IAI
Quality and Innovation

R-unit

# REC System

## Instruction Manual Fourth Edition *ME0394-4A*



IAI Corporation

# Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please downloaded the user's manual from our website.
You can download it free of charge. User registration is required for the first time downloading.
URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

## [Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- 
- 

ME0394-4A

# REC System Instruction Manual Configuration

| Product name | Instruction manual name | Control number |
|---|---|---|
| REC System | First Step Guide | ME0395 |
| REC System | Instruction Manual (this document) | ME0394 |
| RCON System | Instruction Manual | ME0384 |
| PC software | RCM-101-MW/RCM-101-USB Instruction Manual | ME0155 |
| Touch Panel Teaching Pendant | TB-02/02D Instruction Manual | ME0355 |
| Touch Panel Teaching Pendant | TB-03 Instruction Manual | ME0376 |
| 24V Power Supply Unit | PSA-24 Instruction Manual | ME0379 |

# Contents

## Chapter 4 Startup of REC System



## Chapter 5 Operation



## Chapter 6 Parameter

# Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

## Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

| No. | Operation Description | Description |
|---|---|---|
| 1 | Model Selection | ● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible.<br>Accordingly, do not use it in any of the following applications.<br>1) Medical equipment used to maintain, control or otherwise affect human life or physical health.<br>2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility)<br>3) Important safety parts of machinery (Safety device, etc.)<br>● Do not use the product outside the specifications.<br>Failure to do so may considerably shorten the life of the product.<br>● Do not use it in any of the following environments.<br>1) Location where there is any inflammable gas, inflammable object or explosive<br>2) Place with potential exposure to radiation<br>3) Location with the ambient temperature or relative humidity exceeding the specification range<br>4) Location where radiant heat is added from direct sunlight or other large heat source<br>5) Location where condensation occurs due to abrupt temperature changes<br>6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)<br>7) Location exposed to significant amount of dust, salt or iron powder<br>8) Location subject to direct vibration or impact<br>● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece. |

| No. | Operation Description | Description |
|---|---|---|
| 2 | Transportation | ● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane.<br>● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers.<br>● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped.<br>● Transport it using an appropriate transportation measure.<br>The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model.<br>● Do not step or sit on the package.<br>● Do not put any heavy thing that can deform the package, on it.<br>● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work.<br>● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit.<br>● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength.<br>● Do not get on the load that is hung on a crane.<br>● Do not leave a load hung up with a crane.<br>● Do not stand under the load that is hung up with a crane. |
| 3 | Storage and Preservation | ● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation.<br>● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake. |
| 4 | Installation and Start | (1) Installation of Robot Main Body and Controller, etc.<br>● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury.<br>Also, be equipped for a fall-over or drop due to an act of God such as earthquake.<br>● Do not get on or put anything on the product.<br>Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life.<br>● When using the product in any of the places specified below, provide a sufficient shield.<br>1) Location where electric noise is generated<br>2) Location where high electrical or magnetic field is present<br>3) Location with the mains or power lines passing nearby<br>4) Location where the product may come in contact with water, oil or chemical droplets |

| No. | Operation Description | Description |
|---|---|---|
| 4 | Installation and Start | (2) Cable Wiring<br>● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool.<br>● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it.<br>Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error.<br>● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error.<br>● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction.<br>● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product.<br>● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire. |
| | | (3) Grounding<br>● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation.<br>● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load.<br>Perform wiring that satisfies the specifications (electrical equipment technical standards).<br>For detail, follow the description in an instruction manual of each controller or controller built-in actuator.<br>● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below). |

| No. | Operation Description | Description |
|---|---|---|
| 4 | Installation and Start | (4) Safety Measures<br>● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers.<br>● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury.<br>● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation.<br>● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product.<br>● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input.<br>● When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury.<br>● Take the measure so that the work part is not dropped in power failure or emergency stop.<br>● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety.<br>● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire.<br>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. |
| 5 | Teaching | ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers.<br>● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well.<br>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.<br>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.<br>● Place a sign “Under Operation” at the position easy to see.<br>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.<br>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated. |

| No. | Operation Description | Description |
|---|---|---|
| 6 | Trial Operation | ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers.<br>● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation.<br>● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation.<br>● Make sure to perform the programmed operation check at the safety speed.<br>Failure to do so may result in an accident due to unexpected motion caused by a program error, etc.<br>● Do not touch the terminal block or any of the various setting switches in the power ON mode.<br>Failure to do so may result in an electric shock or malfunction. |
| 7 | Automatic Operation | ● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence.<br>● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication.<br>● Make sure to operate automatic operation start from outside of the safety protection fence.<br>● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product.<br>● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure. |

| No. | Operation Description | Description |
|---|---|---|
| 8 | Maintenance and Inspection | ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers.<br>● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well.<br>● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch.<br>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.<br>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.<br>● Place a sign “Under Operation” at the position easy to see.<br>● For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model.<br>● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product.<br>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.<br>● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation.<br>● Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works.<br>Use in incomplete condition may cause damage to the product or an injury.<br>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated. |
| 9 | Modification and Dismantle | ● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion. |
| 10 | Disposal | ● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste.<br>● When removing the actuator for disposal, pay attention to drop of components when detaching screws.<br>● Do not put the product in a fire when disposing of it.<br>The product may burst or generate toxic gases. |
| 11 | Other | ● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device.<br>● See Overseas Specifications Compliance Manual to check whether complies if necessary.<br>● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety. |

# Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the instruction manual for each model.

| Level | Degree of Danger and Damage | Symbol |
|---|---|---|
| Danger | This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury. |  Danger |
| Warning | This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury. |  Warning |
| Caution | This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage. |  Caution |
| Notice | This indicates lower possibility for the injury, but should be kept to use this product properly. |  Notice |

# Precautions for Handling

1. Make sure to follow the usage condition, environment and specification range of the product.
   In case it is not secured, it may cause a drop in performance or malfunction of the product.

2. Use the correct teaching tool.
   Refer to the following item and use compatible tools for PC software and teaching pendant usable for this controller.
   Refer to [4.1.2 Tool to Use]

3. Back up data in order to be prepared for a breakdown.
   Non-volatile memory is used for backup memory of this controller. Registered position data and parameters are written in this memory and backed up. Therefore, these data will normally not be lost even if the power is turned off. However, be sure to save the latest data to enable a quick recovery process in case this controller needs to be replaced with a substitute due to breakdown, etc.

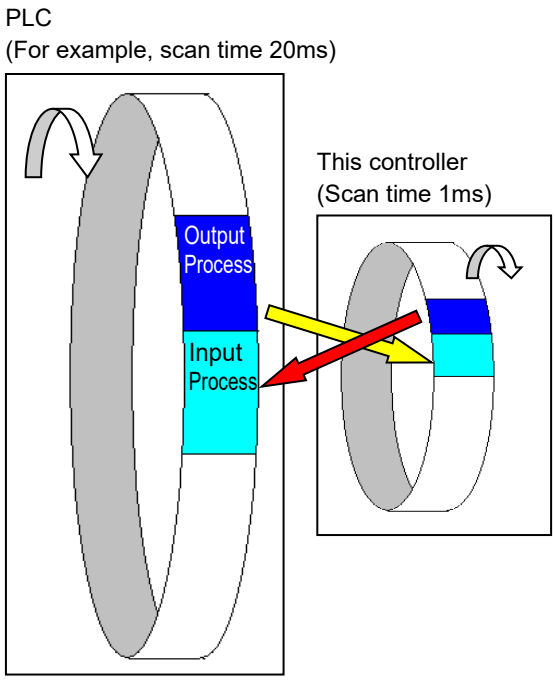
   How to save
   (1) Save to an external memory or a hard disk using PC software
   (2) Record position table and parameters in writing

4. Perform initial operation setting.
   This controller is compatible with 7 types of field network to support various applications. Establish the settings considering the way of use at the startup.
   Refer to [1.2 Features], [Chapter 5 Operation]

5. Creation of sequence programs

When creating a sequence program, be careful of the following.

If exchanging data between devices with different scan time, the length of time required for a reliable signal reading process is greater than the longer scan time. (In order to safely perform the reading process on the PLC side, we recommend using a timer set value of at least twice the longer scan time.)




● Operational image

As shown in the diagram, if exchanging data between 2 devices with different scan time, obviously the I/O timing will not match.

When the signal of this controller turns ON, there is no guarantee that the PLC will read it immediately.

In cases like this, in order to achieve reliable reading, set the PLC side to read after a period greater than the longer scan time has passed. This also applies when the reading is performed on the controller side.

On this occasion, make sure the safety factor of the timer setting is 2 to 4 times or more of the scan time.

As the timer is also processed within the scanning process, setting below the scan time is dangerous.

The example shown in the diagram indicates that even if this controller performs output process once every 1ms, the PLC can only recognize once every 20ms.

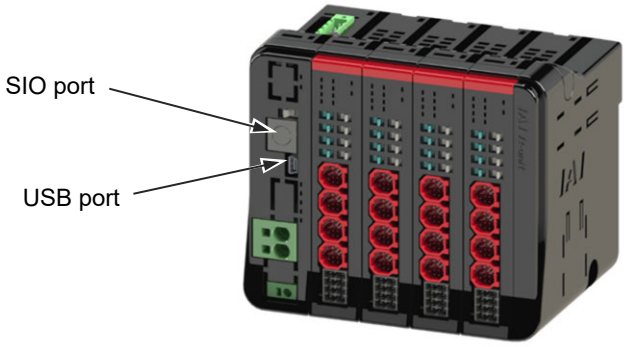
The PLC only performs the output process once every 20ms, meaning that it keeps recognizing the same output status for that period.

Also, if reading is performed while the other device is rewriting output, incorrect signals may be read at times. Wait until the rewriting is completely finished (allow interval of 2 scans or more), then perform reading. In terms of the output-side device, do not allow its output to change until the other device finishes the reading. Additionally, an input constant is set for the input component to prevent mistaken detection of noise, etc. so it only accepts signals that last more than a certain period of time. It is necessary to add this period of time as well.

6. PLC timer setting
   The PLC timer setting should not be at minimum set value.
   If "1" is set, some PLCs turn ON somewhere between 0 and 100ms with a 100ms timer, or between 0 and 10ms with a 10ms timer.
   Consequently, the process which will be performed is the same as when a timer is not set, which may lead to failures such as failing to position to a specified position No. in positioner mode, etc.
   The minimum set value of the 10ms timer should be "2", and when required to set to 100ms, use the 10ms timer and set it to "10".

7. External communication ports
   The REC gateway unit has 2 types of communication port.
   - SIO port (RS485 round connector)
   - USB port (USB mini-B connector)

   Do not connect multiple ports and perform communication simultaneously.
   This may result in following errors:
   - Occurrence of communication error
   - Occurrence of unpredictable operation

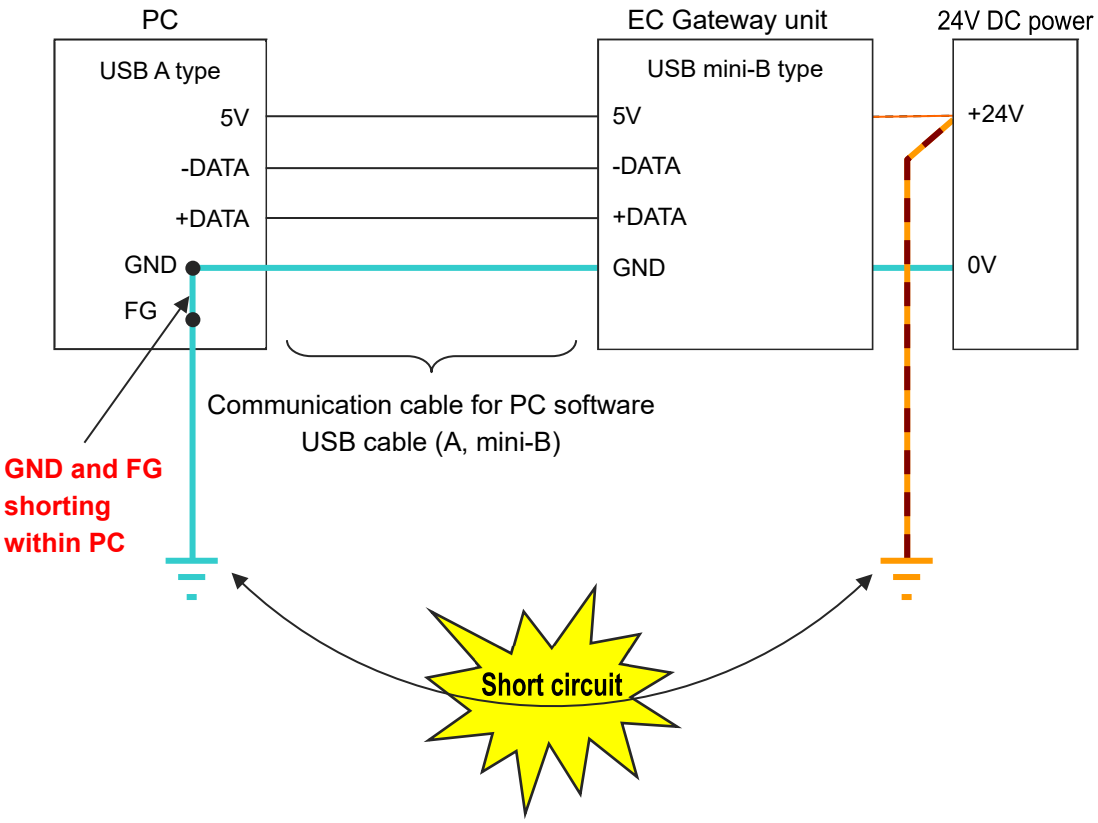



8. The REC system is not capable of operating ELECYLINDER in the single solenoid system.
   ELECYLINDER may not operate as commanded by a host system if Parameter No.9 Select Electromagnetic Valve System (Operation System) is changed to Single.

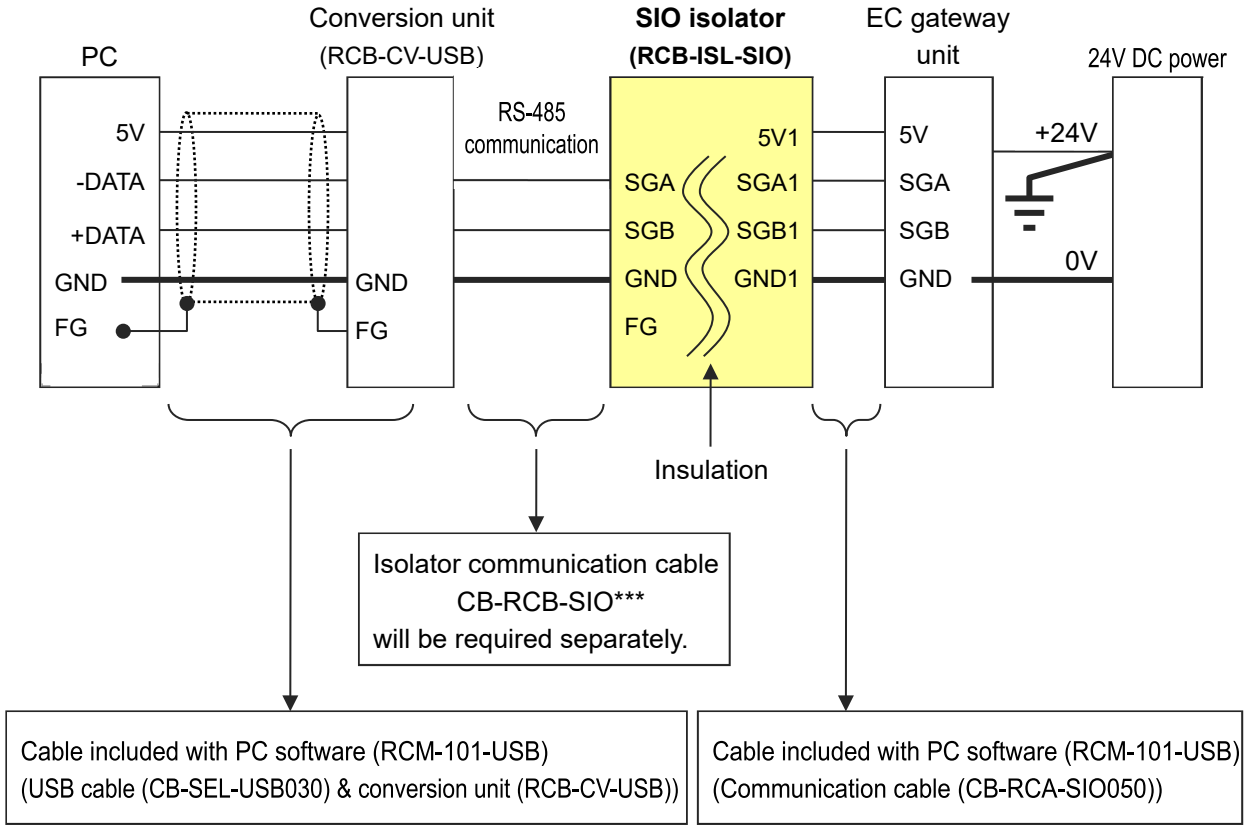
9. Caution in Use
   Make sure to read [5.3.2 Caution for REC system].
   Failure in operation could cause damage on the products and equipment.

# Precautions for PC Connection to REC Gateway Unit Grounded at Positive Terminal of 24V DC Power Supply

If the EC gateway unit is grounded at the positive terminal of the 24V DC power supply, a PC cannot be connected to the USB connector (mini-B) of the EC gateway unit.
If connected directly, short-circuiting of the power will occur as shown in the diagram below, causing malfunction of the PC.



If the EC gateway unit is grounded at the positive terminal of the 24V DC power supply, use an SIO isolator (RCB-ISL-SIO) as shown in the diagram below when connecting a PC to the SIO connector of the EC gateway unit.
If a PC is connected to the EC gateway unit without using an SIO isolator, the power will short-circuit and cause the PC to malfunction.




## Caution

- RS232 conversion unit (RCB-CV-MW) cannot be used.

# Overseas Standard Compliance

This product complies with the following overseas standards.
Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

| RoHS3 Directive | CE Marking | UL Certification |
|---|---|---|
| ○ | ○ | ○ |

# About UL/cUL

**1. Environment of Use**

- Use in an environment of Pollution Degree 2 is available.
- Use it in an environment with the peripheral temperature at 55°C or less.

**2. Short Circuit Current Rating (SCCR：Short Circuit Current Rating)**

This product should be used with connectivity to the power supply environment of 5,000Arms or less. Also, the maximum voltage available to use is as 24V and 100A or less.

# Actuator Coordinate System

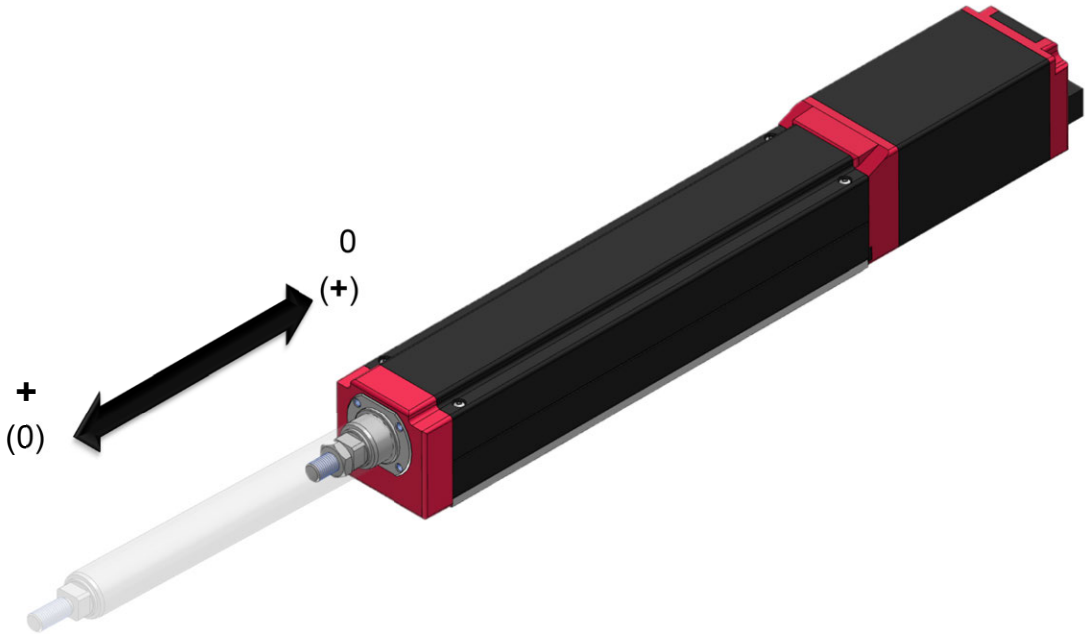
Unless indicated as home reverse specification (option), the direction of home return for the linear axis is on the motor side, the rotary axis is on the counterclockwise side, and the gripper is on the outside (open side).

## Caution

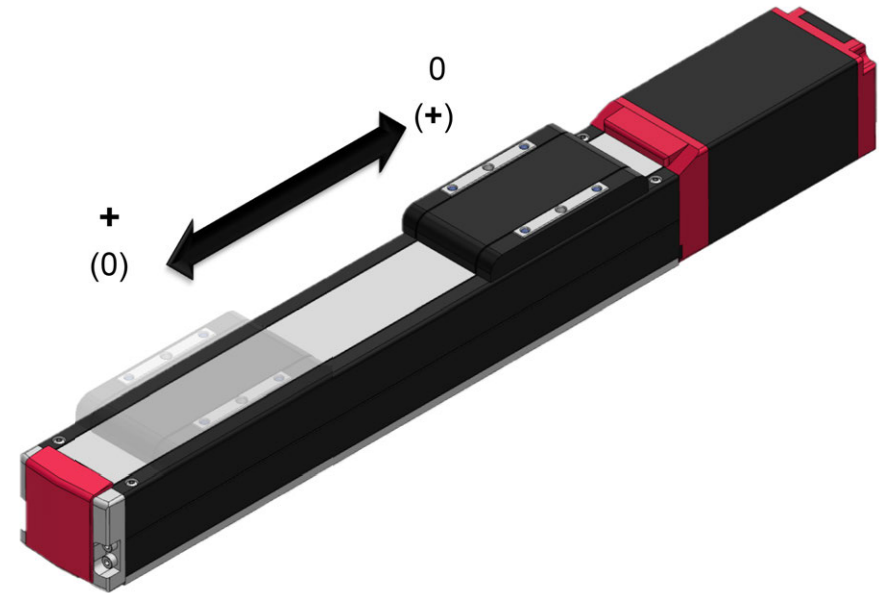
- Homing direction cannot be changed with some models.
- If it becomes necessary to reverse the homing direction after assembly to equipment, check the model of the applicable actuator to ensure that the homing direction is changeable.
- For models with which change is not possible, the actuator must be replaced. Contact IAI if anything is unclear.

The “0” in the figure below shows home. The parentheses show home reverse specification.

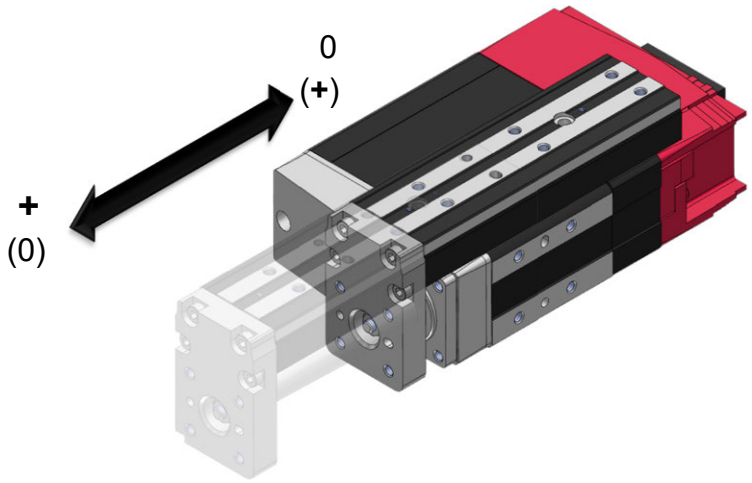
(1) Rod type



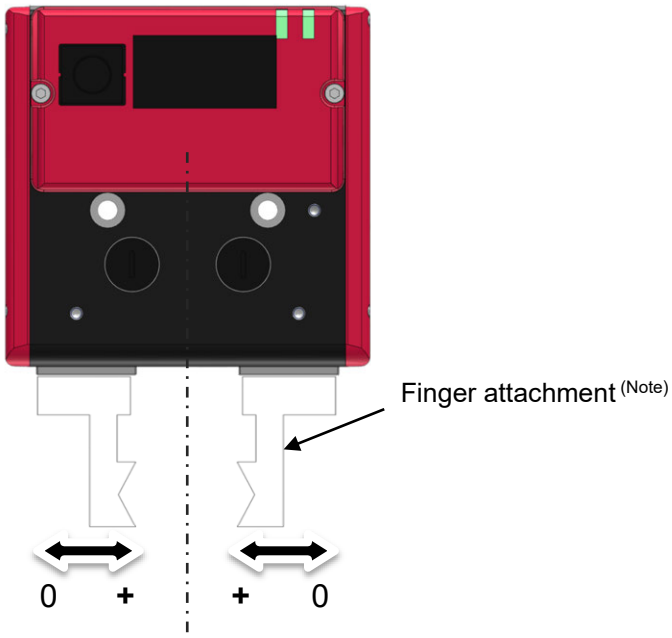
(2) Slider type




(3) Table type

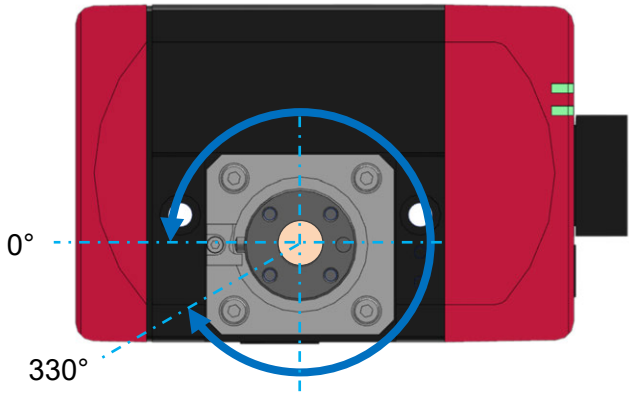


(4) Gripper type




Note: The finger attachment is not an accessory for the actuator.
It is to be prepared by the customer.

