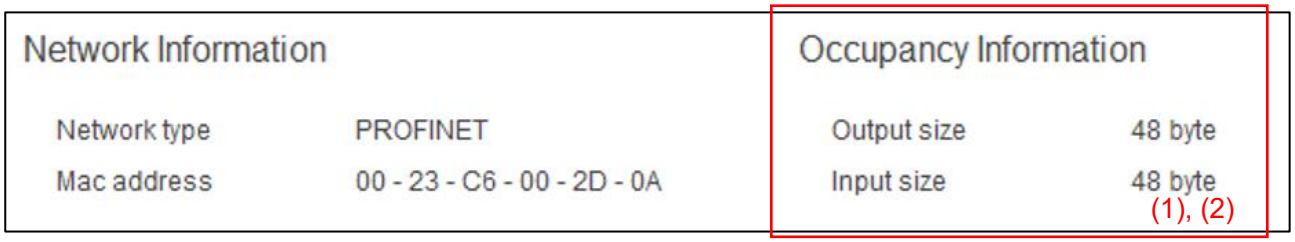
Slot	Module
0	JXD1-MGW-EC
1	JXD1-MDP_16/16
2	JXD1-MDP_2/2
17	JXD1-MTR



9.5 Gateway units (PROFINET)

9.5.1 Controller parameter setting

The controller parameters are set using the ACT-Connected software.



The settings for each parameter are given below.

(1) Output size.
The data length determined by the number of axes connected and the operating mode combination of each axis is shown. Use this value when setting up the PLC connection.
*Please note that if the termination unit is not connected, the display will not be correct.

(2) Input size.
The data length determined by the number of axes connected and the operating mode combination of each axis is shown. Use this value when setting up the PLC connection.
*Please note that if the termination unit is not connected, the display will not be correct.

9.5.2 Hardware Configurations

(1) GSDML file and icon
The GSDML file and icon are required to configure the controller. The GSDML file and icon can be downloaded from the SMC website.
URL **https://www.smcworld.com**

GSDMLfile：GSDML-V2.44-SMC-JXD1-20240606.xml
Icon：GSDML-0083-0031-JXD1.bmp

(2) JXD1-MGW-PN input/output module configuration

The following shows how to set up the JXD1-MGW-EC input/output module with a SIEMENS PLC. Please refer to the Operation Manual of the SIEMENS PLC for detailed operation.

∗ The image below shows the SIEMENS software, TIA PORTAL V13.

Please refer to the manual of the relevant configuration software for the setting method.

■For automatic input/output module configuration

Add the PLC to be connected to the controller from [Hardware catalog] in TIA Portal to [Devices & networks], configure the PLC and communication module settings, and set the network and IP address of the PLC, then perform the following.

(1) Select 'Online' in the menu bar of the TIA Portal main screen.
(2) From [Hardware detection], perform hardware detection of the PROFINET device and configure the input/output modules.

■For manual input/output module configuration

Select " JXD1-MGW-PN " from "Hardware catalog" of TIA PORTAL and drag and drop it on the "Devices & networks" screen. Please do the following steps after connecting the PLC to the Network.

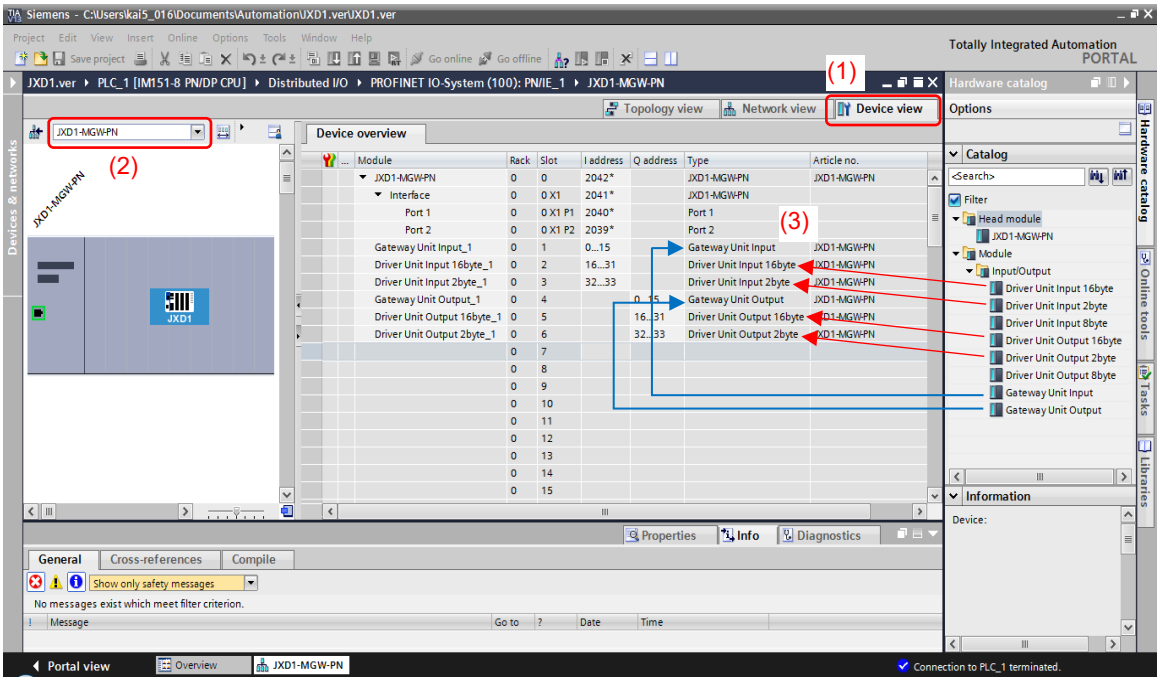
(1) Please select [Device view] tab.
(2) Please chose "JXD1-MGW-PN" from [Select device].
(3) Please drag and drop input/output module from [Hardware catalog] to [Device overview] according to the operating mode set in ACT-Connected.

Input/output module of [Hardware catalog]

Module	Data length [byte]	Used operating mode	Description
Driver Unit Input	16	Direct numerical setting mode	Driver Unit Inputs
Driver Unit Input	2	IO mode	Driver Unit Inputs
Driver Unit Input	8	Step instruction mode Simple direct value mode	Driver Unit Inputs
Driver Unit Output	16	Direct numerical setting mode	Driver Unit Outputs
Driver Unit Output	2	IO mode	Driver Unit Outputs
Driver Unit Output	8	Step instruction mode Simple direct value mode	Driver Unit Outputs
Gateway Unit Input	16	-	Gateway Unit Inputs
Gateway Unit Output	16	-	Gateway Unit Outputs

e.g.) Axis 0: Direct numerical setting mode, Axis 1: IO mode

Slot	Type
1	Gateway Unit Input
2	Driver Unit Input 16byte
3	Driver Unit Input 2byte
4	Gateway Unit Output
5	Driver Unit Output 16byte
6	Driver Unit Output 2byte


(1)
(2)
(3)
Siemens - C:\Users\kai5_016\Documents\Automation\UXD1.ver\UXD1.ver
Totally Integrated Automation PORTAL
JXD1.ver ▸ PLC_1 [IM151-8 PN/DP CPU] ▸ Distributed I/O ▸ PROFINET IO-System (100): PN/IE_1 ▸ JXD1-MGW-PN
Topology view
Network view
Device view
Hardware catalog
Options
Catalog
Device overview
Module
Rack
Slot
I address
Q address
Type
Article no.
JXD1-MGW-PN
Interface
Port 1
Port 2
Gateway Unit Input_1
Driver Unit Input 16byte_1
Driver Unit Input 2byte_1
Gateway Unit Output_1
Driver Unit Output 16byte_1
Driver Unit Output 2byte_1
Gateway Unit Input
Driver Unit Input 16byte
Driver Unit Input 2byte
Gateway Unit Output
Driver Unit Output 16byte
Driver Unit Output 2byte
Head module
Module
Input/Output
Driver Unit Input 8byte
Driver Unit Output 8byte
Information
Device:
Properties
Info
Diagnostics
General
Cross-references
Compile
Show only safety messages
No messages exist which meet filter criterion.
Message
Go to
Date
Time
Portal view
Overview
Connection to PLC_1 terminated.

9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)

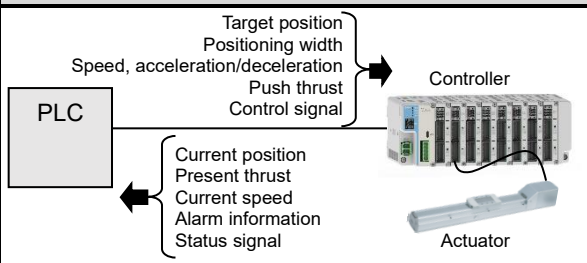
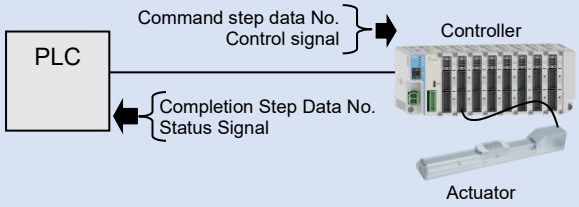
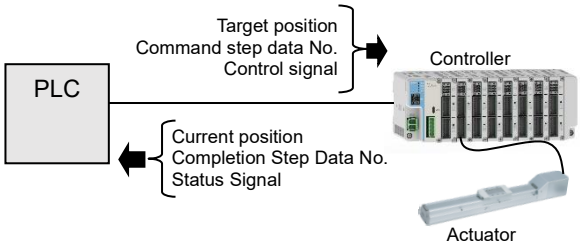
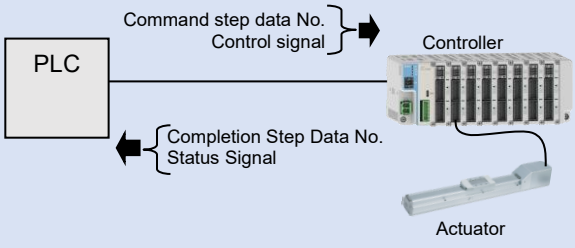
9.6.1 Outline of Fieldbus Operation Mode

This mode transmits operation commands from the PLC to each axis unit of the controller via fieldbus (CC-Link, Ethernet/IP, EtherCAT, PROFINET).
Status signals and information from each axis unit are sent to the host PLC via fieldbus.

9.6.2 List of fieldbus operation modes

The controller supports the following 4 patterns of fieldbus operation modes (hereinafter referred to as "operation modes").

(1) Direct numerical setting mode
(2) Step instruction mode
(3) Simple direct value mode
(4) IO mode
(5) Unset mode

Mode	Contents	Outlines
Direct numerical setting mode	This mode does not use step data, but re-writes all operation data via fieldbus for each positioning operation. All data necessary for operation, such as target position and speed, are specified.	
Step instruction mode	This mode operates using the operation data (step data) pre-registered in the driver unit. Specify the step data number of the registered operation data.	
Simple direct value mode	This mode operates using the operation data (step data) pre-registered in the driver unit, but only the target position is indicated numerically. Specify the step data number and target position of the registered operation data.	
IO mode	This mode operates using the operation data (step data) pre-registered in the driver unit. Specify the step data number of the registered operation data. Operates using the minimum amount of data required. (The amount of control and status signal data used is less than in step instruction mode).	
Unset mode	The amount of operation data occupied by the axis set to unset mode becomes 0. When the operation mode is set, operation data is sent and received regardless of whether the axis is enabled or disabled. When a Disabled axis is set for any axis, it is possible to set the Unset mode so that unnecessary operation data will not be occupied. Refer to section **10.2 Enabling and disabling axes** for more information on axis enable / disable.	

9.6.3 How to set the fieldbus operation mode

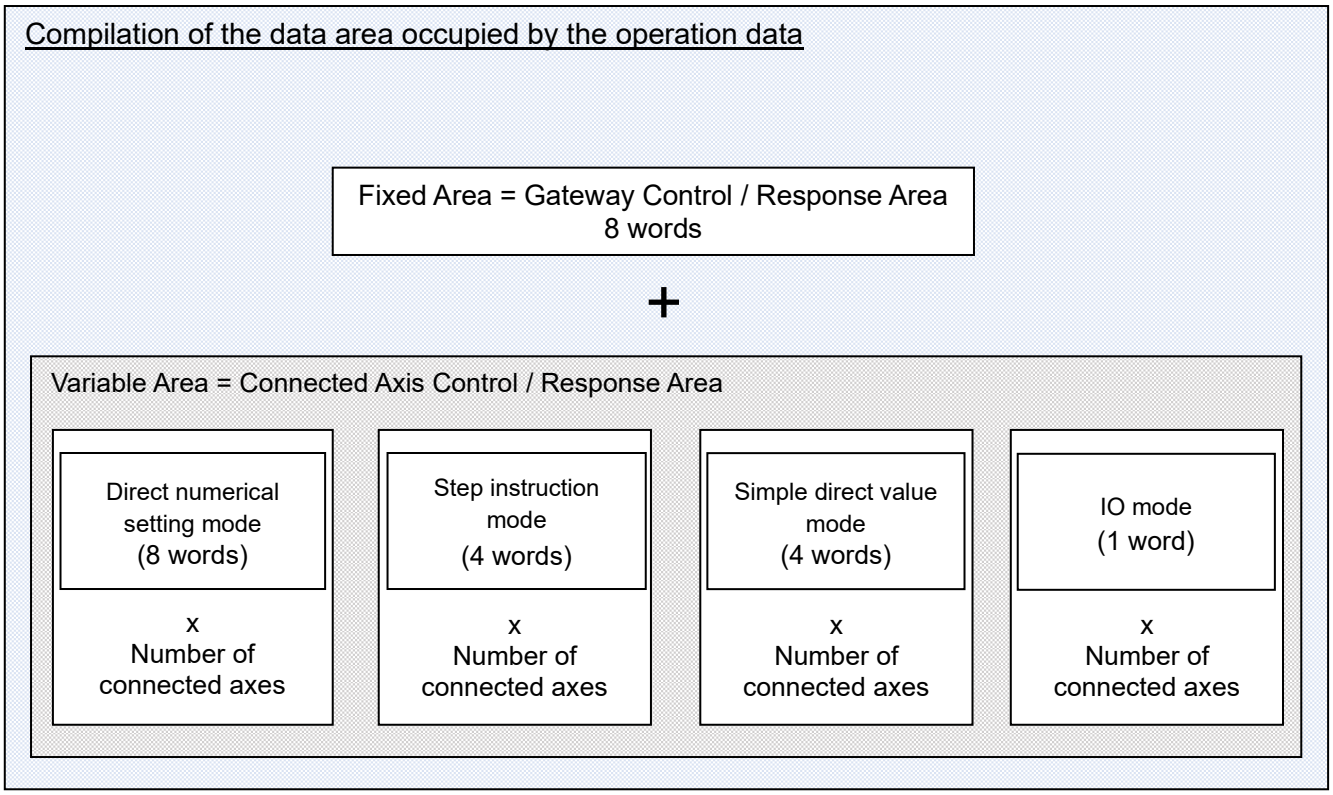
Using the controller setting software "ACT-Connected", the operation mode can be set from a PC.
The factory default of the operating mode is " Unset mode ".
For details, please refer to the ACT-Connected manual.

9.6.4 Data area of the PLC⇔Gateway Unit

This section describes the contents of operation data communicated via fieldbus.
Operation data consists of fixed-length data related to the control and status of the gateway unit, and variable-length data that collectively contains commands and information for each axis.
Actuators are controlled by writing / reading operation data to / from memory areas corresponding to I/O ports.

The data area occupied by the operation data is listed below.
(Unset mode is omitted because it is 0 words).

Fixed Area = Gateway Control / Response Area: 8 words (16 bytes)
Variable Area = Connected Axis Control / Response Area: 1 to 8 words (2 to 16 bytes)
∗Varies depending on the operation mode and number of connected axes.



(1) Data area of PLC⇒Gateway Unit

Assuming that 16 axes are connected and all axes are in the same operation mode, the data area assignment for each operation mode is described below.

For CC-Link, the Gateway control area is assigned to Remote Output (Ry) and the connected axis control area to Remote Register (RWw).

<table>
<tr><th></th><th>PLC Output Area (Word)</th><th>Direct numerical setting mode</th><th>Step instruction mode</th><th>Simple direct value mode</th><th>IO mode</th><th>Unset mode</th></tr>
<tr><td rowspan="8">Gateway control area</td><td>0*1)</td><td colspan="5">GW control 0</td></tr>
<tr><td>1</td><td colspan="5">GW control 1 (not used)</td></tr>
<tr><td>2</td><td colspan="5">Request command (not used)</td></tr>
<tr><td>3</td><td colspan="5">Data 0 (not used)</td></tr>
<tr><td>4</td><td colspan="5">Data1 (not used)</td></tr>
<tr><td>5</td><td colspan="5">Data 2 (not used)</td></tr>
<tr><td>6</td><td colspan="5">Data 3 (not used)</td></tr>
<tr><td>7</td><td colspan="5">Occupied area (not used)</td></tr>
<tr><td rowspan="16">Connected axis control area</td><td>8*1)</td><td rowspan="2">Target Position (Axis No. 0)</td><td rowspan="2">Not used (Axis No. 0)</td><td rowspan="2">Target Position (Axis No. 0)</td><td>Control signal / Command step data No. (Axis No. 0)</td><td></td></tr>
<tr><td>9</td><td>Axis No.1 Assignment area</td><td></td></tr>
<tr><td>10</td><td rowspan="2">Positioning Width (Axis No.0)</td><td>Command step data No. (Axis No.0)</td><td>Command step data No. (Axis No.0)</td><td>Axis No.2 Assignment area</td><td></td></tr>
<tr><td>11</td><td>Control signal (Axis No.0)</td><td>Control signal (Axis No.0)</td><td>Axis No.3 Assignment area</td><td></td></tr>
<tr><td>12</td><td>Speed (Axis No.0)</td><td rowspan="4">Axis No.1 Assignment area</td><td rowspan="4">Axis No.1 Assignment area</td><td>Axis No.4 Assignment area</td><td></td></tr>
<tr><td>13</td><td>Acceleration / deceleration (Axis No.0)</td><td>Axis No.5 Assignment area</td><td></td></tr>
<tr><td>14</td><td>Pushing force (Axis No.0)</td><td>Axis No.6 Assignment area</td><td></td></tr>
<tr><td>15</td><td>Control signal (Axis No.0)</td><td>Axis No.7 Assignment area</td><td></td></tr>
<tr><td>16～23</td><td>Axis No.1 Assignment area</td><td>Axis No.2～3 Assignment area</td><td>Axis No.2～3 Assignment area</td><td>Axis No.8～15 Assignment area</td><td></td></tr>
<tr><td>24～31</td><td>Axis No.2 Assignment area</td><td>Axis No.4～5 Assignment area</td><td>Axis No.4～5 Assignment area</td><td rowspan="3"></td><td></td></tr>
<tr><td>32～71</td><td>Axis No.3～7 Assignment area</td><td>Axis No.6～15 Assignment area</td><td>Axis No.6～15 Assignment area</td><td></td></tr>
<tr><td>72～135</td><td>Axis No.8～15 Assignment area</td><td colspan="2"></td><td></td></tr>
</table>

*1) Word0 (=Ry0) and Word8 (=RWw0) of CC-Link correspond to the first address of the remote output and remote register allocated by the master.
The address changes depending on the contents of the assignment in the master.

(2) Data area of Gateway Unit⇒PLC

Assuming that 16 axes are connected and all axes are in the same operation mode, the data area assignment for each operation mode is described below.

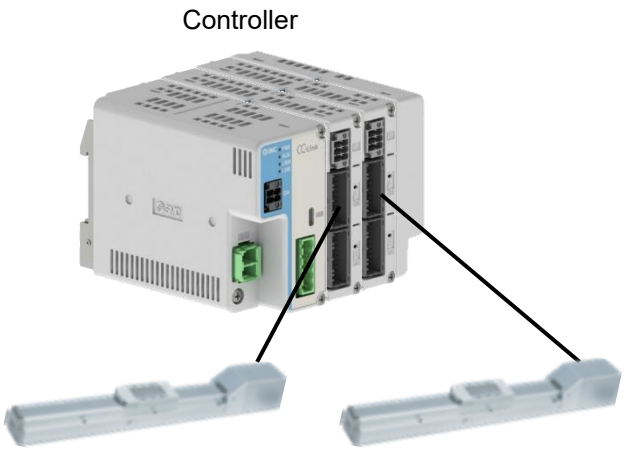
For CC-Link, the gateway response area is assigned to the remote input (Rx) and the connection axis response area to the remote register (RWr).

<table>
<tr><th></th><th>PLC input Area (Word)</th><th>Direct numerical setting mode</th><th>Step instruction mode</th><th>Simple direct value mode</th><th>IO mode</th><th>Unset mode</th></tr>
<tr><td rowspan="8">Gateway response area</td><td>0*1)</td><td colspan="5">GW state 0</td></tr>
<tr><td>1</td><td colspan="5">GW state 1 (not used)</td></tr>
<tr><td>2</td><td colspan="5">Request command (not used)</td></tr>
<tr><td>3</td><td colspan="5">Data 0 (not used)</td></tr>
<tr><td>4</td><td colspan="5">Data1 (not used)</td></tr>
<tr><td>5</td><td colspan="5">Data 2 (not used)</td></tr>
<tr><td>6</td><td colspan="5">Data 3 (not used)</td></tr>
<tr><td>7</td><td colspan="5">Occupied area (not used)</td></tr>
<tr><td rowspan="16">Connected axis response area</td><td>8*1)</td><td rowspan="2">Current Position (Axis No.0)</td><td colspan="2" rowspan="2">Current Position (Axis No.0)</td><td>Status Signal / Completion Step Data No. (Axis No.0)</td><td></td></tr>
<tr><td>9</td><td>Axis No.1 Assignment area</td><td></td></tr>
<tr><td>10</td><td>Current force (Axis No.0)</td><td colspan="2">Completion Step Data No. (Axis No.0)</td><td>Axis No.2 Assignment area</td><td></td></tr>
<tr><td>11</td><td>Not used (Axis No.0)</td><td colspan="2">Status Signal (Axis No.0)</td><td>Axis No.3 Assignment area</td><td></td></tr>
<tr><td>12</td><td>Current speed (Axis No.0)</td><td colspan="2" rowspan="4">Axis No.1 Assignment area</td><td>Axis No.4 Assignment area</td><td></td></tr>
<tr><td>13</td><td>Not used (Axis No.0)</td><td>Axis No.5 Assignment area</td><td></td></tr>
<tr><td>14</td><td>Alarm code (Axis No.0)</td><td>Axis No.6 Assignment area</td><td></td></tr>
<tr><td>15</td><td>Status Signal (Axis No.0)</td><td>Axis No.7 Assignment area</td><td></td></tr>
<tr><td>16～23</td><td>Axis No.1 Assignment area</td><td colspan="2">Axis No.2～3 Assignment area</td><td>Axis No.8～15 Assignment area</td><td></td></tr>
<tr><td>24～31</td><td>Axis No.2 Assignment area</td><td colspan="2">Axis No.4～5 Assignment area</td><td rowspan="3"></td><td></td></tr>
<tr><td>32～71</td><td>Axis No.3～7 Assignment area</td><td colspan="2">Axis No.6～15 Assignment area</td><td></td></tr>
<tr><td>72～135</td><td>Axis No.8～15 Assignment area</td><td colspan="2"></td><td></td></tr>
</table>

∗1) Word0 (=Rx0) and Word8 (=RWr0) of CC-Link correspond to the first address of the remote input and remote register allocated by the master.
The address changes depending on the contents of the assignment in the master.

(3) Unset mode

This section explains the changes in data allocation when using the Unset mode, using the state in which two driver units of 2-axis specifications are connected as an example.



	Port	Axis No.	Axis Setting
Driver Unit 1	CH A	0	Enable
	CH B	1	Disable
Driver Unit 2	CH A	2	Enable
	CH B	3	Disable

When a connection is made as shown in the above figure and the operation mode is set to IO mode for all axes, the amount of operation data communicated between the PLC and the gateway unit is 12 words (Regardless of whether the axis is enabled or disabled, operation data is sent and received when the operation mode is set).

The amount of operation data can be reduced by assigning "Mode Not Set" to an axis that is set as an invalid axis, such as Axes No. 1 and No. 3 in the above figure.

PLC Input/output area(Word)	Data assignment		
	Axis No.0~3 : IO mode	→	Axis No.0,2 : IO mode Axis No.1,3 : Unset mode
0～7	Gateway Unit Control/Response Area		Gateway Unit Control/Response Area
8	Axis No.0 Assignment area	→	Axis No.0 Assignment area
9	Axis No.1 Assignment area		Axis No.2 Assignment area
10	Axis No.2 Assignment area		
11	Axis No.3 Assignment area		

The address of the operation data of axis No. 2 is moved up because axis No. 1 is in the unset mode (number of occupied words = 0 word).

9.6.5 Data assignment details for each operation mode (CC-Link , EtherNet/IP , EtherCAT)

Details of operation data are described for each mode.
For the connected axis memory addresses, relative addresses are listed because they change depending on the connection status (axis No., number of connected axes, operation mode, etc.).
(First address = n)

(1) Common part of each mode (gateway control / response area)
●PLC⇒Gateway Unit (Gateway control area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
Ry0	0	0～14	GW control	Not Used	
		15		GWMON	Disable control from PLC: 0 Enable control from PLC: 1 1) In the case that the "Enable/disable PLC commands" setting is enabled, this address must always be set to 1 when controlling from a PLC. 2) In the case that the "Enable/Disable PLC commands" setting is disabled, this address is unused and control from the PLC is always enabled. Refer to section **9.1 List of Gateway unit special setting parameters** for more information on "Enable/disable PLC commands".
Ry1	1	0～15	Not Used		
Ry2	2				
Ry3	3				
Ry4	4				
Ry5	5				
Ry6	6				
Ry7	7				

●Gateway Unit⇒PLC (Gateway response area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
Rx0	0	0～7	GW status	GWALC	Displays the latest GW alarm code in hexadecimal.
		8		SSTOP	Normal: 0 Stop SW input detection: 1
		9		Not used	
		10			
		11		GWALM	Normal: 0 GW alarm in progress: 1
		12		Not used	
		13		SIRERR	Normal: 0 Internal communication error occurred:1
		14		FBERR	Normal: 0 Fieldbus communication error occurred: 1
		15		GWRUN	Power not turned on: 0 Normal operation: 1
Rx1	1	0～15		LINK15-0	The bit of the axis number recognized by GW is ON. Axis 15 = bit 15 - Axis 0 = bit 0
Rx2	2	0～15	Not used		
Rx3	3				
Rx4	4				
Rx5	5				
Rx6	6				
Rx7	7				

(2) Direct numerical setting mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWw n	n	0～7	Target position	Lowermost ↑ ↓ Uppermost	Enter the target position as a 32-bit signed integer. (Unit: 0.01 mm) The range of values is the same as the input range for “Position” in 10.3.1 Step Data Entry.
		8～15			
RWw n+1	n+1	0～7			
		8～15			
RWw n+2	n+2	0～7	Positioning Width	Lowermost ↑ ↓ Uppermost	Enter the positioning width as a 32-bit unsigned integer. (Unit: 0.01 mm) The range of values is the same as the input range for “Positioning Width” in 10.3.1 Step Data Entry.
		8～15			
RWw n+3	n+3	0～7			
		8～15			
RWw n+4	n+4	0～7	Speed	Lower	Enter the speed as a 16-bit integer. (Unit: mm/s) The range of values is the same as the input range for “Speed” in 10.3.1 Step Data Entry.
		8～15		Upper	
RWw n+5	n+5	0～7	Acceleration / deceleration	Lower	Enter the acceleration / deceleration rate as a 16-bit integer. (Unit: mm/s^2) The range of values is the same as the input range for “Acceleration” and “deceleration” in 10.3.1 Step Data Entry.
		8～15		Upper	
RWw n+6	n+6	0～7	Pushing force	Lower	Enter the pushing thrust as a 16-bit integer.(Unit: %) The INP is switched to ON after a certain period has elapsed after the pushing force has been reached. The range of values is the same as the input range for “Pushing force” in 10.3.1 Step Data Entry.
		8～15		Upper	
RWw n+7	n+7	0	Control signal	DRIVE	Indicates the start of operation at the rising edge of the signal.
		1		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of ‘home position ± parameter "initial positioning range".
		2		HOLD	When turned ON during an operation it will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
		3		RESET	This is an instruction to reset the alarm and stop operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration”. At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
		4		SVON	Turns Servo ON/OFF. ON: Servo ON OFF: Servo OFF
		5		FLGTH	Switches between JOG operation and constant dimension feed operation. At the rising edge of JOG signal, ON: constant dimension feed OFF: JOG operation The feed rate for constant dimension feed is determined by the parameter "constant dimension distance”.
		6		Not used	
		7		JOG(-)	JOG operation instruction; moves in the - direction while ON. When FLGTH is ON, constant dimension feed is performed in the - direction at the rising edge of the signal.
		8		JOG(+)	JOG operation instruction; moves in the + direction while ON. When FLGTH is ON, constant dimension feed is performed in the + direction at the rising edge of the signal.
		9～11		Not used	
		12		POI	Push operation command. At the rising edge of the DRIVE signal ON: Push operation OFF: Positioning operation
		13		PDIR	Push direction selection. At the rising edge of the DRIVE signal ON: Push in the + direction OFF: Push in the – direction
		14		INC/ABS	INC (relative) / ABS (absolute) switch the movement designation. ON: INC OFF: ABS
		15		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.

●Gateway Unit⇒PLC (Connected axis response area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWx n	n	0～7	Current Position	Lowermost ↑ ↓ Uppermost	Outputs the current position as a 32-bit signed integer. (Unit: 0.01 mm)
		8～15			
RWx n+1	n+1	0～7			
		8～15			
RWx n+2	n+2	0～7	Current force	Lower	Outputs the Current force as a 16-bit signed integer. (Unit: %)
		8～15		Upper	
RWx n+3	n+3	0～15	Not used		
RWx n+4	n+4	0～7	Current speed	Lower	Outputs the velocity as a 16-bit integer. (Unit: mm/s)
		8～15		Upper	
RWx n+5	n+5	0～15	Not used		
RWx n+6	n+6	0～7	Alarm code	Lower	The latest alarm that has occurred at the driver unit is output as an alarm code (0 to FFFF h). If no alarm has occurred, the code is 0h. For the alarm codes, please see 9.7.1 Handling of individual data for details.
		8～15		Upper	
RWx n+7	n+7	0	Status Signal	INP	Turns ON when the current position is within the target position Width.(Target position width) ・In-position operation: Target position ± positioning Width. ・pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
		1		SETON	Indicates that homing is complete and the position is fixed. ON: Position is fixed OFF: Position is not fixed
		2		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During temporary stop by HOLD input ("Running" during homing). ・During pushing operation and INP output (When INP is OFF, the servo is "in operation"). ・When the motor stops when the servo is ON, other than the above.
		3		ALM	Indicates an alarm status. Turns OFF when all alarms are cleared.
		4		SVRE	Indicates a servo ON status. ON/OFF changes according to the ON/OFF of SVON.
		5		PMIS	Turns ON when a swing occurs during pushing operation. PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
		6		Not used	
		7		WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal
		8～11		Not used	
		12		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2. OFF: Out of range.
		13		Not used	
		14		RDY	Indicates that the servo is ready for operation. ON: Servo is ON and there is no alarm.
		15		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal.

(3) Step instruction mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWwn	n	0～15	Not used		
RWwn+1	n+1	0～15	Not used		
RWwn+2	n+2	0	Command step data No.	IN0	Specifies the step data No. of operation data. Operation of the specified step data No. starts at the rising edge of the DRIVE signal. Only the lower 6 bits are valid (No. 0 to 63 can be specified).
		1		IN1	
		2		IN2	
		3		IN3	
		4		IN4	
		5		IN5	
		6～15	Not used		
RWwn+3	n+3	0	Control signal	DRIVE	Indicates the start of operation at the rising edge of the signal.
		1		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of ‘home position ± parameter "initial positioning range" ‘.
		2		HOLD	Turning ON during operation will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
		3		RESET	This is an instruction to reset the alarm and stop operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration. At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
		4		SVON	Turns Servo ON / OFF. ON: Servo ON, OFF: Servo OFF.
		5		FLGTH	Switches between JOG operation and constant dimension feed operation. At the rising edge of JOG signal, ON: constant dimension feed, OFF: JOG operation. The feed rate for constant dimension feed is determined by the parameter "constant dimension distance".
		6		Not used	
		7		JOG(-)	JOG operation instruction; moves in the - direction while ON. When FLGTH is ON, constant dimension feed is performed in the - direction at the rising edge of the signal.
		8		JOG(+)	JOG operation instruction; moves in the + direction while ON. When FLGTH is ON, constant dimension feed is performed in the + direction at the rising edge of the signal.
		9～14		Not used	
		15		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.

●Gateway Unit⇒PLC(Connection axis response area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWx n	n	0～7	Current Position	Lowermost ↑ ↓ Uppermost	Outputs the current position as a 32-bit signed integer. (Unit: 0.01 mm)
		8～15			
RXw n+1	n+1	0～7			
		8～15			
RWx n+2	n+2	0	Completed Step Data No.	OUT0	Outputs the step data No. (0 to 63) for which the operation has been completed.
		1		OUT1	
		2		OUT2	
		3		OUT3	
		4		OUT4	
		5		OUT5	
		6～15	Not used		
RWx n+3	n+3	0	Status Signal	INP	Turns ON when the current position is within the target position width. (Target position width) ・In-position operation: Target position ± positioning width. ・Pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
		1		SETON	Indicates that homing is complete and the position is fixed. ON: Position is fixed OFF: Position is not fixed
		2		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During a temporary stop by HOLD input ("Running" during homing). ・During a pushing operation and INP output (When INP is OFF, the servo is "in operation"). ・When the motor stops when the servo is ON, other than the above.
		3		ALM	Indicates an alarm status. Turns OFF when all alarms are cleared.
		4		SVRE	Indicates a servo ON status. ON/OFF changes according to the ON/OFF of SVON.
		5		PMIS	Turns ON when a swing occurs during pushing operation PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
		6		Not used	
		7		WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal
		8～10		Not used	
		11		AREA	Indicates that the current position is within the area range of the operation data. ON: Area output end 1 ≤ Current position ≤ Area output end 2 OFF: Out of range The area output setting range changes for each operation data. When area output end 1 = area output end 2 = 0, the setting is invalid.
		12		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2 OFF: Out of range
		13		Not used	
		14		RDY	Indicates that the servo is ready for operation. ON: Servo is ON and there is no alarm.
		15		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal

(4) Simple direct value mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWwn	n	0～7	Target position	Lowermost ↑ ↓ Uppermost	Enter the target position as a 32-bit signed integer. (Unit: 0.01 mm)
		8～15			
RWwn+1	n+1	0～7			
		8～15			
RWwn+2	n+2	0	Command step data No.	IN0	Specifies the step data No. of operation data. Operation of the specified step data No. starts at the rising edge of the DRIVE signal. Only the lower 6 bits are valid (No. 0 to 63 can be specified). Registers commands other than the target position.
		1		IN1	
		2		IN2	
		3		IN3	
		4		IN4	
		5		IN5	
		6～15	Not used		
RWwn+3	n+3	0	Control signal	DRIVE	Indicates the start of operation at the rising edge of the signal.
		1		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of 'home position ± parameter "initial positioning range" '.
		2		HOLD	When turned ON during an operation it will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
		3		RESET	This is an instruction to reset the alarm and stop the operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration". At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
		4		SVON	Turns Servo ON/OFF. ON: Servo ON OFF: Servo OFF
		5		FLGTH	Switches between JOG operation and constant dimension feed operation. At the rising edge of JOG signal, ON: constant dimension feed OFF: JOG operation The feed rate for constant dimension feed is determined by the parameter "constant dimension distance".
		6		Not used	
		7		JOG(-)	JOG operation instruction; moves in the - direction while ON. When FLGTH is ON, constant dimension feed is performed in the - direction at the rising edge of the signal.
		8		JOG(+)	JOG operation instruction; moves in the + direction while ON. When FLGTH is ON, constant dimension feed is performed in the + direction at the rising edge of the signal.
		9～14		Not used	
		15		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.

●Gateway Unit⇒PLC(Connected axis response area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWxn	n	0～7	Current Position	Lowermost ↑ ↓ Uppermost	Outputs the current position as a 32-bit signed integer. (Unit: 0.01 mm)
		8～15			
RWxn+1	n+1	0～7			
		8～15			
RWxn+2	n+2	0	Completed Step Data No.	OUT0	Outputs the step data No. (0 to 63) for which the operation has been completed.
		1		OUT1	
		2		OUT2	
		3		OUT3	
		4		OUT4	
		5		OUT5	
		6～15	Not used		
RWxn+3	n+3	0	Status Signal	INP	Turns ON when the current position is within the target position Width. (Target position width) ・In-position operation: Target position ± positioning Width. ・pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
		1		SETON	Indicates that homing is complete and the position is fixed. ON: Position is fixed OFF: Position is not fixed
		2		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During temporary stop by HOLD input ("Running" during homing). ・During pushing operation and INP output (When INP is OFF, the servo is "in operation"). ・When the motor stops when the servo is ON, other than the above.
		3		ALM	Indicates an alarm status. Turns OFF when all alarms are cleared.
		4		SVRE	Indicates a servo ON status. ON/OFF changes according to the ON/OFF of SVON.
		5		PMIS	Turns ON when a swing occurs during pushing operation. PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
		6		Not used	
		7		WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal
		8～10		Not used	
		11		AREA	Indicates that the current position is within the area range of the operation data. ON: Area output end 1 ≤ Current position ≤ Area output end 2 OFF: Out of range The area output setting range changes for each operation data. When area output end 1 = area output end 2 = 0, the setting is invalid.
		12		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2. OFF: Out of range.
		13		Not used	
		14		RDY	Indicates that the servo is ready for operation. ON: Servo is ON and there is no alarm.
		15		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal.

(5) IO mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWwn	n	0	Command step data No.	IN0	Specifies the step data No. of operation data. Operation of the specified step data No. starts at the rising edge of the DRIVE signal. Only the lower 6 bits are valid (No. 0 to 63 can be specified).
		1		IN1	
		2		IN2	
		3		IN3	
		4		IN4	
		5		IN5	
		6～7		Not used	
		8	Control signal	DRIVE	Indicates the start of operation at the rising edge of the signal.
		9		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of ‘home position ± parameter "initial positioning range".
		10		HOLD	Turning ON during operation will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During a JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
		11		RESET	This is an instruction to reset the alarm and stop operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration”. At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
		12		SVON	Turns Servo ON/OFF. ON: Servo ON OFF: Servo OFF.
		13～14		Not used	
		15		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.

●Gateway Unit⇒PLC (Connected axis response area)

PLC memory address			Name		Details
CC-Link	EtherNet/IP EtherCAT	Bit			
RWxn	n	0	Completed Step Data No.	OUT0	Outputs the step data No. (0 to 63) for which the move has been completed.
		1		OUT1	
		2		OUT2	
		3		OUT3	
		4		OUT4	
		5		OUT5	
		6		Not used	
		7		WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal
		8	Status Signal	INP	Turns ON when the current position is within the target position width. (Target position width). ・In-position operation: Target position ± positioning width. ・Pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
		9		SETON	Indicates that homing is complete and the position is fixed. ON: Position is fixed OFF: Position is not fixed.
		10		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During temporary stop by HOLD input ("Running" during homing). ・During a pushing operation and INP output (When INP is OFF, the servo is “in operation”). ・When the motor stops when the servo is ON, other than the above.
		11		ALM	Indicates alarm status. Turns OFF when all alarms are cleared.
		12		SVRE	Indicates servo ON status. ON/OFF changes according to the ON/OFF of SVON.
		13		PMIS	Turns ON when a swing occurs during pushing operation. PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
		14		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2. OFF: Out of range.
		15		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal.

9.6.6 Data assignment details for each operation mode (PROFINET)
Details of operation data are described for PROFINET.
For the connected axis memory addresses, relative addresses are listed because they change depending on the connection status (axis No., number of connected axes, operation mode, etc.).
(First address = n)

(1) Common part of each mode (gateway control / response area)
●PLC⇒Gateway Unit (Gateway control area)

PLC memory address		Name		Details
PROFINET	Bit			
0	0～6	GW control	Not Used	
	7		GWMON	Disable control from PLC: 0 Enable control from PLC: 1 1) In the case that the "Enable/disable PLC commands" setting is enabled, this address must always be set to 1 when controlling from a PLC. 2) In the case that the "Enable/Disable PLC commands" setting is disabled, this address is unused and control from the PLC is always enabled. Refer to section **9.1 List of Gateway unit special setting parameters** for more information on “Enable/disable PLC commands”.
	8～15		Not Used	
1	0～15	Not Used		
2				
3				
4				
5				
6				
7				

●Gateway Unit⇒PLC (Gateway response area)

PLC memory address		Name		Details
PROFINET	Bit			
0	0	GW status	SSTOP	Normal: 0 Stop SW input detection: 1
	1		Not Used	
	2			
	3		GWALM	Normal: 0 GW alarm in progress: 1
	4		Not Used	
	5		SIRERR	Normal: 0 Internal communication error occurred:1
	6		FBERR	Normal: 0 Fieldbus communication error occurred: 1
	7		GWRUN	Power not turned on: 0 Normal operation: 1
	8～15		GWALC	Displays the latest GW alarm code in hexadecimal.
1	0～15		LINK15-0	The bit of the axis number recognized by GW is ON. Axis 15 = bit 7 - Axis 8 = bit0; Axis 7＝bit15 - Axis 0＝bit8
2	0～15	Not Used		
3				
4				
5				
6				
7				

(2) Direct numerical setting mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address		Name		Details PROFINET
PROFINET	Bit			
n	0～7	Target position	Uppermost ↑ ↓ Lowermost	Enter the target position as a 32-bit signed integer. (Unit: 0.01 mm) The range of values is the same as the input range for “Position” in 10.3.1 Step Data Entry.
	8～15			
n+1	0～7			
	8～15			
n+2	0～7	Positioning Width	Uppermost ↑ ↓ Lowermost	Enter the positioning width as a 32-bit unsigned integer. (Unit: 0.01 mm) The range of values is the same as the input range for “Positioning Width” in 10.3.1 Step Data Entry.
	8～15			
n+3	0～7			
	8～15			
n+4	0～7	Speed	Upper	Enter the speed as a 16-bit integer. (Unit: mm/s) The range of values is the same as the input range for “Speed” in 10.3.1 Step Data Entry.
	8～15		Lower	
n+5	0～7	Acceleration / deceleration	Upper	Enter the acceleration / deceleration rate as a 16-bit integer. (Unit: mm/s^2) The range of values is the same as the input range for “Acceleration” and “deceleration” in 10.3.1 Step Data Entry.
	8～15		Lower	
n+6	0～7	Pushing force	Upper	Enter the pushing thrust as a 16-bit integer.(Unit: %) The INP is switched to ON after a certain period has elapsed after the pushing force has been reached. The range of values is the same as the input range for “Pushing force” in 10.3.1 Step Data Entry.
	8～15		Lower	
n+7	0	Control signal	JOG(+)	JOG operation instruction; moves in the + direction while ON. When FLGTH is ON, constant dimension feed is performed in the + direction at the rising edge of the signal.
	1～3		Not Used	
	4		POI	Push operation command. At the rising edge of the DRIVE signal ON: Push operation OFF: Positioning operation
	5		PDIR	Push direction selection. At the rising edge of the DRIVE signal ON: Push in the + direction OFF: Push in the – direction
	6		INC/ABS	INC (relative) / ABS (absolute) switch the movement designation. ON: INC OFF: ABS
	7		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.
	8		DRIVE	Indicates the start of operation at the rising edge of the signal.
	9		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of ‘home position ± parameter "initial positioning range".
	10		HOLD	When turned ON during an operation it will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
	11		RESET	This is an instruction to reset the alarm and stop operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration”. At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
	12		SVON	Turns Servo ON/OFF. ON: Servo ON OFF: Servo OFF
	13		FLGTH	Switches between JOG operation and constant dimension feed operation. At the rising edge of JOG signal, ON: constant dimension feed OFF: JOG operation The feed rate for constant dimension feed is determined by the parameter "constant dimension distance”.
	14		Not Used	
	15		JOG(-)	JOG operation instruction; moves in the - direction while ON. When FLGTH is ON, constant dimension feed is performed in the - direction at the rising edge of the signal.

●Gateway Unit⇒PLC (Connected axis response area)

PLC memory address		Name		Details PROFINET
PROFINET	Bit			
n	0～7	Current Position	Uppermost ↑ ↓ Lowermost	Outputs the current position as a 32-bit signed integer. (Unit: 0.01 mm)
	8～15			
n+1	0～7			
	8～15			
n+2	0～7	Current force	Upper	Outputs the Current force as a 16-bit signed integer. (Unit: %)
	8～15		Lower	
n+3	0～15	Not used		
n+4	0～7	Current speed	Upper	Outputs the velocity as a 16-bit integer. (Unit: mm/s)
	8～15		Lower	
n+5	0～15	Not used		
n+6	0～7	Alarm code	Upper	The latest alarm that has occurred at the driver unit is output as an alarm code (0 to FFFF h). If no alarm has occurred, the code is 0h. For the alarm codes, please see 9.7.2 Handling of individual data(PROFINET) for details.
	8～15		Lower	
n+7	0～3	Status signal	Not used	
	4		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2. OFF: Out of range.
	5		Not used	
	6		RDY	Indicates that the servo is ready for operation. ON: Servo is ON and there is no alarm.
	7		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal.
	8		INP	Turns ON when the current position is within the target position Width.(Target position width) ・In-position operation: Target position ± positioning Width. ・pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
	9		SETON	Indicates that homing is complete and the position is fixed. ON: Position is fixed OFF: Position is not fixed
	10		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During temporary stop by HOLD input ("Running" during homing). ・During pushing operation and INP output (When INP is OFF, the servo is "in operation"). ・When the motor stops when the servo is ON, other than the above.
	11		ALM	Indicates an alarm status. Turns OFF when all alarms are cleared.
	12		SVRE	Indicates a servo ON status. ON/OFF changes according to the ON/OFF of SVON.
	13		PMIS	Turns ON when a swing occurs during pushing operation. PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
	14		Not used	
	15		WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal

(3) Step instruction mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address		Name		Details
PROFINET	Bit			
n	0～15	Not used		
n+1	0～15	Not used		
n+2	0～7	Not used		
	8	Command and step data No.	IN0	Specifies the step data No. of operation data. Operation of the specified step data No. starts at the rising edge of the DRIVE signal. Only the lower 6 bits are valid (No. 0 to 63 can be specified).
	9		IN1	
	10		IN2	
	11		IN3	
	12		IN4	
	13		IN5	
	14～15	Not used		
n+3	0	Control signal	JOG(+)	JOG operation instruction; moves in the + direction while ON. When FLGTH is ON, constant dimension feed is performed in the + direction at the rising edge of the signal.
	1～6		Not used	
	7		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.
	8		DRIVE	Indicates the start of operation at the rising edge of the signal.
	9		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of 'home position ± parameter "initial positioning range" '.
	10		HOLD	Turning ON during operation will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
	11		RESET	This is an instruction to reset the alarm and stop operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration. At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
	12		SVON	Turns Servo ON / OFF. ON: Servo ON, OFF: Servo OFF.
	13		FLGTH	Switches between JOG operation and constant dimension feed operation. At the rising edge of JOG signal, ON: constant dimension feed, OFF: JOG operation. The feed rate for constant dimension feed is determined by the parameter "constant dimension distance".
	14		Not used	
	15		JOG(-)	JOG operation instruction; moves in the - direction while ON. When FLGTH is ON, constant dimension feed is performed in the - direction at the rising edge of the signal.