(5) Rotary type




(330° rotation specification)

*R E C*

Chapter 1

# REC Overview

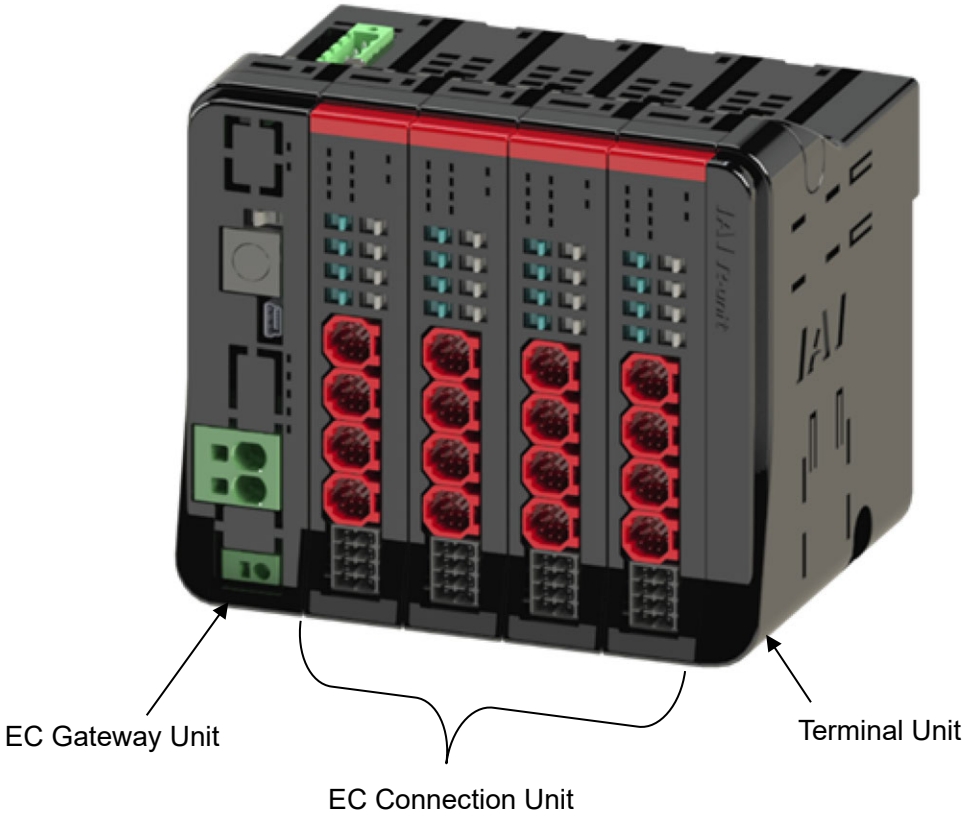
# 1.1 Overview



REC System is capable to control 16 axes of ELECYLINDER at the maximum in the field network of the host programable controller (hereinafter described as the PLC).

The system is to be constructed with combinations of EC connection units capable to connect four axes per each between the EC gateway unit that is an interface for the field network connection and the terminal unit (terminal resistor). EC connection unit is available for four units at the maximum (16 axes) for connection.

There are seven types of the EC gateway units, for CC-Link, for CC-Link IE Field, for DeviceNet, for EtherCAT, for EtherNet/IP, for PROFIBUS-DP and for PROFINET.



## 1.2 Features



(1) Applicable for Field Networks

The system is capable to control ELECYLINDER in seven types of field networks (CC-Link, CC-Link IE Field, DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS-DP and PROFINET IO).

(2) Modular connections with excellent expansibility

REC System can be constructed with necessary number of the EC connection units combined.

It is available to connect four axes of ELECYLINDER to one unit. The maximum connectable number of axes is 16.

(3) Super compact size

EC gateway unit / EC connection unit are units with super compact size, W30mm/22.6mm x H115mm x D95mm.

With 16 axes linked, the size is W133mm x H115mm x D95mm.

This contributes to the miniaturization of the control board.

(4) High performance

Adopting the total frame communication, the communication cycle time between the EC gateway unit and the EC connection units is 5ms or shorter even with 16 axes connected.

Also, it can support ambient temperatures up to 55°C. (There is no need of a fan unit mounted)

(5) Enhanced preventive and predictive maintenance functions

The current position and motor current value can be monitored, as well as the travel count, travel distance, and motor overload status.

(6) Improved usability

Equipped with a USB port as standard. Connection to a PC is possible using a commercial USB cable.

A JOG switch and brake switch are equipped on the front of the EC connection unit.

Operation is easy even without a teaching tool.

# 1.3 Specifications



## 1.3.1 General Specifications

The specifications regarding installation conditions are listed below.

| Item | Specifications |
|---|---|
| Ambient operating temperature | 0 to 55°C |
| Ambient operating humidity | 5 to 85%RH, but non-condensing or freezing |
| Ambient storage temperature | -20 to 70°C |
| Operating atmosphere | Avoid corrosive gas and in particular avoid excessive dust |
| Altitude | 1,000m or less |
| Vibration resistance | Frequency: 10 to 57Hz/Amplitude: 0.075mm,<br>Frequency: 57 to 150Hz/Acceleration: 9.8m/s$^2$<br>XYZ directions Sweep time: 10 minutes Number of sweeps: 10 times |
| Shock resistance | Drop height: 800mm 1 corner, 3 edges, 6 faces |
| Overvoltage category | I |
| Electric shock protection mechanism | Class III |
| Pollution degree | II |
| Degree of protection | IP20 |
| Insulation withstanding voltage | 500V DC 10MΩ (between Power Supply Terminal and Frame Ground) |
| Cooling method | Natural air cooling |

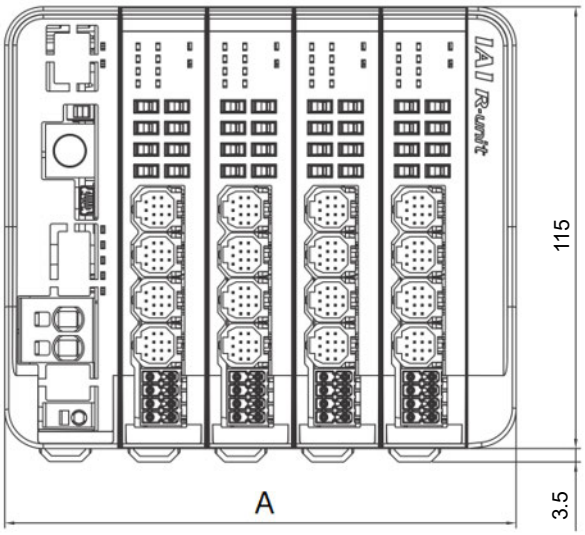
The specifications regarding control are listed below.

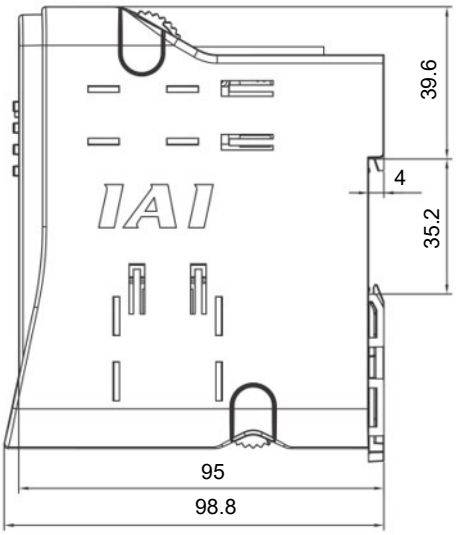
| Item | Specifications | | | |
|---|---|---|---|---|
| Number of controlled axes | 1 to 16-axis | | | |
| Encoder resolution [pulse/r] | Pulse motor | Incremental | | 800 |
| | | Battery-less Absolute | | 800 |
| | PM stepping motor | Incremental | | 32768 |
| | 200V AC Servo motor | Battery-less Absolute | | 16384 |
| Cable length | Motor/encoder cable: 10m or less | | | |
| Field network interface | CC-Link, CC-Link IE Field, DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS-DP, PROFINET IO | | | |
| SIO interface | Teaching port | Communication method | RS-485 | |
| | | Communication speed | 9.6/19.2/38.4/57.6/115.2/230.4 kbps | |
| | USB port | Communication method | USB | |
| | | Communication speed | 12Mbps | |
| PIO interface | No | | | |
| Data recording device | Position data and parameters to be stored in non-volatile memory (No limit to writing count) | | | |
| Safety category compatibility | - | | | |
| Drive-source cutoff method | Drive cutoff by semiconductor (Power MOSFET) | | | |
| Protection functionality | Overcurrent, abnormal temperature, encoder disconnection, overload | | | |
| Preventive/ predictive maintenance functions | No | | | |
| Laws and Standards | CE Marking and UL standard | | | |

# 1.4 External Dimensions

## 1.4.1 REC System

| Item | Specifications |
|---|---|
| External dimensions | W133mm × H115mm × D95mm<br>(when four units of EC connection unit) |
| Mass | About 675g (when four units of EC connection unit) |
| External view | See figure below |


| Number of EC Connection Units | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Max. Connectable Number of Units | 4 axes | 8 axes | 12 axes | 16 axes |
| A dimensions [mm] | 65.2 | 87.8 | 110.4 | 133.0 |
| Mass [g] | 306 | 429 | 552 | 675 |

R E C

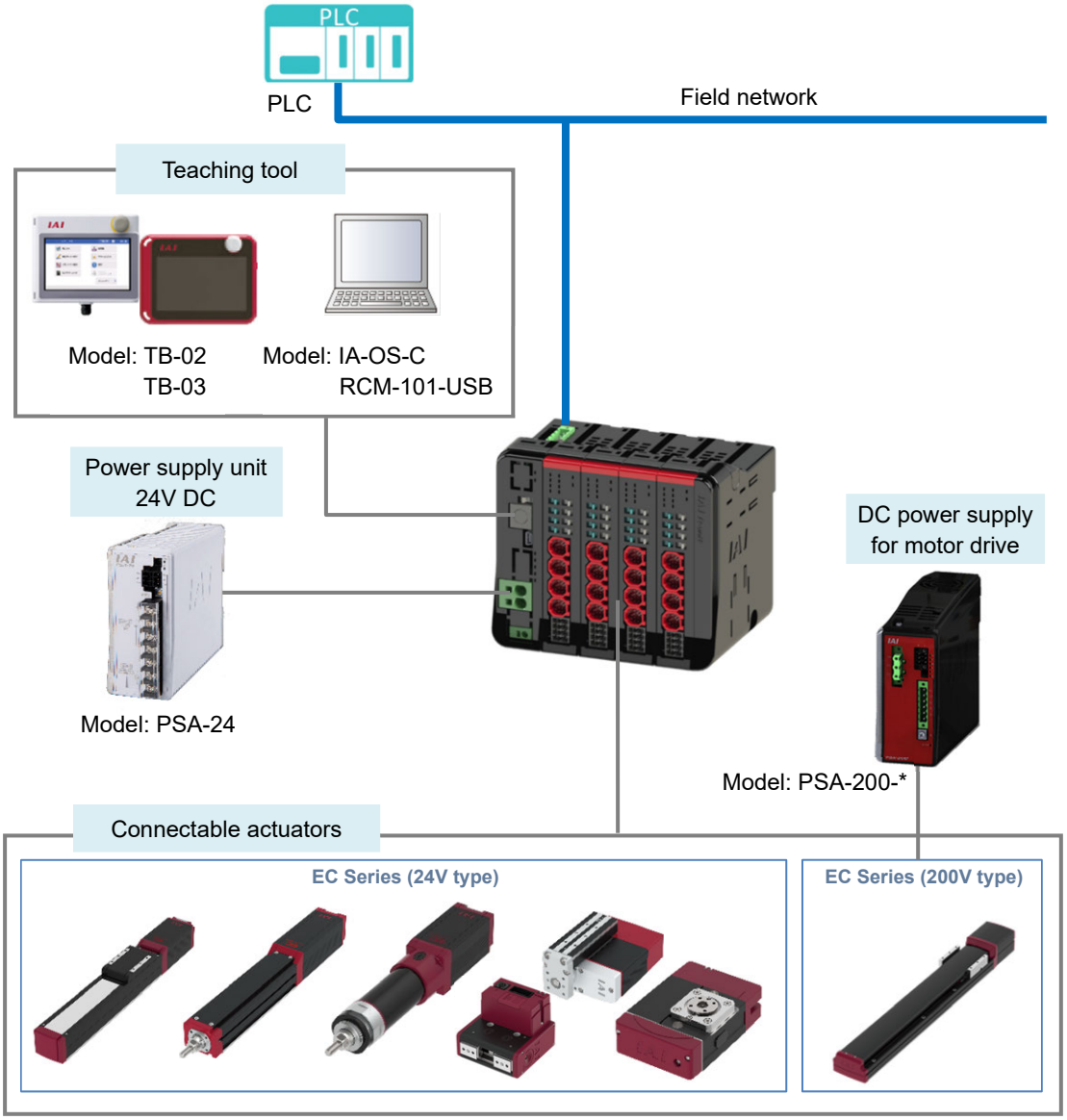
Chapter 2

# System Configuration and Power Supply Type

# 2.1 System Configuration

The following shows the system configuration.






Note: ELECYLINDER is available for operation only in the double solenoid system

Note: Number of Connectable Units of EC Connection Unit

Up to 16 axes can be controlled with each EC gateway unit.

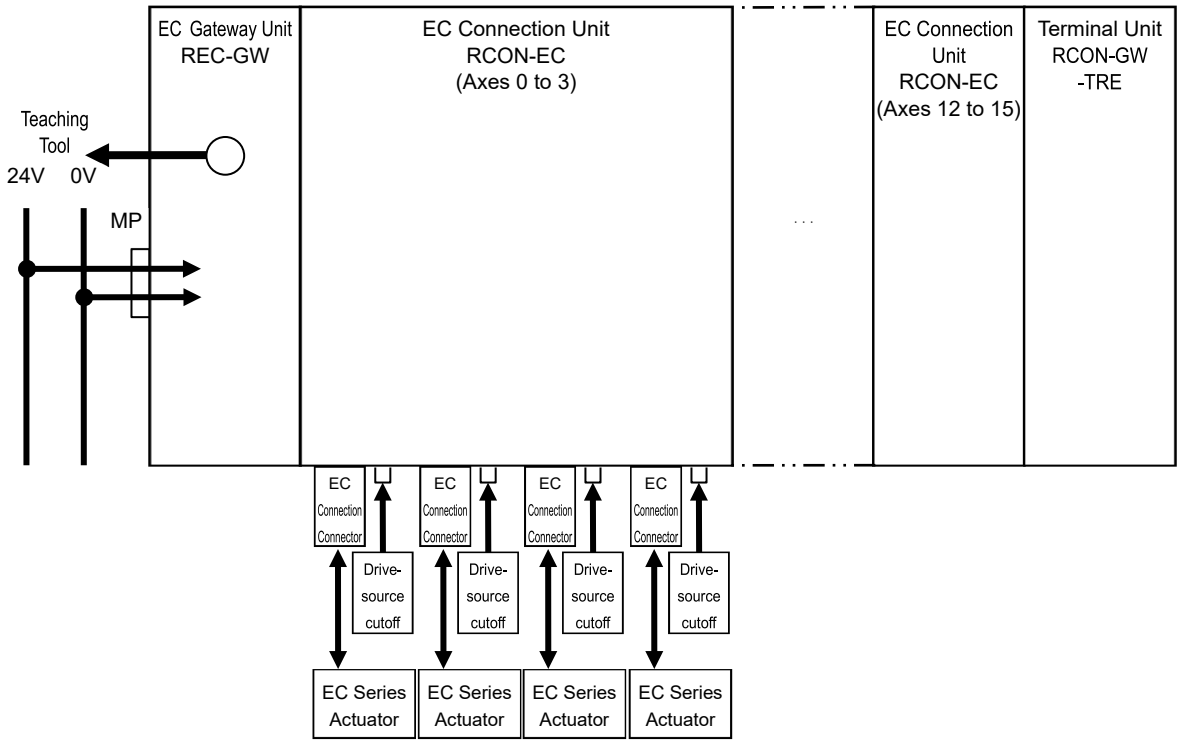
Even though there is no limit for number of connection structurally for the unit, the number of the EC connection units to be connected should be four units (16 axes) at the maximum. (Regardless of whether to connect ELECYLINDER to the unit or not, one unit should occupy domains and axis numbers for four axes.)

## 2.2 Configuration Unit List

The units that configure the REC system are listed below.

| Product name | | Model |
|---|---|---|
| **EC Gateway unit** | CC-Link connection type | REC-GW-CC |
| | CC-Link IE Field connection type | REC-GW-CIE |
| | DeviceNet connection type | REC-GW-DV |
| | EtherCAT connection type | REC-GW-EC |
| | EtherNet/IP connection type | REC-GW-EP |
| | PROFIBUS-DP connection type | REC-GW-PR |
| | PROFINET IO connection type | REC-GW-PRT |
| **EC Connection Unit** | ELECYLINDER connection type | RCON-EC-4 |
| **Terminal Unit** | Enclosed to EC Gateway Unit | RCON-GW-TRE |

REC configuration example　When EC 16-axis is connected



# 2.3 Power Supply Specifications



Power capacity is divided into two parts, control power capacity and motor power capacity.
24V DC power supply should be input from the 24V power supply connector on the EC gateway unit.
The motor supply to the 200V type ELECYLINDER should be input from the DC power supply for the motor drive (PSA-200).

## 2.3.1 24V DC Power Supply Capacity

**[24V DC Power Supply]**
The necessary power capacity is calculated from adding the
[total control power capacity of the unit in use] and the [total motor power capacity of the connected actuator].
It is necessary that the rated current of the 24V power supply satisfies the rated current of the motor power capacity and the peak current satisfies the maximum current of the motor power capacity. However, when multiple axes are connected, provided that not all of the actuators' operation timing is the same, the resulting value is not a simple total, because the rated current/maximum current do not flow simultaneously.

The specifications related to the power capacity are as shown below.

[Power supply voltage]

| Item | Specifications |
|---|---|
| Power supply voltage | 24V DC ±10% |

[REC system Control power capacity (per unit)]

| Product name | Supply Current |
|---|---|
| EC Gateway unit (includes terminal unit) | 0.8A |
| EC Connection Unit | 0.1A |

[Control power capacity (1 axis per ELECYLINDER)]

| Item | Specifications | Type | Supply Current |
|---|---|---|---|
| 24V DC Type ELECYLINDER | Not equipped with brakes | All types | 0.3A |
| | Equipped with brake | All types | 0.5A |
| 200V AC Type ELECYLINDER | Not equipped with brakes | All types | 0.32A |
| | Equipped with brake | S10□/SX10□ | 0.54A |
| | | S13□/SX13□<br>S15□/SX10□ | 1.2A |

[Motor power capacity (1 axis per ELECYLINDER)]

| Moter | Type | Power Saving Setting | Supply Current | |
|---|---|---|---|---|
| | | | Rated Current | Max. Current |
| 35P/42P/56P | Other than the following | Disabled | 2.3A | 3.9A |
| | | Enabled | — | 1.9A |
| | ST15 | — | — | 1.9A |
| 28P | S3,RR3 | — | — | 1.9A |
| | RP4, GS4, GD4, TC4, TW4, RTC9, GRB10/13 | — | — | 1.7A |
| 20P | GRB8 | — | — | 1.9A |
| $\Phi$20 | SL3,GDS3,GDB3,T3 | — | 0.4A | 0.8A |

**[24V DC Current Limit Values]**

The current limit values used for selection calculation are listed below.

| Item | Current limit values for selection calculation |
|---|---|
| Control power supply (CP) | 9.0A or less |
| Motor power supply (MP) | 37.5A or less |

Check that the results from the calculations of the control power supply and the motor power supply based on the construction of REC System would not exceed the current limit.
Note that the EC gateway unit is not included in the calculations.

Calculation examples are shown below.

**[Control Power]** * The EC gateway unit is not included in the calculations.

For 24V Type ELECYLINDER (brake equipped) × 16 axes

…… ELECYLINDER 0.5A × 16 axes = 8.0A

…… EC Connection Unit 0.1A × 4 units ＝ 0.4A Total 8.4A ⇒ OK

**[Motor Power Supply]**

When 24V Type 35P ELECYLINDER (with power saving mode disabled) × 16 axes

…… ELECYLINDER rated current 2.3A × 16 axes = 36.8A ⇒ OK

Note For those with no description of the rated current for the motor power capacity, calculate with the maximum current.

Note Supposing that the operation pattern is that all axes only perform acceleration/deceleration simultaneously, and operating duty is 100%, the motor power must be calculated by using the maximum current value.

### 2.3.2 Power Supply Type of DC Power Supply for Motor Drive (PSA-200)

**[Power Supply Specifications]**

The specifications of the motor drive (PSA-200) should be as shown below.

| Item | Specifications | |
|---|---|---|
| | **Single-Phase 100V AC type** | **Single-Phase 200V AC type** |
| Power Supply Input Voltage Range | 100 to 115V AC ±10% | 200 to 230V AC ±10% |
| Input Frequency Range | 50/60Hz ±5% | |
| In-Rush Current (Note 1) | Refer to [2.3.5 Inrush Current] | |
| Output voltage | 280V DC typ | |
| Max. Motor Connection Wattage | 800W | 1,600W |
| Max. Axis Count Available for Drive | 6 axes | 6 axes |
| Transient Power Outage Resistance | 50Hz: 20ms, 60Hz: 16ms | |
| Insulator Voltage Resistance (between Primary and FG) | 1,500V AC 1 | |
| Insulation Resistance | 500V DC 10MΩ or more | |
| Leak Current | Total 3.1mA (When recommended noise filter used (*1), 6 axes connected) | |
| Electric Shock Protection Feature | Class I Basic Insulation | |

Note 1 Inrush current should flow for approximately 20ms after the power is turned on. Be aware that the inrush current could vary depending on the impedance and the internal element temperature (thermistor) in the power supply line.

*1 Recommended noise filter: NF2010A-UP (Maker: Soshin Electric),
NAC-10-472 (Maker: COSEL)

**Caution**

The maximum length of the motor power supply cable CB-EC-PW□□□-RB between the main unit of ELECYLINDER and the motor drive DC power supply PSA-200 is 10m. Even though the maximum number of connectable axes is six axes, the motor power supply cable may not reach depending on the layout of the unit of ELECYLINDER. Be aware that an additional unit of the DC power supply for motor drive PSA-200 is needed in case the cable does not reach.

**[Power Amperage and Heat Radiation]**

For the power amperage and heat radiation on each axis, use the values shown in the table and figure out in the formulas below.

Figure out the power amperage and heat radiation for the axes connected to the DC power supply for motor drive.

The total should be the power amperage and heat radiation of the DC power supply for motor drive.

Rated power amperage [VA] = Motor power amperage [VA] + Control transient max. power amperage [VA]

Transient max. power amperage [VA] = Motor transient max. power amperage [VA] + Control transient max. power amperage [VA]

Heat radiation [W] = Motor power supply heat radiation [W] + Control power supply heat radiation [W] + Fixed resistor heat radiation [W]

| Model | Number of motor wattage | Motor power supply | | | Control power supply | | Fixed Resistor |
|---|---|---|---|---|---|---|---|
| | | Power amperage [VA] | Transient max. power amperage [VA] | Heat radiation [W] | Power amperage [VA] | Heat radiation [W] | Heat radiation [W] |
| EC-S10□<br>EC-S10X□ | 100W | 238 | 714 | 1.0 | 14.5 | 8.7 | 16.2 |
| EC-S13□<br>EC-S13X□ | 200W | 402 | 1206 | 1.7 | | | |
| EC-S15□<br>EC-S15X□ | 400W | 772 | 2316 | 3.3 | | | |

Note The control power supply shows the values at the maximum load.

Note The values for the motor power supply may differ depending on load. It shows the maximum performance of the controller.

Note Current up to three times of the rated current at the maximum should flow during acceleration. Therefore, the transient maximum power amperage should be three times of the power amperage.

### 2.3.3 Max. Number of Connectable Axes for DC Power Supply for Motor Drive (PSA-200)

The restrictions regarding the motor drive DC power supply (PSA-200) should be as shown below.

| Specifications | Number of max connection axis | Number of max connection motor wattage |
|---|---|---|
| 100V AC power supply type | 6 axes | 800W |
| 200V AC power supply type | 6 axes | 1,600W |

The number of axes that the total of the motor wattage of connected ELECYLINDER would not exceed the restricted values in the table above can be connected. However, the maximum number of connectable axes is six.
The motor wattage of ELECYLINDER should be as described below.

| Model | Number of motor wattage |
|---|---|
| EC-S10□<br>EC-S10X□ | 100W |
| EC-S13□<br>EC-S13X□ | 200W |
| EC-S15□<br>EC-S15X□ | 400W |

**Caution**

The maximum length of the motor power supply cable CB-EC-PW□□□-RB between the main unit of ELECYLINDER and the DC power supply for motor drive PSA-200 is 10m. Even though the maximum number of connectable axes is six axes, the motor power supply cable may not reach depending on the layout of the unit of ELECYLINDER. Be aware that an additional unit of the DC power supply for motor drive PSA-200 is needed in case the cable does not reach.

### 2.3.4 Selection of Circuit Breaker for Power Supply Protection

**[When 24V DC Power Supply]**

It is recommended that protection of the power supply is performed on the primary side (AC power source side) in the 24V DC power supply unit.

Be mindful of the in-rush current of the 24V DC power supply unit and the rated interrupting current of the circuit breaker when select.

Rated Interrupting Current > Short-Circuit Current = Primary Side Current Amperage ÷ Power Supply Voltage

**[Inrush Current of IAI Power Supply Unit PSA-24]**

| Item | Conditions | Specifications | |
|---|---|---|---|
| Inrush Current | At Cold Start (25°C) | 100V AC | 17A (typ) |
| | | 200V AC | 34A (typ) |
| | At Cold Start (40°C) | 100V AC | 27.4A (typ) |
| | | 200V AC | 54.8A (typ) |

The pulse width that the inrush current flows in is 5ms or less. Also, in parallel operation, the inrush current is added for number of units. Confirm the characteristics when select so the breaker would not work at the inrush current.

**[When DC Power Supply for Motor Drive PSA-200]**

Follow the instructions below when selecting a circuit breaker.

- The controller current three times of the rated should flow during acceleration/deceleration. Select one that would not trip when this much current flows. Select a breaker with the rated current one rank higher in case it trips. (Check the performance in the operation characteristics curve shown in a product catalog.)
- Select a breaker that would not trip with inrush current. (Check the performance in the operation characteristics curve shown in a product catalog.)
- For the rated cutoff current, select a current value that can be cut off certainly even if short-circuit current flows.

  Rated cutoff current > Short-circuit current = Primary power amperage / Power voltage
- Select a circuit breaker with margin to the rated current.

  Circuit breaker rated current > Motor power amperage [VA] / AC input voltage * Safety margin (1.2 to 1.4)

***About Selection of Leakage Breaker**

- A clear purpose is necessary when selecting a leakage breaker such as to protect from fire or protection of personnel.
- As the leak current may vary depending on the motor wattage, cable length and ambient environment, it is required to have a measurement of leak current at the point to install a leakage breaker when a leakage protection measure is to be taken.
- For leakage breaker, use a high frequency applicable type.

### 2.3.5 Inrush Current

**[EC Connection Unit]**

It is only ELECYLINDER that is connected to an EC connection unit that generates the inrush current.

The inrush current values are listed below.

| Item | Specifications | |
|---|---|---|
| Inrush current (About 5ms) | RCON-EC | Max. 40.0A (Note 1) |

Note 1 Condition of four axes of ELECYLINDER being connected

When multiple ELECYLINDERs are used, depending on the capacity of the 24V DC power source, a voltage drop might occur when the units are turned on.

**[DC Power Supply for Motor Drive (PSA-200)]**

| Item | | Conditions | Specification |
|---|---|---|---|
| In-Rush Current | Motor power | 40°C | 50A |
| | | 50°C | 70A |
| | Control power | 40°C | 40A |
| | | 50°C | 60A |

Note 1 Inrush current should flow for approximately 20ms after the power is turned on. Be aware that the inrush current could vary depending on the impedance and the internal element temperature (thermistor) in the power supply line.