●Gateway Unit⇒PLC(Connection axis response area)

PLC memory address		Name		Details
PROFINET	Bit			
n	0～7	Current Position	Uppermost ↑ ↓ Lowermost	Outputs the current position as a 32-bit signed integer. (Unit: 0.01 mm)
	8～15			
n+1	0～7			
	8～15			
n+2	0～7	Not used		
	8	Completed Step Data No.	OUT0	Outputs the step data No. (0 to 63) for which the operation has been completed.
	9		OUT1	
	10		OUT2	
	11		OUT3	
	12		OUT4	
	13		OUT5	
	14～15	Not used		
n+3	0～2	Status Signal	Not used	
	3		AREA	Indicates that the current position is within the area range of the operation data. ON: Area output end 1 ≤ Current position ≤ Area output end 2 OFF: Out of range The area output setting range changes for each operation data. When area output end 1 = area output end 2 = 0, the setting is invalid.
	4		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2 OFF: Out of range
	5		Not used	
	6		RDY	Indicates that the servo is ready for operation. ON: Servo is ON and there is no alarm.
	7		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal
	8		INP	Turns ON when the current position is within the target position width. (Target position width) ・In-position operation: Target position ± positioning width. ・Pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
	9		SETON	Indicates that homing is complete and the position is fixed. ON: Position is fixed OFF: Position is not fixed
	10		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During a temporary stop by HOLD input ("Running" during homing). ・During a pushing operation and INP output (When INP is OFF, the servo is "in operation"). ・When the motor stops when the servo is ON, other than the above.
	11		ALM	Indicates an alarm status. Turns OFF when all alarms are cleared.
	12		SVRE	Indicates a servo ON status. ON/OFF changes according to the ON/OFF of SVON.
	13		PMIS	Turns ON when a swing occurs during pushing operation PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
	14		Not used	
	15		WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal

(4) Simple direct value mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address		Name		Details
PROFINET	Bit			
n	0～7	Target position	Uppermost ↑ ↓ Lowermost	Enter the target position as a 32-bit signed integer. (Unit: 0.01 mm)
	8～15			
n+1	0～7			
	8～15			
n+2	0～7	Not used		
	8	Command step data No.	IN0	Specifies the step data No. of operation data. Operation of the specified step data No. starts at the rising edge of the DRIVE signal. Only the lower 6 bits are valid (No. 0 to 63 can be specified). Registers commands other than the target position.
	9		IN1	
	10		IN2	
	11		IN3	
	12		IN4	
	13		IN5	
	14～15	Not used		
n+3	0	Control signal	JOG(+)	JOG operation instruction; moves in the + direction while ON. When FLGTH is ON, constant dimension feed is performed in the + direction at the rising edge of the signal.
	1～6		Not used	
	7		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.
	8		DRIVE	Indicates the start of operation at the rising edge of the signal.
	9		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of 'home position ± parameter "initial positioning range" '.
	10		HOLD	When turned ON during an operation it will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
	11		RESET	This is an instruction to reset the alarm and stop the operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration". At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
	12		SVON	Turns Servo ON/OFF. ON: Servo ON OFF: Servo OFF
	13		FLGTH	Switches between JOG operation and constant dimension feed operation. At the rising edge of JOG signal, ON: constant dimension feed OFF: JOG operation The feed rate for constant dimension feed is determined by the parameter "constant dimension distance".
	14		Not used	
	15		JOG(-)	JOG operation instruction; moves in the - direction while ON. When FLGTH is ON, constant dimension feed is performed in the - direction at the rising edge of the signal.

●Gateway Unit⇒PLC(Connected axis response area)

PLC memory address		Name		Details
PROFINET	Bit			
n	0～7	Current Position	Uppermost ↑ ↓ Lowermost	Outputs the current position as a 32-bit signed integer. (Unit: 0.01 mm)
	8～15			
n+1	0～7			
	8～15			
n+2	0～7	Not used		
	8	Completed Step Data No.	OUT0	Outputs the step data No. (0 to 63) for which the operation has been completed.
	9		OUT1	
	10		OUT2	
	11		OUT3	
	12		OUT4	
	13		OUT5	
	14～15	Not used		
n+3	0～2	Status Signal	Not used	
	3		AREA	Indicates that the current position is within the area range of the operation data. ON: Area output end 1 ≤ Current position ≤ Area output end 2 OFF: Out of range The area output setting range changes for each operation data. When area output end 1 = area output end 2 = 0, the setting is invalid.
	4		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2. OFF: Out of range.
	5		Not used	
	6		RDY	Indicates that the servo is ready for operation. ON: Servo is ON and there is no alarm.
	7		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal.
	8		INP	Turns ON when the current position is within the target position Width. (Target position width) ・In-position operation: Target position ± positioning Width. ・pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
	9		SETON	Indicates that homing is complete, and the position is fixed. ON: Position is fixed OFF: Position is not fixed
	10		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During temporary stop by HOLD input ("Running" during homing). ・During pushing operation and INP output (When INP is OFF, the servo is "in operation"). ・When the motor stops when the servo is ON, other than the above.
	11		ALM	Indicates an alarm status. Turns OFF when all alarms are cleared.
	12		SVRE	Indicates a servo ON status. ON/OFF changes according to the ON/OFF of SVON.
	13		PMIS	Turns ON when a swing occurs during pushing operation. PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
	14		Not used	
	15		WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal

(5) IO mode

●PLC⇒Gateway Unit (Connected axis control area)

PLC memory address		Name		Details
PROFINET	Bit			
n	0	Control signal	DRIVE	Indicates the start of operation at the rising edge of the signal.
	1		SETUP	Indicates the homing operation. BUSY turns ON during the homing operation, and SETON turns ON after the homing operation is completed. At that time, INP is turned ON if it is within the range of 'home position ± parameter "initial positioning range".
	2		HOLD	Turning ON during operation will decelerate to a stop according to the acceleration / deceleration setting. (The remaining travel is put on hold). When turned OFF, it starts moving the remaining travel distance. During a JOG operation, even if HOLD is turned OFF, operation will not resume unless JOG is turned ON. Caution: The HOLD signal is disabled during pushing in the Pushing operation mode.
	3		RESET	This is an instruction to reset the alarm and stop operation. If an alarm is still occurring, ALM is turned OFF. During operation, decelerate and stop according to the parameter "maximum acceleration / deceleration". At that time, if it is within the target position range, INP is turned ON (Otherwise, INP is not turned ON).
	4		SVON	Turns Servo ON/OFF. ON: Servo ON OFF: Servo OFF.
	5～6		Not used	
	7		LKRL	Lock-force release signal (valid only when servo is OFF) ON: Lock forced release OFF: Lock retained.
	8	Command step data No.	IN0	Specifies the step data No. of operation data. Operation of the specified step data No. starts at the rising edge of the DRIVE signal. Only the lower 6 bits are valid (No. 0 to 63 can be specified).
	9		IN1	
	10		IN2	
	11		IN3	
	12		IN4	
	13		IN5	
	14～15		Not used	

●Gateway Unit⇒PLC (Connected axis response area)

PLC memory address		Name		Details
PROFINET	Bit			
n	0	Status Signal	INP	Turns ON when the current position is within the target position width. (Target position width). ・In-position operation: Target position ± positioning width. ・Pushing operation: Current force is higher than Pushing force. ・Home positioning: Home position ± parameter "Initial positioning width". Turns OFF when the target position is out of range or when the target position width is changed by the next operation command.
	1		SETON	Indicates that homing is complete and the position is fixed. ON: Position is fixed OFF: Position is not fixed.
	2		BUSY	Indicates that the motor is rotating or running. However, the following statuses are "Stopped". ・During temporary stop by HOLD input ("Running" during homing). ・During a pushing operation and INP output (When INP is OFF, the servo is “in operation”). ・When the motor stops when the servo is ON, other than the above.
	3		ALM	Indicates alarm status. Turns OFF when all alarms are cleared.
	4		SVRE	Indicates servo ON status. ON/OFF changes according to the ON/OFF of SVON.
	5		PMIS	Turns ON when a swing occurs during pushing operation. PMIS is switched off at the following times. -At the start of the next operation command execution. -When stopping by EMG or RESET. -When an ALARM occurs.
	6		WAREA	Indicates that the current position is within the range of the parameter "W area output end". ON: W area output end 1 ≤ current position ≤ W area output end 2. OFF: Out of range.
	7		ESTOP	Turns ON when the axis is set to disabled in ACT-Connected or the stop is caused by a specific reason. ON: The following stop inputs were present. ・EMG stop at the power input terminal. ・Stopped due to low motor power supply voltage. ・Stopped due to low control power supply voltage. OFF: Normal.
	8	Completed Step Data No.	OUT0	Outputs the step data No. (0 to 63) for which the move has been completed.
	9		OUT1	
	10		OUT2	
	11		OUT3	
	12		OUT4	
	13		OUT5	
	14		Not used	
	15	Status Signal	WARN	Indicates an alarm (warning) that is not accompanied by a stop. ON: Alarm (warning) detection without stop OFF: Normal

9.7 Handling of Each Transmitted and Received Data

9.7.1 Handling of data(CC-Link , EtherNet/IP , EtherCAT)

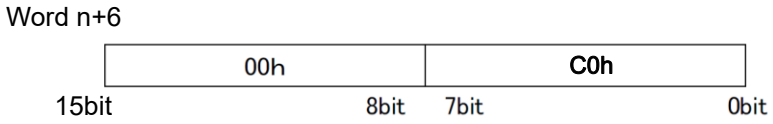
Assuming that the operation mode is Direct numerical setting mode, this section describes the handling of operation data.

・1 word data

For 1-word data such as speed, acceleration / deceleration, alarm code etc., handle as follows.

1)Example: When 100 mm/s is input for speed (Word n+4) (PLC ⇒ GATEWAY UNIT)
100 mm/s is 0064h in hexadecimal.
When inputting 00 64 h to the register, do the following:

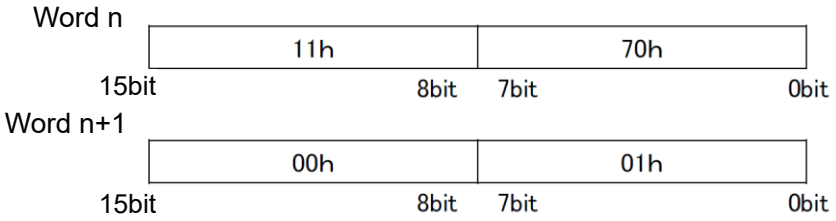
2) Example: When the alarm "Encoder error (192)" of the drive unit is displayed in the alarm code (Word n+6) (Gateway unit ⇒ PLC)
The value representing alarm code 192 in decimal is 00 C0h in hexadecimal.
As the alarm code is displayed in hexadecimal, convert it to decimal and read it.
For information on alarms in the drive unit, see **13.2 Alarm detection of driver unit**.



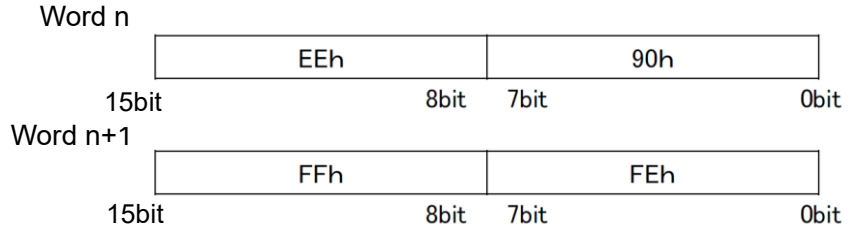
・2 word data

For 2-word data such as position, etc., handle as follows.

1) Example: When 700.00 mm is entered for position (Word n, Word n+1) (PLC => GATEWAY UNIT)
The position data is in units of 0.01 mm.
The value representing 700.00 mm is 70000, which is 00011170h in hexadecimal.
When entering 00 01 11 70h into the register, do the following:



2) Example: When entering -700.00 mm in position (Word n, Word n+1) (PLC ⇒ GATEWAY UNIT)
The position data is in units of 0.01 mm. Values with a minus sign are expressed in 2's complement.
- The value representing -700.00 mm is -70000, which is FFFEEE90h in hexadecimal.
When entering FF FE EE 90h into the register, do the following:



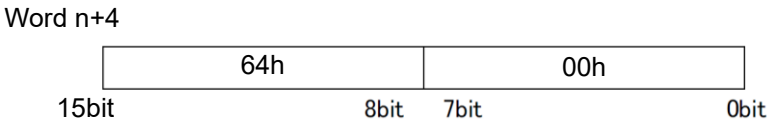
9.7.2 Handling of data(PROFINET)

Assuming that the operation mode is Direct numerical setting mode, this section describes the handling of operation data.

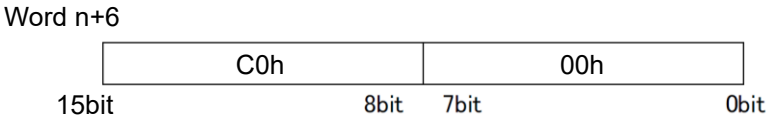
・1 word data

For 1-word data such as speed, acceleration / deceleration, alarm code etc., handle as follows.

1) Example: When 100 mm/s is input for speed (Word n+4) (PLC ⇒ GATEWAY UNIT)
100 mm/s is 00 64h in hexadecimal.
When inputting 00 64h to the register, perform the following:



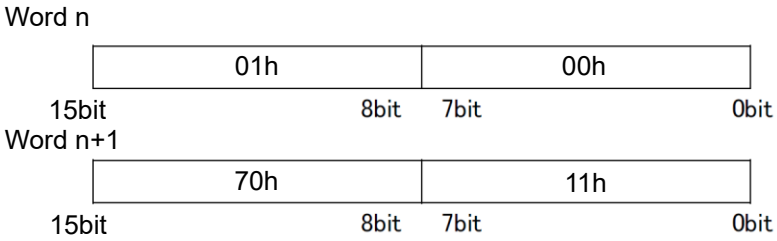
2) Example: When the alarm "Encoder error (192)" of the drive unit is displayed in the alarm code (Word n+6) (Gateway unit ⇒ PLC)
The value representing alarm code 192 in decimal is 00 C0h in hexadecimal.
As the alarm code is displayed in hexadecimal, convert it to decimal and read it.
For information on alarms in the drive unit, see **13.2 Alarm detection of driver unit.**



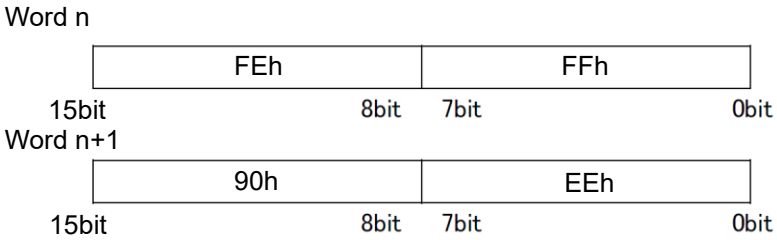
・2 word data

For 2-word data such as position, etc., handle as follows.

1) Example: When 700.00 mm is entered for position (Word n, Word n+1) (PLC => GATEWAY UNIT)
The position data is in units of 0.01 mm.
The value representing 700.00 mm is 70000, which is 00 01 11 70h in hexadecimal.
When entering 00 01 11 70h into the register, perform the following:



2) Example: When entering -700.00 mm in position (Word n, Word n+1) (PLC ⇒ GATEWAY UNIT)
The position data is in units of 0.01 mm. Negative values are expressed using 2's complement.
- The value representing -700.00 mm is -70000, which is FF FE EE 90h in hexadecimal.
When entering FF FE EE 90h into the register, perform the following:



9.7.3 Relationship between binary (BIN), decimal (DEC), and hexadecimal (HEX)

The relationship between binary (BIN) / decimal (DEC) / hexadecimal (HEX) is as follows:

e.g.) 1 byte

Binary (BIN)								Decimal (DEC)	Hexadecimal (HEX)
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	1
0	0	0	0	0	0	1	0	2	2
0	0	0	0	0	0	1	1	3	3
0	0	0	0	0	1	0	0	4	4
0	0	0	0	0	1	0	1	5	5
0	0	0	0	0	1	1	0	6	6
0	0	0	0	0	1	1	1	7	7
0	0	0	0	1	0	0	0	8	8
0	0	0	0	1	0	0	1	9	9
0	0	0	0	1	0	1	0	10	A
0	0	0	0	1	0	1	1	11	B
0	0	0	0	1	1	0	0	12	C
0	0	0	0	1	1	0	1	13	D
0	0	0	0	1	1	1	0	14	E
0	0	0	0	1	1	1	1	15	F
0	0	0	1	0	0	0	0	16	10
0	0	0	1	0	0	0	1	17	11
≀								≀	≀
0	0	0	1	1	1	1	0	30	1E
0	0	0	1	1	1	1	1	31	1F
0	0	1	0	0	0	0	0	32	20
0	0	1	0	0	0	0	1	33	21
≀								≀	≀
0	0	1	1	1	1	1	0	62	3E
0	0	1	1	1	1	1	1	63	3F
0	1	0	0	0	0	0	0	64	40
0	1	0	0	0	0	0	1	65	41
≀								≀	≀
0	1	1	1	1	1	1	0	126	7E
0	1	1	1	1	1	1	1	127	7F
1	0	0	0	0	0	0	0	128	80
1	0	0	0	0	0	0	1	129	81
≀								≀	≀
1	1	1	1	1	1	1	0	245	FE
1	1	1	1	1	1	1	1	255	FF

9.8 Controller input signal response time

The controller input signal response time delay includes the following factors.
(1) Controller input signal scan delay
(2) Delay due to input signal analysis
(3) Delay of command analysis
When the signals are continuously input, set the time to more than twice the communication cycle time for the interval between signals, as the PLC processing delays and controller scanning delays can occur.

10. Driver unit settings

10.1 Parameter input for connected actuators

10.1.1 When using an actuator for the first time or to initialize the actuator parameters

This command initializes (resets) the parameters set in the controller to the defaults.
The settings are made in the "Write default value" section of the setup using the ACT-Connected software.
The controller reads the connected actuator part number for each axis when checking the connection.
The connected actuator part number is automatically displayed, so select the connected actuator part number and write the parameters to the controller.
∗ Refer to the ACT-Connected instruction manual for how to write the initial values.

10.1.2 When using an actuator with the same part number as the actuator currently used

The parameters that have already been set in the controller are taken over.
Set only when using an actuator with the same part number as the actuator currently used.
The setting is performed using "Clear pairing ID" in the setup of ACT-Connected.
∗ For details on how to set the "Clear pairing ID", please refer to the ACT-Connected instruction manual.

10.1.3 When using a backup file

The parameters that have already been set for the controller in advance can be stored in a backup file.
Write the saved parameters to the controller from the backup file.
The settings are made using ACT-Connected.
∗ Refer to the ACT-Connected instruction manual for information on how to write parameters using the backup file.

⚠ Caution

For axes to which no actuator is connected, no parameters are set in the ACT-Connected setup.

10.2 Enabling and disabling axes

Axes can be enabled or disabled using ACT-Connected.
When an axis is disabled, its LED (CH A or CH B) is turned off and the axis function is disabled.
(For the axis that is set to disabled, the “ESTOP" of Gateway unit => PLC (connected axis response area) in the memory map is turned ON.)
However, regardless of whether the axis function is enabled or disabled, the data length of the selected operation mode is transmitted and received.
Regarding this function, please refer to the **9.6.4 Data area of the PLC⇔Gateway Unit (3) Unset mode**.
The settings are made in "Axis activation" using ACT-Connected.
∗ Refer to the ACT-Connected instruction manual for information on how to enable and disable the axes.

10.3 Settings and Data Entry

Parameters related to the actuator are set for each axis of the driver unit.
Each data input from ACT-Connected is stored in the memory in the controller.

Data that can be set using ACT-Connected include "Step data" and "Parameter".
In addition, "Parameter" includes "Basic parameters", "Return to origin parameters", and "Drive parameters".

∗ Refer to the ACT-Connected instruction manual for information on how to set parameters.

⚠ Caution

Writing of the step data and parameter should be performed while the electric actuator is stopped.

10.3.1 Step Data Entry

A "Step data" is the setting data mainly describing the movement of the actuator.
The operation pattern can be set using ACT-Connected to move the actuator to the specified position.
A total of 64 step data (13 attributes per step) can be handled by the controller. Each step data will become effective as soon as it is recorded into the controller.

E.g.) Step data on the PC (ACT-Connected) screen

No.	Movement mode	Speed [mm/s]	Position [mm]	Acceleration [mm/s2]	Deceleration [mm/s2]	Pushing force [%]	Trigger LV [%]	Pushing speed [mm/s]	Moving force [%]	AREA 1 [mm]	AREA 2 [mm]	In position [mm]
0(Posn)	Absolute	100	20.00	1000	1000	0	0	1	100	18.00	22.50	0.5
1(Push)	Absolute	50	10.00	1000	1000	70	60	5	100	6.0	12.0	1.5
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
63(Posn)	Absolute	20	5.00	500	500	0	0	1	100	3.0	8.0	1.2

Details of step data

<table>
<tr><th>Description</th><th>Range</th><th>Explanation</th></tr>
<tr><td>No.</td><td>0 to 63</td><td>Number of the step data.
If "Pushing Force" is 0, "Position" is automatically added after the numerical value, and if "Pushing Force" is 1 or more, "Push" is automatically added after the numerical value.</td></tr>
<tr><td>Movement mode</td><td>3 types
(Refer to the table on the right)</td><td>Specifies the co-ordinate system for the target position.
<table>
<tr><th>Movement mode</th><th>Details</th></tr>
<tr><td>Blank</td><td>The step data is ineffective.</td></tr>
<tr><td>Absolute</td><td>The target position will be defined in relation to the absolute origin point.</td></tr>
<tr><td>Relative</td><td>The target position will be defined relative to the current position.</td></tr>
</table></td></tr>
<tr><td>Speed</td><td>∗1 ∗2
The upper limit is influenced by the basic parameter "Max speed" and the lower limit by the "Speed lower limit".</td><td>This is the speed of movement to the target position or the starting position for pushing.
(Unit: mm/s)</td></tr>
<tr><td>Position</td><td>∗1 ∗2
The upper limit is influenced by the basic parameter "Stroke(+)" and the lower limit by the " Stroke(-)".</td><td>Target position or starting position for pushing.
(Unit: mm)</td></tr>
<tr><td>Acceleration</td><td rowspan="2">∗1 ∗2</td><td>Sets the acceleration to reach to travel speed. (Unit: mm/s^2)</td></tr>
<tr><td>Deceleration</td><td>Sets the deceleration from travel speed to stop. (Unit: mm/s^2)</td></tr>
<tr><td>Pushing force</td><td>∗1 ∗2
The upper limit is influenced by the basic parameter "Max force".</td><td>The setting to define the pushing operation or the positioning operation.
For the pushing operation, the value specifies the force as a percentage of the maximum force (Unit: %).
<table>
<tr><th>Value</th><th>Method of operation</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></td></tr>
<tr><td>Trigger LV</td><td>∗1 ∗2
The upper limit is influenced by the Step date "Pushing force".</td><td>■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.</td></tr>
</table>

<table>
<tr><th>Description</th><th>Range</th><th>Explanation</th></tr>
<tr><td>Pushing speed</td><td>∗1 ∗2
The lower limit is influenced by the basic parameter "Speed lower limit"</td><td>■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)
Refer to the actuator manual for the appropriate range of speed.
■For the positioning operation, this value is ignored.</td></tr>
<tr><td>Moving force</td><td>∗1 ∗2</td><td>The setting to define the maximum torque during the positioning operation. (Unit: %)
The thrust generated is automatically adjusted within the range of the maximum thrust according to the load.
⚠ Caution
If used with a value lower than the default setting may cause unexpected behaviour, which may result in equipment failure.
To change the setting, please refer to the actuator manual.</td></tr>
<tr><td>AREA 1</td><td>∗1 ∗2
The upper limit is influenced by the step data "AREA 2" and the lower limit by the basic parameter "Stroke (-)".</td><td rowspan="2">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 will be activated.
(However, no alarm is generated if "Area1" = "Area2" = 0, the “AREA” signal will be OFF).</td></tr>
<tr><td>AREA 2</td><td>∗1 ∗2
The upper limit is influenced by the basic parameter "Stroke (+)" and the lower limit by the step data "AREA 1".</td></tr>
<tr><td>In position</td><td>∗1 ∗2</td><td>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)
<table><tr><th>Method of operation</th><th>Details</th></tr><tr><td>Positioning operation</td><td>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.
■ Range where "INP" turns ON:
Target position - in position ≤ actuator position ≤ target position + in position</td></tr><tr><td>Pushing operation</td><td>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.</td></tr></table></td></tr>
</table>

∗1 The range varies depending on the actuator. Refer to the actuator manual for more details.

∗2 The input range is automatically calculated by ACT-Connected according to the step data and the parameters of the connected actuator.

10.3.2 Parameter Entry

(1) Basic parameters

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

Details of basic parameters

Basic parameters become effective after data is written to the controller.

Description	Range	Details
Stroke(+)	∗1 ∗2 The upper and lower limits are affected by the return to origin parameter "ORIG offset".	This defines the positive (+)limit of the position. (Unit: mm) If this value is exceeded, the alarm code 052 "Set stroke is outside the stroke limit" occurs.
Stroke(-)	∗1 ∗2 The upper and lower limits are affected by the return to origin parameter "ORIG offset".	This defines the negative (-)limit of the position. (Unit: mm) If this value is exceeded, the alarm code 052 "Set stroke is outside the stroke limit" occurs.
Max speed∗3	∗1 ∗2 The lower limit is influenced by the basic parameter "Speed lower limit"	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.
Max ACC/DEC	∗1 ∗2	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" and the "Decel" field data of step parameter setup.
Max force	∗1 ∗2	The maximum force for the pushing operation. (Unit: %)
W-AREA1	∗1 ∗2 The upper limit is influenced by the basic parameter "W-AREA 2" and the lower limit by the "Stroke (-)".	This is the setting to define the conditions where the “W-AREA” signal will turn ON. (Unit: mm) Enter a value smaller than "W area output end 2". ∗ 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	∗1 ∗2 The upper limit is influenced by the basic parameter " Stroke (+)" and the lower limit by the " W-AREA1".	This is the setting to define the conditions where the "W-AREA" signal will turn ON. (Unit: mm) Enter a value greater than "W area output end 1". ∗ 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
Reference pushing speed	∗1 ∗2 The lower limit is influenced by the basic parameter "Speed lower limit"	Set the "Pushing speed" when using the direct numeric setting mode. (Unit: mm/s)
Reference positioning torque	∗1 ∗2	Set the "Moving force" when using the direct numerical setting mode. (Unit: %)
Speed lower limit	1～100	Sets the lower limit of the set speed. (Unit: mm/s)

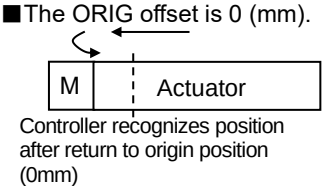
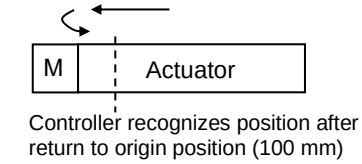
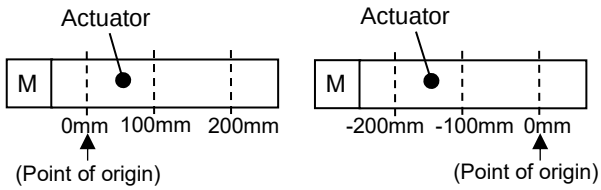
∗1 The actuator model determines the available input values. Refer to the actuator operation manual for details.

∗2 The input range is automatically calculated by ACT-Connected according to the step data and the parameters of the connected actuator.

∗3 It is recommended to set the “maximum speed” for the electric actuator operation. Control is restricted so that the set value is not exceeded. The response will be slower as a result.

(2) Return to origin parameters
The “Return to origin parameters” is the setting data for the return to origin operation.

Details of return to origin parameters
Return to origin parameters become effective after data is written to the controller.

Description	Range	Details
ORIG offset	-10000.00～ 10000.00	The position after completion of the return to origin recognised by the controller can be set to a position other than 0 mm. (Unit: mm) ■The ORIG offset is 0 (mm).  In the examples, the actuator positions are not different but the reference point that the controller recognizes will be changed after the return to origin operation. ■The ORIG offset is 100 (mm).  **⚠ Caution** If the value for the “ORIG offset” is changed, the “Stroke(+)” and “Stroke(-)” of the basic parameters should be checked. “ORIG offset” becomes valid after the return to origin operation, make sure that a return to origin operation is performed after any changes.
ORIG limit	∗1 ∗2	A pushing force level at which to set the origin. (Unit: %)
ORIG speed	∗1 ∗2 The lower limit is influenced by the basic parameter "Speed lower limit"	The allowable speed to move to origin. (Unit: mm/s)
ORIG direction	+ direction / - direction	Change the co-ordinate of the electric actuator. The direction will be opposite from the return to origin when the setting is changed. Therefore, the return to origin is required. **⚠ Caution** Changing the "ORIG direction" reverses the direction of movement of the actuator's mover and changes the position recognized by the controller. ■+ direction ■- direction 
Zero positioning distance	∗1 ∗2	Set the travel amount to be offset after torque detection in return to origin. (Unit: mm)

Description	Range	Details
Origin return error time	1～65535	An alarm will occur if the return-to-origin is not completed within this time. If the return-to-origin speed is lowered, set it according to the speed. (Unit: s)
Def In position	∗1 ∗2	This defines the range to activate the INP output after the return to origin operation. (Unit: mm)

∗1 The range varies depending on the actuator. Refer to the actuator manual for more details.

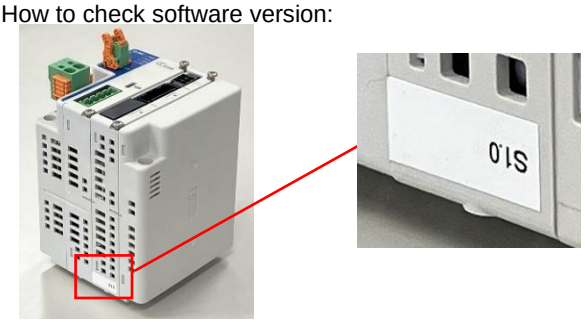
∗2 The input range is automatically calculated by ACT-Connected according to the step data and the parameters of the connected actuator.

∗3 When power is supplied again after changing the Return to origin parameter “Return to Origin Direction”, “Zero positioning distance”, the SETON output is turned OFF. Please perform the return to origin operation again.

(3) Drive parameters
The "Drive parameters" is data to set the actuator motion and JOG operation.

Details of drive parameters
Drive parameters become effective after data is written to the controller.

Description	Range	Details
Acceleration and Deceleration ratio	∗1 ∗2	Sets the level of followability of acceleration/deceleration. Followability to the acceleration becomes loose as the setting value increases. (Becomes close to the trapezoidal acceleration as the setting value reaches 0)
JOG speed	∗1 ∗2 The upper limit is influenced by the basic parameter "Max speed" and the lower limit by the "Speed lower limit".	Defines the JOG operation speed. (Unit: mm/s)
JOG Accel	∗1 ∗2	Defines the JOG operation acceleration. (Unit: mm/s^2)
JOG Decel		Defines the JOG operation deceleration. (Unit: mm/s^2)
JOG thrust	∗1 ∗2	Defines the torque limit during JOG operation. (Unit: %) **⚠ Caution** If used with a value lower than the default setting may cause unexpected behaviour, which may result in equipment failure. To change the setting, please refer to the actuator manual.
Fixed distance	∗1 ∗2	Defines the Inching distance. (Unit: mm)
Safe speed LIM	∗1 ∗2 The upper limit is influenced by the basic parameter "Max speed" and the lower limit by the "Speed lower limit".	Defines the maximum speed when the safe speed limit is in effect. (Unit: mm/s)
Torque when held	∗1 ∗2	Sets the stop torque after positioning operation. (Unit: %) **⚠ Caution** For vertical use, do not change the torque when held from the Default value. For horizontal use, it is possible to lower the torque when held from the Default value, but after changing the torque when held, check if there is any problem with the behavior when the actuator stops.
Position loop P constant	∗1 ∗2	Sets the position loop P constant. (Unit: Hz) **⚠ Caution** Actuator causes unexpected behaviour when this parameter setting is changed, which may result in equipment failure. To change the setting, please refer to the actuator manual.

Description	Range	Details
Speed loop P constant	∗1 ∗2	Sets the speed loop P constant. (Unit: 10Hz) **⚠ Caution** Actuator causes unexpected behaviour when this parameter setting is changed, which may result in equipment failure. To change the setting, please refer to the actuator manual.
Speed loop I constant	∗1 ∗2	Sets the speed loop I constant. (Unit: ms) **⚠ Caution** Actuator causes unexpected behaviour when this parameter setting is changed, which may result in equipment failure. To change the setting, please refer to the actuator manual.
Positioning time Level	0.1～25.5	Sets the time to generate an arrival time error alarm. (Unit: s)
Short brake release∗3	Enable Disable	Enables or disables the short brake function release. **⚠ Caution** (1) This function is effective with software version S1.1 or later. How to check software version:  The software version can also be checked from the controller setting software ACT-Connected. Please refer to the ACT-Connected operation manual for details. (2) If the software version of the driver unit is S1.0, short brake release cannot be performed even if this parameter is set to valid.

∗1 The range varies depending on the actuator. Refer to the actuator manual for more details.
∗2 The input range is automatically calculated by ACT-Connected according to the step data and the parameters of the connected actuator.
∗3 The initial value of the short brake release parameter is "disabled" regardless of the actuator type. For details on short brake function release, please refer to **7.4 (4) Short brake function release**.
Enable: Short brake function is released.
Disable: Short brake function is not released.

11. Operation Explanation

11.1 Return to origin

A Return to origin operation should be performed first in the following cases.

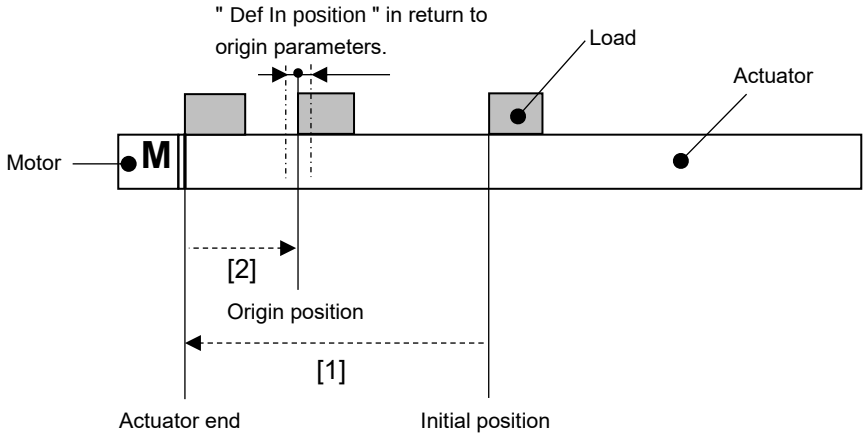
(1) When the power is turned on.
When power is turned on for the first time, homing is required.
The next time the power is turned on again, homing is not required.
(2) When the actuator or motor is replaced.
(3) When alarm “Alarm Group D2” or “Alarm Group E” is cleared by supplying the power again.
(4) When one of the following parameters (Refer to section **10.3.2 Parameter entry** is changed:
- ●ORIG offset
- ●ORIG direction
- ●Zero positioning distance
- ●Def In position

An "Abs ID mismatch (alarm code 153)" alarm occurs when power is turned on for (1) and (2), so reset the alarm and then perform homing.
Please refer to the ACT-Connected instruction manual for information on how to perform alarm resets.

■Return to origin operation

The actuator moves from the initial position to the actuator end according to the “ORIG direction” and “ORIG speed” in the Return to origin parameters at the moment of power ON. Refer to [1] in the figure below.
The actuator moves to the end of the actuator, stops and then remains above the torque value set in the in the Return to origin parameters " ORIG limit " for a certain period of time. The controller recognizes the position as the end of stroke limit of the actuator. Then, the actuator moves to the position which set in the “Zero positioning distance” with 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. When the Return to origin operation is completed, the SETON signal will be turned ON. If the current position is within the defines the range which defined in "Def In position" parameter, the INP signal will also switched ON.

●Example of the return to origin operation



⚠ Caution

(1) The homing direction of the actuator depends on the actuator and the "ORIG direction" parameter.
(2) If you want to set an origin position other than 0 mm after completion of the return to origin that is recognised by the controller, use the "ORIG offset" parameter in the Return to origin parameters.

11.2 Positioning operation

■ Step instruction mode, IO mode

Step data "Pushing force" is set to 0.

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

■ Simple direct value mode

Step data "Pushing force" is set to 0.

The actuator moves to the "Target position" in the data area of the PLC => Gateway unit.

■ Direct numerical setting mode

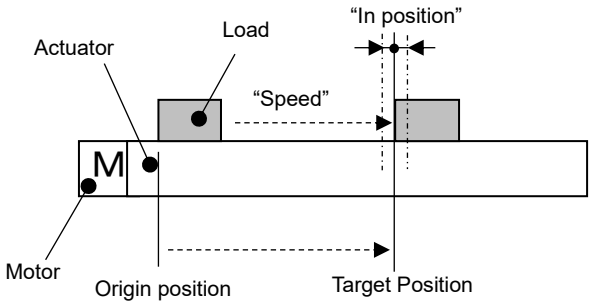
The control signal is set to the following statuses.

●INC/ABS input is ON (INC: relative) or OFF (ABS: absolute).

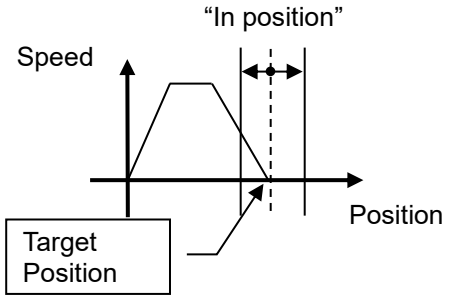
●POI input is OFF (positioning operation).

The actuator moves to the "Target position" in the data area of the PLC => Gateway unit.

●Example of positioning operation



●Example of positioning operation [Speed/Position]



11.3 Pushing operation

■Step instruction mode, IO mode

The pushing operation is active when the value of the "Pushing force" in the Step data is set to "1" or more.
The positioning operation is performed at the "Position" and "Speed" of the step data.
Then, the pushing operation starts from the starting position defined by the "Position".
The actuator pushes the load with a force no more than the maximum force set in the "Pushing force" of the step data.

■Simple direct value mode

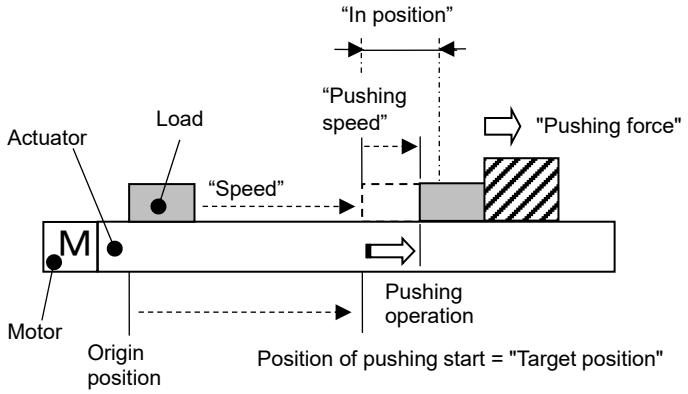
When a value of 1 or more is registered for "Pushing Force" in the step data, a pushing operation is performed.
The positioning operation is performed at the "Target Position" in the data area of the PLC => Gateway unit and at the "Speed" of the step data.
Then, the pushing operation starts from the starting position defined by the "Target Position".
The pushing operation is performed at or below the maximum thrust specified in the "Pushing force" of the step data.

■Direct numerical setting mode

The pushing operation is performed when the control signal is as follows.
- ●INC/ABS input is ON (INC: relative) or OFF (ABS: absolute).
- ●POI input is ON (pushing Operation).
- ●PDIR input is ON (push in the + direction) or OFF (push in the - direction).
  - ∗ Direction of position increase: + direction
    Direction of position decrease: - direction

The positioning operation is performed at the "Target position" and "Speed" in the data area of the PLC => Gateway unit.
Then, the pushing operation starts from the start position defined by the "Target position".
The pushing operation is performed at or below the maximum pushing force specified in "Pushing force" in the data area of PLC => Gateway unit.

●Example of pushing operation



(1) Pushing operation is successfully performed

■Simple direct value mode, Step instruction mode, IO mode

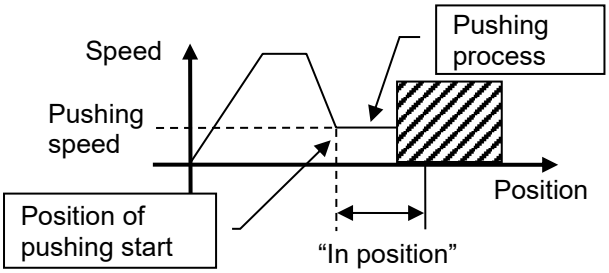
During the pushing operation, When the pushing force is higher than the value specified by "Trigger LV" of the step data for a certain time, “INP” will turn ON. Even after the completion of the pushing operation, the actuator will keep generating the force set in the step data.

■Direct numerical setting mode

In the pushing operation, the INP output turns ON when the "Pushing force" in the data area of the PLC => Gateway unit is reached and continues for a certain period of time.

However, even after the pushing operation is completed, the thrust set in "Pushing force" in the data area of PLC => Gateway unit will continue to be generated.

●Example of pushing operation [Speed/Position]



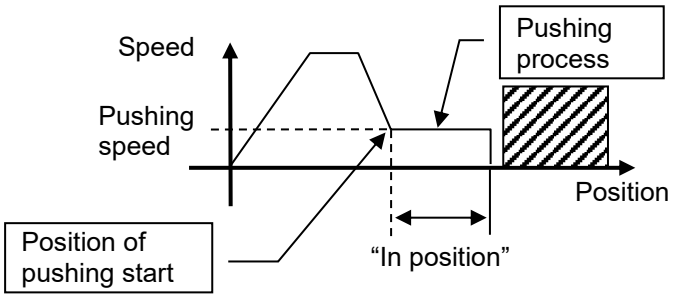
(2) Pushing operation failed (empty pushing)

When the pushing operation is not completed within the range defined by the "In position" from the starting position of the pushing operation, the operation is stopped.

At this time, the PMIS (empty pushing) output is turned ON and the INP output is turned OFF.

In this case, no alarm is generated.

The pushing operation is maintained.



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

[1] The workpiece moves in the pushing direction

After the pushing operation is completed, the INP output turns off under the following conditions and follows the change within the positioning range.

■Simple direct value mode, Step instruction mode, IO mode:
The thrust falls below the "Trigger LV" of the step data.

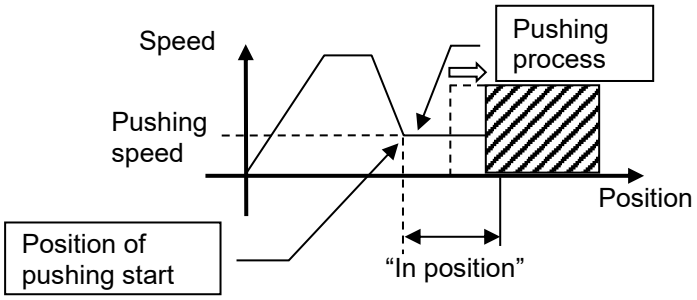
■Direct numerical setting mode:
The thrust falls below the thrust value specified in "Pushing Force" in the data area of PLC => Gateway unit.

When the following conditions continue for a certain period of time, the INP output turns ON again.

■Simple direct value mode, Step instruction mode, IO mode:
The "Trigger LV" of the step data is higher than the specified thrust value.

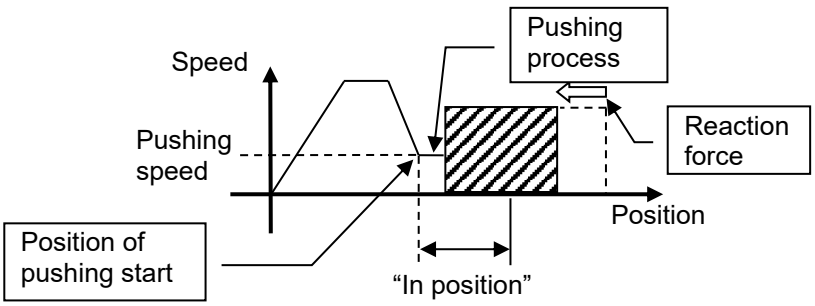
■Direct numerical setting mode:
The thrust value is greater than or equal to the thrust value specified in "Pushing Force" in the data area of PLC => Gateway unit.

When the pushing operation is not completed within the range defined by the "In position" from the start position of the pushing operation, the operation is stopped.
At this time, the INP output turns OFF.
In this case, no alarm occurs. The pushing operation is maintained.



[2] Movement of the workpiece in the opposite direction to the pushing direction (The actuator is pushed back due to the reaction force from the workpiece being too large).

When the actuator is pushed back due to a large reaction force of the object to be pushed after the pushing operation is completed, the actuator is pushed back until the reaction force and the force of the pushing operation are balanced (pushed back in the direction of the starting position of the pushing operation).
At this time, the INP output remains ON.



11.4 Methods of interrupting operation

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

●Operation stops after deceleration of all axes by shut off between control power supply plug EMG terminal and controller power supply 24 VDC

When connection between the control power supply plug EMG terminal and the controller power supply 24 VDC is disconnected during operation, the actuator will decelerate to a stop in all axes and then turn the servo OFF and will not hold the stop position.

(In the case of an actuator with lock, it will be held by the lock mechanism).

The SETON output remains ON.

●Operation stops after deceleration for each axis by disconnection between M24VIN1 and M24VOUT1 (or between M24VIN2 and M24VOUT2) of the power supply blocking plug

When the power supply blocking plug is disconnected between M24VIN1 and M24VOUT1 (or between M24VIN2 and M24VOUT2) during operation, the actuator will decelerate to a stop for each axis and then turn the servo OFF and will not hold the stop position.

(In the case of an actuator with lock, the position will be held by the lock mechanism).

The SETON output remains ON.

●Stop by RESET signal

Turning the RESET input ON during operation will cause the actuator to decelerate to a stop.

(The servo does not turn OFF).

At this time, when the position is within the target position range, the INP output is turned ON.

The RESET signal input during HOLD is valid.

(In this case, even if the HOLD input is turned OFF, operation is not resumed).

●Stop by HOLD signal

Turning the HOLD input ON during operation will cause the actuator to decelerate to a stop.

(The servo does not turn off).

The remaining travel is put on hold, and when the HOLD input is turned OFF, the actuator moves for the remaining travel.

⚠ Caution

The HOLD signal is disabled during pushing in the Pushing operation mode.

11.5 Operation (example)

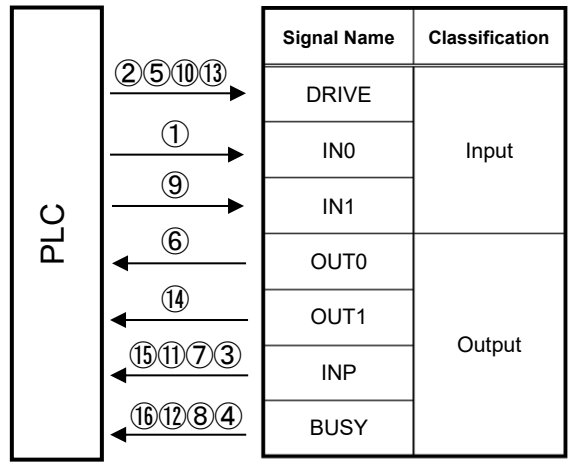
11.5.1 Positioning operation

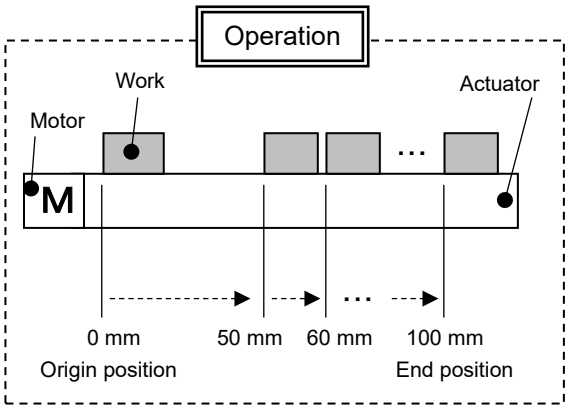
E.g.) Move an actuator from the origin to 100 mm point at 50 mm/s (Step No.1 instruction).
Next, move the actuator from the 50 mm point to 100 mm point by moving it 5 times continuously, 10 mm at a time, at a speed of 50 mm/s (Step No. 2 instruction).