### 2.3.6 Number of Connectable Regenerative Resistor Units (Option) (Reference)

Shown below is a reference for the number of the regenerative resistor units (option) connectable to the DC power supply for motor drive (PSA-200).
When the total motor wattage of ELECYLINDER in horizontal orientation is 800W and the total in vertical orientation is 400W for example, the value where 800W in horizontal and 400W in vertical crosses shows that the regenerative resistor units should be two units (reference).

| Motor wattage count | | Horizon | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 |
| Vertical | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | 200 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | 400 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | - | - |
| | 600 | 1 | 1 | 2 | 2 | 2 | 2 | - | - | - |
| | 800 | 1 | 2 | 2 | 2 | 2 | - | - | - | - |
| | 1000 | 2 | 2 | 2 | 2 | - | - | - | - | - |
| | 1200 | 2 | 2 | 3 | - | - | - | - | - | - |
| | 1400 | 2 | 3 | - | - | - | - | - | - | - |
| | 1600 | 3 | - | - | - | - | - | - | - | - |

## Caution

1. The table above shows a reference when an actuator makes a back and forth operation under the condition of rated acceleration/deceleration, rated load, stroke at 1,000mm and 50% of duty ratio.
2. Regenerative energy should be absorbed also in a controller. Regenerative energy should be absorbed also in a controller.
   If the duty ratio of operation is higher than 50% or load is high in vertical orientation, it is necessary to have more regenerative resistor units to be connected than what is shown in the able above.
   Also, the number of connectable regenerative resistor units should be five at the maximum.
   Connecting more than five units may cause malfunction. Make sure not to do so.

REC

Chapter 3

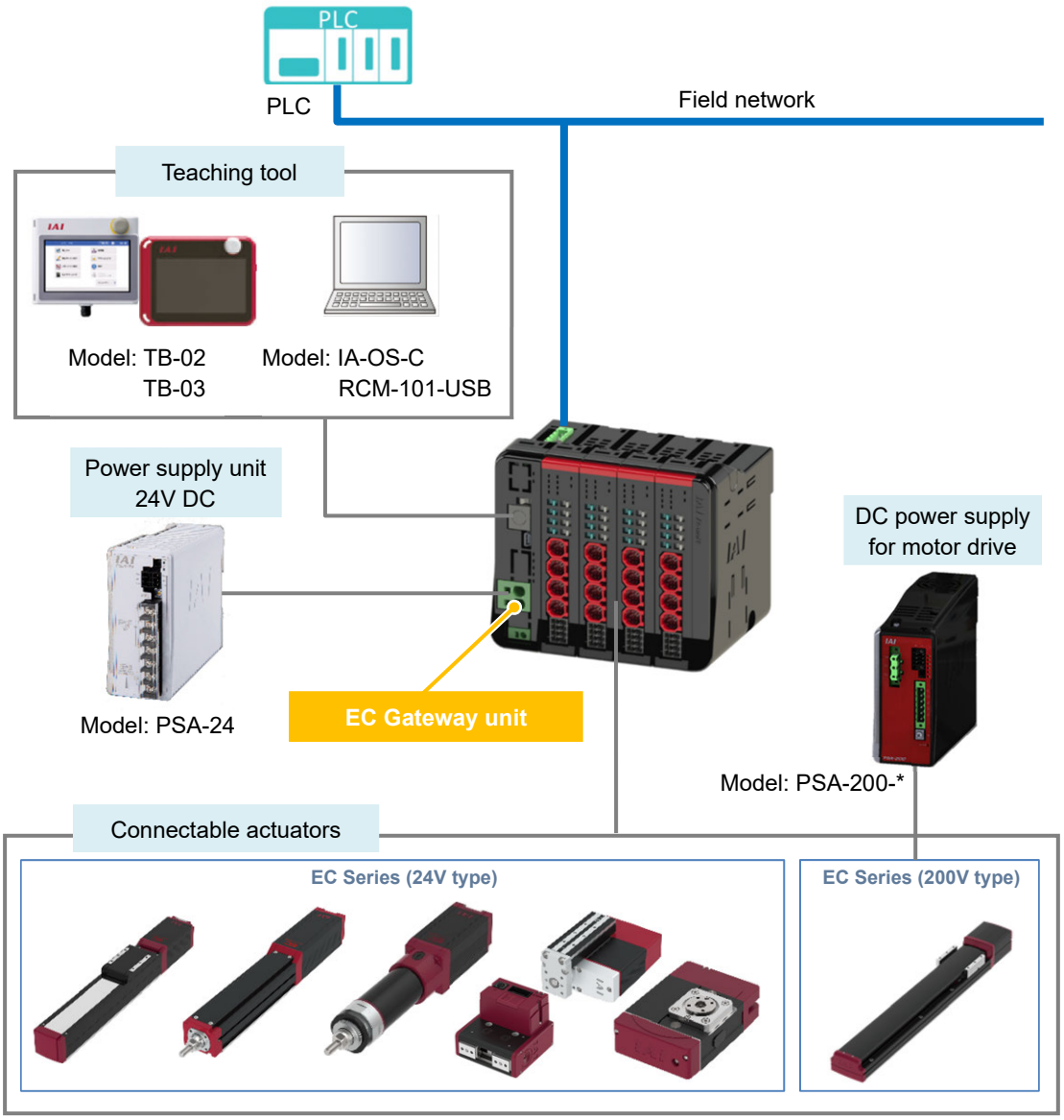
# Specifications of Each Unit

# 3.1 EC Gateway Unit

## 3.1.1 Overview

The EC gateway unit is a slave station equipped with the gateway feature in order to make operation with ELECYLINDER connected to the field network of the host PLC. It is applicable for seven types of field networks (CC-Link, CC-Link IE Field, DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS-DP, PROFINET IO).

By connecting the EC connection unit (RCON-EC) to the REC system, 16 axes at the maximum can be connected.




Note: ELECYLINDER is available for operation only in the double solenoid system

### 3.1.2 Model

(1) How to Read the Model Number

The model of the EC gateway unit is as follows.

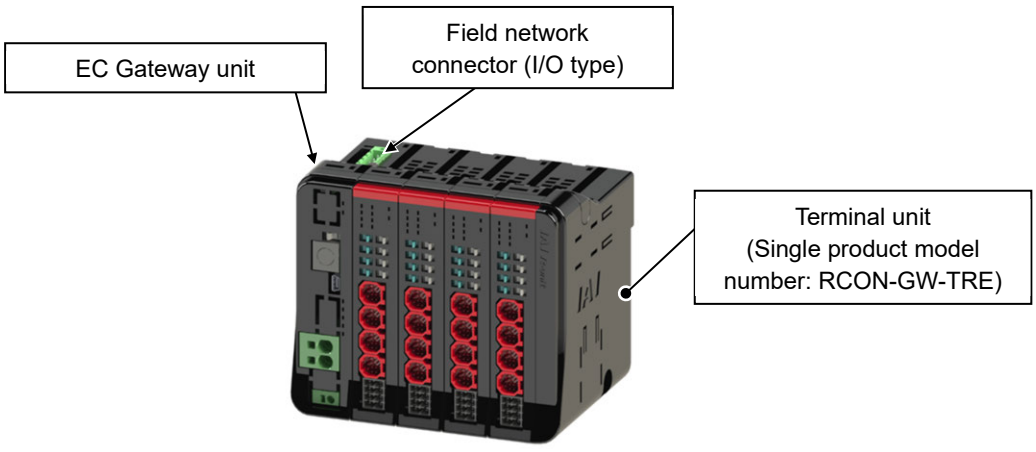
**EC Gateway unit model**

REC – [Type] – [I/O Type] – [Options]

| Type | |
|---|---|
| GW | Standard type |

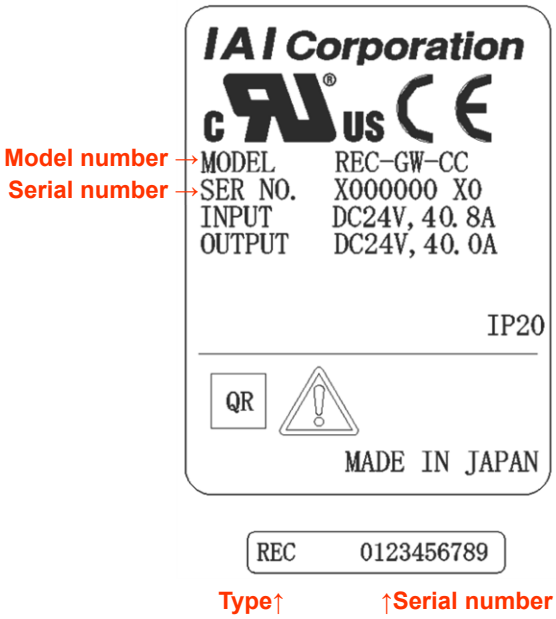
| I/O Type | |
|---|---|
| CC | CC-Link connection specification |
| CIE | CC-Link IE Field connection specification |
| DV | DeviceNet connection specification |
| EC | EtherCAT connection specification |
| EP | EtherNet/IP connection specification |
| PR | PROFIBUS-DP connection specification |
| PRT | PROFINET IO connection specification |

| Options | |
|---|---|
| TRN | Without terminal unit |

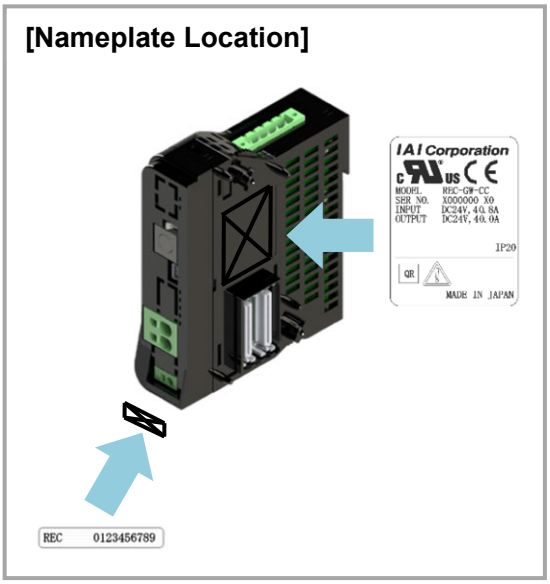


(2) How to read the model nameplate

**[EC Gateway Unit]**



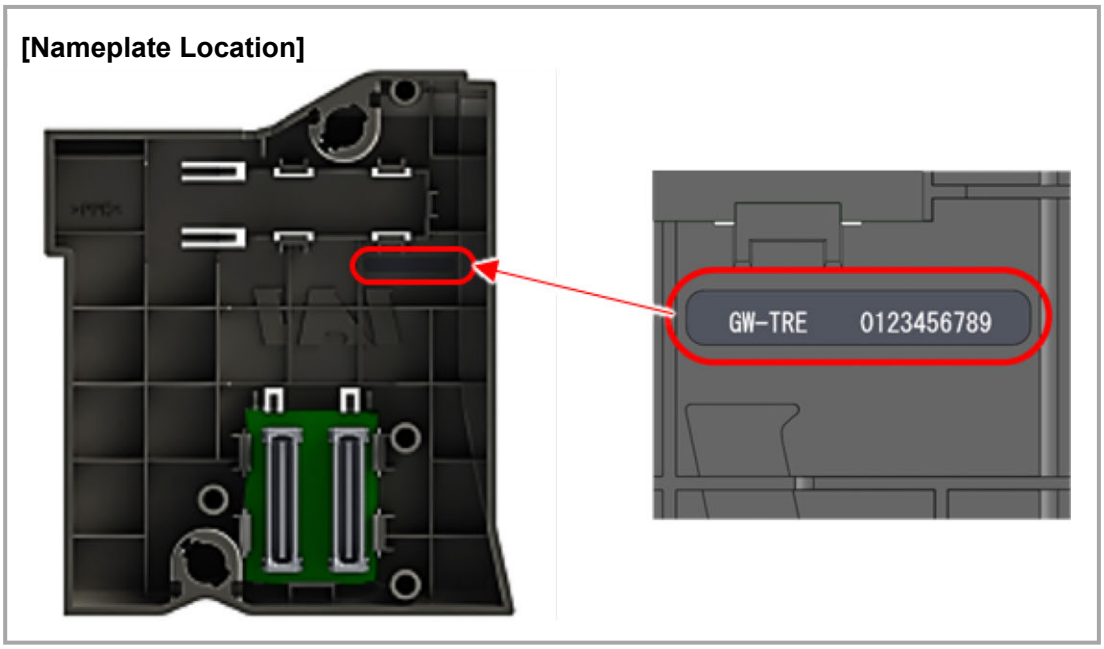

**[Nameplate Location]**




| Mark | Explanation of Mark |
|---|---|
| ⚠ | Use IAI specified cables only. |

**[Terminal Unit]**

**[Nameplate Location]**



### 3.1.3 Components

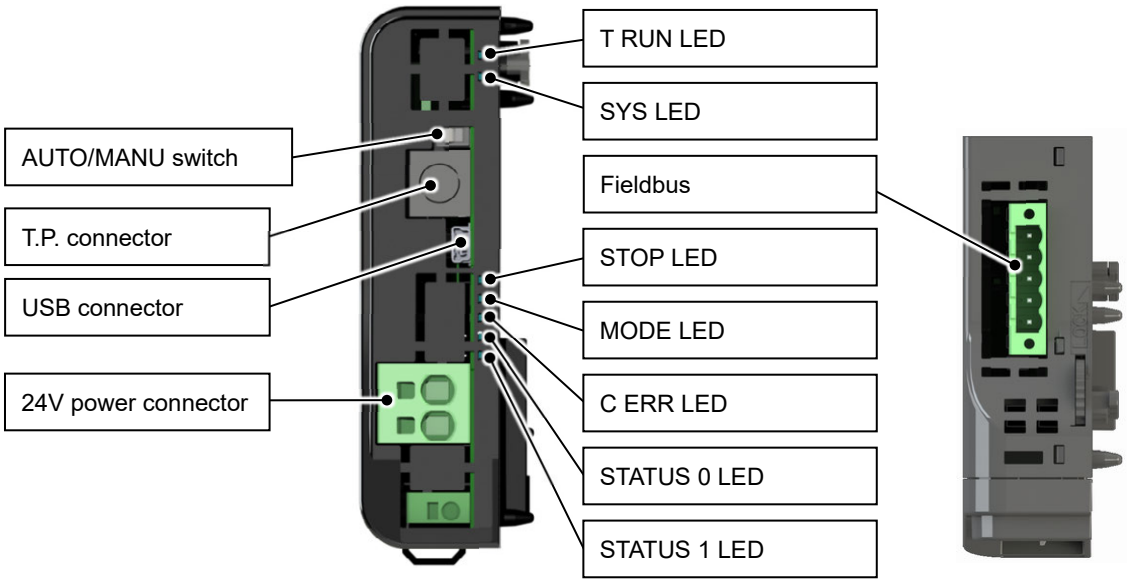
The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

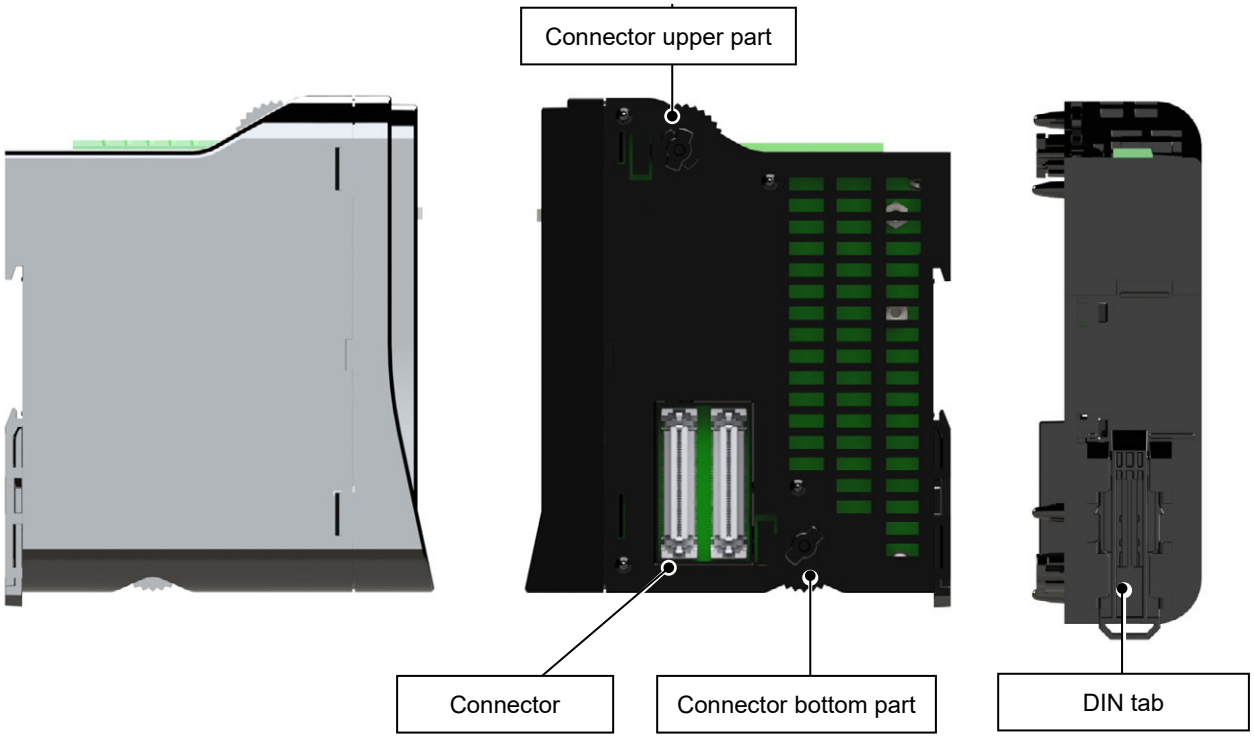
| | Part name | Shape | Quantity | Remarks |
|---|---|---|---|---|
| Main body | EC Gateway unit |  | 1 | Model example:<br>REC-GW-CC |
| Accessories | Terminal unit |  | 1 | Single product model number:<br>RCON-GW-TRE<br>(Not supplied with TRN specification) |
| | Field network connector |  | 1 | Depends on I/O type |
| | First Step Guide |  | 1 | ME0395 |
| | Safety Guide |  | 1 | M0194 |

### 3.1.4 Part Names / Functions

[Part names: EC gateway unit]

REC-GW

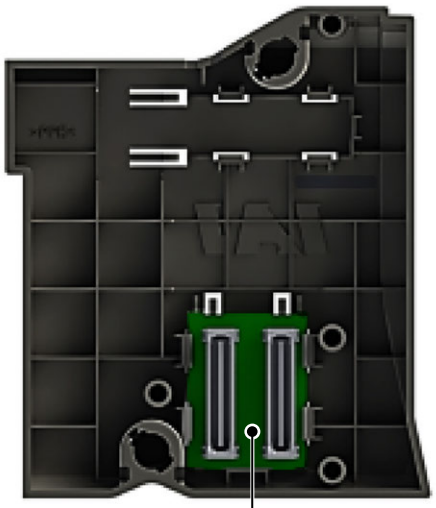





Left side　　Right side　　Rear

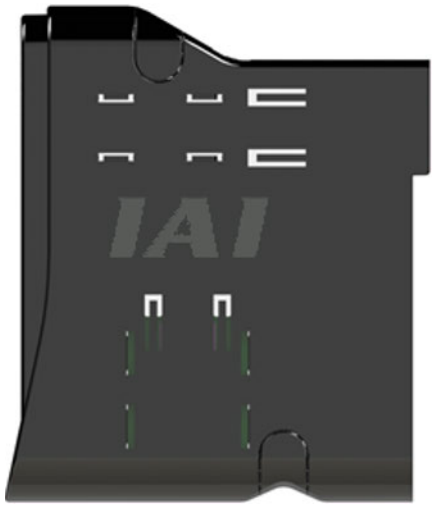
[Part names: Terminal unit]

RCON-GW-TRE



Connector

Left side



Right side

Rear

(1) LED display

LED for indicating EC gateway unit status and field network status.

| Panel notation | Display color | Status | Description |
|---|---|---|---|
| T RUN | Green | Light ON | Normal internal bus communication |
| | | Blinking | Waiting for initialization signal |
| | Orange | Light ON | Bus communication error generated |
| SYS | Green | Light ON | Normal operation<br>(It also lights up green when an alarm is generated in the driver unit or simple absolute unit) |
| | Orange | Light ON | Gateway alarm triggered |
| STOP | Red | Light ON | STOP signal input OFF (driver unit drive power cut-off) |
| | | Light OFF | STOP signal input ON |
| MODE | Green | Light ON | AUTO (automatic operation) mode ON |
| | | Light OFF | MANU (manual operation) mode ON |
| C ERR | Orange | Light ON | Field network error generated |
| | | Light OFF | Field network operating normally |
| STATUS 0 | - | - | Differs with field network<br>Refer to [3.1.6 Field Network General Specifications] |
| STATUS 1 | - | - | Differs with field network<br>Refer to [3.1.6 Field Network General Specifications] |

(2) AUTO/MANU switch

Switches between automatic and manual operation.


| Symbol | Description |
|---|---|
| AUTO | Online operation mode that enables reception of commands from host devices such as PLCs |
| MANU | Teaching operation mode that enables reception of commands from host devices such as PLCs |

## Caution

- Switching from MANU to AUTO while an operation command being input from the PLC should allow the command signal accepted and make operation.
  Turn an operation command off when set to MANU or stopping a program so it would not start operating at the timing to switch from MANU to AUTO.

(3) SIO connector

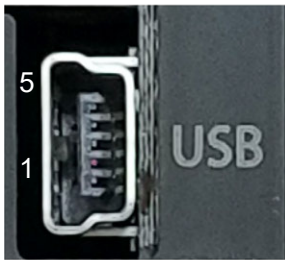
A connector for connecting the teaching pendant to PC software.
PC software can also be connected with a USB.


| Pin No. | Signal name | Description |
|---|---|---|
| 1 | TP_SD+ | Teaching pendant/PC RS485 differential signal + side |
| 2 | TP_SD- | Teaching pendant/PC RS485 differential signal - side |
| 3 | T5V | Teaching pendant 5V output |
| 4 | ENB | Enable signal input |
| 5 | STOPA | Stop line A |
| 6 | T24V | Teaching pendant 24V output |
| 7 | GND | 0V |
| 8 | STOPB | Stop line B |
| 9 (shell) | GND | 0V |

(4) USB connector

It is a connector to be connected to the PC software or gateway parameter configuration tool. For how to install (*1) the driver, refer to [PC software Instruction Manual (ME0155)].

*1 It is not necessary to install the driver if your PC OS is Windows 10.

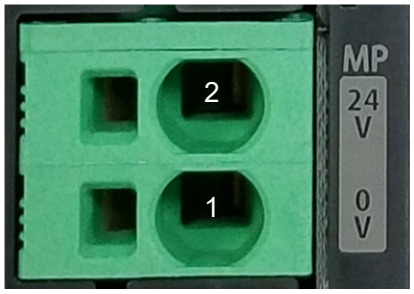



Connector: USB mini-B

| **Connector type** | Mini-B | |
|---|---|---|
| **Model** | 51387-0530 | |
| **Maker** | Molex | |
| **Pin No.** | **Signal name** | **Description** |
| 5 | GND | Power supply ground |
| 4 | ID | USB ID (identification) terminal |
| 3 | D+ | USB differential transfer data positive side |
| 2 | D- | USB differential transfer data negative side |
| 1 | Vbus | USB power supply input |
| Shell | GND | Power supply ground |

(5) 24V power connector

Motor power supply +24 V supply connector. Supplies power to the motor of the driver unit linked to the EC gateway unit.




| **Model** | SPT5/2-H-7.5-ZB | |
|---|---|---|
| **Maker** | Phoenix Contact | |
| **Pin No.** | **Signal name** | **Description** |
| 2 | 24V | Motor power supply +24V input |
| 1 | 0V | 0V input |
| **Rated voltage** | 1,000V (II/2) | |
| **Rated current** | 41A | |
| **Connection cable specifications** | | |
| **Item** | **Specifications** | |
| **Compatible wire** | AWG20 to 8 (0.5 to 8mm$^2$) | |
| **Strip length** | 15mm | |
| **Rated Temperature on Isolation Coating** | 60°C or more | |

## Caution

- Select a wire with thickness that tolerates the rated current total value obtained in [2.3.1 24V DC Power Supply Capacity].
- When supplying the power by turning on/off the 24V DC, keep the 0V being connected and have the 24V supplied/disconnected (cut one side only). Shutting power supply on the both ends may make the electric potential unstable when the power gets cut on the 0V end first. This may cause malfunction of components inside the controller.

(6) FG connector

FG (Frame ground) connector.


| **Model** | SPT2.5/1-H-5.0 | |
|---|---|---|
| **Maker** | Phoenix Contact | |
| **Pin No.** | **Signal name** | **Description** |
| 1 | FG (Note 1) | Frame ground |
| **Rated voltage** | 630V (II/2) | |
| **Max. load current** | 24A | |

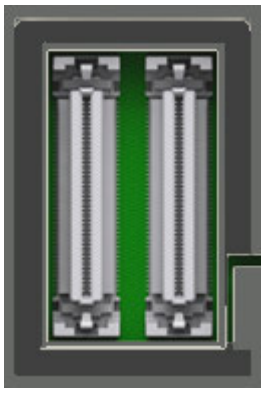
Note 1 For wiring of frame ground, refer to [4.2 Installation [Noise countermeasures and mounting method]].

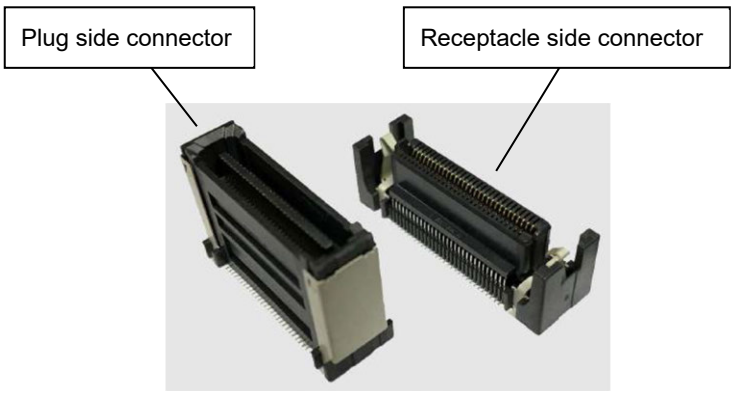
(7) Field network connector

A connector for connecting to field networks. Field network details are listed in [3.1.6 Field Network General Specifications)].


(8) Connectors

A connector for use between units. Two identical connectors are used. The connectors have a floating structure that absorbs connector misalignment due to housing mating or mounting misalignment between connectors.

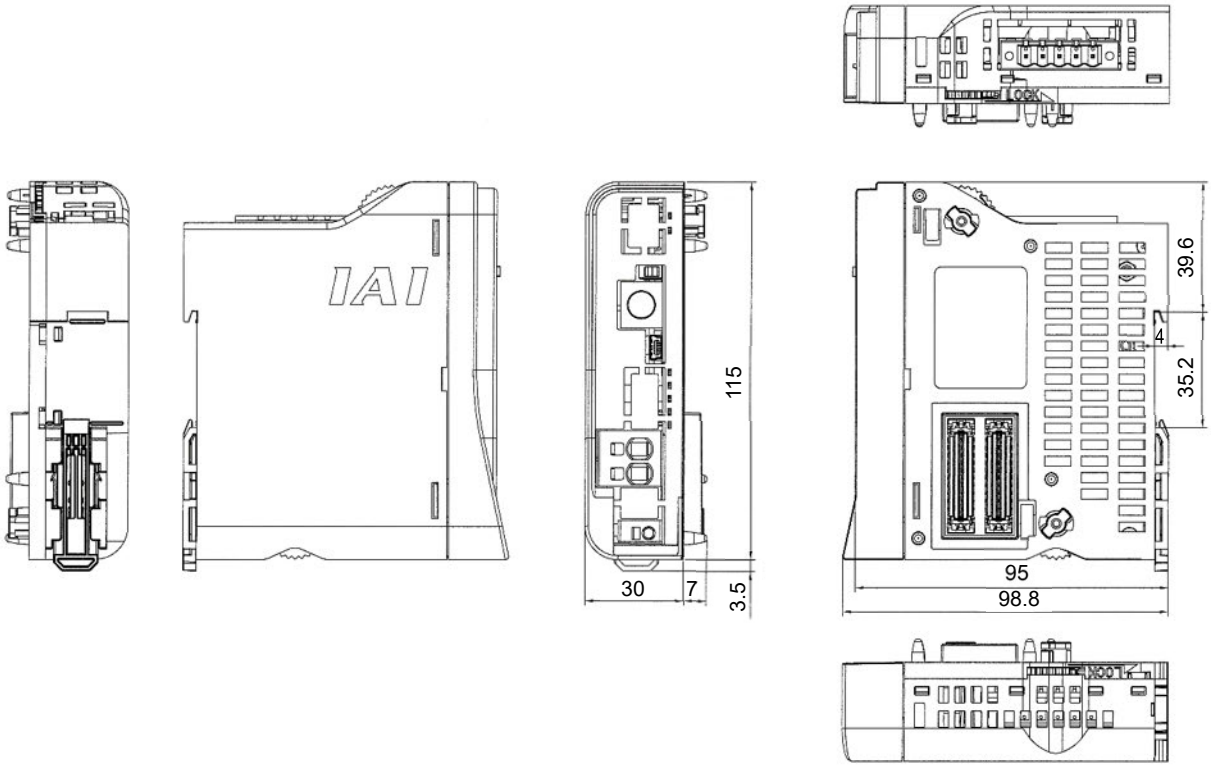




### 3.1.5 External Dimensions

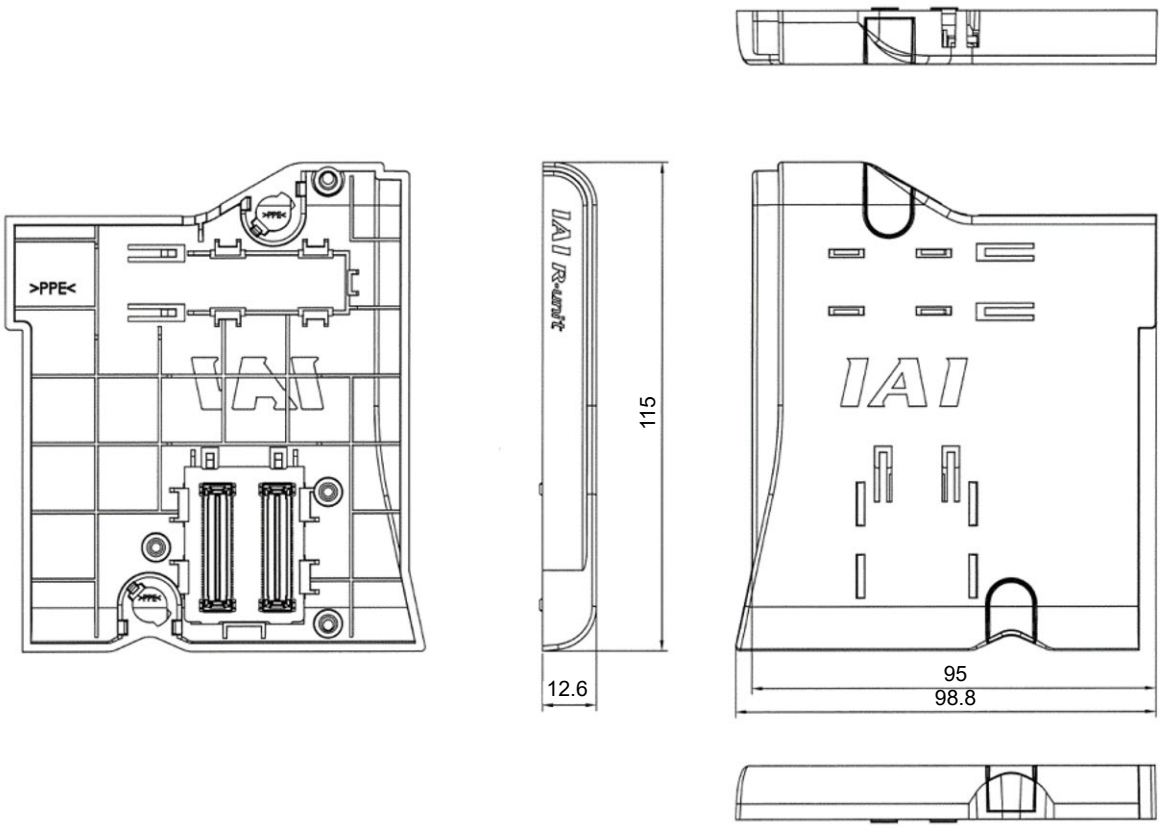
EC Gateway unit

| Item | Specifications |
|---|---|
| External dimensions | W30mm × H115mm × D95mm |
| Mass | About 135g |
| External view | See figure below |



Terminal unit

| Item | Specifications |
|---|---|
| External dimensions | W12.6mm × H115mm × D95mm |
| Mass | About 48g |
| External view | See figure below |



### 3.1.6 Field Network General Specifications

(1) CC-Link


| **Model** | MSTB2.5/5-GF-5.08 AU | |
|---|---|---|
| **Maker** | Phoenix Contact | |
| **Pin No.** | **Signal name** | **Description** |
| 1 | DA | Communication line A |
| 2 | DB | Communication line B |
| 3 | DG | Digital GND |
| 4 | SLD | Connects the shield of shielded cables |
| 5 | FG | Frame ground |
| **Connection cable specifications** | | |
| **Item** | **Specifications** | |
| **Recommended unsheathed length** | 7mm | |
| **Mating connector (Signal name sticker attached)** | | |
| **Model** | MSTB2.5/5-STF-5.08 AU | |
| **Maker** | Phoenix Contact | |

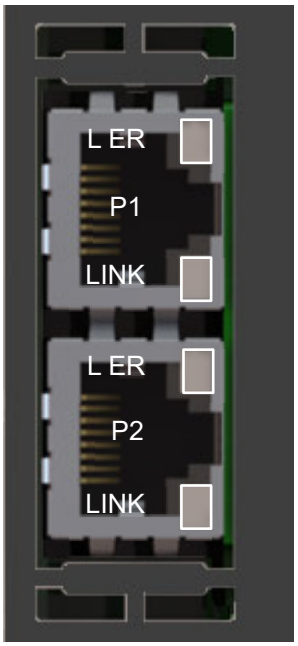
* The model code of the mating connector is the one before the signal name sticker is attached.

Note The cable should be prepared by the customer (the mating connector is enclosed).

Status LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | RUN | Green | Light ON | After joining the network, refresh & poll normal reception or refresh normal reception |
| | | | Light OFF | 1. Network not joined<br>2. Channel carrier detected<br>3. Timeout<br>4. Hardware reset in progress |
| STATUS 1 | ERR | Orange | Light ON | 1. CRC error<br>2. Station number setting error when reset canceled<br>(0 or 65 stations or more, including occupied stations)<br>3. Baud rate setting error when reset canceled (Baud rate setting is 5 or more) |
| | | | Blinking<br>(0.4s blinking) | Value of station number or baud rate setting changed when reset canceled |
| | | | Light OFF | 1. Normal communication<br>2. Hardware reset in progress |

(2) CC-Link IE Field




| | |
|---|---|
| **Connector type** | 8P8C modular connector (RJ-45) |
| **Recommendation cable** | Enhanced Category 5e Standard or higher (Note 1) |

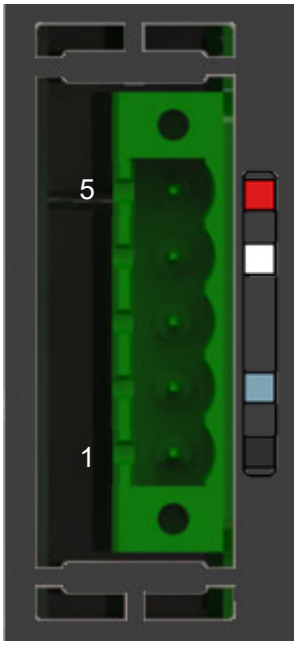
Note 1 Cable is to be prepared by the customer.
(Recommendation: SC-E5EW Series (Mitsubishi Electric System & Servise Co.,Ltd.))

| LED name | Color | Status | Contents |
|---|---|---|---|
| LINK | Green | Blinking | Link up |
| | | Light OFF | Link down, Power not supplied |
| L ER | Yellow | Light ON | Receive data error |
| | | Light OFF | Receive data normal, Power not supplied |

Status LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | MS | Green | Light ON | Normal operation |
| | | | Light OFF | Hardware error generated, Power not supplied |
| | | Orange | Light ON | Error generated<br>(Node error / station number setting error) |
| | | | Light OFF | Normal operation, Power not supplied |
| STATUS 1 | NS | Green | Light ON | Cyclic transmission ON |
| | | | Blinking | Cyclic transmission OFF |
| | | | Light OFF | Cyclic transmission not yet implemented, fragmented, Power not supplied |
| | | Orange | Light ON | Receive data error (Turns on with or of L.ER) |
| | | | Light OFF | Receive data normal, Power not supplied |

(3) DeviceNet



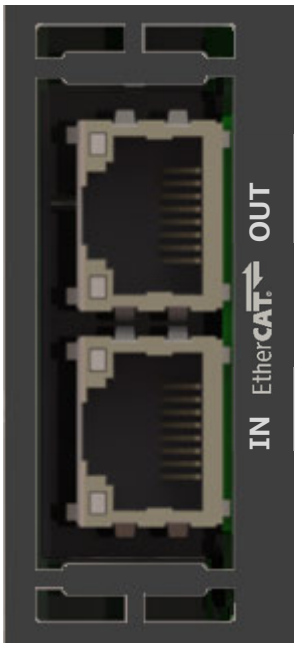

| **Model** | MSTB2.5/5-GF-5.08 AU | |
|---|---|---|
| **Maker** | Phoenix Contact | |
| **Pin No.** | **Signal name** | **Description** |
| 1 | Black | Power supply cable - side |
| 2 | Blue | Signal data Low side |
| 3 | - | Shield |
| 4 | White | Signal data High side |
| 5 | Red | Power supply cable + side |
| **Connection cable specifications** | | |
| **Item** | **Specifications** | |
| **Recommended unsheathed length** | 7mm | |
| **Mating connector** | | |
| **Model** | MSTB2.5/5-STF-5.08 AU M | |
| **Model** | TMSTBP2.5/5-STF-5.08 AU M (Two-way branched) | |

Note The cable should be prepared by the customer (the mating connector is enclosed).

Status LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | MS | Green | Light ON | Normal operation |
| | | | Blinking (1 Hz) | No configuration information, incomplete information, or device test operation required |
| | | Orange | Light ON | Non-recoverable fault |
| | | | Blinking (1 Hz) | Recoverable fault |
| | | Green/orange | Alternate blinking | Self-diagnosis |
| STATUS 1 | NS | Green | Light ON | Online, connection established |
| | | | Blinking (1 Hz) | Online, connection not established |
| | | Orange | Light ON | Fatal error |
| | | | Blinking (1 Hz) | Connection timeout |
| | | Orange/green | Alternate blinking | Self-diagnosis |
| | | | Light OFF | Offline |

(4) EtherCAT



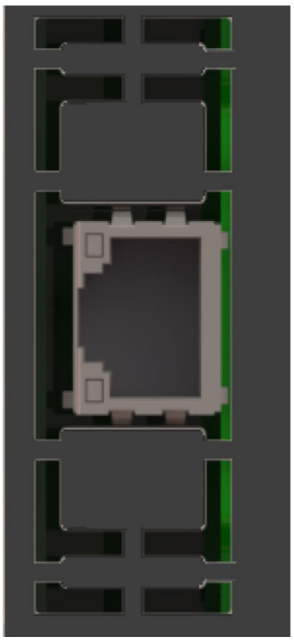

| | |
|---|---|
| **Connector type** | 8P8C modular connector (RJ-45) |
| **Recommendation cable** | Enhanced Category 5e Standard or higher (Note 1) |

Note 1 Cable is to be prepared by the customer.

Status LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | ERR | Orange | Light ON | Signal component (module) error |
| | | | Blinking (continuous) | Configuration information (settings) error<br>ON: 200ms / OFF: 200ms |
| | | | Blinking (2 times) | Watchdog timer / timeout<br>ON: 200ms x 2 / OFF: 1,000ms |
| | | | Light OFF | Initialized status |
| STATUS 1 | RUN | Green | Light ON | Normal operation (OPERATION) status |
| | | | Blinking (continuous) | PRE-OPERATION status<br>ON: 200ms / OFF: 200ms |
| | | | Blinking (1 time) | SAFE OPERATION status<br>ON: 200ms / OFF: 1,000ms |
| | | Orange | Blinking | Signal component (module) error |

(5) EtherNet/IP



| | |
|---|---|
| **Connector type** | 8P8C modular connector (RJ-45) |
| **Recommendation cable** | Enhanced Category 5e Standard or higher (Note 1) |

Note 1 Cable is to be prepared by the customer.

Status LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | MS | Green | Light ON | Normal operation |
| | | | Blinking | No configuration information, or scanner in idle status |
| | | Orange | Light ON | Non-recoverable fault |
| | | | Blinking | Recoverable fault |
| STATUS 1 | NS | Green | Light ON | Online, connection established |
| | | | Blinking | Online, connection not established |
| | | Orange | Light ON | Fatal error, IP address duplication error |
| | | | Blinking | Connection timeout |
| | | Green/orange | Light OFF | No IP address |

(6) PROFIBUS-DP

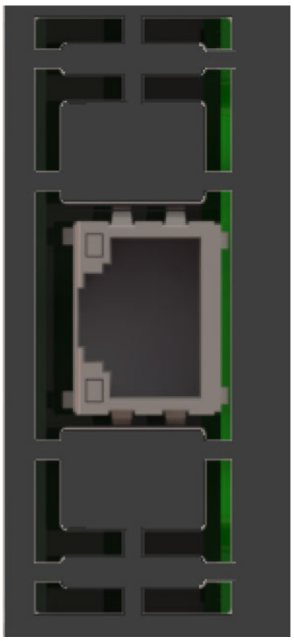

| Connector type | D-sub connector 9 pin (Socket) | |
|---|---|---|
| **Pin No.** | **Signal name** | **Description** |
| 1 | NC | Not connected |
| 2 | NC | Not connected |
| 3 | B-Line | Communication line B (RS485) |
| 4 | RTS | Transmission request |
| 5 | GND | Signal GND (isolated) |
| 6 | +5V | +5V Output (isolated) |
| 7 | NC | Not connected |
| 8 | A-Line | Communication line A (RS485) |
| 9 | NC | Not connected |
| Housing | Shield | Cable shield<br>(Connected with FG inside controller) |

Note The mating connector and cable should be prepared by the customer.

Status LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | MS | Green | Light ON | Initialization complete |
| | | | Blinking | Initialization complete, diagnosis event found |
| | | Orange | Light ON | Exception error |
| | | Green/orange | Light OFF | Uninitialized |
| STATUS 1 | NS | Green | Light ON | Online, data exchange |
| | | | Blinking | Online, clear status |
| | | Orange | Light ON | Parameter error |
| | | | Blinking | Configuration error |
| | | Green/orange | Light OFF | Offline |

(7) PROFINET IO

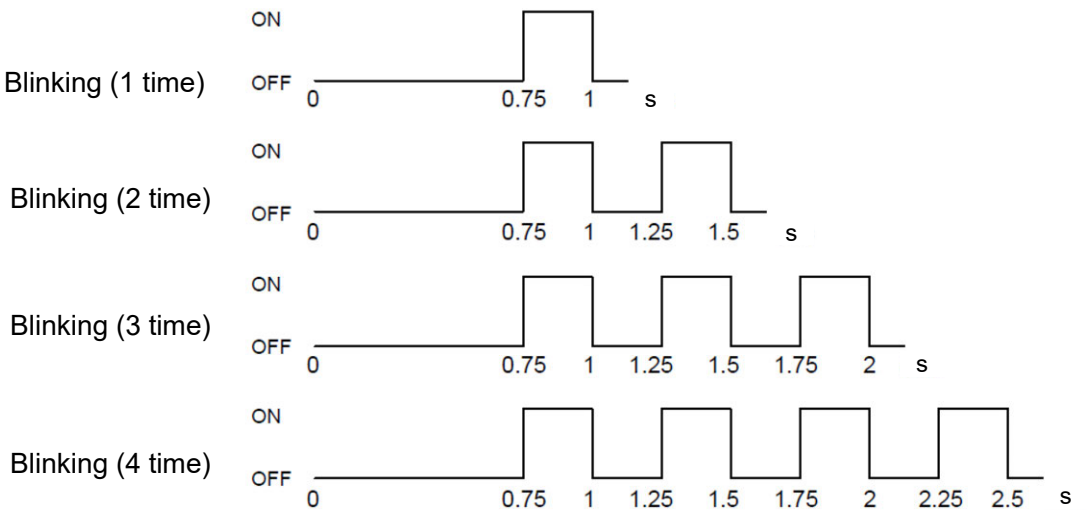


| | |
|---|---|
| **Connector type** | 8P8C modular connector (RJ-45) |
| **Recommendation cable** | Enhanced Category 5e Standard or higher (Note 1) |

Note 1 Cable is to be prepared by the customer.

Status LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | MS | Green | Light ON | Normal communication |
| | | | Blinking (1 time) | Network being diagnosed |
| | | | Blinking (2 times) | Engineering tool is identifying the node |
| | | Orange | Light ON | Exception error generated (hardware failure) |
| | | | Blinking (1 time) | Settings and actual network configuration differ |
| | | | Blinking (2 times) | IP address not set |
| | | | Blinking (3 times) | Station name not set |
| | | | Blinking (4 times) | Internal error generated |
| | | Green/orange | Light OFF | Initializing |
| STATUS 1 | NS | Green | Light ON | Online status (normal communication: RUN) |
| | | | Blinking | Online status (STOP) |
| | | Green/orange | Light OFF | No connection |

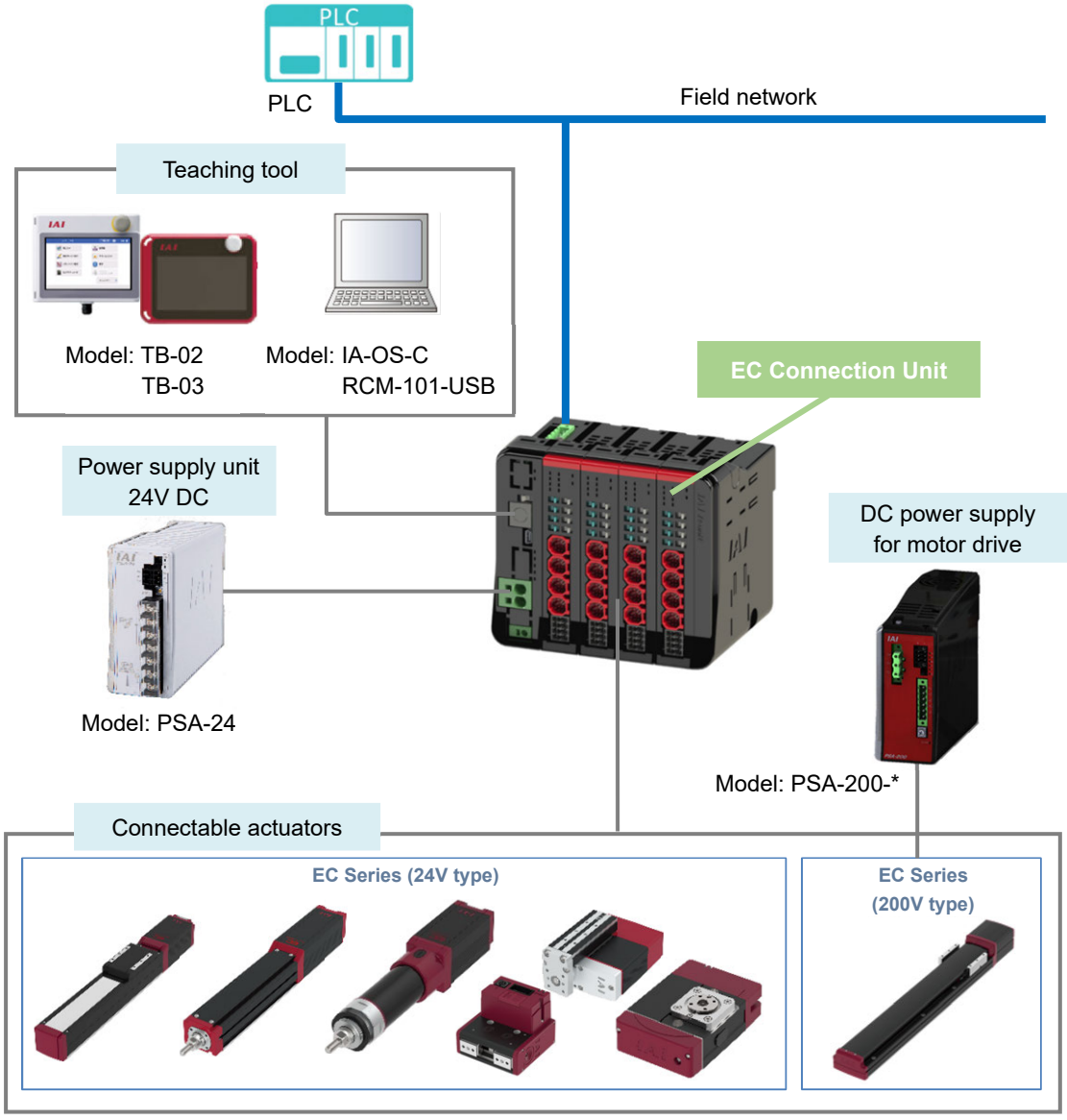


# 3.2 EC Connection Unit

## 3.2.1 Overview

EC connection unit is the ELECYLINDER connection unit dedicated for R Unit.
Connecting RCON-EC connection type (Option: ACR) ELECYLINDER to EC connection unit, ELECYLINDER can be controlled in the field network communication.
Also, the maximum number of ELECYLINDER available to be connected to one unit of the EC connection unit should be four axes.

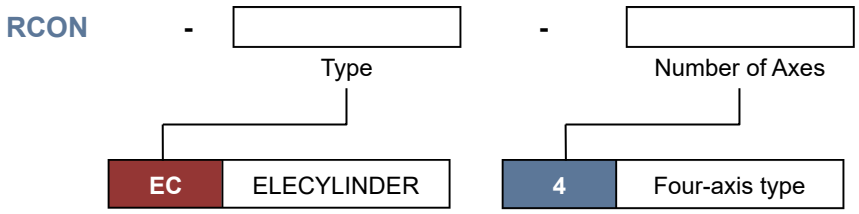
In this chapter, explains the EC connection unit (RCON-EC).



### 3.2.2 Model

(1) How to read the model number

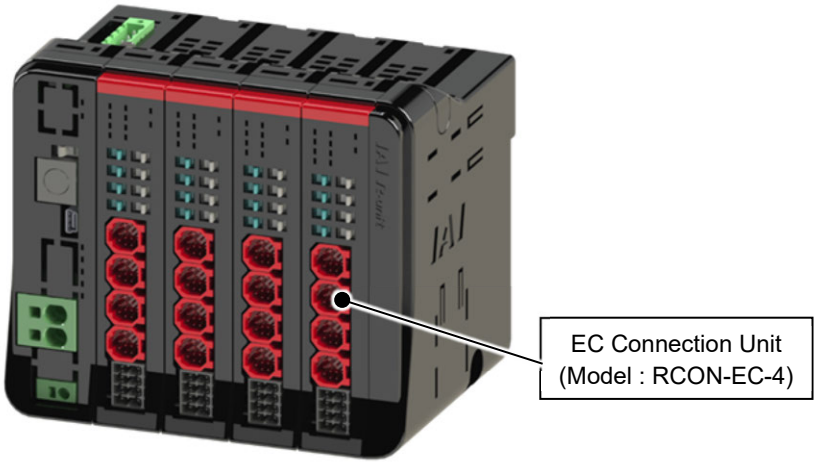
**EC Connection unit model**




*ELECYLINDER capable to be connected to the EC connection unit is the option: ACR only.