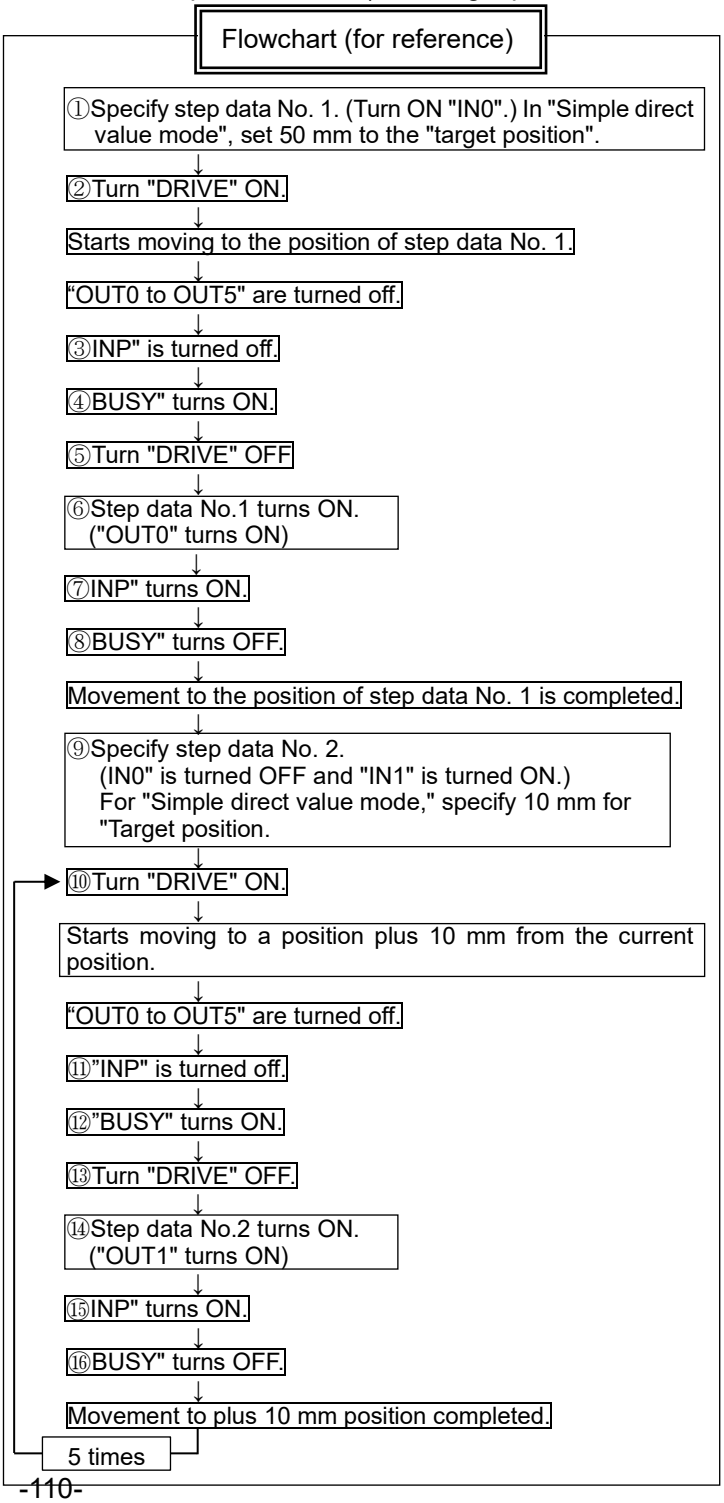
■"Simple direct value mode" *1, "Step instruction mode", "IO mode" Example of step data setting

No.	Movement mode	Speed [mm/s]	Position [mm]	Acceleration [mm/s²]	Deceleration [mm/s²]		Pushing force [%]	Trigger LV [%]	Pushing speed [mm/s]	Moving force [%]	AREA 1 [mm]	AREA 2 [mm]	In position [mm]
0	—	—	—	—	—		—	—	—	—	—	—	—
1(Posn)	ABS	100	50.00	1000	1000		0	0	1	100	0	0	0.1
2(Posn)	INC	50	10.00	1000	1000		0	0	1	100	0	0	0.1

∗1 In "Simple direct value mode", data other than "Position" of step data is used (Set "Target position" with PLC).







E.g.) Move an actuator from the origin to 100 mm point at 50 mm/s (PLC No.1 instruction).
Next, move the actuator from the 50 mm point to 100 mm point by moving it 5 times continuously, 10 mm at a time, at a speed of 50 mm/s (PLC No.2 instruction).

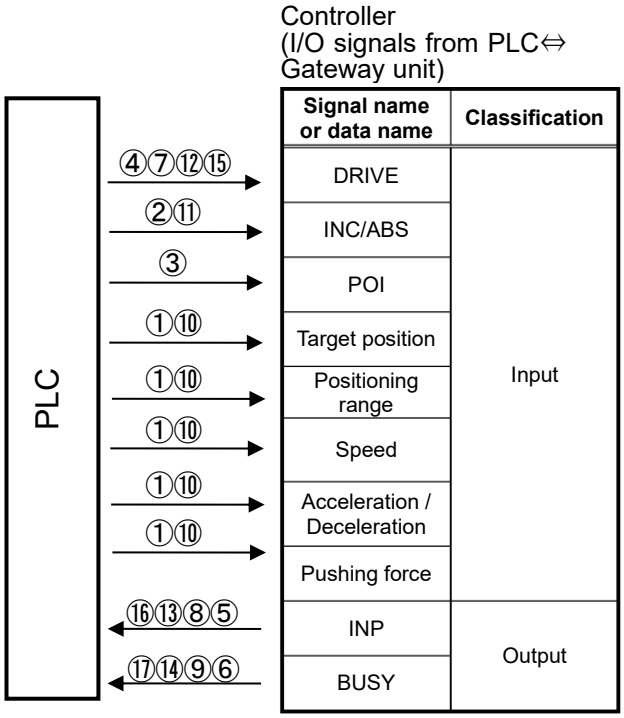
■"Direct numerical setting mode"

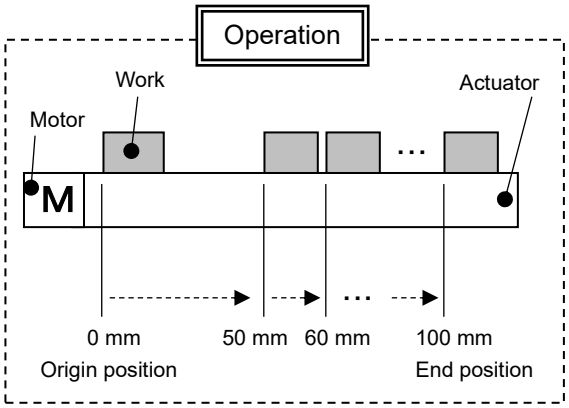
PLC Setting Example

No.	Target position [mm]	Positioning Width [mm]	Speed [mm/s]	Acceleration / Deceleration [mm/s²]	Pushing force [%]
1	50.00	0.1	100	1000	0
2	10.00	0.1	50	1000	0

Example of Driver Unit Basic Parameter Setting

Reference positioning torque [%]	Reference pushing speed [mm/s]
100	1





Flowchart (for reference)

①Specify "Target Position", "Positioning Width", "Speed", "Acceleration / Deceleration", and "Pushing force" for PLC setting example No. 1.
↓
②Turn off "INC/ABS". (ABS: Absolute position setting) ("INC/ABS" is determined by the rising edge of the DRIVE signal.)
↓
③Turn "POI" OFF. (The "POI" is set to "in-position operation".) ("POI" is determined by the rising edge of the DRIVE signal.)
↓
④Turn "DRIVE" ON.
↓
Start moving to the 50 mm position.
↓
⑤INP" is turned off.
↓
⑥BUSY" turns ON.
↓
⑦Turn "DRIVE" OFF
↓
⑧INP" turns ON.
↓
⑨BUSY" turns OFF.
↓
Movement to the position of step data No. 1 is completed.
↓
⑩Specify "Target Position", "Positioning Width", "Speed", "Acceleration / Deceleration", and "Pushing force" in PLC Setting Example No. 2.
↓
⑪Turn "INC/ABS" ON. (INC: Specify a relative position.)
↓
⑫Turn "DRIVE" ON.
↓
Starts moving to a position plus 10 mm from the current position.
↓
⑬"INP" is turned off.
↓
⑭"BUSY" turns ON.
↓
⑮Turn "DRIVE" OFF.
↓
⑯INP" turns ON.
↓
⑰"BUSY" turns OFF.
↓
Movement to the plus 10 mm position is complete.
↓
5 times

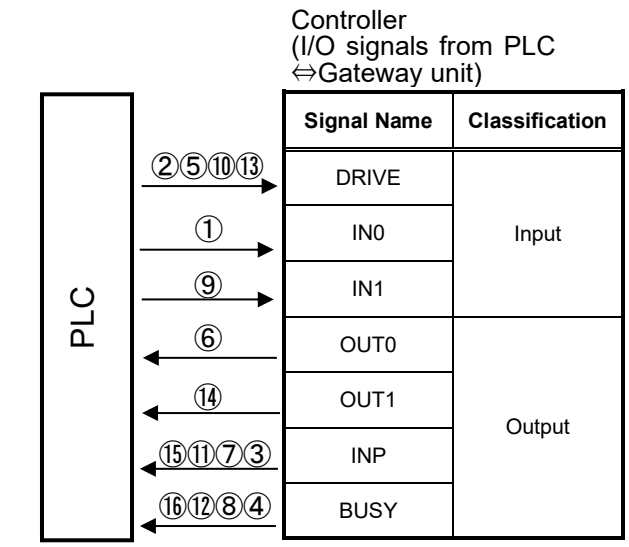
11.5.2 Pushing Operation

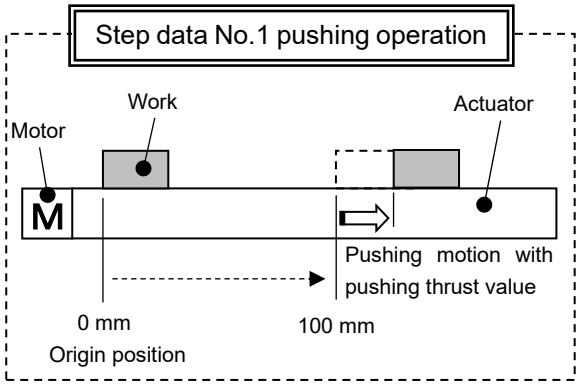
E.g.) Move the actuator from the origin to a point 100 mm away at 100 mm/s (Step Data No.1 is used for this operation). From the 100 mm point, the actuator must start a pushing operation of 10 mm/s speed and 50% or less force (the pushing distance is up to 5 mm).
Then, the actuator should move from the 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).

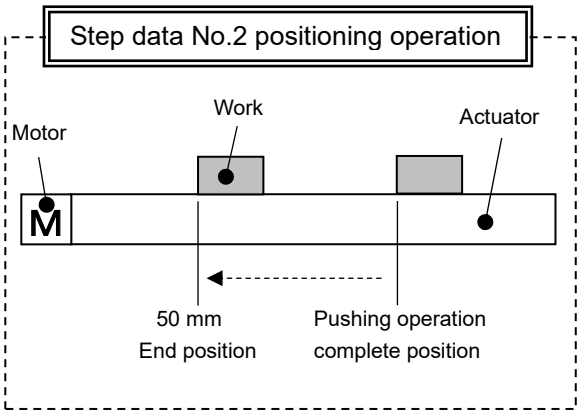
■"Simple direct value mode" *1, "Step instruction mode", "IO mode"　Example of step data setting

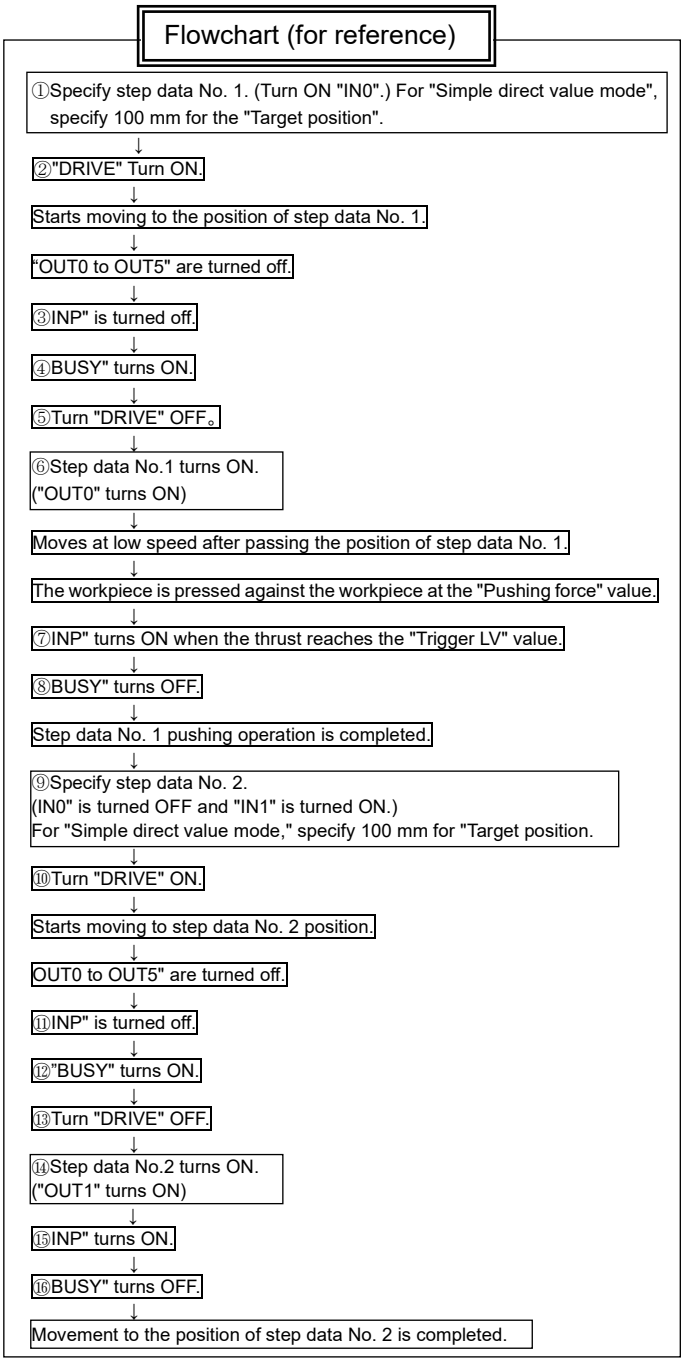
No.	Movement mode	Speed [mm/s]	Position [mm]	Acceleration [mm/s²]	Deceleration [mm/s²]	Pushing force [%]	Trigger LV [%]	Pushing speed [mm/s]	Moving force [%]	AREA 1 [mm]	AREA 2 [mm]	In position [mm]
0	—	—	—	—	—	—	—	—	—	—	—	—
1(Push)	ABS	100	100.00	1000	1000	50	40	10	100	0	0	5
2(Posn)	ABS	50	50.00	1000	1000	0	0	1	100	0	0	0.1

*1 In "Simple direct value mode", data other than "Position" of step data is used (Set "Target position" with PLC).









E.g.) From the origin position, the machine moves to the 100 mm position at a speed of 100 mm/s.
From the 100 mm position, a push operation is performed at a speed of 10 mm/s with a push thrust value of 50% or less (Maximum push-in amount is 5 mm) (PLC No.1 instruction).
Next, from the position where the push operation is completed ("INP" is ON), move to the 50 mm position at a speed of 50 mm/s (PLC No.2 instruction).

■"Direct numerical setting mode"

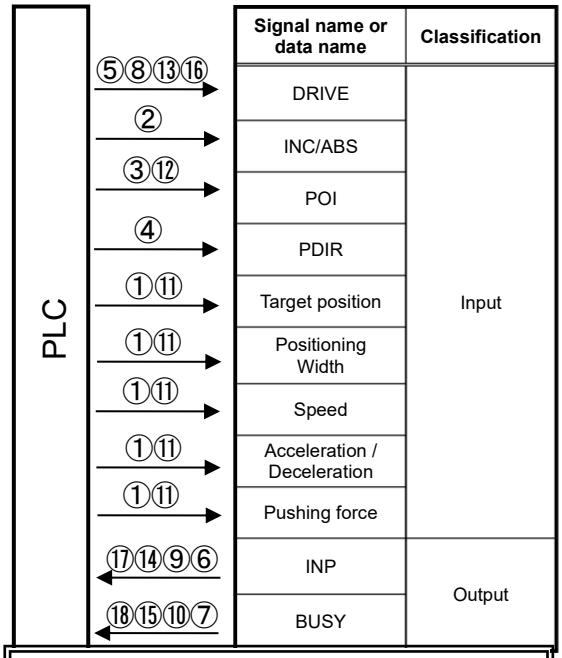
PLC Setting Example

No.	Target position [mm]	Positioning Width [mm]	Speed [mm/s]	Acceleration / Deceleration [mm/s²]	Pushing force [%]
1	100.00	5	100	1000	50
2	50.00	0.1	50	1000	0

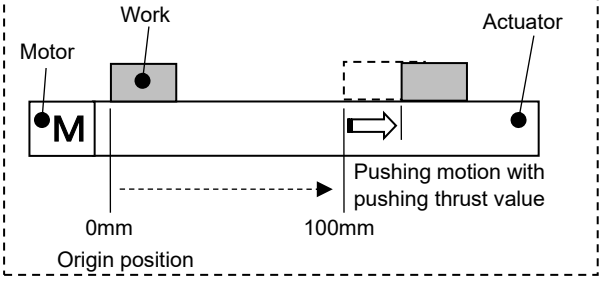
Example of Driver unit
Basic Parameter Setting

Reference positioning torque [%]	Reference pushing speed [mm/s]
100	10

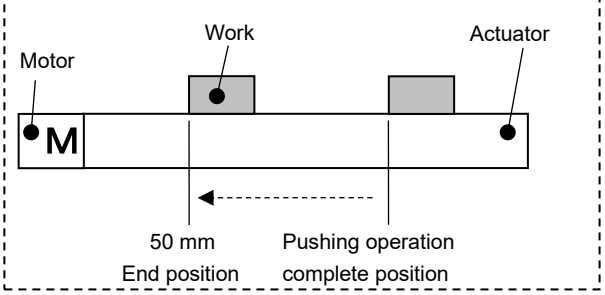
Controller
(I/O signals from PLC⇔ Gateway unit)



PLC setting example No.1 pushing operation



PLC setting example No.2 positioning operation



Flowchart (for reference)

①Specify "Target Position", "Positioning Width", "Speed", "Acceleration / Deceleration", and "Pushing force" for PLC setting example No. 1.
↓
②Turn off "INC/ABS". (ABS: Absolute position setting)
("INC/ABS" is determined by the rising edge of the DRIVE signal.)
↓
③Turn ON "POI". (This is the push-on operation designation.)
("POI" is determined by the rising edge of the DRIVE signal.)
↓
④Turn "PDIR" ON. (Push in the + direction.)
("PDIR" is determined by the rising edge of the DRIVE signal.)
↓
⑤Turn "DRIVE" ON.
↓
Start moving to the position of PLC setting example No.1.
↓
⑥INP" is turned off.
↓
⑦BUSY" turns ON.
↓
⑧Turn "DRIVE" OFF.
↓
PLC setting example: The machine moves at low speed after passing the position of No. 1.
↓
The workpiece is pressed against the workpiece at the "Pushing force" value.
↓
⑨INP" turns ON when the thrust reaches the "Pushing force" in the PLC setting example.
↓
⑩"BUSY" turns OFF.
↓
PLC setting example No.1 pushing operation is completed.
↓
⑪Specify "Target Position", "Positioning Width", "Speed", "Acceleration / Deceleration", and "Pushing force" in PLC Setting Example No. 2.
↓
⑫Turn "POI" OFF. (Set to "Positioning operation".)
↓
⑬Turn "DRIVE" ON.
↓
Start moving to the position of PLC setting example No.2.
↓
⑭INP" is turned off.
↓
⑮"BUSY" turns ON.
↓
⑯Turn "DRIVE" OFF.
↓
⑰INP" turns ON.
↓
⑱"BUSY" turns OFF.
↓
Movement to the position of PLC setting example No.2 is completed.

12. Operating Procedure

12.1 Power start-up procedure

12.1.1 Overview of start-up procedures

Procedure for start-up of the battery-less absolute encoder for every occasion when the power is supplied.

(1) When power is supplied for the first time

In the following cases, alarm code 153 [Absolute encoder ID does not match controller data] will occur after power-on. Please perform the "Write default value" in the setup in ACT-Connected software. After setup, rebooting the controller* will be performed automatically, and then the alarm will be reset. The SETON output signal is OFF, so please refer to **12.1.3 When an alarm (Group E) is cleared by reconnecting power** to carry out the return to origin.

・When connecting the electric actuator for the first time and initial start-up
→Sets "Write default value".

・When replacing the connected electric actuator (different part number)
→Sets "Write default value".

・When replacing the connected electric actuator (same part number)
→Sets "Clear pairing ID ".

* The controller is automatically rebooted after setup with ACT-Connected.

(2) When power is supplied for the second or subsequent time

As the SETON output is already turned ON, please perform the servo ON according to **12.1.2 Power-on**.

(3) Alarm (group E) is cleared by disconnecting the power supply

SETON output is turned OFF. Please refer to section **12.1.3 When an alarm (Group E) is cleared by reconnecting power** for details, then perform a Return to origin.

Similarly, if the "origin direction" or "zero positioning distance" parameter is changed, it is necessary to write the parameter to the controller and then perform the return to origin again.

12.1.2 Power-on

-Procedure-

①Supply power

↓

②ESTOP output is turned OFF
ALARM output is turned OFF

↓

③GWRUN output turns ON

↓

④GWMON input is turned ON

∗The GWMON input must only be turned ON if the setting "Enable/Disable PLC commands" is enabled. Please refer to the section **9.1 List of Gateway unit special setting parameters** for details.

↓

⑤SETON output is turned ON.

↓

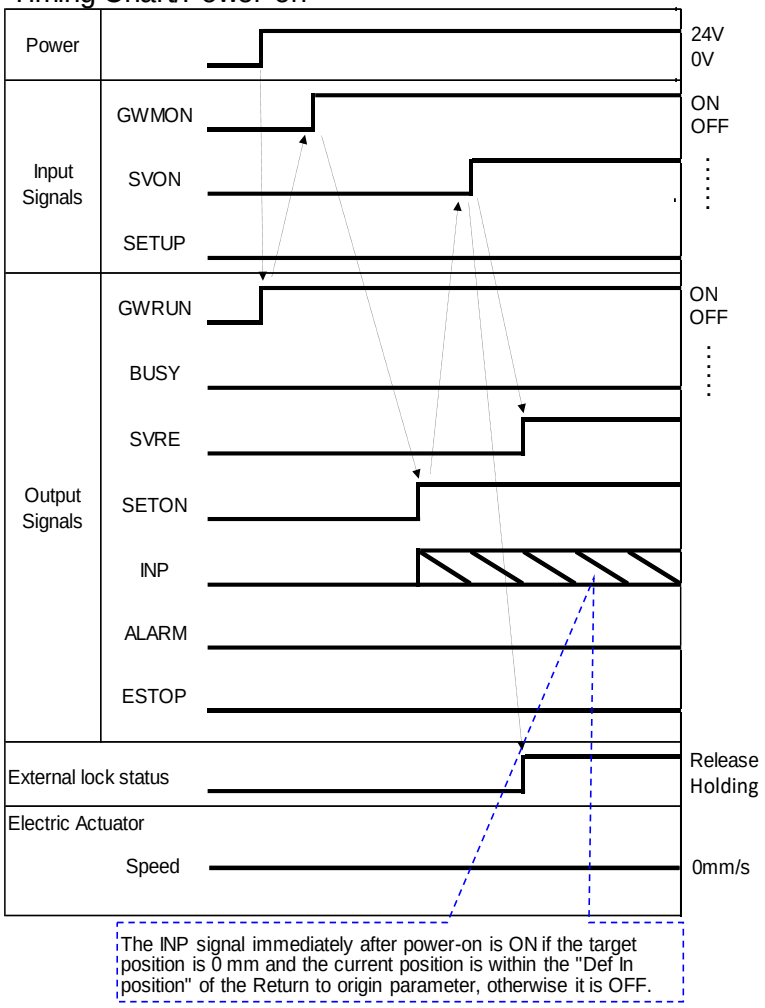
⑥SVON input is turned ON.

↓

⑦SVRE output is turned ON.

∗The time it takes for the SVRE output to turn ON varies depending on the electric actuator type and operating conditions. For electric actuators with lock, the lock is released. Then DRIVE etc. can be operated.