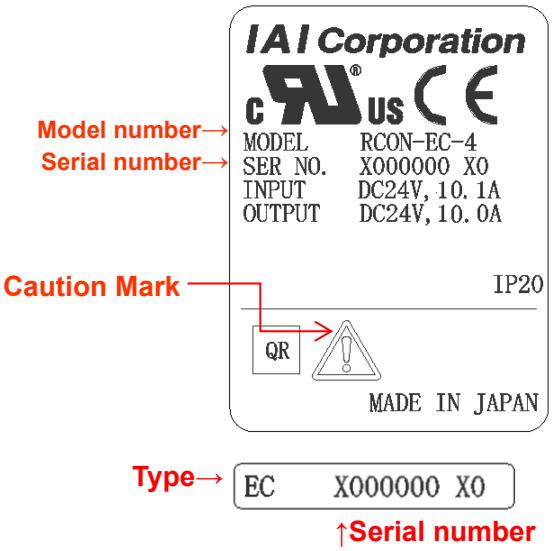
**EC** - [ ] - [ ] - ( [ ] ) - [ ] - [ ] - **ACR**

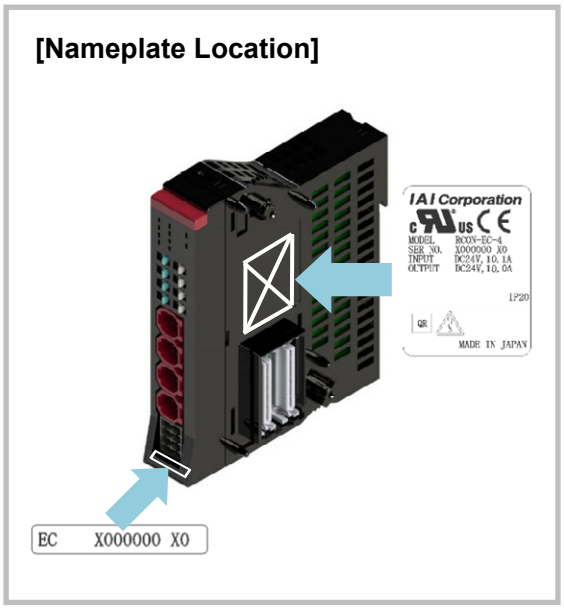
<Series> <Type> <Lead> < Motor Joint Type> < Stroke> < Cable Length> <Option>
ACR: RCON-EC connection type



(2) How to read the model nameplate

**[EC Connection Unit]**




| Mark | Explanation of Mark |
|---|---|
| ⚠ | Use IAI specified cables only. |

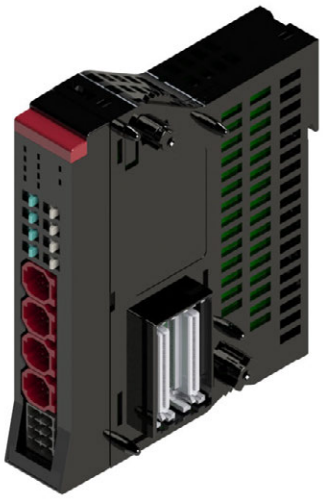
### 3.2.3 Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

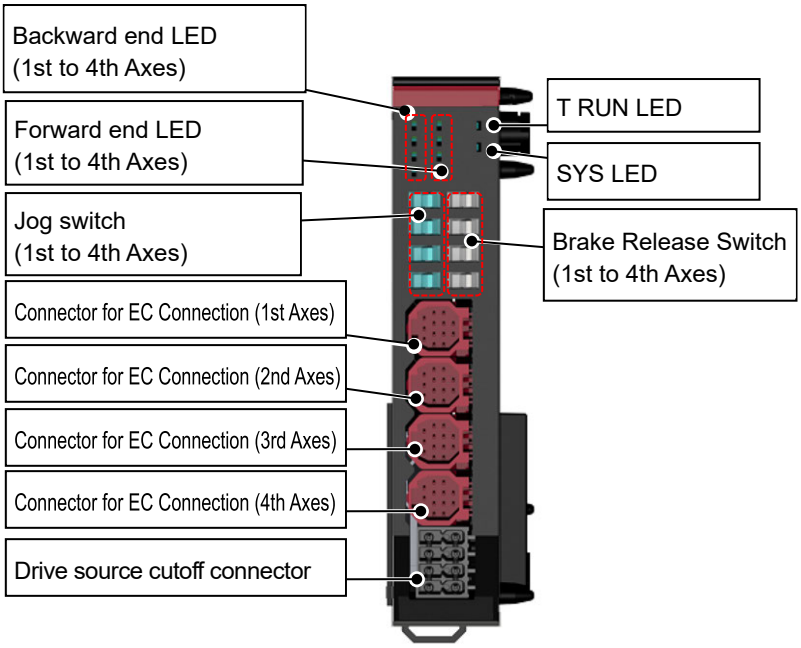
**[EC Connection Unit]**

| | Part name | Shape | Quantity | Remarks |
|---|---|---|---|---|
| Main body | EC Connection Unit |  | 1 | Model example: RCON-EC |
| Accessories | Drive source cutoff connector |  | 1 | Model: DFMC1.5/4-ST-3.5<br>* Supplied with EC Connection Unit |
| | First Step Guide |  | 1 | ME0395 |
| | Safety Guide |  | 1 | M0194 |

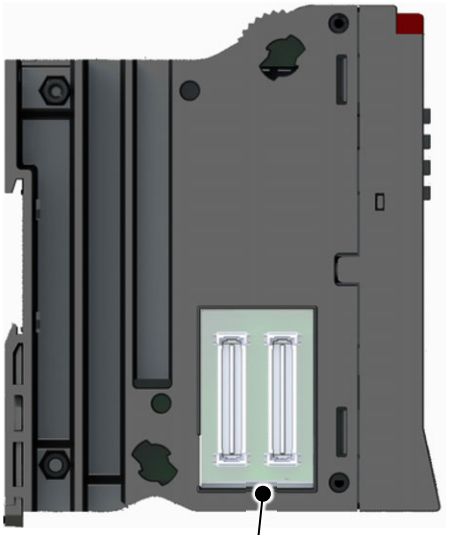
### 3.2.4 Part Names / Functions



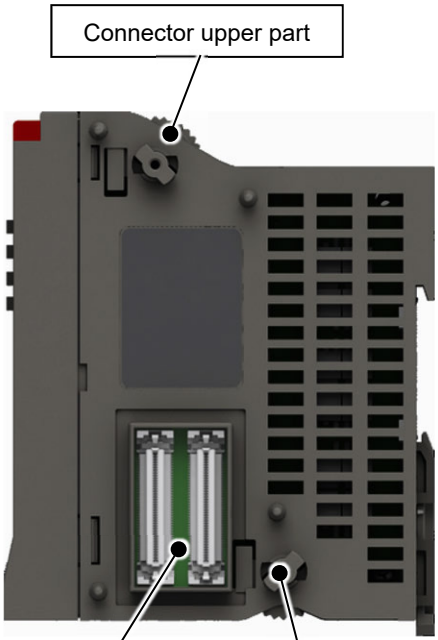
RCON-EC



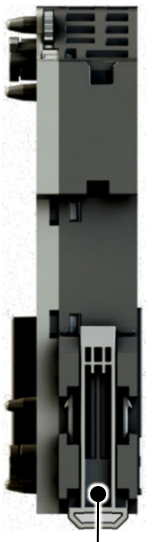

Front




Left side




Right side




Rear

(1) LED display

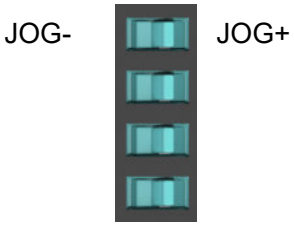
| Panel notation | Display color | Status | Description |
|---|---|---|---|
| T RUN | Green | Light ON | Normal internal bus communication |
| | | Blinking | Waiting for initialization signal, initialization communication failed |
| | Orange | Light ON | Bus communication error generated |
| SYS | Green | Light ON | Normal operation |
| | | Light OFF | Control power supply voltage drop, Motor power supply voltage drop, Emergency stop, communication error to EC |
| | Red | Light ON | Control power supply voltage drop, Motor power supply voltage drop, Emergency stop, communication error to EC |
| | | Light OFF | Normal operation |
| LS1/ALM (I = 1st axes, II = 2nd axes, III = 3rd axes, IV = 4th axes) | Green | Light ON | Movement to Forward End Complete |
| | | Light OFF | Stop |
| | Red | Light ON | Alarm triggered |
| LS0 (I = 1st axes, II = 2nd axes, III = 3rd axes, IV = 4th axes) | Green | Light ON | Movement to Backward End Complete |
| | | Light OFF | Stop |

(2) Jog switch

They are switches for the jog operation. It comes the switches for 1st, 2nd, 3rd and 4th axes from the top.

Set a switch to the JOG+ side and the jog operation to the positive direction (target position registered as the forward end in the position data) should be made and set it to the JOG- side and the jog operation to the negative side (target position registered as the backward end) to be made. The jog speed should be the velocity registered in the position data. If the switch gets released on the way, stop should be performed with the deceleration registered in the position data. However, if the home-return operation is incomplete, it should perform the home-return operation no matter which side the switch is set to. Releasing the switch one the way should cancel the home-return operation.

The operation on on the jog switch is enabled only in MANU Mode. It should be disabled in AUTO Mode. Also, when a window to operate actuators is open on a teaching tool, the jog switch should be inactivated. If a window capable to operate actuators gets opened during operation with the jog switch, an actuator should decelerate and stop.
Setting “RCON-EC Jog Switch” in GW Parameter “Disabled” should make the jog switches on all the units of the EC connection unit connected to the EC gateway unit inactivated. (It is set to “Enabled” in the initial setting.)



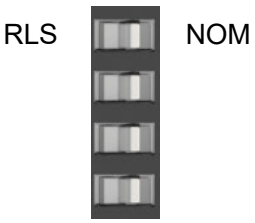

| Symbol | Description |
|---|---|
| JOG+ | Jog operation to positive direction (target position registered as forward end in position data) |
| JOG- | Jog operation to negative direction (target position registered as backward end in position data) |

## Caution

- The jog switch is disabled when the communication with the teaching tool is disconnected while the screen in which the actuator can be operated with the teaching tool is opened.
- To enable jog switch operation again, turn the REC system on again or perform software reset.

(3) Brake release switch

They are switches to release the brake compulsorily. It comes the switches for 1st, 2nd, 3rd and 4th axes from the top. Should be on NOM side during normal operation. On NOM side, the brake will be released by servo ON and locked by servo OFF. On RLS side, there will be forced release regardless of servo ON/OFF (except when control power is OFF).



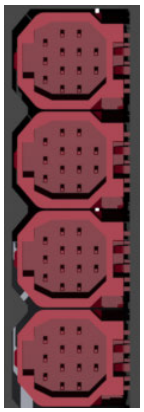

| Symbol | Description |
|---|---|
| RLS | Brake release (Brake Release) |
| NOM | Brake lock (Normal) |

## Warning

- Be careful when releasing the brake. Releasing carelessly may cause injury or damage to the actuator body, workpiece or surrounding devices due to the slider or rod falling.
- After releasing the brake, be sure to return the brake to the enabled status. It is very dangerous to operate with the brake released. It may cause injury or damage to the actuator body, workpiece or surrounding devices due to the slider or rod falling.

(4) Connectors for EC connection

They are connectors to connect ELECYLIDER. It comes the connectors for 1st, 2nd, 3rd and 4th axes from the top.
Axis numbers for four axes should be assigned to the EC connection unit even if ELECYLINDER is not connected to all of four. An axis number that an axis is not connected should not be pulled one number forward.





**[RCON-EC]**

| Pin No. | Signal name | Description |
|---|---|---|
| 1 | 24V (MP) | Motor Power Supply +24V |
| 2 | GND | 0V |
| 3 | IN0 | Input 0 |
| 4 | IN1 | Input 1 |
| 5 | IN2 | Input 2 |
| 6 | SD+ | Communication Line + |
| 7 | OUT0 | Output 0 |
| 8 | OUT1 | Output 1 |
| 9 | OUT2 | Output 2 |
| 10 | SD- | Communication Line - |
| 11 | BKRLS | Brake Release |
| 12 | 24V (CP) | Control Power Supply +24V |
| 13 | FG | Frame Grounding |

(5) Drive source cutoff connector

Drive source cutoff input. Drive source can be cutoff by individual axes.


Cable side connector name: DFMC1.5/2-ST-3.5 (Phoenix Contact)

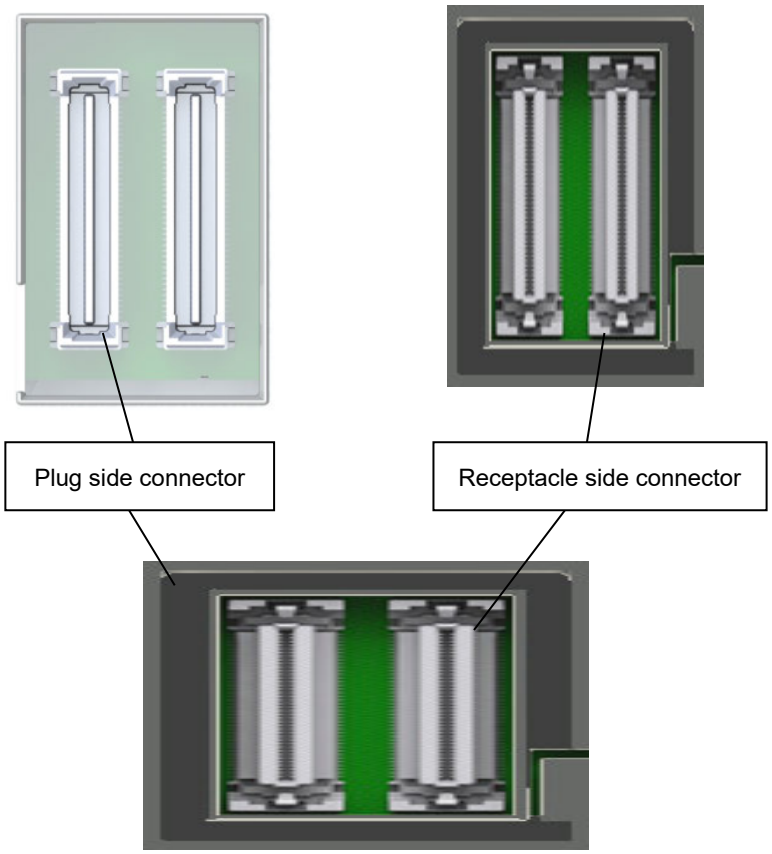
| Pin No. | Signal name | Description |
|---|---|---|
| 1 | MPO_4 | Motor power output 4th axes |
| 2 | MPO_3 | Motor power output 3rd axes |
| 3 | MPO_2 | Motor power output 2nd axes |
| 4 | MPO_1 | Motor power output 1st axis |
| 5 | MPI_4 | Motor power input 4th axes |
| 6 | MPI_3 | Motor power input 3rd axes |
| 7 | MPI_2 | Motor power input 2nd axes |
| 8 | MPI_1 | Motor power input 1st axis |

Cable side connector compatible wire

| Item | Specifications |
|---|---|
| Compatible wire | AWG20 to 16 (Copper Wire) |
| Strip length | 10.0mm |
| Rated Temperature on Isolation Coating | 60°C or more |

(6) Connectors

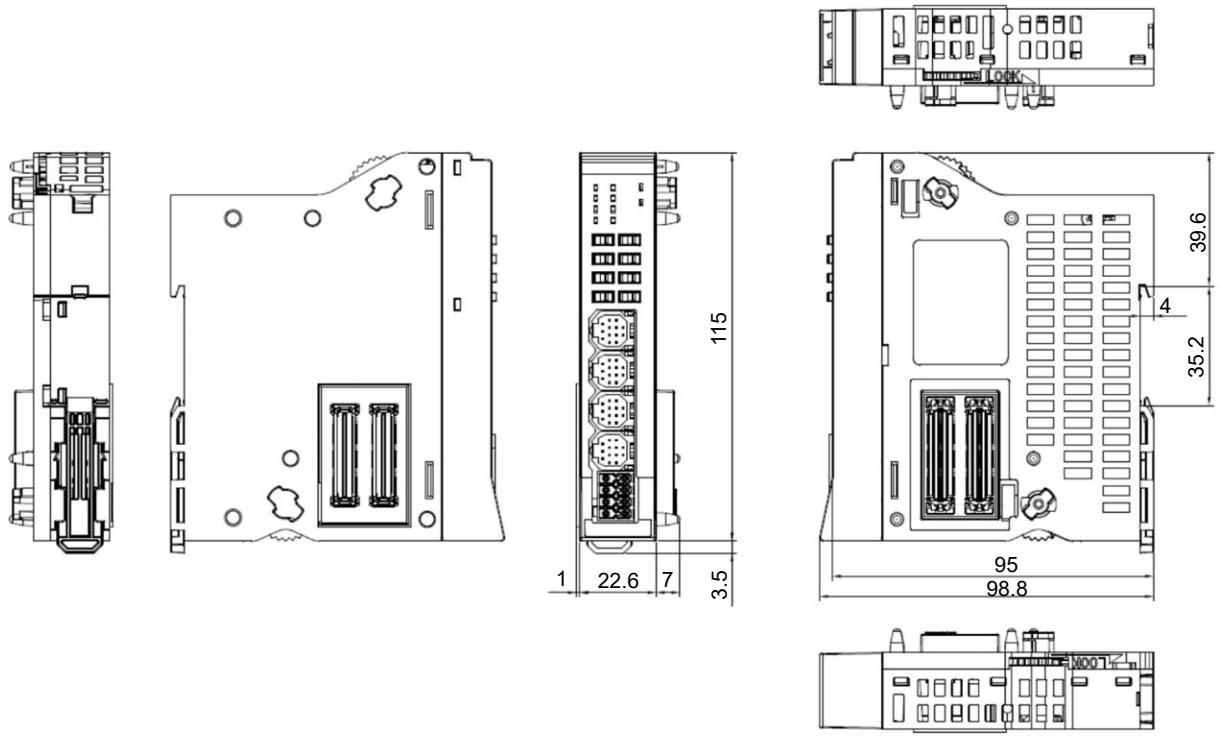
A connector for use between units. Two identical connectors are used. The connectors have a floating structure that absorbs connector misalignment due to housing mating or mounting misalignment between connectors.



### 3.2.5 External Dimensions

**[EC Connection Unit]**

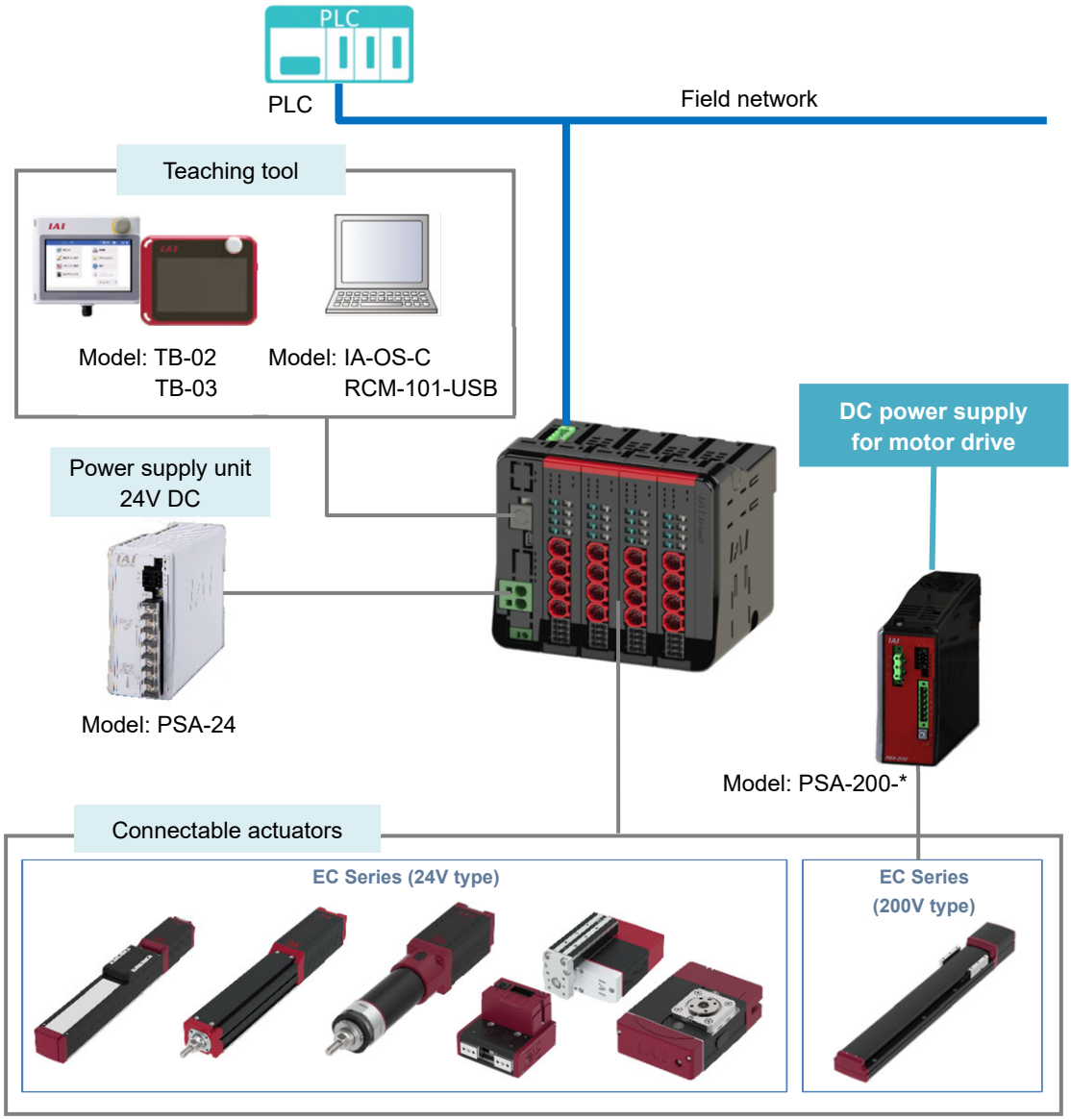
| Item | Specifications |
|---|---|
| External dimensions | W22.6mm × H115mm × D95mm |
| Mass | About 123g |
| External view | See figure below |



# 3.3 DC Power Supply for Motor Drive (PSA-200)

## 3.3.1 Overview

It is a power supply unit dedicated for supplying the drive DC power supply (hereinafter called PSA-200) to 200V type ELECYLINDER.
There are two types of power supply voltage, 100V AC type an 200V AC that are capable of supplying to PSA-200. 100V AC type is capable of driving ELECYLINDER for 800W in total and 200V AC type for 1,600W. Also, the number of ELECYLINDER units connectable to one unit of PSA-200 is six axes at the maximum.



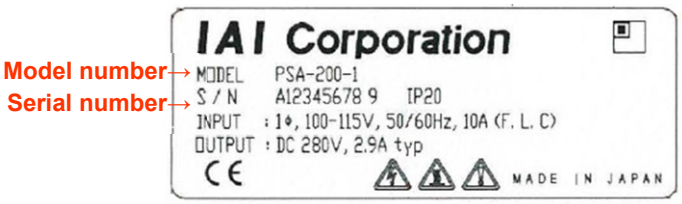

* It is mandatory to have PSA-200 when using 200V type ELECYLINDER.
* It is not necessary to have this power supply unit when using 24V type ELECYLINDER.

### 3.3.2 Model

(1) How to read the model number

(2) How to read the model nameplate


[100V type]



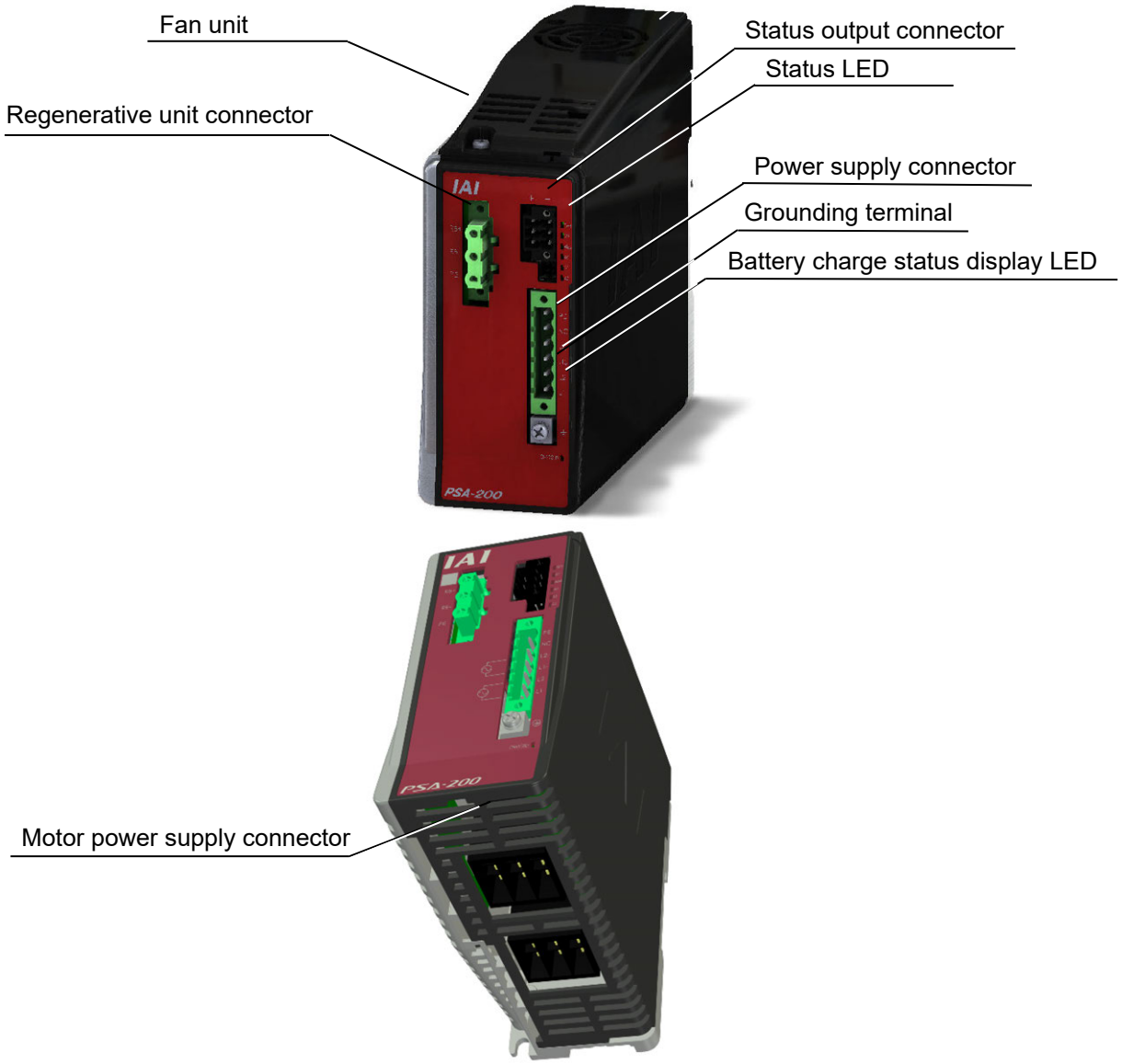

[200V type]

### 3.3.3 Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

| | Part name | Shape | Quantity | Remarks |
|---|---|---|---|---|
| Main body | EC Connection Unit |  | 1 | Model example:<br>PSA-200-*<br>* Set power supply voltage in * |
| Accessories | Drive source cutoff connector |  | 1 | Model:<br>MSTB2,5/6-STF-5,08 |
| | Status output connector |  | | Model:<br>DFMC1,5/3-STF-3,5 |
| | Safety Guide |  | 1 | M0194 |

### 3.3.4 Part Names / Functions



(1) Status display LED

The status of PSA-200 (status of control power supply, status of motor power supply and status of alarms) should be displayed in the LED lamps.


●PWR (Control power supply) / MP (Motor power supply)

| Panel notation | Display color | Status | Description |
|---|---|---|---|
| PWR | Green | Light ON | Normal startup |
| | | Light OFF | Control power supply cutoff |
| MP | Green | Light ON | Motor power supply normal output |
| | | Light OFF | Drive source cutoff |

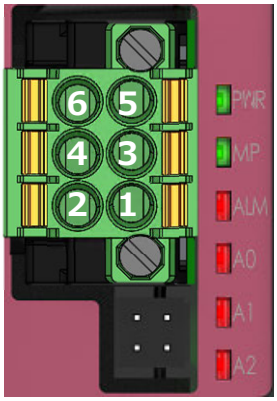
●ALM (Alarm)

| Panel notation | | | | Drive source | Alarm name | Detail description Reference |
|---|---|---|---|---|---|---|
| ALM | A0 | A1 | A2 | | | |
| - | ☆ | | | Non interception | Internal Relay Life Count Alert | Refer to [Page 7-11 “Alarms in Motor Drive DC Power Supply PSA-200”] |
| - | | ☆ | | Non interception | Electrolytic Capacitor Life Alert | |
| - | | | ☆ | Non interception | Fan Revolution Drop | |
| ○ | ○ | | | Cutoff | Motor Power Drop Voltage | |
| ○ | | ○ | | Cutoff | Fan Error Detected | |
| ○ | | | ○ | Cutoff | Regenerative Discharge Excess Power | |
| ○ | ○ | ○ | | Cutoff | Motor Power Excess Voltage | |
| ○ | ○ | | ○ | Cutoff | PCB Temperature Error | |
| ○ | | ○ | ○ | Cutoff | Power Device Overheated | |
| ○ | ○ | ○ | ○ | Cutoff | Critical Malfunction | |

○: Illuminated in red, -: Turned off, ☆: Flashing in red (frequency in 500ms), Blank: flashing or illuminated for another reason

(2) Status output connector

It outputs the status of control power supply (short-circuit / released), status of motor power supply (short-circuit / released) and alarm status (H/L level). The output should link with PWR, MP and ALM LED lamps. Keep it unconnected when not to be used.




| **Connector model** | DMC 1,5/ 3-G1F-3,5-LRP20THR | | |
|---|---|---|---|
| **Maker** | Phoenix Contact | | |
| **Pin No.** | **Signal name** | **Description** | |
| 6 | CP+ | Control Power Supply Contact Output | Photocoupler Isolation Open Collector Output |
| 5 | CP- | | |
| 4 | MP+ | Motor Power Supply Contact Output | |
| 3 | MP- | | |
| 2 | *ALM+ | Alarm Contact Output | |
| 1 | *ALM- | | |

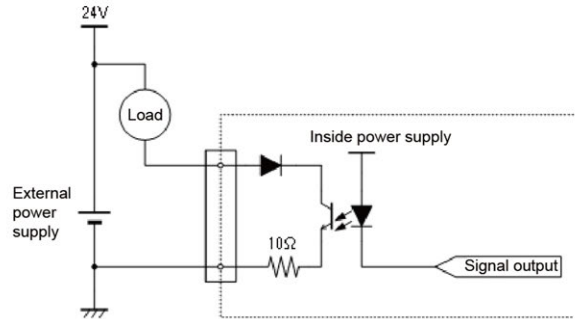
Connection cable type

| **Item** | **Specifications** |
|---|---|
| **Compatible wire** | AWG24 to 16 (0.2 to 1.3mm$^2$) |
| **Max. cable length** | 10m |
| **Strip length** | 10mm |
| **Mating connector** | |
| **Model** | DFMC 1,5/3-STF-3,5 |
| **Maker** | Phoenix Contact |

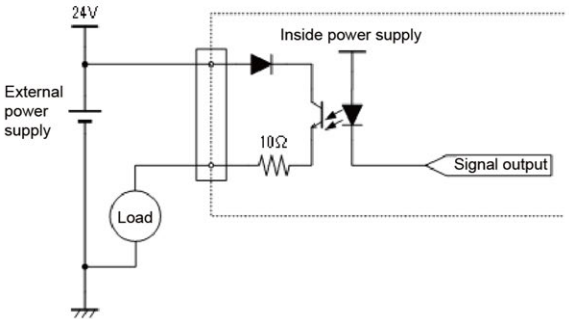
The output should be the open collector output of a photocoupler.
As it does not have a common terminal, it should be applicable for both NPN/PNP due to wiring.

| Item | Specifications |
|---|---|
| Output Points | 3 points |
| Rated Load Voltage | 24V DC ±10% |
| Max. load current | 50mA/1 circuit |
| Leak Current | Max0.1mA/1 point |
| Residual Voltage | 2V or less |
| Isolation System | Photocoupler Isolation |

NPN Connection



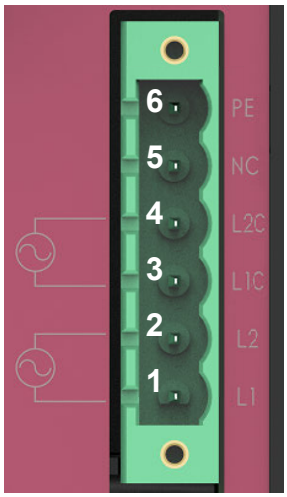

PNP Connection




* In case the current exceeding the maximum load current flows, the circuit may get damaged and the output should become open.

(3) Power supply connector

It is a connector for a connection to the AC power supply. The input should be split into the control power supply side and the motor power supply side.




| **Connector model** | MSTB 2,5/6-GF-5.08 | |
|---|---|---|
| **Maker** | Phoenix Contact | |
| **Pin No.** | **Signal name** | **Description** |
| 6 | PE | Ground |
| 5 | NC | (Not connected) |
| 4 | L2C | Control power supply AC input (Grounding End) |
| 3 | L1C | Control power supply AC input (Non-Grounding End) |
| 2 | L2 | Motor power supply AC input (Grounding End) |
| 1 | L1 | Motor power supply AC input (Non-Grounding End) |

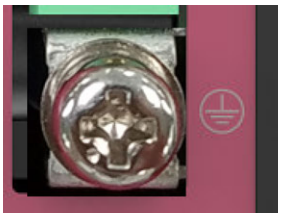
Connection cable type

| **Item** | **Pin No.** | **Signal name** | **Contents** | **Compatible wire diameter** |
|---|---|---|---|---|
| **Compatible wire** | 6 | PE | Ground | AWG14 (2.0 to $mm^2$) |
| | 5 | NC | (Not connected) | - |
| | 4 | L2C | Control power supply AC input (Grounding End) | AWG18 (0.75$mm^2$) |
| | 3 | L1C | Control power supply AC input (Non-Grounding End) | |
| | 2 | L2 | Motor power supply AC input (Grounding End) | AWG14 (2.0 to $mm^2$) |
| | 1 | L1 | Motor power supply AC input (Non-Grounding End) | |
| **Strip length** | 7mm | | | |
| **Mating connector** | | | | |
| **Model** | MSTB2,5/6-STF-5.08(*1) | | | |
| **Maker** | Phoenix Contact | | | |

*1 It is the model code before attaching the connector seal.

(4) Grounding Terminal

It is a screw for the protection grounding. Make sure that you ground it.

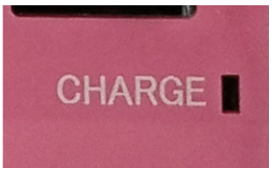


| | |
|---|---|
| **Terminal Model** | OT-010-M4 |
| **Accessory screw** | Pan Head Machine Screw with Captive Washer M4×8 |

* It is connected to PE on the power supply connector internally.

(5) Battery Charge Status Display LED

It is an LED lamp to show that the internal circuit is on charge.

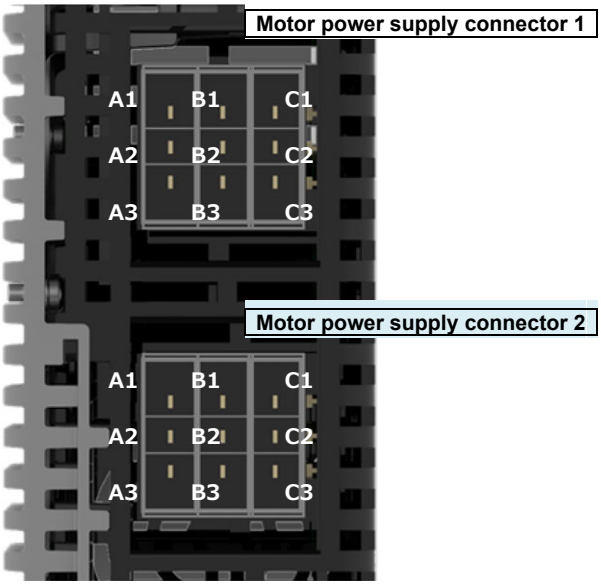



## Warning

- Do not attempt to touch the product while the charge status display LED lamp is illuminated in red. It may cause electric shock.
  In case when you touch this product for such a purpose as inspection, turn the power off and make sure that the battery charge status display LED lamp is turned off before touching the product.

(6) Motor power supply connector

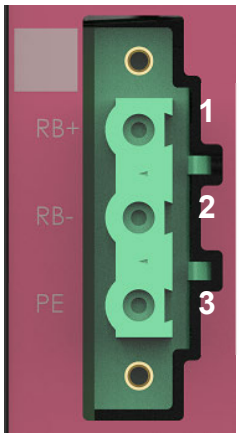
It is a connector to supply the motor power (280V DC typ) to the 200V type ELECYLINDER.
There are two connectors equipped on the bottom of PSA-200.
Each connector has three inlets thus six inlets are available for connection in total. As they are connected in parallel internally, there is no difference due to connected position.




| Name | Pin No. | | Signal name | Contents | Remarks |
|---|---|---|---|---|---|
| Motor power supply connector 1 | A | 1 | MP | Motor power supply DC output (+ side) | The same signals are to be connected to each other internally.<br>The 280V DC typ. should be output. |
| | B | 1 | | | |
| | C | 1 | | | |
| | A | 2 | MN | Motor power supply DC output (- side) | |
| | B | 2 | | | |
| | C | 2 | | | |
| | A | 3 | PE | Ground | |
| | B | 3 | | | |
| | C | 3 | | | |
| Motor power supply connector 2 | A | 1 | MP | Motor power supply DC output (+ side) | The same signals are to be connected to Motor Power Supply Connector 1 internally. |
| | B | 1 | | | |
| | C | 1 | | | |
| | A | 2 | MN | Motor power supply DC output (- side) | |
| | B | 2 | | | |
| | C | 2 | | | |
| | A | 3 | PE | Ground | |
| | B | 3 | | | |
| | C | 3 | | | |

(7) Regenerative Unit Connector

It is a connector to connect a resistor unit that absorbs the regenerative current generated when an actuator decelerates and stops. It is available to connect the regenerative resistor unit RESU-1.




| **Connector model** | GIC 2.5/3-GF-7.62 | |
|---|---|---|
| **Maker** | Phoenix Contact | |
| **Pin No.** | **Signal name** | **Description** |
| 6 | PE | Ground |
| 5 | NC | (Not connected) |
| 4 | L2C | Control power supply AC input (Grounding End) |
| 3 | L1C | Control power supply AC input (Non-Grounding End) |
| 2 | L2 | Motor power supply AC input (Grounding End) |
| 1 | L1 | Motor power supply AC input (Non-Grounding End) |
| **Connection cable** | | |
| **Model** | CB-ST-REU010 (Cable length: 1m) | |

The description of the specifications of the regenerative resistor unit is shown in [4.3.8 Regenerative Resistor Unit (Option)].

(8) Fan unit

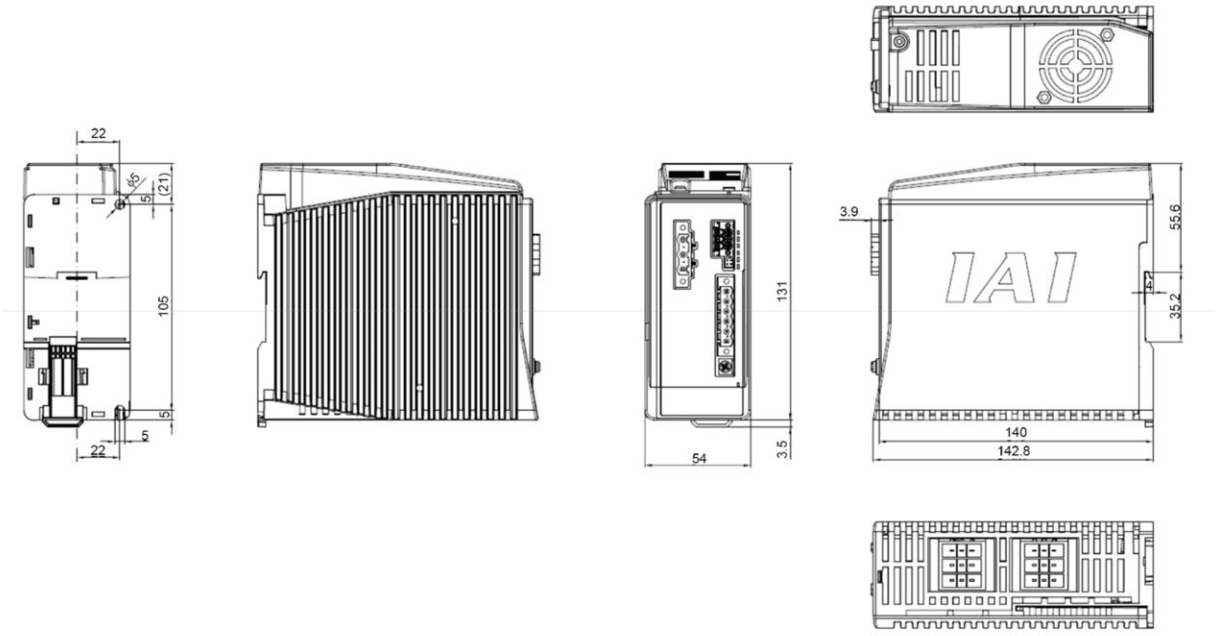
It is a fan to perform forced air cooling. It is to be used by connecting to the fan connector on the power supply side.

| **Unit model** | PSA-FNB |
|---|---|

### 3.3.5 External Dimensions

**[PSA-200]**

| Item | Specifications |
|---|---|
| External dimensions | W54mm×H131mm×D140mm |
| Mass | About 840g |
| External view | See figure below |



R E C

Chapter 4

# Startup of REC System

# 4.1 Preparation Before Startup

## 4.1.1 Check of Product

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

**[EC Gateway Unit]**

| | Part name | Shape | Quantity | Remarks |
|---|---|---|---|---|
| Main body | EC Gateway Unit |  | 1 | Model example: REC-GW-CC |
| Accessories | Terminal unit |  | 1 | Single product model number: RCON-GW-TRE (Not supplied with TRN specification) |
| | Field network connector |  | 1 | Depends on I/O type |
| | First Step Guide |  | 1 | ME0395 |
| | Safety Guide |  | 1 | M0194 |

**[EC Connection Unit]**

| | Part name | Shape | Quantity | Remarks |
|---|---|---|---|---|
| Main body | EC Connection Unit |  | 1 | Model example: RCON-EC |
| Accessories | Drive source cutoff connector |  | 1 | Model: DFMC1.5/4-ST-3.5<br>* Supplied with EC Connection Unit |
| | First Step Guide |  | 1 | ME0395 |
| | Safety Guide |  | 1 | M0194 |

**[DC Power Supply for Motor Drive (PSA-200)]**

| | Part name | Shape | Quantity | Remarks |
|---|---|---|---|---|
| Main body | DC power supply for motor drive (*1) |  | 1 | Model example: PSA-200-* * Set power supply voltage in * |
| Accessories | Power supply connector |   | 1 | Model: MSTB2,5/6-STF-5,08 |
| | Status output connector |  | | Model: DFMC1,5/3-STF-3,5 |
| | Safety Guide |   | 1 | M0194 |

*1 It is mandatory to have PSA-200 when using 200V type ELECYLINDER.
It is not necessary to have this power supply unit when using 24V type ELECYLINDER.

### 4.1.2 Tool to Use

In this manual, describes how to use IA-OS as a tool to construct and start up the REC system. Also, the setup can be performed in the RC/EC PC software or a teaching pendant (TB-02, TB-03) and the gateway parameter setting tool.

The applicable version for each tool is as shown below.

**[PC software]**

- ●IA-OS Ver.3.00.00.00 or later
- ●RCM-101-*-* Ver.13.01.00.00 or later

**[Teaching pendant]**

- ●TB-02/TB-02D Ver.2.70 or later
- ●TB-03 Ver.2.70 or later

**[Gateway parameter configuration tool]**

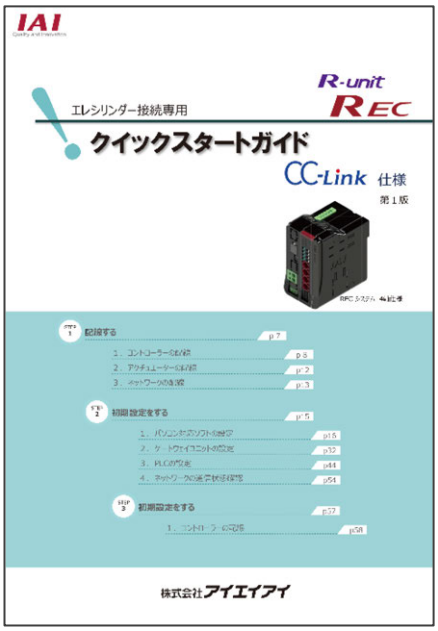
- ●Ver.3.1.7.0 or later

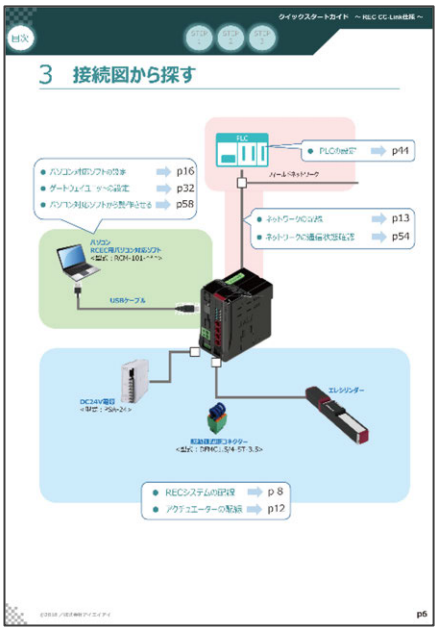
The gateway parameter configuration tool is included in the PC software, but you can also download the latest version from our website.
For the operation of PC software and teaching pendant, refer to the following instruction manual.

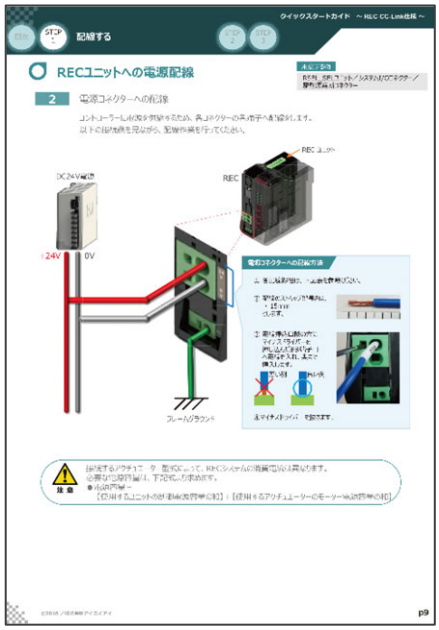
**Reference**

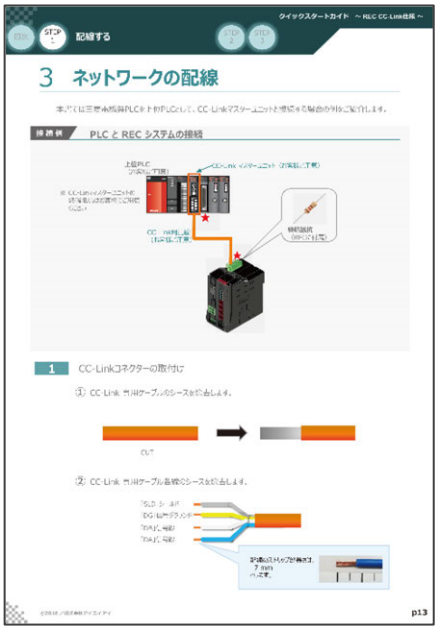
| | |
|---|---|
| How to operate in PC software | PC software (RCM-101-*-*) instruction manual (ME0155) |
| Detail of how to operate in teaching pendant | Touch Panel Teaching Pendant instruction manual TB-02/02D (ME0355), TB-03 (ME0376) |

Refer to [4.4.2 Parameter Edit in Gateway] for how to set up the gateway parameters.
Also, “Quick Start Guide” explaining how to set up each network is available to download from IAI homepage. (Quick Start Guide available in Japanese only)



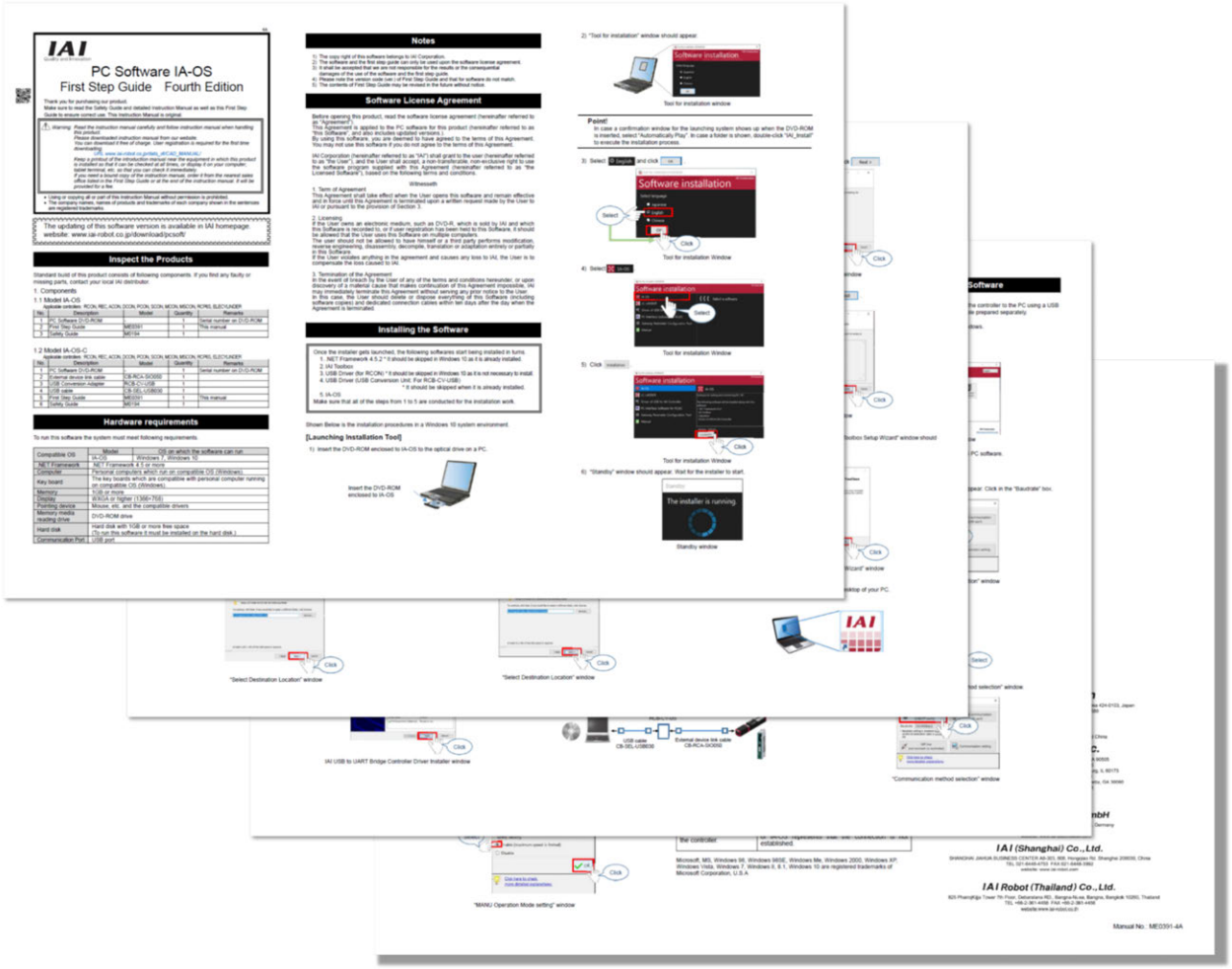



### 4.1.3 Installation Work of IA-OS

Items to prepare

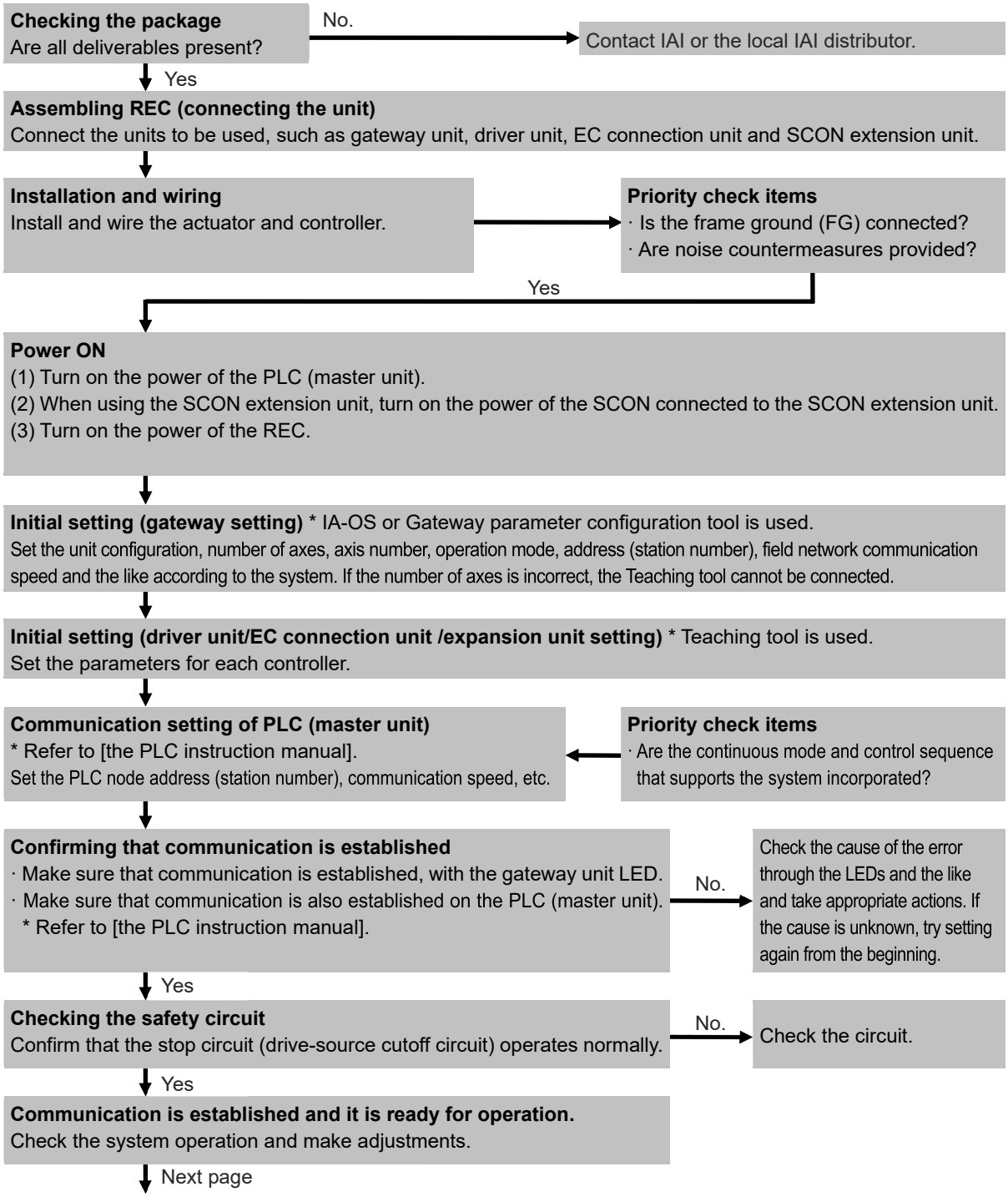
REC system / PC / IA-OS enclosed to DVD-ROM / Cable

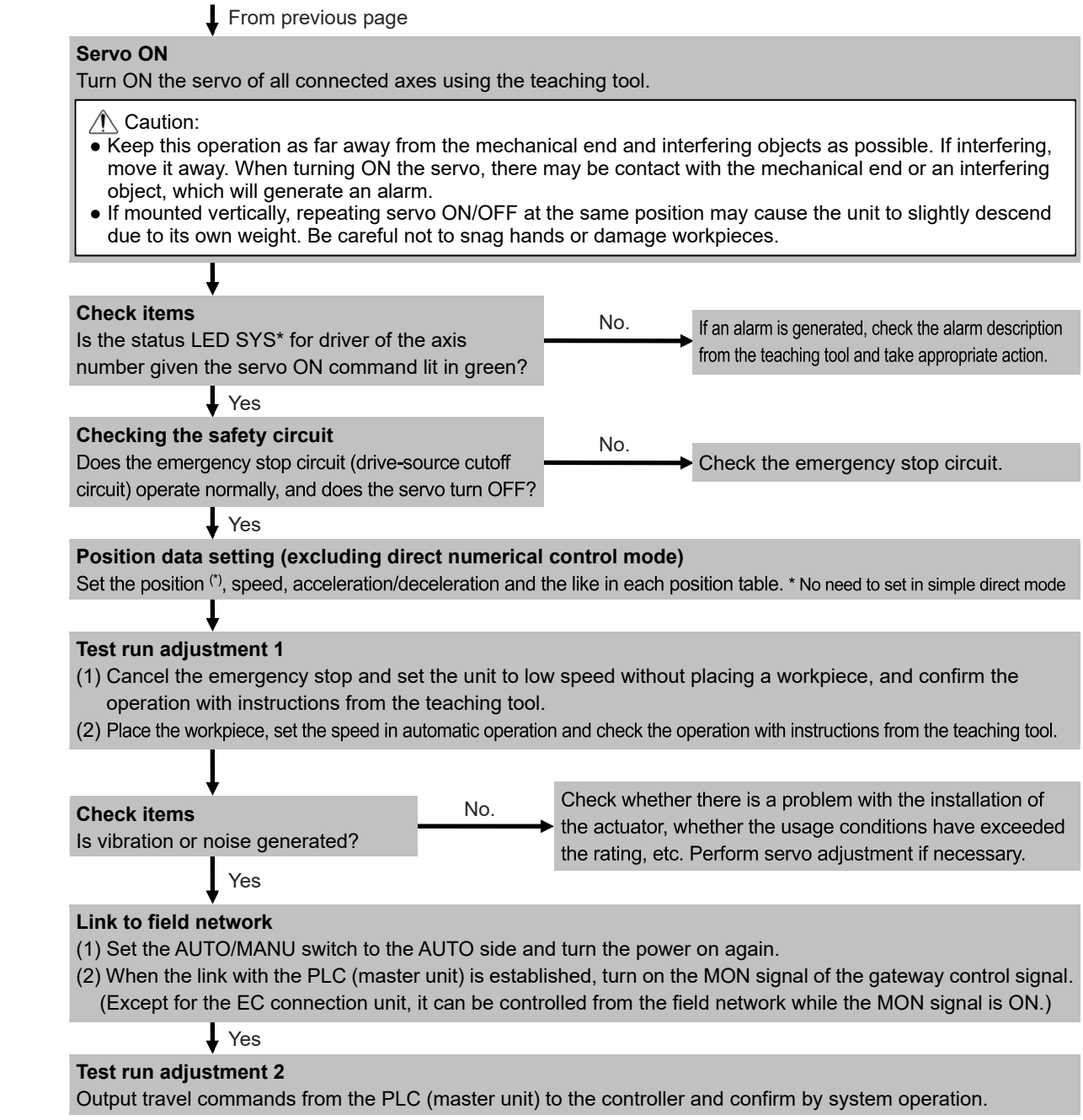
Refer to [PC Teaching Software IA-OS First Step Guide (ME0391)] for how to operate.