Timing Chart/Power-on



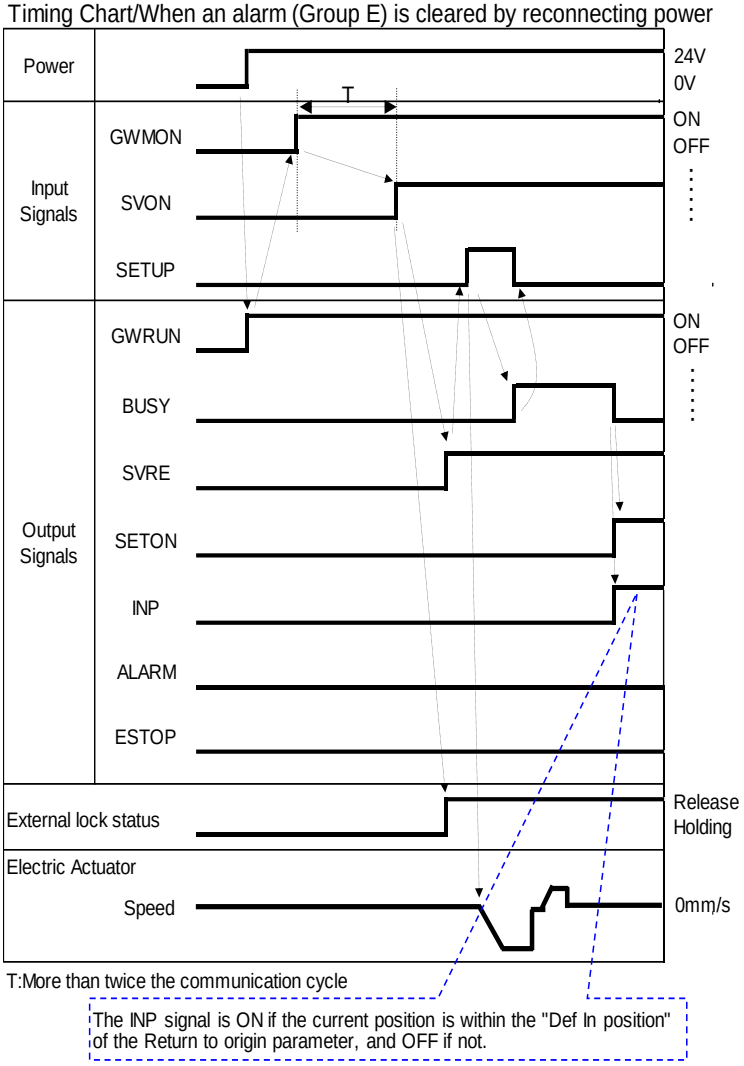
12.1.3 When an alarm (Group E) is cleared by reconnecting power

It is necessary to perform the Return to origin when alarm (group E) is generated and the alarm is cleared by turning off the power supply.
The same startup procedure is followed after the “Origin Direction” or “Zero positioning distance” is changed and the parameter is written to the controller.
Please refer to **10.3.2 (2) Return to Origin parameters** for details.

-Procedure-

①Supply power
↓
②ALARM output turns OFF
ESTOP output is turned OFF
↓
③GWRUN output turns ON
↓
④GWMON input is turned ON
∗The GWMON input must only be turned ON if the setting "Enable/Disable PLC commands" is enabled. Please refer to the section **9.1 List of Gateway unit special setting parameters** for details.
↓
⑤SVON input turns ON.
↓
⑥SVRE output is turned ON.
∗The time taken for SVRE output to turn ON depends on the actuator type and the operating conditions.
∗The actuator with lock is unlocked.
↓
⑦SETUP input is turned ON.
↓
⑧BUSY output is turned ON.
(Starts the operation.)
↓
⑨After the BUSY output is turned ON, the SETUP input is switched OFF.
↓
⑩SETON, INP output is turned ON .
Return to origin is completed when BUSY output is turned OFF. Then DRIVE etc. can be operated.

Timing Chart/When an alarm (Group E) is cleared by reconnecting power



12.2 Operation Procedure of Indicated Operation Function by Step Data No.

Please refer to the following steps and timing charts for each item.

12.2.1 Positioning operation

(1) In [Step instruction mode], [IO mode], and [Simple direct value mode]

-Procedure-

①Input of step data No. (IN0 to IN5)

∗For [simplified direct value mode], only the target position without using step data, The "target position" is set by the PLC. For details, please refer to section **9.6.4 Data area of PLC ⇔Gateway unit.**

↓

②Turn on the DRIVE input.
(All OUT signals at the output are switched off).

⇒After reading the step data No. (IN0 to IN5 inputs) and turning the DRIVE input OFF, the step data No. is output (OUT0 to OUT5 outputs).

↓

③BUSY output is turned on.
(Start positioning operation).

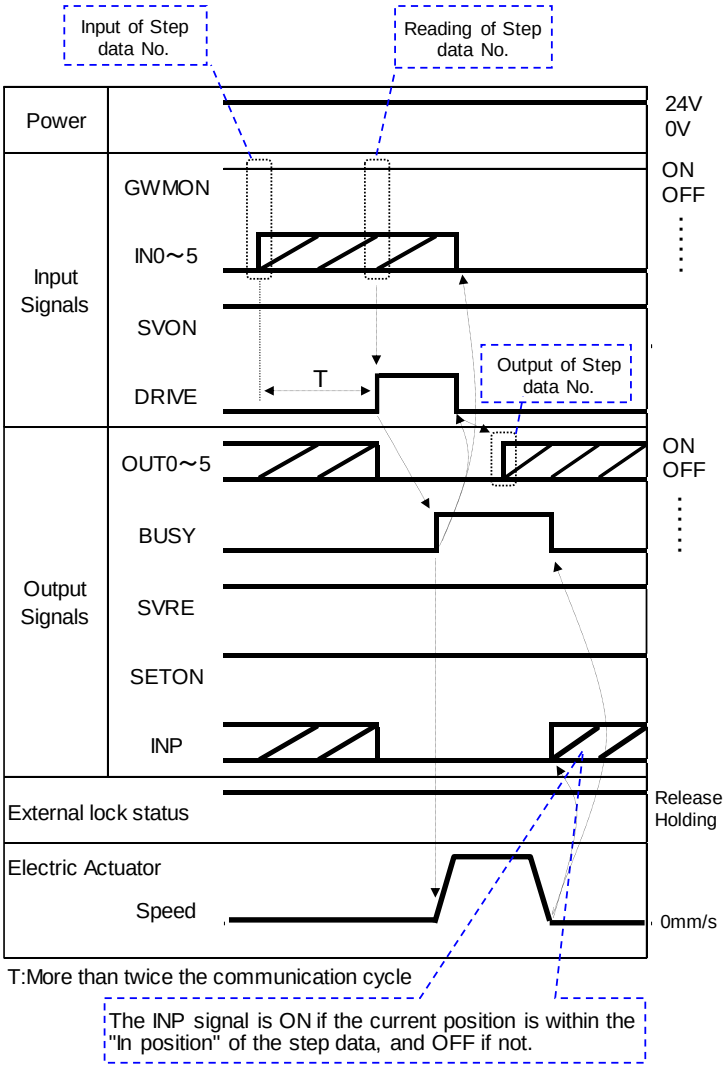
↓

④Turn off the DRIVE input and the step data No. (IN0 to IN5 inputs).

↓

⑤When the INP output turns ON and the BUSY output turns OFF, the positioning operation is complete.

Timing chart / Positioning operation



(2) In [Direct numerical setting mode]

-Example-
Move the actuator directly to a position 50.00 [mm] from the origin at a speed of 100 mm/s using the direct numerical setting mode. An example of PLC settings is shown below.

PLC Setting Example

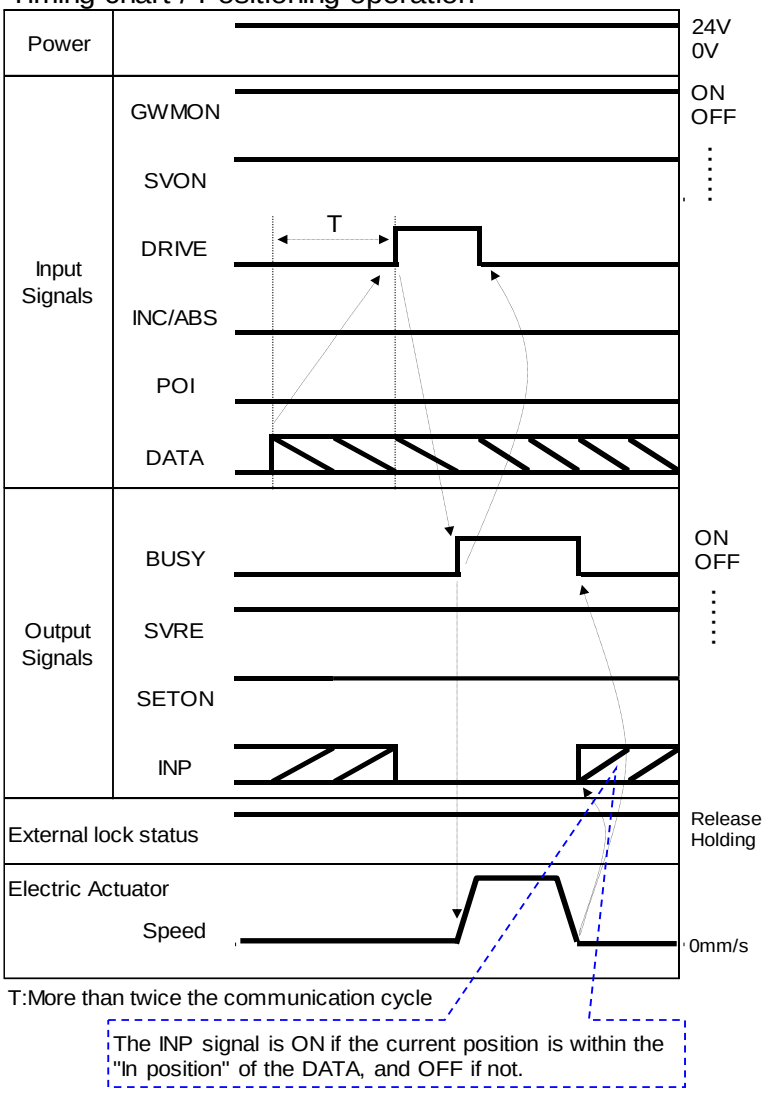
Target position [mm]	In position [mm]	Speed [mm/s]	Acceleration/Deceleration [mm/s^2]	Pushing force [%]
50.00	0.1	100	1000	0

→For details, please refer to section **9.6.4 Data Area of PLC⇔Gateway Unit.**

-Procedure-

①Please setting following three points.
-Turn off the "INC/ABS" input.
(ON: INC, OFF: ABS, "INC/ABS" is determined by the rising edge of the DRIVE signal).
-Turn off the "POI" input.
(Set to the positioning operation. It is determined by the rising edge of the DRIVE signal).
-Enter the data for the PLC setup example above.
↓
②Turn on the "DRIVE" input.
↓
③BUSY output turns ON.
(Starts positioning operation).
↓
④Turn off the "DRIVE" input.
↓
⑤When INP output turns ON and BUSY output turns OFF, the positioning operation is complete.

Timing chart / Positioning operation



12.2.2 Pushing Operation

(1) In [Step instruction mode]、[IO mode]、[Simple direct value mode]

-Procedure-

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

∗In the case of [simple direct value mode], the target position is set using the PLC without using step data. For details, please refer to section **9.6.4 Data Area of PLC⇔Gateway Unit.**

↓

②Turn ON the DRIVE input.
(All OUT signals during output are turned off).

⇒After reading the step data No. (IN0 to IN5 inputs), when the DRIVE input is turned OFF Step data No. (OUT0 to OUT5 output) is output.

↓

③When the Pushing operation is started, the BUSY output turns ON.

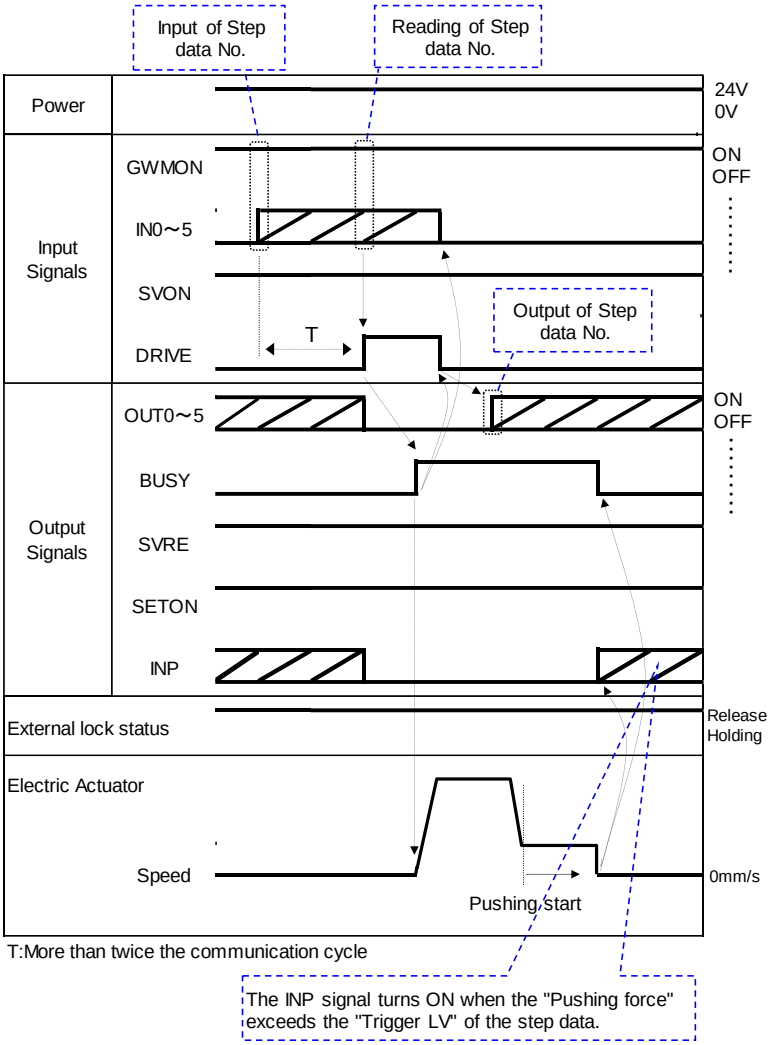
↓

④Turn off the DRIVE input and the step data No. (IN0 to IN5 inputs).

↓

⑤When INP output turns ON and BUSY output turns OFF, the Pushing operation is complete.
(The “pushing force” above the "Trigger LV" of the step data is generated).

Timing chart / Pushing operation



(2) In [Direct numerical setting mode]

-Example-

The actuator is moved directly from the origin to a position of 100.00 [mm] at a speed of 100 [mm/s] in the Direct numerical setting mode. From the 100.00 [mm] position, a pushing operation is performed at a speed of 10 [mm/s] and a pushing force of 50 [%] or less (the pushing distance is up to 5 [mm]). An example of the PLC and parameter settings is shown below.

PLC Setting Example

Target position [mm]	In position [mm]	Speed [mm/s]	Acceleration/Deceleration [mm/s^2]	Pushing force [%]
100.00	5	100	1000	50

→For details, please refer to section **9.6.4 Data Area of PLC⇔Gateway Unit.**

Example of basic parameter setting for driver unit

Reference positioning torque [%]	Reference pushover speed [mm/s]
100	10

-Procedure-

①Please setting following four points.
- Turn off the "INC/ABS" input. (ON: INC, OFF: ABS, "INC/ABS" is determined by the rising edge of the DRIVE signal).
- Turn on the "POI" input. (Designation of push operation. The signal is determined by the rising edge of the DRIVE signal).
- "PDIR" input is used to specify the push direction. (ON: Push in + direction, OFF: Push in - direction)
- Enter the data for the PLC setup example above.

↓

②Turn on the "DRIVE" input.

↓

③When the operation is started, the BUSY output turns ON.

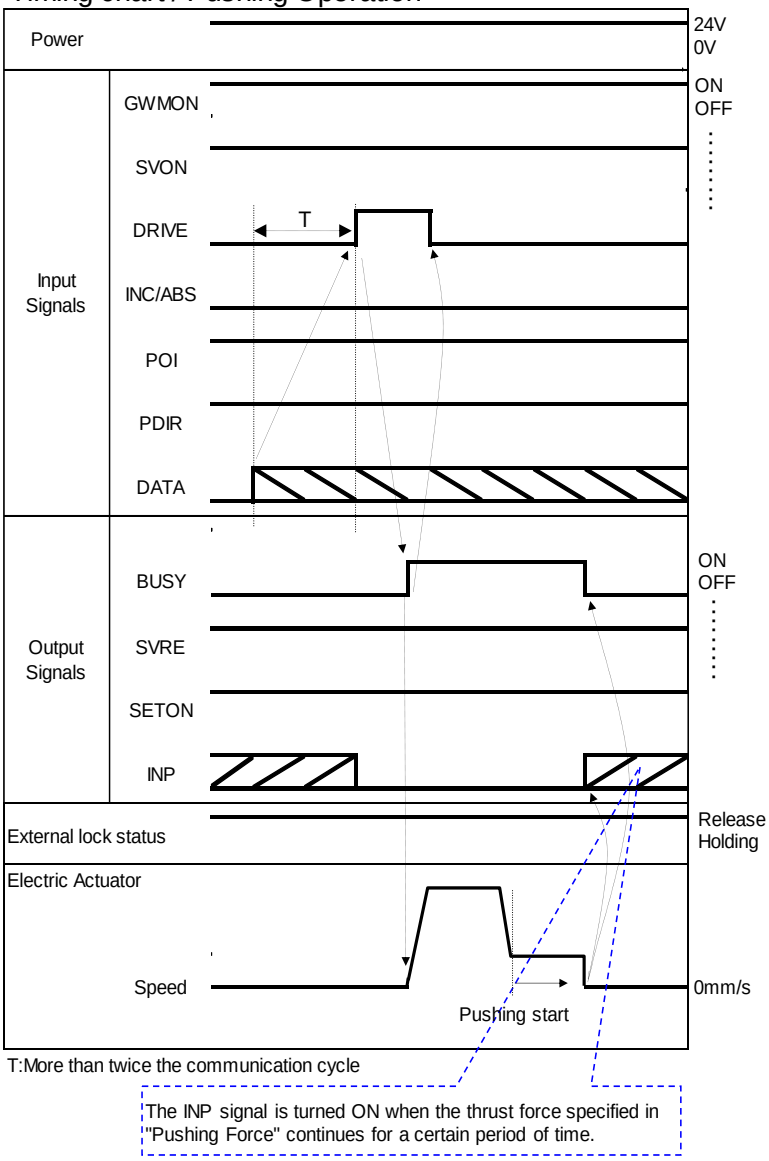
↓

④Turn off the "DRIVE" input.

↓

⑤When INP output turns ON and BUSY output turns OFF, the Pushing operation is complete.

Timing chart / Pushing Operation



T:More than twice the communication cycle

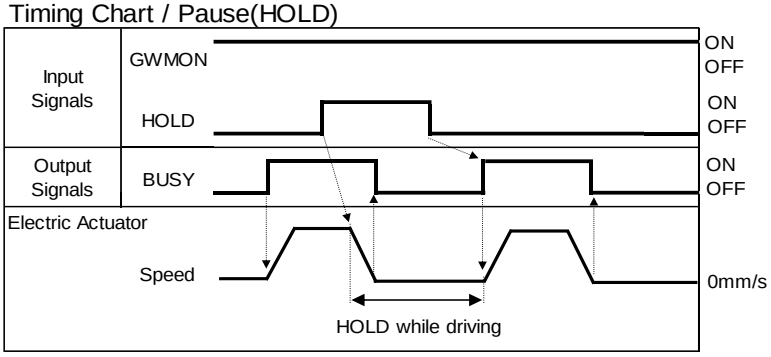
The INP signal is turned ON when the thrust force specified in "Pushing Force" continues for a certain period of time.

12.2.3 Pause (HOLD)

-Procedure-

①In operation (BUSY output turns ON)
Turn ON the HOLD input.
↓
②BUSY output turns OFF (It stops).
↓
③Turn HOLD output OFF.
↓
④BUSY output turns ON (It operates again).

Timing Chart / Pause(HOLD)

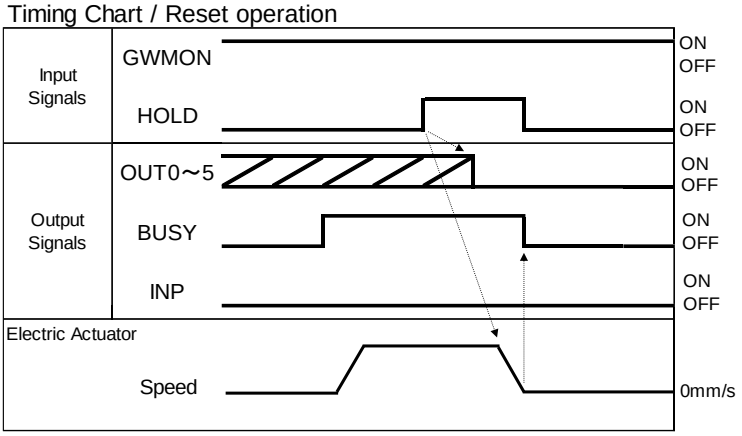


12.2.4 Reset for operation

-Procedure-

①In operation (BUSY output turns ON).
Turn on the RESET input.
↓
②OUT0 to OUT5 outputs are turned off.
↓
③BUSY output turns OFF (Stops).

Timing Chart / Reset operation

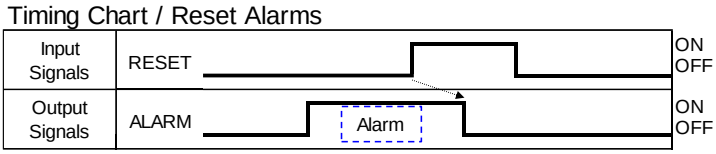


12.2.5 Reset for alarms

-Procedure-

①Alarm Occurrence
ALARM output turns ON.
↓
②Turn on the RESET input.
↓
③ALARM output is turned off.
(Alarm is deactivated).

Timing Chart / Reset Alarms

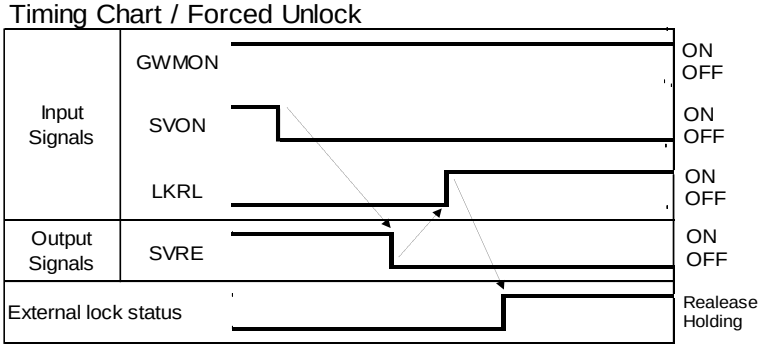


12.2.6 Lock-force release (LKRL)

-Procedure-

①Turn off the SVON input.
↓
②SVRE output turns off.
↓
③Turn on the LKRL input.
(The locking mechanism of the actuator is forcibly released.)

Timing Chart / Forced Unlock



⚠ Caution

(1) Use the LKRL input only for maintenance and assembly of the equipment in a safe environment.
(2) Do not constantly energize LKRL input.
Be sure to set the LKRL input to OFF during normal operation.
Due to the lock is forcibly released during servo OFF. Therefore, the workpiece may fall under its own weight when the servo is turned off, which may result in equipment failure.

12.2.7 Area Output

In [Step instruction mode]、[IO mode]、[Simple direct value mode]

-Procedure-

●Step data No. 1 operation

①Input of step data No. (IN0 to IN5 input)

∗In [Simple direct value mode], The PLC sets the "target position" without using step data only for the target position. For details, please refer to section **9.6.4 Data area of the PLC⇔Gateway Unit**

↓

②Turn ON the DRIVE input.

⇒Step data No. 1 (IN0 to IN5 inputs).
Then, DRIVE input is turned off.
Then step data No.1
(OUT0 to OUT5 output) is output.

↓

③BUSY output turns ON.
(It operates).
INP output is turned off.

↓

④Step data No. 1 AREA output turns ON.
(150 mm position)

↓

⑤BUSY output turns OFF (It stops).
INP output turns ON.

↓

●Step data No.2 operation

⑥Input of step data No. (IN0 to IN5)

↓

⑦Turn ON the DRIVE input.

⇒Reading step data No. 2 (IN0 to IN5 inputs) and then turning off the DRIVE input causes step data No. 2 (OUT0 to OUT5 outputs) to be output.

↓

⑧AREA output is turned off.
BUSY output turns ON (It operates).
INP output is turned off.

↓

⑨AREA output of step data No. 2 turns ON. (170 mm position)

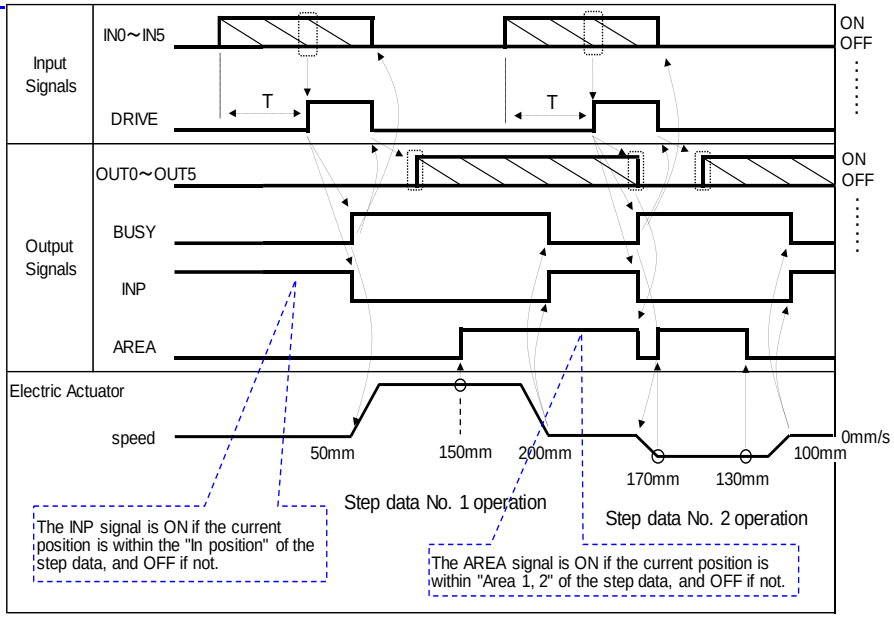
↓

⑩AREA output of step data No. 2 turns OFF. (130 mm position)

↓

⑪BUSY output turns OFF (It stops).
INP output turns ON.