### 4.1.4 Startup Procedure

When using this product for the first time, refer to the following procedure and pay attention so as to avoid checking or wiring errors.
This section describes the startup procedure of the REC system. For installation and wiring of miscellaneous devices connected to the network, controllers and actuators, follow the respective instruction manuals.






## Caution

- If the actual number of connected axes of the REC system does not match the number of axes set in the gateway parameter configuration tool, the PC software cannot be connected.
- Set and transfer the gateway parameters suitably according to the actual unit configuration and the number of connected axes.

# 4.2 Installation

## 4.2.1 Notice / Caution

**[Installation Environment]**

Usage is possible in environments of pollution degree 2[*1] or equivalent.

*1 Pollution degree 2: Environment in which generally only nonconductive pollution occurs, but temporary conductive pollution may occur due to condensation. (IEC60664-1)

(1) Installation environment

Avoid the following locations for installation.

- Where the ambient temperature exceeds the range of 0 to 55°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds the range of 5 to 85%RH
- Where the unit is exposed to odorous or combustible gases
- Where the unit is exposed to significant amounts of dust, salt or iron powder
- Where the unit is subject to direct vibration or impact
- Where the unit receives direct sunlight
- Where the unit may come in contact with water, oil or chemical spray
- Where vents are blocked [see the section for installation and noise countermeasures]
- Where the altitude exceeds 1,000m

If the unit is used in any of the following locations, provide sufficient shielding measures:

- Where noise is generated due to static electricity, etc.
- Where there are strong electrical or magnetic fields
- Where mains or power lines pass nearby

(2) Storage/preservation environment

For the storage and preservation environment, see the installation environment. However, give especial consideration to the prevention of condensation.

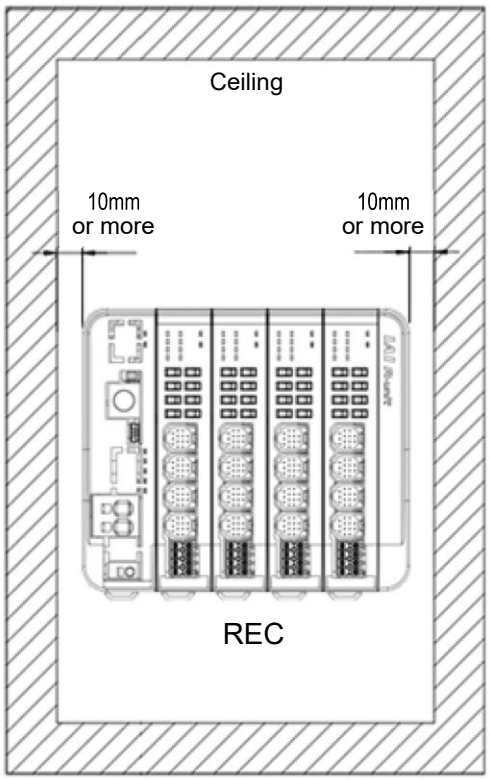
Unless especially specified, desiccant is not included in the package at shipping. If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures for the package overall from the exterior, or directly after opening the package.

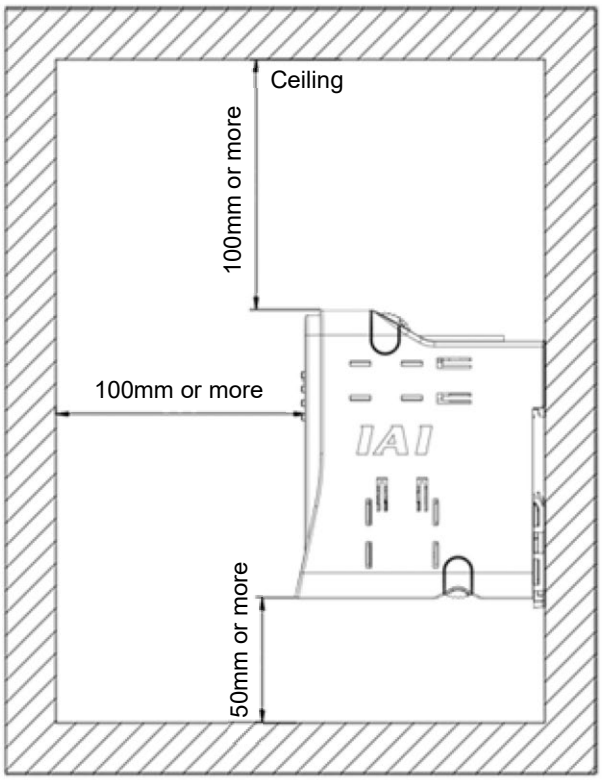
**[Installation and Mounting (EC Gateway Unit, EC Connection Unit)]**

Consider the size of the control panel, placement of the REC controller, cooling and the like when designing and manufacturing so that the ambient temperature is 0 to 55°C.

| Item | Specifications |
|---|---|
| Installation direction | Vertical mounting (exhaust side on top) |
| Installation method | DIN rail mounting |
| Installation conditions | See figure below |

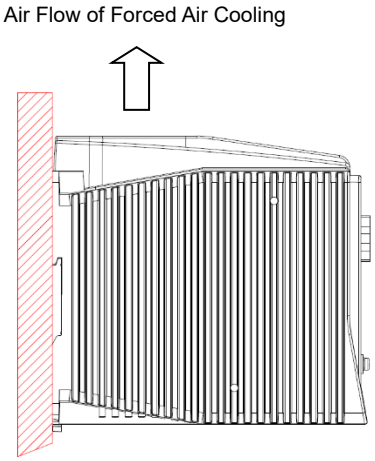
| Item | Specifications |
|---|---|
| Ambient operating temperature | 0 to 55°C |
| Ground | Class D grounding |



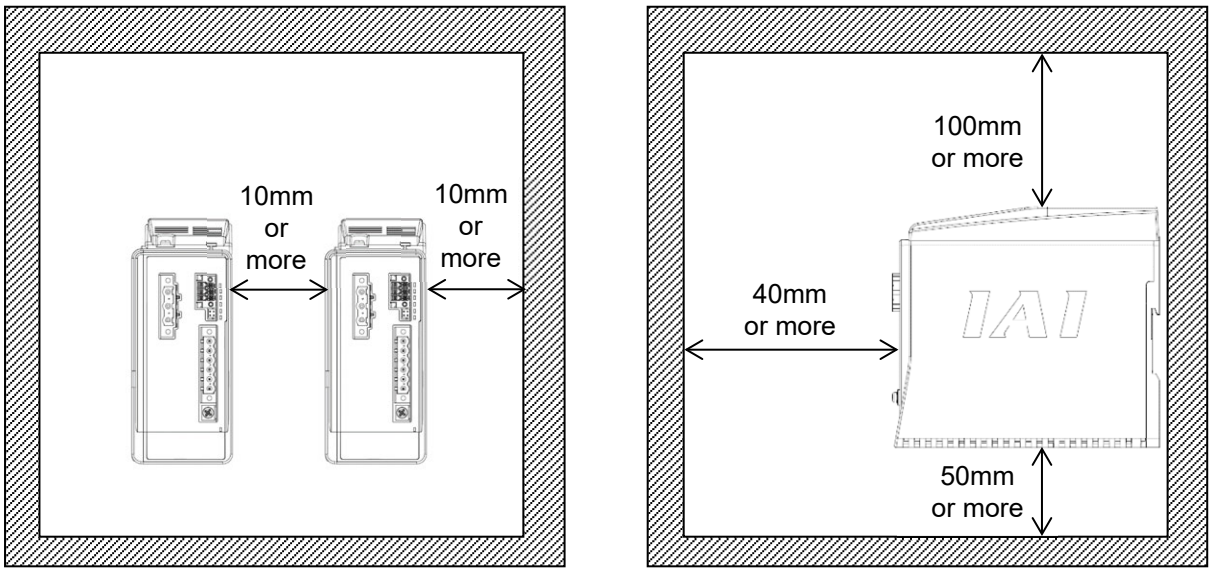
**[Installation and Mounting (DC Power Supply for Motor Drive)]**

The way to install the unit is either screw attachment or DIN rail attachment.
→Refer to [3.2.5 External Dimensions] for the dimensions.
The orientation of installation should be vertical as shown in the figure below.




Installing Orientation in Control Panel

The minimum distance to a wall and minimum distance to peripheral devices are as shown in the figure below. Design and build the system to have the ambient temperature of this power supply at the installation place at 0°C or above and 55°C or below.




Restriction in Ambient Environment (PSA-200)

**[Operating Temperature Range]**

The operating temperature of the gateway unit/ EC Connection Unit is within the range of 0 to 55°C.

## Caution

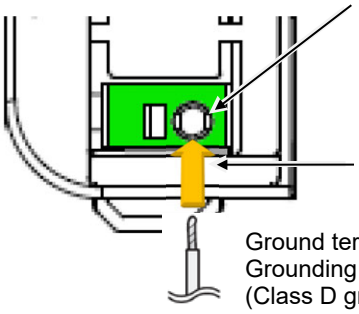
- Under conditions where the temperature is higher than 55°C, the unit cannot be used, regardless of the operating duty.
- When used under unsuitable conditions, the alarm code 0CA "Heating error" may be generated, causing the actuator to stop.

**[Noise Countermeasures and Mounting Method]**

In order to for electric shock prevention, electrostatic charging prevention, to improve noise resistance performance and to control unnecessary radiation, make sure to certainly perform the grounding as shown in the figure below.

(1) Grounding for noise countermeasures (frame ground)

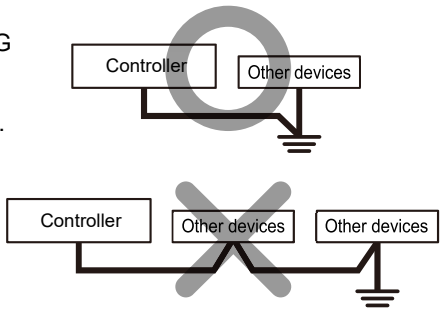
[24V DC]



Connect the ground wire to the FG terminal block of the main body. Push in the square hole with a screwdriver or the like to connect.

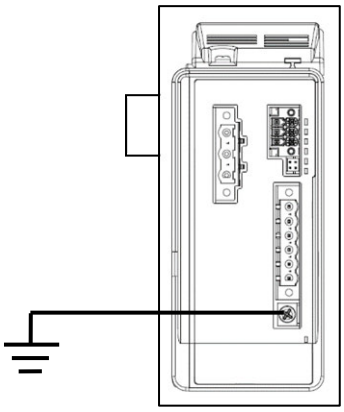
Annealed copper wire: 1.6 mm diameter
Connect with a ground wire of (2 $mm^2$: AWG14)

Ground terminal
Grounding resistance: 100Ω or less
(Class D grounding construction)

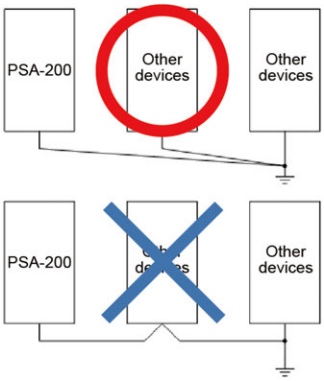



Grounding wires should not be connected in common with other devices and separate controllers should be grounded.

[Motor drive DC power supply (PSA-200)]



Class D grounding construction
(Old Class 3 Grounding: Grounding resistance 100Ω or less)




Do not attempt to have the ground line in common with other devices or link it to another. Have it grounded for each power supply unit.

(2) Notes on wiring method

1) Have the 24V DC power supply wires twisted.

2) Separate the wiring of signal wires and encoders from power supply lines and power lines.

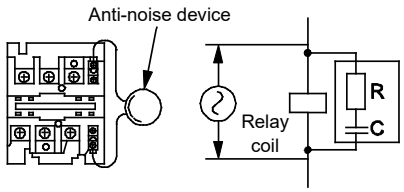
(3) Noise sources and noise prevention

For the same power supply path and power supply device in the same device, take measures against noise.

Countermeasure examples for noise sources are shown below.

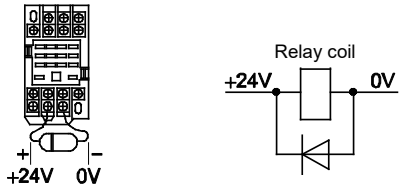
1) AC solenoid valve / magnetic switch / relay

[Measure] Install an anti-noise device in parallel with the coil.




2) DC solenoid valve / magnetic switch / relay

[Measure] Install a diode in parallel with the coil or use the diode built-in type.



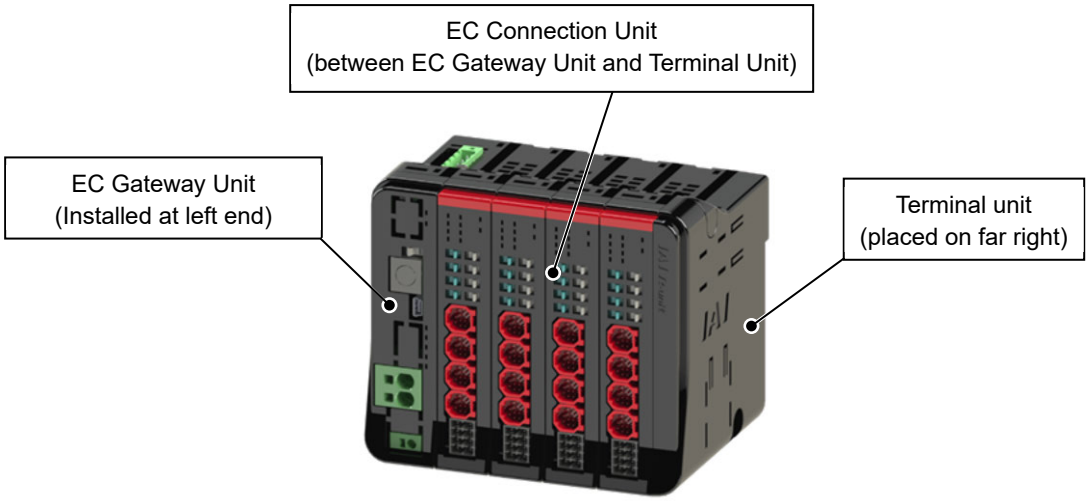
### 4.2.2 Unit Connection Restrictions

The REC system has the following restrictions.
Check the following descriptions and then make a selection for each unit.

(1) Unit arrangement

The REC system has a unit-connecting configuration. Each of the units has the same connector and the same locking configuration, which allows the units to be connected in any order. However, the arrangement of the following units is restricted.

EC Gateway unit : Placed on the far left of the REC system.
Terminal unit : Placed on the far right of the REC system.

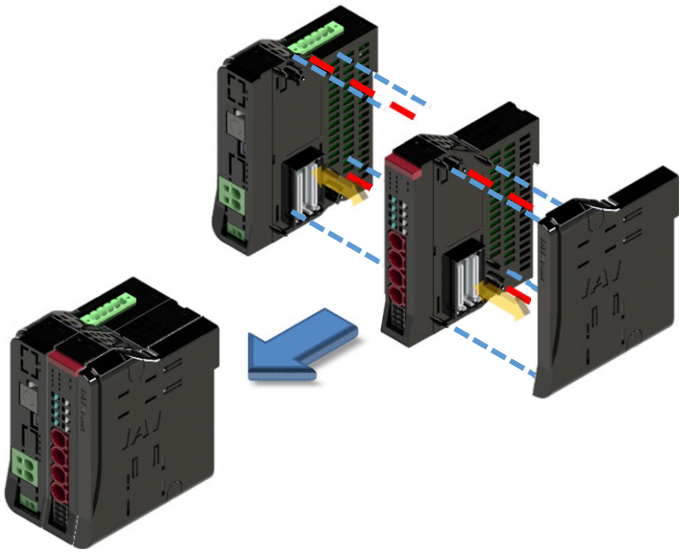



(2) Number of Connectable Units of EC Connection Unit

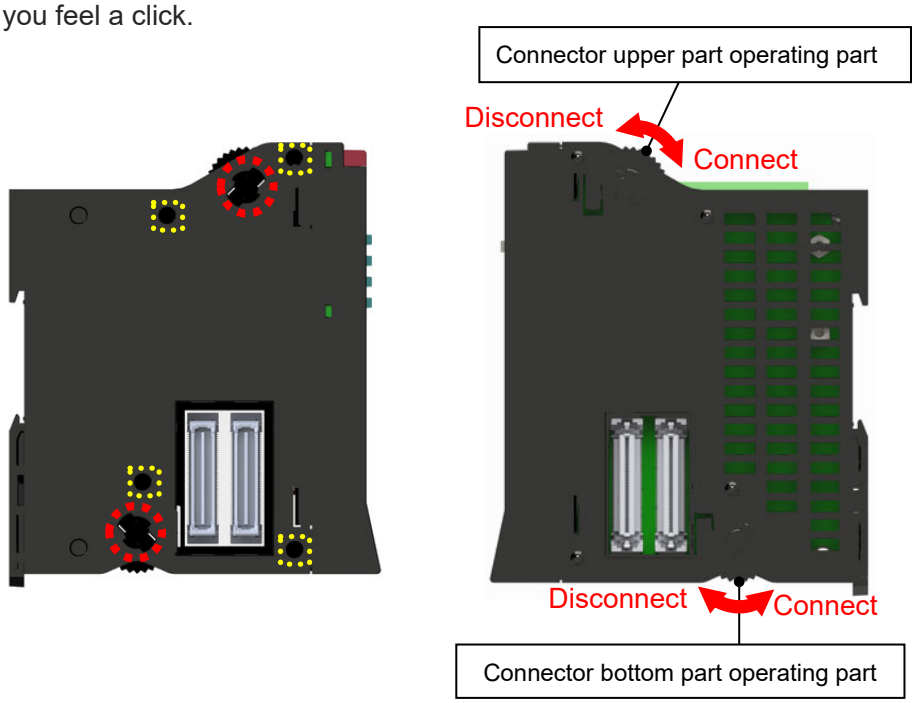
Up to 16 axes can be controlled with each EC gateway unit.
Even though the EC connection units have a structure capable to be connected with no upper limit, have them connected up to four units (16 axes) at the maximum. (EC connection unit occupies the domains and axis numbers for four axes per unit regardless of ELECYLINDER connected to the unit or not.)
When it is required to have 17 axes or more of actuators controlled, have 2 or more units of the EC gateway unit to establish the construction.

### 4.2.3 Unit Connection

In here, describes how to link units in REC system. It is recommended that the unit link is established before connected to DIN rails.

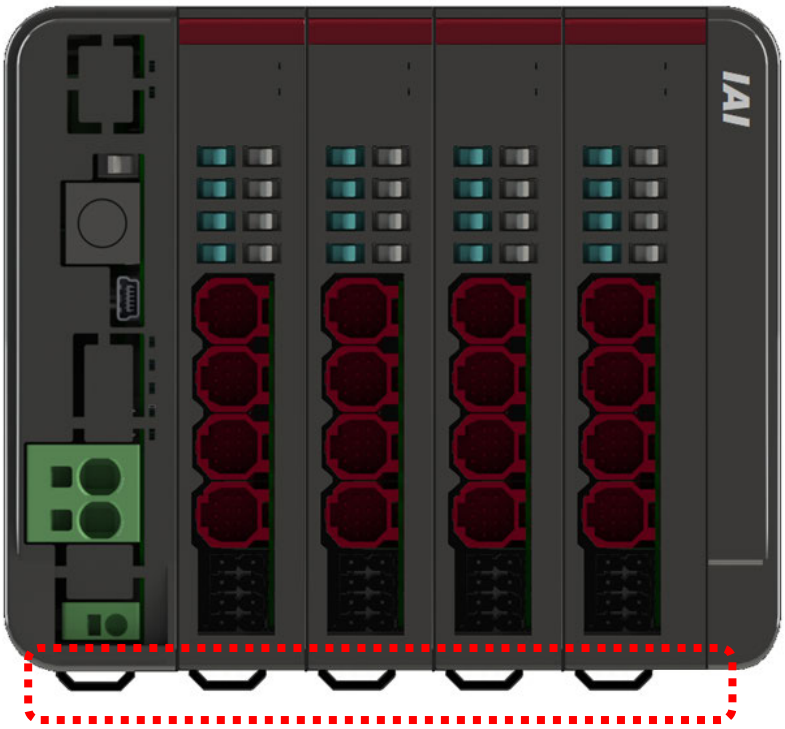


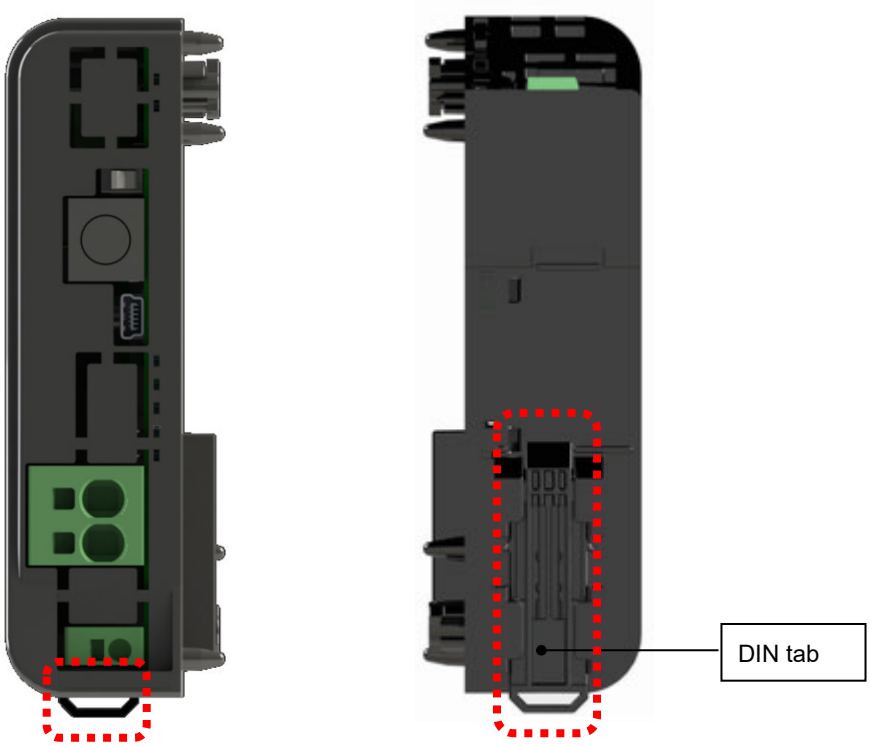
(1) Turn the operating parts of the connector upper/bottom part towards the panel and position on the panel end.
(2) The 2 sections circled with a dashed line and the 4 positioning bosses within the square dotted lines are used as a total of 6 mating sections for positioning 2 units.
(3) When positioning is completed, insert the cable connectors × 2 so that they are firmly connected.
(4) Turn the operating parts of the connector upper/bottom part towards the rear, rotating firmly until you feel a click.



### 4.2.4 Unit Mounting

REC System is available only with DIN rail installation. Pull down the DIN tab visible from the lower part of the housing rear (red color part in a dashed line in the figure below), mount on the DIN rail, then push the DIN operating part upward to lock it.