Timing Chart/Area Output
Initial position: 50mm
↓
Step data No. 1 operation: Position: 200 mm Area 1 to Area 2: 150 to 250 mm
↓
Step data No. 2 operation: Position: 100 mm Area 1 to Area 2: 130 to 170 mm



T:More than twice the communication cycle

13. Alarm

13.1 Alarm detection of Gateway Unit

13.1.1 Alarms common to gateway units

This section describes alarms generated by gateway units independent of the fieldbus communication protocol.

(1) Unit/LED status and priority

The LED indications for the Gateway Unit status are shown in the table below.

Unit Status	LED Status	
	PWR	ALM
System error has occurred (microcontroller peripheral initialization failure)	ON	ON
Alarm has occurred	OFF	ON
Normal operation	ON	OFF

(2) Alarm contents and countermeasures for Gateway Unit

When an alarm common to all gateway units occurs, the alarm code (hexadecimal) appears on the remote input (Rx) of the register.

This group of alarms can be cleared by removing the cause of the alarm and then reconnecting the control power supply.

For registers, check the contents of section

9.6.5 Data assignment details for each operation mode(CC-Link , EtherNet/IP , EtherCAT).
9.6.6 Data assignment details for each operation mode(PROFINET).

Alarm Name in ACT-Connected (code)	Contents, measures
Fieldbus Communication error (80)	**<Contents>** This alarm occurs when there is an error in the fieldbus link. **<Countermeasures>** Check the fieldbus settings (node address, communication speed, etc.) and wiring.
Driver unit Communication error (96)	**<Contents>** Internal communication error. This alarm occurs when the communication between the gateway unit and the driver unit has failed. **<Countermeasures>** Check the driver unit installation status.
Internal error in driver unit communication (transmission) (97)	**<Contents>** Internal communication error. This alarm occurs when there is an abnormality in data transmission by the internal circuit during communication between the gateway unit and the driver unit. **〈Countermeasures〉** Please contact us if this error reoccurs even after supplying power again.
Internal error in driver unit communication (receiving) (98)	**<Contents>** Internal communication error. This alarm occurs when there is an abnormality in data reception by the internal circuit during communication between the gateway unit and the driver unit. **<Countermeasures>** Please contact us if this error reoccurs even after supplying power again.
GW parameter error (128)	**<Contents>** This alarm occurs when there is a parameter error in the Gateway Unit. **<Countermeasures>** Please check if the number of connected axes, operation mode, etc. are correct, and then reconfigure them using ACT-Connected.

Parameter Checksum abnormal (129)	**<Contents>** This alarm occurs when the internal memory data of the gateway or driver unit is corrupted.
	<Countermeasures> Please reconnect the power supply or replace the Gateway Unit.
Fieldbus Module error (155)	**<Contents>** This alarm occurs when a fieldbus module has failed.
	<Countermeasures> Please reconnect the power supply or replace the Gateway Unit.
Fieldbus Module not detected (156)	**<Contents>** This alarm occurs when the communication board for the fieldbus cannot be identified because the communication board has not been inserted, or because the communication board has failed.
	<Countermeasures> Please reconnect the power supply or replace the Gateway Unit.
Fieldbus module Initialization timeout (157)	**<Contents>** This alarm occurs when the initialization of the fieldbus module is not completed after a certain period of time.
	<Countermeasures> Reconnect the power supply or replace the Gateway Unit.
Excessive control supply voltage (160)	**<Contents>** The following are possible causes. 1) The 24 VDC power supply voltage is too high. 2) Use of power supplies with insufficient current capacity. 3) Failure of parts inside the Gateway unit.
	<Countermeasures> Please implement the following measures. 1) Check the power supply voltage. 2) Use a power supply with sufficient current capacity. 3) Replace the Gateway unit.
Control power supply voltage low (161)	**<Contents>** This alarm occurs when the control power supply voltage falls below the voltage drop threshold. The following are possible causes. 1) Low voltage of 24 VDC power supply 2) Component failure inside the Gateway unit
	<Countermeasures> Check the power supply voltage. If voltage values are normal, replace the Gateway unit, as this may indicate component failure inside the unit.
Excessive motor power supply voltage (170)	**<Contents>** This alarm occurs when the motor power supply voltage exceeds the overvoltage threshold.
	<Countermeasures> Check the power supply voltage.
Motor power supply voltage low (171)	**<Contents>** This alarm occurs when the motor power supply voltage falls below the voltage drop threshold.
	<Countermeasures> Check the power supply voltage.
Number of axes / operating mode Mismatch (186)	**<Contents>** This alarm occurs when driver units are connected for 17 or more axes.
	<Countermeasures> Set the driver units to no more than 16 axes total and set the appropriate parameters for the Gateway unit.

Ethernet initialization process Error (240)	**<Contents>** This alarm occurs when the initialization of the Ethernet circuit ends abnormally or has failed.
	<Countermeasures> Reconnect the power supply or replace the Gateway unit.
CPU error (250)	**<Contents>** This alarm occurs when the CPU in the Gateway unit has detected an error.
	<Countermeasures> Please contact SMC if this error reoccurs even after supplying power again.
GW power on (255)	**<Contents>** This alarm always occurs when the power is switched on. It is not an alarm but is stored in the controller's alarm history. ∗It is not displayed in "GWALC" in the memory map.

13.1.2 Fieldbus specific alarms

This section describes the alarms that may occur at the Gateway unit, which vary depending on the fieldbus communication protocol.

(1) Alarm details and countermeasures for CC-Link communication

The contents of alarms related to CC-Link communication can be checked on the LED display of the Gateway unit.

The alarms can be classified into two categories: those that occur at the time of initial setting and require turning off and on the control power, and those that occur in the middle of sequence processing and are automatically recovered.

The following table shows the alarms that can be checked on the controller LED display and their countermeasures.

Controller Status	LED Names and Indications				Contents, measures
	PWR	ALM	LRUN	LERR	
CPU Abnormality (1)	-	-	Green light ON	Red light ON	**<Contents>** An error has occurred in the communication CPU. **<Countermeasures>** Please contact SMC if this error reoccurs even after supplying power again.
CPU Abnormality (2)	-	-	Green Flashing	Red Flashing	**<Contents>** An error has occurred in the communication CPU. **<Countermeasures>** Please contact SMC if this error reoccurs even after supplying power again.
Station number setting error	-	-	Green Flashing	Red light ON	**<Contents>** This alarm occurs when a station number setting error is confirmed from the internal circuit. **<Countermeasures>** Please check if the station number setting is correct and reconfigure the station number setting using ACT-Connected.
Communication speed setting error	-	-	Green light ON	Red Flashing	**<Contents>** This alarm occurs when a communication speed setting error is confirmed in the internal circuit. **<Countermeasures>** Please check if the communication speed is correct and reconfigure the communication speed using ACT-Connected.
CC-Link CRC error	-	-	OFF	Red light ON	**<Contents>** This alarm occurs when a CRC error is confirmed by the internal circuit during sequence processing. **<Countermeasures>** If it does not automatically recover, turn the power off and on again. Please contact SMC if this error reoccurs even after supplying power again.
CC-Link Communication stopped	-	-	OFF	OFF	**<Contents>** This alarm occurs when communication with the internal circuit times out during sequence processing. **<Countermeasures>** If it does not automatically recover, turn the power off and on again. Please contact SMC if this error reoccurs even after supplying power again.

(2) Alarm details and countermeasures for Ethernet/IP communication

The following table shows the alarms that can be checked on the controller LED display and their countermeasures.

Controller Status	LED Names and Indications				Contents, measures
	PWR	ALM	MS	NS	
Not configured or scanner idling	-	-	Green Flashing	-	**<Contents>** A configuration error has occurred. **<Countermeasures>** Please check and set the configuration correctly. **<Contents>** The PLC is in a STOP state or communication is idling. **<Countermeasures>** Please put the PLC into RUN state.
Recoverable Fault occurred	-	-	Red Flashing	-	**<Contents>** A recoverable error has occurred. **<Countermeasures>** Please perform hardware configuration. ⇒9.3.2 Hardware configuration
Major Fault occurred	-	-	Red light ON	-	**<Contents>** A non-recoverable error has occurred. **<Countermeasures>** Please stop using the product and contact your SMC sales representative.
IP address not set	-	-	-	OFF	**<Contents>** IP address has not been set. **<Countermeasures>** Please set the IP address.
Online connection not established	-	-	-	Green Flashing	**<Contents>** Communication is not established. **<Countermeasures>** Please check the following and reboot the system. ・Signal line is connected from the PLC. ・The communication speed of the PLC is appropriate. ・The communication lines are routed away from noise sources.
One or more connections timed out	-	-	-	Red Flashing	**<Contents>** Communication has timed out. **<Countermeasures>** Please check the following and reboot the system. ・The signal line is connected from the PLC. ・The communication speed of the PLC is appropriate. ・The communication lines are routed away from noise sources.
IP address duplication	-	-	-	Red light ON	**<Contents>** IP address is duplicated with another device. **<Countermeasures>** Please reconfigure the IP address to an address not yet in use.
Communication error between units or no valid axis	-	-	OFF	OFF	**<Contents>** Driver unit or termination unit is not connected. **<Countermeasures>** Please check the connection status between units. **<Contents>** There is no valid axis. **<Countermeasures>** Check the connection status of the actuator. Check the operation mode setting status of each axis.

(3) Alarm details and countermeasures for EtherCAT communication

The following table shows the alarms that can be checked on the controller LED display and their countermeasures.

Controller Status	LED Names and Indications						Contents, measures
	PWR	ALM	ERR	RUN	IN	OUT	
EtherCAT communication is not established.	-	-	-	-	OFF	OFF	**<Contents>** EtherCAT communication is not established. **<Countermeasures>** Please carry out the following and repower the controller. -Supply power to the upper side EtherCAT device where IN LED is OFF. -Connect the communication cable connectors correctly. Change the communication cable if it appears faulty. -Keep wiring away from noise sources.
EtherCAT communication is established, but data is not received.	-	-	-	-	Green LED on	Green LED on	**<Contents>** EtherCAT communication is established, but data is not received. **<Countermeasures>** Please carry out the following and repower the controller. -Put EtherCAT master device into the “RUN” state. -Supply the power supplies to the upper side EtherCAT devices. -Connect the communication cable connectors correctly. Change the communication cable if it appears faulty. -Keep wiring away from noise sources.
EtherCAT communication error (Application watch dog timeout)	-	-	Red LED is Double flashing *1	-	-	-	**<Contents>** An EtherCAT communication error (application watchdog timeout) has occurred. **<Countermeasures>** Please carry out the following and repower the controller. -Put EtherCAT master device into the “RUN” state. -Supply power to EtherCAT devices. -Connect the communication cable connectors correctly. Change the communication cable if it appears faulty.
EtherCAT communication setting error	-	-	Red LED is blinking *1	-	-	-	**<Contents>** An EtherCAT communication setting error has occurred. **<Countermeasures>** Please confirm the configuration of the EtherCAT master device matches the physical setup.
Synchronisation errors and EtherCAT communication data errors	-	-	Red LED is single flashing *1	-	-	-	**<Contents>** Synchronisation errors and EtherCAT communication data errors have occurred. **<Countermeasures>** Please confirm the configuration of the EtherCAT master device matches the physical setup.

Init state	-	-	-	OFF	-	-	**<Contents>** Device is in the Initialized state **<Countermeasures>** - Put EtherCAT master device into the “RUN” state. -Please configure with the ESI file (XML file) downloaded from SMC web site.
Pre-Operational state	-	-	-	Green LED is blinking *1	-	-	**<Contents>** Device is in the Pre-Operational state. **<Countermeasures>** Put EtherCAT master device into the “RUN” state.
Safe-Operational state	-	-	-	Green LED is single flashing *1	-	-	**<Contents>** Device is in the Safe-Operational state. **<Countermeasures>** Put EtherCAT master device into the “RUN” state.

∗1 For details on LED flashing operation, see **8.3.1 LED display contents**.

(4) Alarm details and countermeasures for PROFINET communication

The following table shows the alarms that can be checked on the controller LED display and their countermeasures.

Controller Status	LED Names and Indications						Contents, measures
	PWR	ALM	SF	BF	P1	P2	
Communication is not established.	-	-	-	-	OFF	OFF	**<Contents>** Communication is not established. **<Countermeasures>** Please carry out the following and repower the controller. -Supply power to the upper side PROFINET device where IN LED is OFF. -Connect the communication cable connectors correctly. Change the communication cable if it appears faulty. -Keep wiring away from noise sources.
Communication is established, but data is not received.	-	-	-	-	Green LED on	Green LED on	**<Contents>** EtherCAT communication is established, but data is not received. **<Countermeasures>** Please carry out the following and repower the controller. -Put PROFINET master device into the “RUN” state. -Supply the power supplies to the upper side PROFINET devices. -Connect the communication cable connectors correctly. Change the communication cable if it appears faulty. -Keep wiring away from noise sources.
Offline status	-	-	-	OFF	-	-	**<Contents>** Device is in Offline status. **<Countermeasures>** Please carry out the following and repower the controller. -Correct the wiring or connection of the communication cable or replace them. -If the PLC communication speed setting is abnormal, correct the setting in reference to the PLC Operation Manual. -Please keep the communication and power cables away from the noise source or cover them. -Please correct the power supply and power supply cables in reference to the PLC Operation Manual.
STOP status	-	-	-	Green LED is single flashing	-	-	**<Contents>** Device is in Stop state **<Countermeasures>** -Put PROFINET master device into the “RUN” state. Please confirm the configuration of the PROFINET master device matches the physical setup.
Device Name error	-	-	-	Red LED is single flashing	-	-	**<Contents>** There is an error in the Device Name setting. **<Countermeasures>** -Please configure with the GSDML file (XML file) downloaded from SMC web site. -Please set a unique device name.

IP address error	-	-	-	Red LED is double flashing	-	-	**<Contents>** An error has occurred in the IP address configuration. **<Countermeasures>** Please set a unique IP address
Configuration error	-	-	-	Red LED is triple flashing	-	-	**<Contents>** An error has occurred in the configuration. **<Countermeasures>** Please check the PLC configuration and the actual configuration match.

13.2 Alarm detection of driver unit

The contents of alarms related to the driver unit can be checked using ACT-Connected.
For details on how to check alarms, please refer to the ACT-Connected instruction manual.

⚠ Caution

When an alarm is generated, deactivate the alarm after troubleshooting and correcting the error with reference to section "13.2 (2) Alarm contents and countermeasures for driver unit ".

Alarms are divided into two types.
One alarm type can be cleared by inputting the remote I/O signal, RESET.
The other type cannot be cleared unless the control power supply (24 VDC) is turned off.

(1) Alarm types and groupings
After generation of the alarm, SVRE or SETON are output according to the contents of the alarm as shown below.

Alarm group	Remote IO signal output		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 D1	OFF	No change	Turn ON “RESET”, then turn ON “SVON”.
Alarm group D2	OFF	OFF	Turn ON in the order of "RESET", "SVON", and "SETUP".
Alarm group E	OFF	OFF	Turn off the control power supply and supply it again.

- Procedure to restart operation when alarm group D1 is generated -
Procedure 1: Alarm group D1 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).

- Procedure to restart operation when alarm group D2 is generated -
Procedure 1: Alarm group D2 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).
Procedure 3: Turn ON SETUP → (return to origin operation) → SETON turns ON after completion of return to origin.

(2) Alarm contents and countermeasures for driver unit
If an alarm occurs in the driver unit when direct numerical designation mode is selected, the alarm code is stored in the memory map Gateway unit => PLC (connected axis response area).
The alarm code to be stored is the 3-digit number "(code)" in the ACT-Connected alarm name (code) in the table below.
Note that the alarm code values in this table are decimal numbers.

⚠ Caution

Alarm codes are not output except in the direct numerical setting mode.
The storage location of alarm codes varies depending on the number of axes and the operation mode setting for each axis.
For the storage location details, please check the contents of section
9.6.5 Data assignment details for each operation mode(CC-Link , EtherNet/IP , EtherCAT).
9.6.6 Data assignment details for each operation mode(PROFINET).

Alarm Name in ACT-Connected (code) *1	Group	How to deactivate	Contents, measures
Drive data value is incorrect (048)	B	RESET	**<Contents>** The operation data is incorrect for the following conditions: (Settable range) (1) Area1 < Area2 (If both Area 1 and Area 2 are 0, the alarm does not occur). (2) Trigger LV ≤ Pushing force. (If the Pushing force is 0, the alarm does not occur even if the Pushing force < Trigger LV). (3) Pushing speed ≤ Speed. (4) Pushing force ≥ Minimum pushing force of actuator. (5) Speed ≥ Minimum speed of actuator (6) Pushing speed ≥ Minimum speed of actuator (7) Pushing speed ≤ Maximum pushing speed of actuator. **<Countermeasures>** Modify the operation data and basic parameter setting. **⚠ Caution** Please refer to the actuator manual or catalogue for the “Maximum pushing speed”, “Minimum pushing force “Minimum speed”.
Parameter value is incorrect (049)	B	RESET	**<Contents>** The basic parameter is not correct for the following condition: (Settable range) (1) Stroke(-) < Stroke(+) (2) W-Area1 < W-Area2 (If both W-Area1 and W-Area2 are 0, the alarm does not occur). (3) "Max force" < Maximum pushing force of actuator **<Countermeasures>** Modify the basic parameter settings. **⚠ Caution** Please refer to the actuator manual or catalogue for the maximum pushing force for the actuator.
Set step data is not registered on list (051)	B	RESET	**<Contents>** This occurs when unregistered No. and No. 64 or more of the step data are instructed to operate. (When operation is commanded through a PLC, this alarm will be generated depending on the signal interval and the holding time of signals). **<Countermeasures>** (1) Make sure that the “Movement mode” in the step data is not "Blank (Disabled)" and that numbers [ABS] and [INC] are input in the numerical instruction operation. (2) When signals are to be continuously input, set the interval time between signals to more than twice the communication cycle time, because PLC processing delays and controller scanning delays can occur.
Set stroke is outside the stroke limit. (052)	B	RESET	**<Contents>** The actuator will move 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). **<Countermeasures>** Please confirm the value of the basic parameters, "Stroke(+)" and "Stroke(-)". Also please confirm the movement distance of actuator. **⚠ Caution** If the operation method of step data is INC, take care with the position where operation starts and the travel distance.

Return to ORIG was not completed in the set time (097)	C	RESET	**<Contents>** Return to origin is not completed within the set time. **<Countermeasures>** Make sure that there are no obstructions that interfere with the actuator movement.
Drive is ON when SVRE is OFF (098)	C	RESET	**<Contents>** The return to origin operation, positioning operation, pushing operation or JOG operation is requested while the Servo motor is OFF (when the EMG terminal is not energized). **<Countermeasures>** Modify the setting so that these operations will be requested while the servo motor is ON (“SVRE” is ON).
Drive is ON when SETON is OFF (099)	C	RESET	**<Contents>** A positioning operation or pushing operation is requested before the return to origin position is completed. **<Countermeasures>** Modify the setting so that these operations will be requested after the return to origin position has been completed.
Motor was not stationary when ABS encoder was communicating (101)	C	RESET	**<Contents>** The power is supplied when the actuator is operated by an external force. **<Countermeasures>** Make sure the actuator is stopped and then turn ON RESET.
Absolute encoder communication error (106)	C	RESET	**<Contents>** This alarm occurs when an error is detected in communication with the absolute encoder at power-on, or when the wiring between the encoder and controller is disconnected. **<Countermeasures>** Check the connector of the controller and actuator wiring is not loose or the cable is not damaged.
Speed exceeded set value (144)	D1	RESET SVON	**<Contents>** The motor speed exceeds a specific level due to an external force, etc. **<Countermeasures>** Make improvements so that the motor speed will not exceed the maximum speed of the actuator. **⚠ Caution** Please refer to the actuator manual or catalogue for the maximum speed of the actuator.

<table>
<tr><td rowspan="4">Motor power supply voltage is outside set range
(145)</td><td rowspan="4">D1</td><td rowspan="4">RESET
SVON</td><td><Contents>
This alarm is generated when the motor power-supply voltage, detected by the controller, is outside of the specified range.
The controller checks the lower limit of the motor power supply voltage only when the servo ON is indicated.</td></tr>
<tr><td><Countermeasures>
Make sure that the voltage supplied to the motor power (M24V) of the controller is within specification.
⚠ Caution
If the power supply is an "inrush-current control type", a voltage drop may cause an alarm during acceleration / deceleration.</td></tr>
<tr><td><Contents>
The alarm may be caused by regenerative power depending on the method of operation of the actuator.</td></tr>
<tr><td><Countermeasures>
Make sure that the operating conditions are within the specifications.
⚠ Caution
Please refer to the actuator manual or catalogue for the method of operation of the actuator.</td></tr>
<tr><td rowspan="2">Controller temperature exceeded set range.
(146)</td><td rowspan="2">D1</td><td rowspan="2">RESET
SVON</td><td><Contents>
The temperature around the power element of the controller is too high.</td></tr>
<tr><td><Countermeasures>
Make improvements so that the temperature around the controller is kept within specification.</td></tr>
<tr><td rowspan="4">Controller supply voltage is outside set range
(147)</td><td rowspan="4">D1</td><td rowspan="4">RESET
SVON</td><td><Contents>
The control power supply voltage within the controller is outside the set range.</td></tr>
<tr><td><Countermeasures>
Make sure that the voltage supplied to the control power (C24V) of the controller is within specification.
⚠ Caution
When the motor power supply and control power supply are shared, if the power supply is of an in-rush current suppression type specification, a voltage drop may occur during acceleration/ deceleration , resulting in an alarm.</td></tr>
<tr><td><Contents>
The alarm may be caused by regenerative power depending on the method of operation of the actuator.</td></tr>
<tr><td><Countermeasures>
Make sure that the operating conditions are within the specifications.
⚠ Caution
Please refer to the actuator manual or catalogue for the method of operation of the actuator.</td></tr>
<tr><td rowspan="2">Current limit is exceeded
(148)</td><td rowspan="2">D1</td><td rowspan="2">RESET
SVON</td><td><Contents>
The output current accumulated value has exceeded the specified value.</td></tr>
<tr><td><Countermeasures>
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.</td></tr>
</table>

The target position was not reached within the set time limit (149)	D1	RESET SVON	**<Contents>** The actuator failed to reach the set position within the set time limit. **<Countermeasures>** 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.
Electrolytic capacitor estimated life-cycle (151)	D1	RESET SVON	**<Contents>** This alarm occurs when the capacitance of the motor drive capacitor in the driver unit decreases and the estimated unit replacement time has arrived. **<Countermeasures>** It is recommended that the driver unit is replaced before the motor drive capacitor reaches its estimated life.
Absolute encoder ID does not match controller data (153)	D2	Turn ON RESET, SVON and SETUP	**<Contents>** The controller detects the absolute encoder specific No. when power is re-applied. This specific No. is different from the number which has been connected before. **<Countermeasures>** This alarm is generated when the product is used for the first time, or when the actuator or controller is replaced. Please refer to **12.1 Power start-up procedure** to clear the alarm.
Encoder error (192)	E	Turn OFF and ON the power supply for the controller	**<Contents>** Abnormality in communication with the encoder. **<Countermeasures>** Check the connection of the actuator cable.
Output current limit has exceeded set value (194)	E	Turn OFF and ON the power supply for the controller	**<Contents>** The output current of the power circuit is abnormally high. **<Countermeasures>** Please check that the actuator cable or connector is not short. If the alarm cannot be deactivated even after the power is re-applied, please contact SMC.
I sense ALM (195)	E	Turn OFF and ON the power supply for the controller	**<Contents>** An abnormality is detected by the current sensor that is checked when the controller is reset. **<Countermeasures>** Make sure that the electric actuator is compatible with the controller. When a command to turn on the 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 re-applied, please contact SMC.
Error counter overflowed (196)	E	Turn OFF and ON the power supply for the controller	**<Contents>** An overflow of the position error counter inside the controller has occurred. **<Countermeasures>** 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.

Memory Abnormality has occurred (197)	E	Turn OFF and ON the power supply for the controller	**<Contents>** An EEPROM error has occurred, or the number of writes has been exceeded. **⚠ Caution** When PWR (green) is flashing (EEPROM writing in progress), do not turn off the controller power supply or disconnect the USB cable. **<Countermeasures>** Please contact SMC (The write limit of the EEPROM is approximately 1,000,000 times).
CPU error (198)	E	Turn OFF and ON the power supply for the controller	**<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). **<Countermeasures>** If the alarm cannot be deactivated even after the power is re-applied, please contact SMC.
Abs Encoder default error (202)	E	Turn OFF and ON the power supply for the controller	**<Contents>** This alarm occurs when an error is confirmed in the internal data of the absolute encoder at power-on. **<Countermeasures>** Please contact SMC if this error reoccurs even after supplying power again.
ABSO Actuator Part No. Abnormal (203)	E	Turn OFF and ON the power supply for the controller	**<Contents>** This alarm occurs when the actuator part numbers stored in the controller and connected actuator are different. **<Countermeasures>** Please contact SMC if this error reoccurs even after supplying power again.
Electrolytic capacitor estimated life limit (204)	E	Turn OFF and ON the power supply for the controller	**<Contents>** This alarm occurs when the motor drive capacitor in the driver unit has reached its estimated life. **<Countermeasures>** Please replace the driver unit to a new one.

∗1 The 3-digit number "(code)" in the table is output as an alarm code.
For the alarm codes, refer to **13.2 (2) Alarm contents and countermeasures for driver unit**.

13.3 Predictive maintenance function

The ACT-Connected software allows monitoring of Records relating to predictive maintenance functions ("Cumulative values" and "Estimated life of the electrolytic capacitors for the motor drive of the driver unit" shown below). This allows the maintenance timing to be set and checked.
If the accumulated value exceeds the set number of times and distance, or when the estimated life of the electrolytic capacitor for the motor drive falls below 30% remaining, a warning (ALML) turns ON.

・Cumulative specified number of times set value [times]

Name	Unit	Setting range	Default
Cumulative instruction count	times	0～4294967295	0 [No warning]

・Cumulative distance travelled set value [m]

Name	Unit	Setting range	Default
Cumulative distance	m	0～4294967295	0 [No warning]

・Electrolytic capacitor warning

Name	Unit	Setting range	Default
Electrolytic capacitor warning	-	Enable / Disable (Enabled: Warning output if the current value is below 30%)	Enable

Performing the "Write Initial Value", "Clear Pairing ID" in the setup or using a backup file in ACT-Connected software, it does not change the current value of the “Cumulative instruction count”, the “Cumulative distance” and the “Electrolytic capacitor warning” output timing.

Please refer to the ACT-Connected instruction manual for how to set each parameter.

To check the warning (WARN) signal at the PLC, check the contents of the following sections.
9.6.5 Data assignment details for each operation mode(CC-Link , EtherNet/IP , EtherCAT).
9.6.6 Data assignment details for each operation mode(PROFINET).

⚠Caution

The controller stores records relating to the predictive maintenance function at 10-minute intervals. If the controller input power supply is cut off within 10 minutes after the last record relating to the predictive maintenance function to the controller, the record relating to the predictive maintenance function from the last record until the power supply is cut off will not be stored. Therefore, if the controller input power supply is cut off within 10 minutes after a warning (WARN) has occurred, the warning (WARN) may return to off at the next start-up.

14. Precautions

14.1 Precautions for wiring and cables

⚠ Warning

(1) Adjusting, mounting or wiring changes should never be made before first turning OFF the power supply to the product.
Electric shock, malfunction and damage can result.

(2) Do not disassemble the cables. Use only specified cables.

(3) Do not connect or disconnect the cable or connector with the power on.

⚠ Caution

(1) Wiring must be carried out correctly and 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.

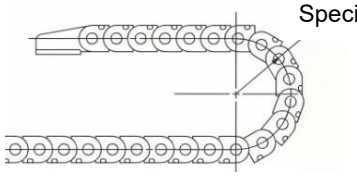
(4) Do not route wires or cables together with power or high voltage cables
The product may malfunction due to interference and surge voltages. Route the wires of the product separately from power or high voltage cables.

(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) When the actuator cable is subjected to repetitive bending action, the following conditions must be observed.
- Cable length 10 m or less: Do not store in a moving wiring duct with a radius smaller than the specified radius (50 mm or more).
- Cable length 15 m or longer: Do not store in a moving wiring duct with a radius smaller than the specified radius (75 mm or more).



(9) Confirm correct 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.

【Transport】

⚠ Caution

(1) Do not carry the motor by the cable.

14.2 Controller and Peripheral Devices / Specific Product Precautions

14.2.1 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 circuit 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 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., turn OFF the power supply for this product and the system immediately.

(6) The number of times to write to EEPROM of the JXD1 controller is limited to 1,000,000 times.
It is not possible to write correctly and reliably if this limit is exceeded.

14.2.2 Handling Precautions

⚠Warning

(1) The inside of the controller and its connectors 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 the 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 electrical 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.

(17) If the electric actuator mover is intentionally moved by external force (e.g. spring, human power, etc.), primary side of the controller input power supply must be cut off before doing that.
The controller has Short Brake Function, which makes it difficult for the actuator mover to move while the control input power supply (C24V) is being supplied.

(18) If the mover is moved while the electric actuator is connected to the controller, the motor induced voltage will be passed around the controller. Therefore, if the actuator is moved at high speed and frequency, this induced voltage may cause the controller to break down.

(19) When using the electric actuator in a mounting position other than horizontal, be sure to use a locking electric actuator.

(20) When several electric actuators are instructed to operate simultaneously, they may not operate simultaneously due to variations in the signal processing time of the driver unit.

14.2.3 Unit Connection

⚠Warning

(1) Do not connect more than 9 driver units together.
It will cause failure or malfunction.

(2) Do not pinch foreign objects when connecting.
It will cause failure or malfunction.

(3) Mount the product using the recommended torque for screws.
If too low, it will cause workpieces to fall off during use.
If too high, it will cause damage.

(4) Do not touch the connector between units.

(5) Do not remove or insert any units while the controller power is on.
The controller or peripheral equipment may be damaged and malfunction may occur.

14.2.4 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.
It may cause a malfunction of the controller and its peripheral devices or cause 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.

14.2.5 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 the product by holding the 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.

14.2.6 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) Use a power supply unit other than the inrush current suppression type for the 24 VDC controller input power supply.
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.

(4) The controller input power supply and the lock release power supply must be separate power supplies.

14.2.7 Grounding

⚠Warning

(1) Ensure that the product is grounded to maintain 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 100 Ω 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.

14.2.8 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.
Provide 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 the controller.
Fire or explosion can result.

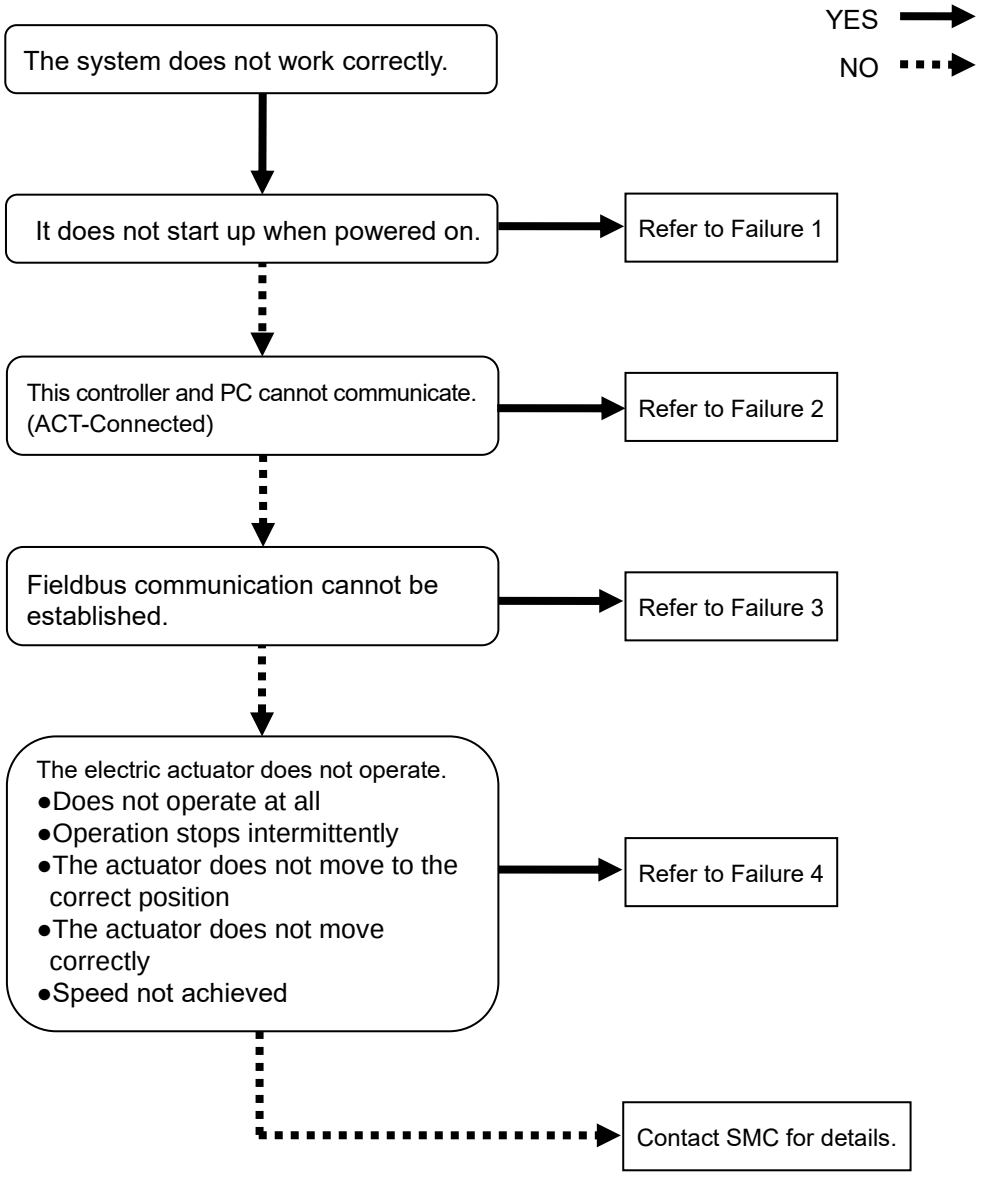
(5) Do not perform an insulation resistance test or insulation withstand voltage test.

(6) Ensure sufficient space for maintenance.
Design the system to allow the required space for maintenance.

(7) Functionality may deteriorate over time

15. Troubleshooting

In case of any problems, please consult the following table.
Consider replacing the controller if none of the causes on this table are applicable.
It is possible that the 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 possible causes	Countermeasures
1	The Controller does not start up when powered on.	Power fault	Is PWR (green) turned on or flashing? Or is ALM (red) turned on?	Check the voltage and current supplied to the controller. ⇒**3. Specifications** ⇒**7. Wiring**
		Incorrect wiring	Is the wiring connected correctly?	Check if the wiring is connected correctly or if there is a broken wire or short-circuit by referring to this Operation Manual. Correct the wiring and check that the input/output of each signal is correct. ⇒**7. Wiring** ⇒**9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)** ⇒**9.7 Handling of Each Transmitted and Received Data**
2	The Controller and PC cannot communicate. (ACT-Connected)	Connection failure	Are there any broken wires?	Please confirm motor controller = USB cable = PC are connected. For example, cannot make communication if the connector has been damaged.
		Communication failure	Is the appropriate USB cable connected?	Please make sure that the USB cable is capable of data transfer.
		Power is not supplied	Is the controller powered on?	Please confirm the power supply of the controller has been turned ON. Communication cannot be established if the power supply is OFF.
		Communication interference	Are any devices other than the controller connected to the PC?	If the equipment (PLC and measurement hardware) other than the controller is connected with PC. (There is a possibility that the communication with other equipment interferes in the PC).
3	CC-Link communication cannot be established.	CPU ALM	Are both the L RUN (green) and L ERR (red) LED ON?	It is possible that the CPU or surrounding circuits have failed, or the CPU is malfunctioning due to electrical noise. If the alarm is still generated when power is re-applied, please contact SMC.
		CC-Link Communication error	What are the states of the L RUN (green) and L ERR (red) LED?	Take appropriate measures by referring to and following the controller operation manual. ⇒**8.1 Gateway Unit (CC-Link)** ⇒13.1.2 Fieldbus specific alarms：**(1) Alarm details and countermeasures for CC-Link communication**
	EtherNet/IP communication cannot be established.	Unrecoverable error	Is the MS (red) LED on?	Discontinue use and please contact SMC.
		EtherNet/IP Communication error	Have the status of the MS and NS LED's been checked?	Take appropriate measures according to the contents of this manual. ⇒**8.2 Gateway unit (EtherNet/IP)** ⇒13.1.2 Fieldbus specific alarms：**(2) Alarm details and countermeasures for Ethernet/IP communication**

3	EtherCAT communication is not established.	Non-Recoverable Error	Are the ERR (red) and RUN (red) LEDs ON?	Discontinue use and please contact SMC.
		EtherCAT communication error	Have you checked the status of ERR and RUN LEDs?	Please take appropriate measures in accordance with the contents of this operation manual. ⇒**8.3 Gateway unit (EtherCAT)** ⇒13.1.2 Fieldbus specific alarms : **(3) Alarm details and countermeasures for EtherCAT communication**
	PROFINET communication is not established.	Non-Recoverable Error	Are the SF (red) and BF (red) LEDs ON?	Discontinue use and please contact SMC.
		PROFINET communication error	Have you checked the status of SF and BF LEDs?	Please take appropriate measures in accordance with the contents of this operation manual. ⇒**8.4 Gateway unit (PROFINET)** ⇒13.1.2 Fieldbus specific alarms :**(4) Alarm details and countermeasures for PROFINET communication**

4	Controller does not operate at all.	Lock release error	Is there a release sound from the lock when the lock forced release switch is turned on and off?	If there is no sound of lock release, the lock brake may be broken. If the problem persists, please contact SMC.
		External equipment failure	Is the PLC connected to the controller operating correctly?	Check the operation by test run using the ACT-Connected, etc. If the electric actuator is operated, a signal output from the PLC is suspected. Refer to the controller operation manual and take appropriate measures. ⇒**9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)** ⇒**9.7 Handling of Each Transmitted and Received Data**
		Unsuitable specification (Pairing ID mismatch)	Is the combination of actuator and controller correct? Does the written data match the electric actuator to be used? Has the pairing ID been set correctly?	Check that the combination of the controller applicable electric actuator model part number and the electric actuator model part number is correct. ⇒**3. Specifications** Write the data that matches the actuator model number to be used. Refer to the ACT-Connected instruction manual to properly set the pairing ID.
		Influence of a magnetic force	Are there any magnets, electromagnetic coils, or other devices that generate magnetic force around the actuator?	Refer to the actuator instruction manual and keep equipment that generates magnetic force away from the motor.
		Stop command	When EMG is de-energized, the actuator is stopped (servo OFF) and will not operate. Is 24 VDC energized to EMG?	Apply 24 VDC to the EMG terminal.
		Incorrect wiring	Is the wiring connected correctly?	Refer to this instruction manual to check the wiring and check for disconnections or shorts. Correct the wiring and check that the input/output of each signal is correct. ⇒**7. Wiring** ⇒**9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)** ⇒**9.7 Handling of Each Transmitted and Received Data**
		Alarm condition	–	Take appropriate measures according to the contents of this instruction manual. ⇒**13. Alarm**

4	Operation stops intermittently	Contact failure	Has the condition of the wiring been checked?	Refer to this instruction manual to check the wiring and check for disconnections or shorts. Correct the wiring as necessary and confirm that the input/output of each signal is correct. ⇒**7. Wiring** ⇒**9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)** ⇒**9.7 Handling of Each Transmitted and Received Data**
		Electrical noise	Is the controller connected to ground? Are the actuator cables of other equipment and cables connected to the controller bundled together?	Ensure that the ground connection is secure. Avoid bundling wires with actuator cables to other equipment. Refer to the controller instruction manual and take appropriate measures according to the contents. ⇒**6.2 Grounding** ⇒7.1.3 Control power supply plug wiring: **(3) Wiring of FG**
		Incorrect parameters	Are the correct parameter values entered?	Check the combination of actuator and controller. Re-enter the correct parameters and check the operation. ⇒**9. Configuration of Gateway units** ⇒**10. Driver unit settings**
		Voltage drop	Is there a temporary voltage drop in the control power supply? (this will cause the control power plug EMG to turn off and stop, but the stop will be released when the voltage returns).	A momentary voltage drop may have occurred due to insufficient power supply capacity of the control power supply compared to the maximum power specified in the actuator specifications. ⇒**3. Specifications**
			Is there a temporary voltage drop in the motor power supply? (this causes the power supply voltage at M24VOUT of the power supply blocking plug to drop, resulting in a stop, but the stop is cancelled when the voltage returns).	A momentary voltage drop may have occurred due to insufficient power supply capacity of the motor power supply compared to the maximum power specified in the actuator specifications. ⇒**3. Specifications**
		Pushing operation failure	Is the "INP" signal turned ON during the pushing operation?	Please confirm that the "INP" signal is ON during the pushing operation. ⇒**9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)**

4	Operation stops intermittently	Influence of a magnetic force	Check if there is equipment which generates a magnetic force, such as a magnet or electro-magnetic coil around the electric actuator.	Refer to the instruction manual of the electric actuator and keep equipment that generates a magnetic force away from the motor.
		Signal timing	Check the timing of the signal from the PLC to the controller.	Take appropriate measures according to the contents of this manual. ⇒**9.8 Controller input signal response time**
		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 s.) from SVON input to SVRE output depending on the electric actuator position. Command operation after SVRE output is turned ON.
		Alarm condition	–	Take appropriate measures according to the contents of this instruction manual. ⇒**13. Alarm**
	The actuator does not move to the correct position. Operation stops Intermittently	Incorrect origin position	If it is a pushing operation, repeat return to origin operations several times to check if the electric 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 electric actuator operate normally (remove foreign matter that interferes with the electric actuator movement, etc.)
		Incorrect parameters	Check that the parameter values are appropriate and the program is correct.	Check the max. speed, acceleration speed, and deceleration speed of the electric actuator and be sure to input the correct parameters. ⇒**9.6.5 Data assignment details for each operation mode(CC-Link , EtherNet/IP , EtherCAT)** ⇒**9.6.6 Data assignment details for each operation mode(PROFINET)** ⇒**10.3 Settings and Data Entry**
	The actuator does not move correctly.	Incorrect input of command	Has the contents of the command been checked?	Please confirm that the input/output of each signal is correct. ⇒**9.6 Fieldbus Operation Mode Settings (Fieldbus common settings)** Please check the handling of transmitted and received data when communicating between the PLC and the controller. ⇒**9.7 Handling of Each Transmitted and Received Data** Please check the timing chart for each signal. ⇒**12. Operating Procedure**
		Incorrect parameters	Check that the parameter values are appropriate and the program is correct.	Check the max. speed, acceleration speed, and deceleration speed of the electric actuator and be sure to input the correct parameters. ⇒**9.6.5 Data assignment details for each operation mode(CC-Link , EtherNet/IP , EtherCAT)** ⇒**9.6.6 Data assignment details for each operation mode(PROFINET)** ⇒**10.3 Settings and Data Entry**

4	The actuator does not move correctly.	Signal timing	Check the timing of the signal from the PLC to the controller.	Take appropriate measures according to the contents of this manual. ⇒**9.8 Controller input signal response time**
		Data not stored correctly	Check whether data (step data, parameter) is written correctly.	During data writing (LED of driver unit CH A or CH B is flashing (cycle 400 ms)), the following actions may fix the cause. ・Turn off the controller input power supply. ・Disconnected / connected cables. Input correct data (step data, parameter) again and confirm operation. ⇒**10.3 Settings and Data Entry**
	Speed not achieved	Incorrect parameters	Check that the parameter values are correct.	Check the max. speed and acceleration of the electric actuator and be sure to input the correct parameters. ⇒**9.6.5 Data assignment details for each operation mode(CC-Link , EtherNet/IP , EtherCAT)** ⇒**9.6.6 Data assignment details for each operation mode(PROFINET)** ⇒**10.3 Settings and Data Entry**
		Operation pattern is not suitable.	Check if a trapezoidal acceleration / deceleration is programmed for the actuator operation.	Check the max. speed and acceleration of the electric actuator and be sure to input the correct parameters. ⇒**9.6.5 Data assignment details for each operation mode(CC-Link , EtherNet/IP , EtherCAT)** ⇒**9.6.6 Data assignment details for each operation mode(PROFINET)** ⇒**10.3 Settings and Data Entry**
		Influence of a magnetic force	Check if there is equipment which generates a magnetic force, such as a magnet or electro-magnetic coil around the actuator.	Refer to the instruction manual of the electric actuator and keep equipment that generates a magnetic force away from the motor.
		Voltage drop	Is there a temporary voltage drop in the control power supply? (this will turn off the EMG terminal of the control power supply plug, causing it to stop, but the stop is released when the voltage is restored).	This alarm may be caused by a momentary voltage drop due to insufficient power supply capacity of the control power supply compared to the maximum power specified for the electric actuator. ⇒**3. Specifications**
			Is there a temporary voltage drop in the power supply? (this causes the power supply voltage at the M24VOUT terminal of the power supply shutoff plug to drop, resulting in a shutdown, but the shutdown is canceled when the voltage returns).	This alarm may be caused by a momentary voltage drop due to insufficient power supply capacity of the control power supply compared to the maximum power specified for the electric actuator. ⇒**3. Specifications**

16. Definitions and terminology

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

	Term	Definition
C	CC-Link	CC-Link is a fieldbus standard promoted by Mitsubishi Electric Corporation etc. The share in the Asian area and Japan is high and CC-Link is used in many companies.
	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 time for sending data from master to slave (JXD1 controller).
	CSP+ File	This file contains information required for the start-up, operation and maintenance of CC-Link Family Connection Units.
D	DLR	Device Level Ring. Performs fast switching to a redundant communication route when a problem occurs within a Ring network.
	Device name	The name of the PROFINET slave device, which is set arbitrarily by the user in the system.
E	EDS file	Allows a device to be configured for an EtherNet/IP network, using PLC setting software. The file describes data exchange, device information and supported EtherNet/IP features.
	Ethernet	The most commonly used LAN technology standardized by IEEE802.3
	ESI file	The file contains information on the EtherCAT slave devices, the communication settings and the parameters that can be set via EtherCAT.
G	GSDML file	The file contains information on the PROFINET slave devices, the communication settings and the parameters that can be set via PROFINET.
F	Fieldbus	It is a standard to perform the signal communication to apparatus (measuring instrument, operation device) which operates in factories and with a PLC using a digital signal.
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. This function maintains communication by switching routes at high speed in the event of ring network failure.
N	Number of stations	It is the total number of stations of all slaves connected to the CC-Link network.
O	Occupied number of stations	Number of stations on the network which one slave station uses. It is possible to set from Station 1 to Station 4 according to the number of the data.
P	PLC	Abbreviation of Programmable Logic Controller. It is a controller which provides sequential control using programs of the Boolean operation, the order operation, and the arithmetic operation, etc.
R	Remote device station	It is the slave station that can use bit data and word data.
	Remote IO	It is a memory area that stores the bit data.
	Remote register	It is a memory area that stores the word data.
	RWr	It is a remote register region of the input side which the master station receives the word data from the slave station.
	RWw	It is a remote register region of the output side which the master station sends the word data from the slave station.
	Rx	It is a remote I/O region of the input side which the master station receives the bit data from the slave station.
	Ry	It is a remote I/O region of the output side which the master station sends the bit data from the slave station.
S	Station No.	The master station is 0, and numbers from 1 to 64 are assigned to the slave station on CC-Link . The slave station is necessary and should not be repeated in consideration of the number of the occupied stations.
	Station type	It is a generic type name of the slave station. By using data (bit data and word data), the types are remote I/O station, the remote device station and the intelligent device station.
T	Topology	Connection configuration of the Fieldbus network. Expresses how each terminal and control components are connected. The typical topology types are star type, linear type and ring type.
U	Upper level device	Controller setting equipment, such as a PLC.

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