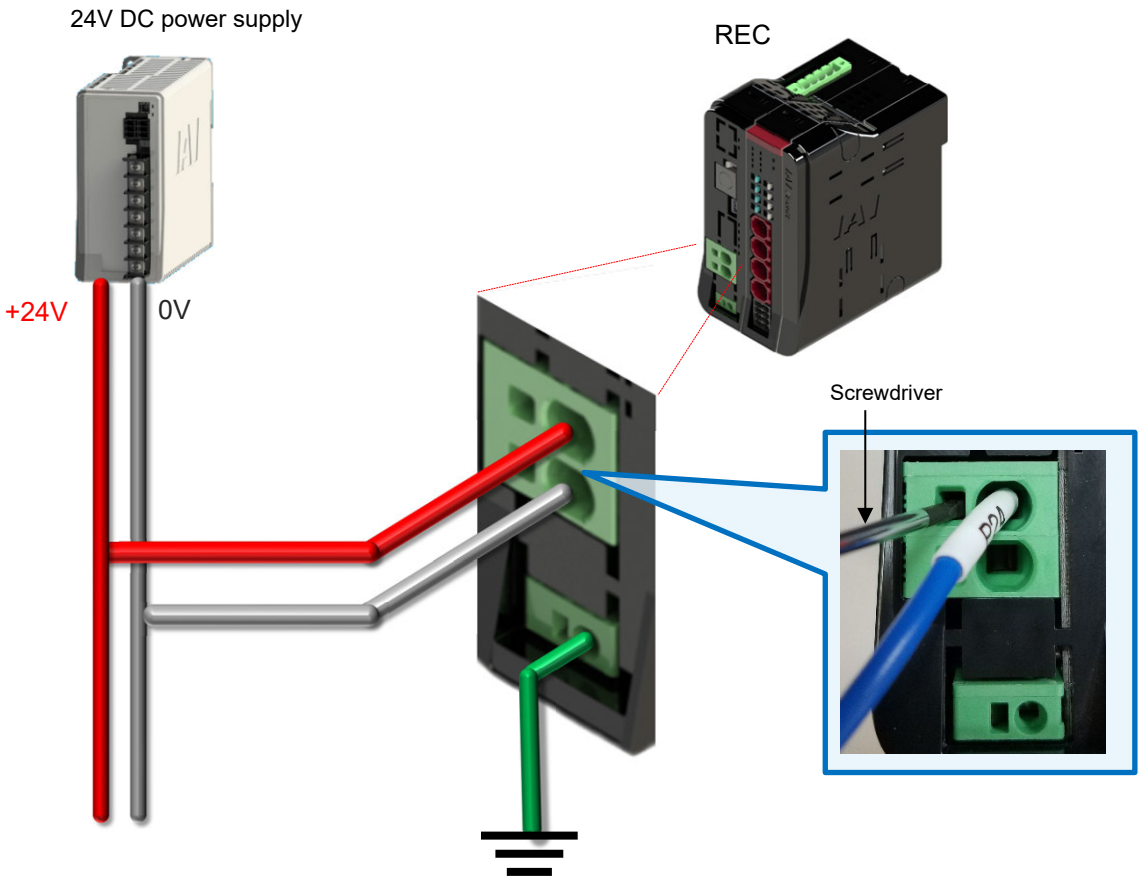




Front Rear

# 4.3 Wiring Method

## 4.3.1 Power Supply Wiring to REC System

To supply power to the REC system, power supply wiring to the EC gateway unit is required.
Here is an example of wiring for the EC gateway unit to IAI 24V DC power supply unit.
Have a wiring work following the layout below.



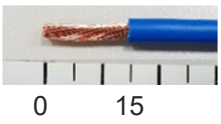

**[Wiring Method to Power Connector]**

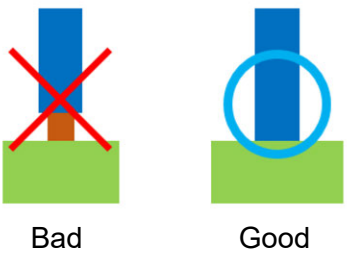
(1) Refer to the table below for the wire diameter for each cable.

(2) The stripped length on a cable should be 15mm.

(3) Insert the wire all the way into the terminal port while pushing the flathead screwdriver into the hole next to the wire insertion port.

(4) Remove the screwdriver.



**[Electric Wire Diameter Used for EC Gateway Unit Power Supply Wiring]**

For the wires to be connected to the power connector, use the following applicable wires.

Compatible wire

| Connector | Signal name | Compatible wire diameter |
|---|---|---|
|  | 24V | AWG20 to 8 (Copper wire) |
| | 0V | AWG20 to 12 (Copper wire) |
|  | FG | AWG14 to 12 (Copper wire) |

* Use cables with their rated temperature on the isolation sheath at 60°C or higher.

The controller current consumption varies depending on the controller model and the motor type of the actuator to be connected. Refer to [2.3.1 24V DC Power Supply Capacity].

## Caution

Using a cable with diameter less than the applicable cable diameter or wiring distance too long may cause an error due to the voltage drop or may drop the actuator performance. In such a case, have the output voltage of the power supply adjusted to 24V for the controller supply voltage.

Reference: Shown below is a list of the recommended products when using a rod terminal (ferrule terminal) for power supply wiring.

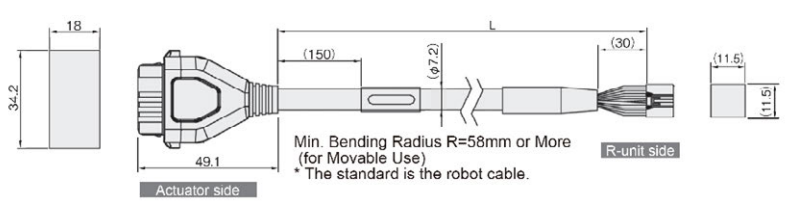
| Model Code for Rod Terminal (Ferrule Terminal) | AWG | Allowable Current (Reference) | Remarks |
|---|---|---|---|
| AI 0.75-8 GY | 18 | 10 | |
| AI 1-8 RD | 18 | 10 | |
| IA 1.5-8 BK | 16 | 13 | |
| AI 2.5-8 BU | 14 | 17 | |
| AI 4-18 GY | 12 | 23 | Cut at 3 mm from tip of ferrule |
| AI 6-18 YE | 10 | 31 | Cut at 3 mm from tip of ferrule |

Applicable crimping tool: CRIMPFOX 6 (supplied by Phoenix contact)

### 4.3.2 REC System Connection Cable

[1] Power Supply / I/O Cable (RCON-EC connection type)

Model **CB-REC-PWBIO□□□-RB**




3-1871946-6

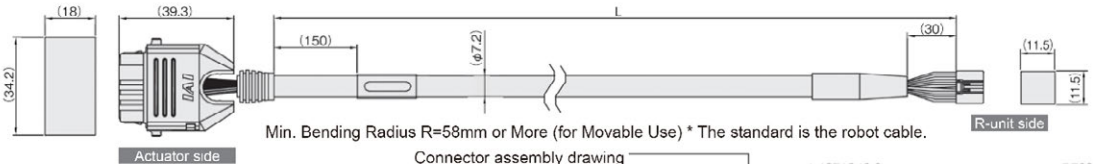
| Color | Signal name | Pin No |
|---|---|---|
| BK (AWG18) | 0V | A1 |
| RD (AWG18) | 24V(MP) | B1 |
| LB (AWG22) | 24V(CP) | A2 |
| OR (AWG26) | IN0 | B3 |
| YW (AWG26) | IN1 | B4 |
| GR (AWG22) | IN2 | B5 |
| YGR (AWG22) | SD+ | B6 |
| LGL (AWG22) | SD- | A6 |
| BL (AWG26) | OUT0 | A3 |
| PU (AWG26) | OUT1 | A4 |
| GL (AWG26) | OUT2 | A5 |
| BR (AWG26) | BKRLS | B2 |

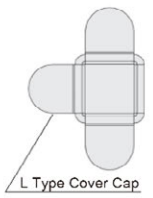
DF62C-13S-2.2C(18)

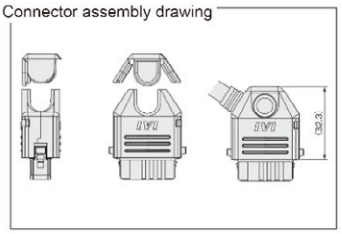
| Pin No | Signal name | Color |
|---|---|---|
| 2 | 0V | BK (AWG18) |
| 1 | 24V(MP) | RD (AWG18) |
| 12 | 24V(CP) | LB (AWG22) |
| 7 | OUT0 | OR (AWG26) |
| 8 | OUT1 | YW (AWG26) |
| 9 | OUT2 | GR (AWG26) |
| 6 | SD+ | YGR (AWG26) |
| 10 | SD- | LGL (AWG26) |
| 3 | IN0 | BL (AWG26) |
| 4 | IN1 | PU (AWG26) |
| 5 | IN2 | GL (AWG26) |
| 11 | BKRLS | BR (AWG26) |
| 13 | FG | GR (AWG26) |

[2] Power Supply / I/O Cable (RCON-EC connection type , 4-way Connector)

Model **CB-REC-PWBIO□□□-RB**



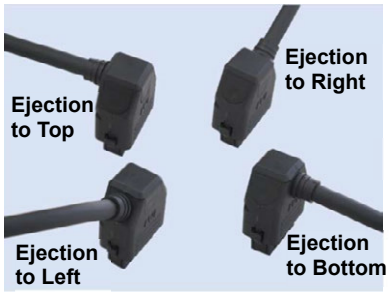




1-1871946-6

| Color | Signal name | Pin No. |
|---|---|---|
| BK (AWG18) | 0V | A1 |
| RD (AWG18) | 24V(MP) | B1 |
| LB (AWG22) | 24V(CP) | A2 |
| OR (AWG26) | IN0 | B3 |
| YW (AWG26) | IN1 | B4 |
| GR (AWG26) | IN2 | B5 |
| YGR (AWG26) | SD+ | B6 |
| LGL (AWG26) | SD- | A6 |
| BL (AWG26) | OUT0 | A3 |
| PU (AWG26) | OUT1 | A4 |
| GL (AWG26) | OUT2 | A5 |
| BR (AWG26) | BKRLS | B2 |

DF62C-13S-2C(18)

| Pin No | Signal name | Color |
|---|---|---|
| 2 | 0V | BK (AWG22) |
| 1 | 24V(MP) | RD (AWG22) |
| 12 | 24V(CP) | LB (AWG22) |
| 7 | OUT0 | OR (AWG26) |
| 8 | OUT1 | YW (AWG26) |
| 9 | OUT2 | GR (AWG26) |
| 6 | SD+ | YGR (AWG26) |
| 10 | SD- | LGL (AWG26) |
| 3 | IN0 | BL (AWG26) |
| 4 | IN1 | PU (AWG26) |
| 5 | IN2 | GL (AWG26) |
| 11 | BKRLS | BR (AWG26) |
| 13 | FG | GR (AWG26) |




* Free Choice of Eject Direction from 4 Ways

* The cable lengths should be 1m at shortest and 10m at longest. Order can be made in every 1m of length.

* Shown below is an example for the model types.

Cable Length 1m → CB-REC (2) -PWBIO010-RB

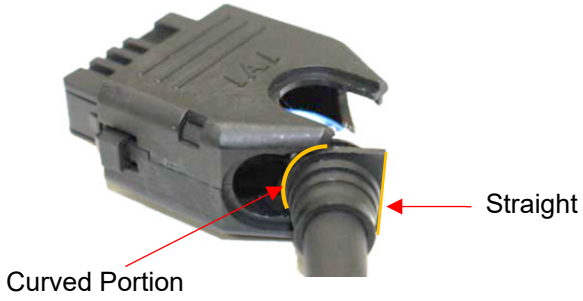
Cable Length 3m → CB-REC- (2) PWBIO030-RB

Cable Length 10m → CB-REC- (2) PWBIO100-RB

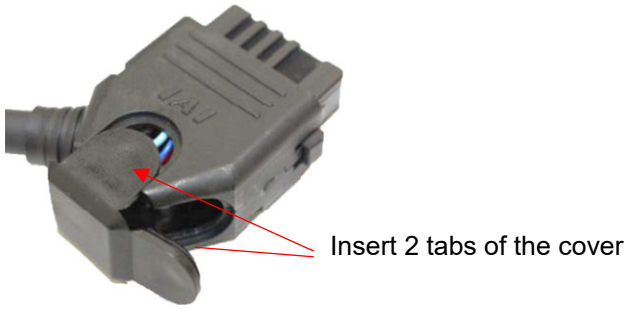
**[How to Build up 4-Way Connector Cable]**

Here states how to build up a 4-way connector cable.

(1) Insert the cable sliding from the curved edge on the semicylindrical shape along the grooves.



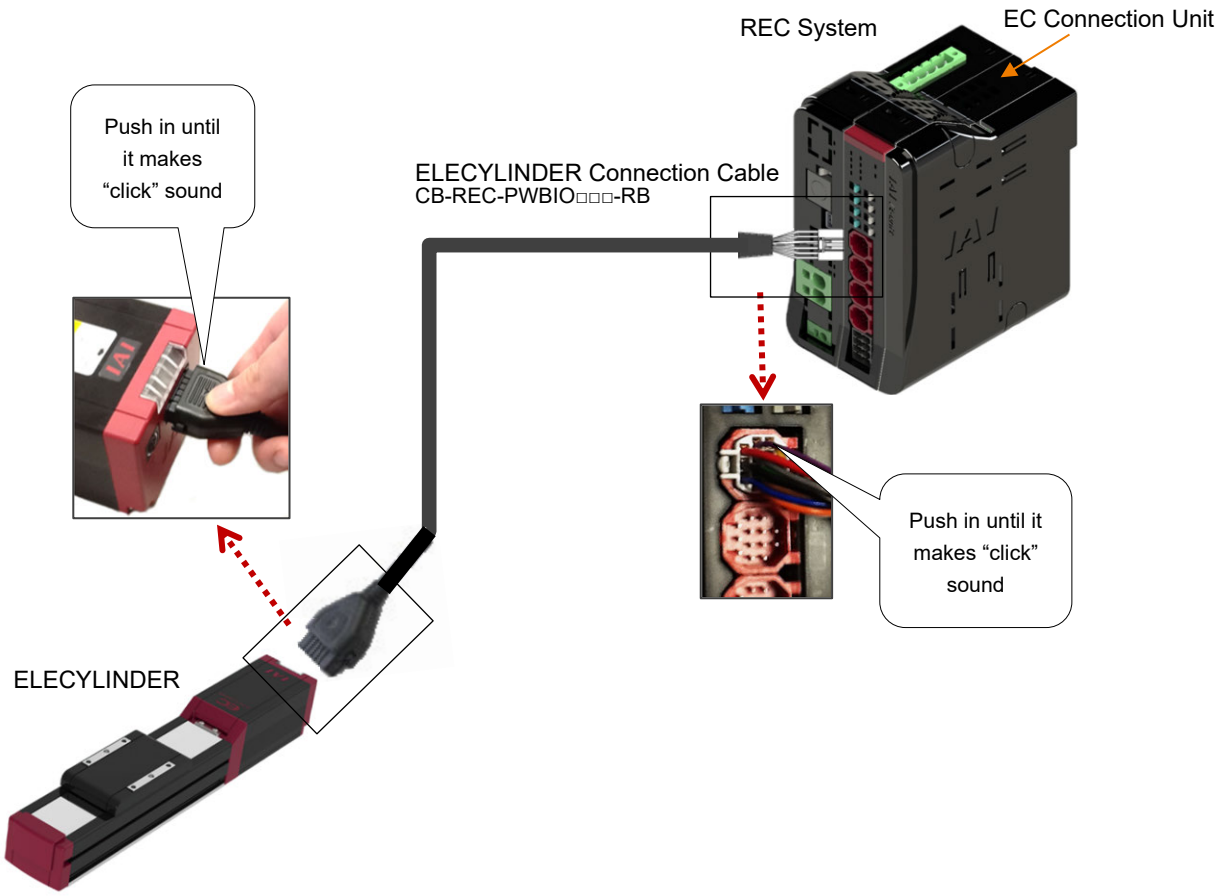

(2) Be sure to check that the cable is settled firmly and insert 2 tabs of the cover along the slits of socket.




(3) Then, push the last tab to the socket

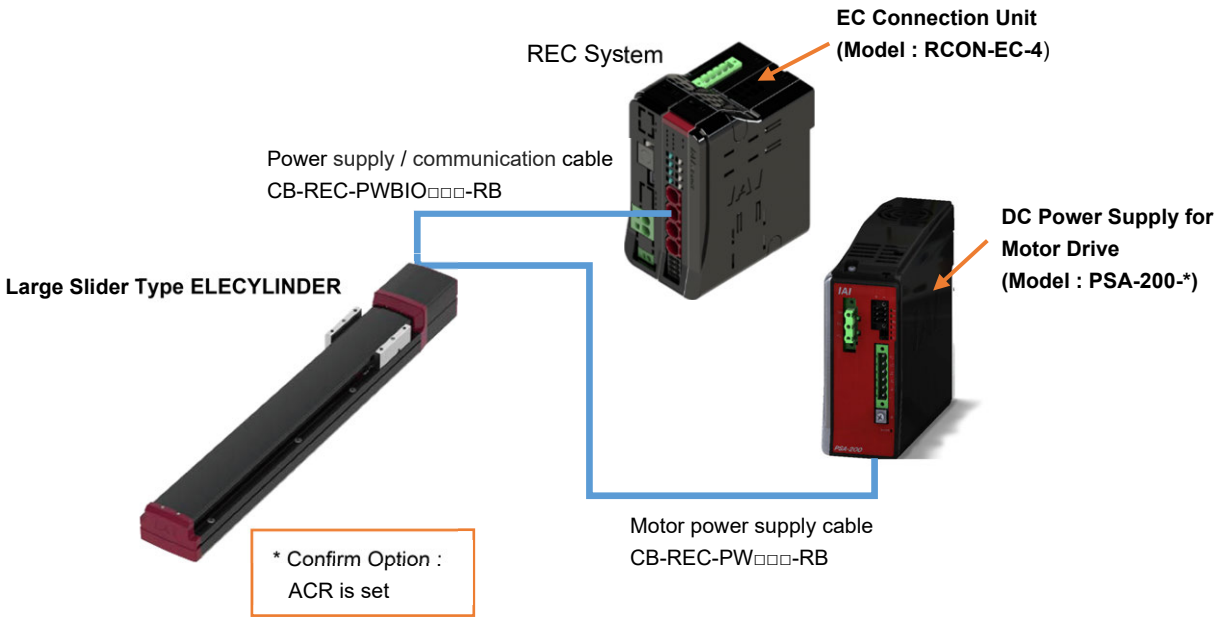
### 4.3.3 Wiring Between ELECYLINDER and EC Connection Unit

Refer to the example of connection below to insert the connectors to ELECYLINDER and the EC connection unit. Push the connectors inward till it makes "click" sound.
The axis number should be determined by the position of the connector on the EC connection unit.



### 4.3.4 Wiring Between Large Slider Type ELECYLINDER and EC Connection Unit

When the large slider type ELECYLINDER is to be connected to an EC connection unit, it is necessary to have a connectivity established with a DC power supply for motor drive as well as 24V power supply.
Shown below is an example of this specific wiring layout.

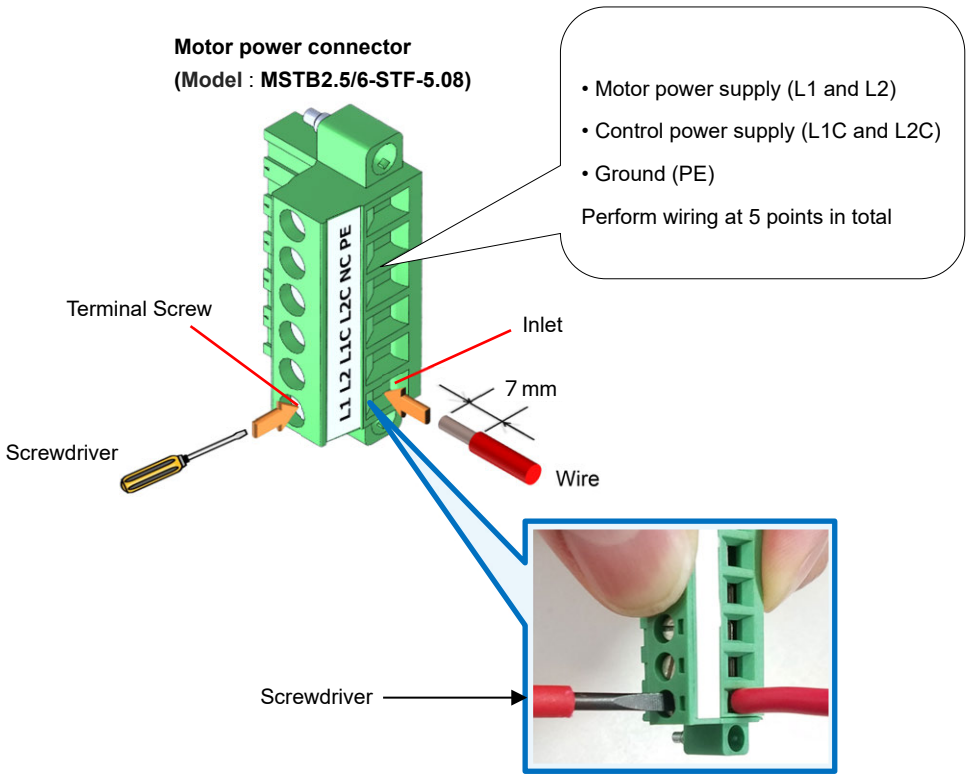



**Caution**

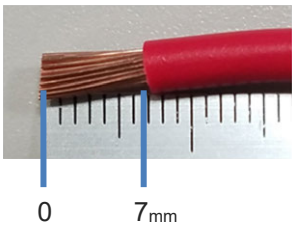
Make sure to confirm that option ACR (RCON-EC connection specifications) is selected for ELECYLINDER before connecting.
The actuator model code is described on the production label on the left side of the main unit.

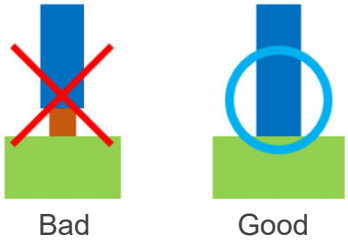
For the detailed specifications for the DC power supply for motor drive, refer to [3.2 Electrical Specifications] in ELECYLINDER Instruction Manual (ME3801).

[1] Wiring to DC Power Supply for Motor Drive




(1) Refer to the table below for the wire diameter for each cable.
(2) The stripped length on a cable should be 7mm.
(3) Insert wires to the inlet on the power supply connector. Inset the wires till they hit the end.
(4) Tighten up the terminal screw with using a slotted screwdriver.

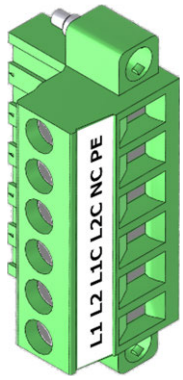


**[Wire Diameters in Cables Used for Power Supply Wiring on DC Power Supply for Motor Drive]**

For the wires to be connected to the power connector, use the following applicable wires.

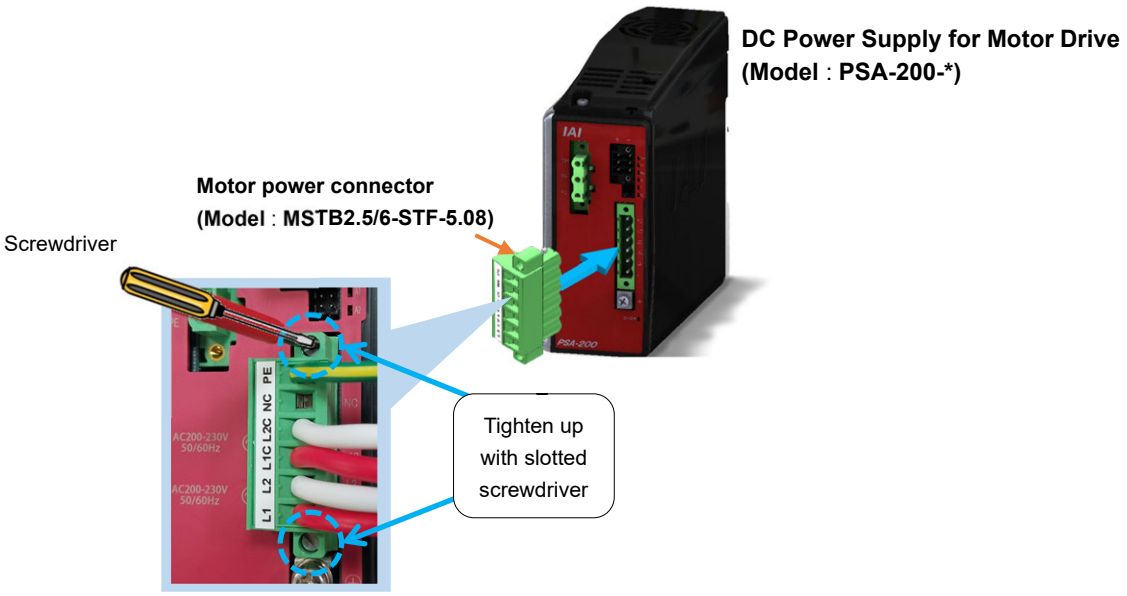
Compatible wire

| Connector | Terminal name | Compatible wire Diameter |
|---|---|---|
|  | PE | AWG14 (Copper wire) |
| | NC | N/A |
| | L2C | AWG18 (Copper wire) |
| | L1C | AWG18 (Copper wire) |
| | L2 | AWG14 (Copper wire) |
| | L1 | AWG14 (Copper wire) |



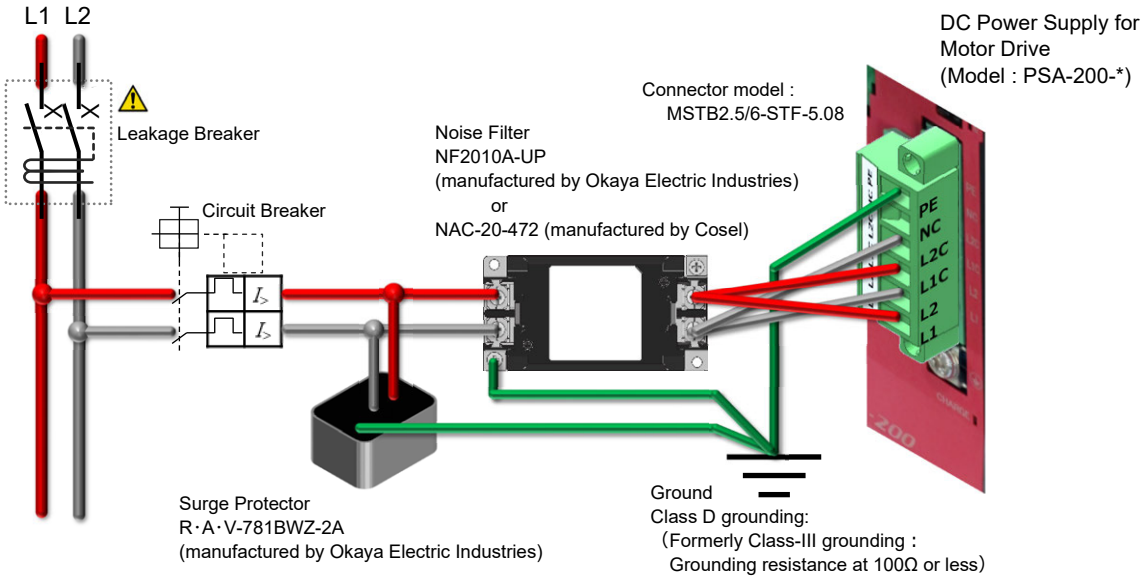
* Use cables with their rated temperature on the isolation sheath at 60°C or higher.

(5) Join the power supply connector to the DC power supply for motor drive and tighten up the fixing screws on the flanges of the connector by using a slotted screwdriver.



**[Installation of Noise Filter and Surge Protector on DC Power Supply for Motor Drive]**

For the wires to be connected to the power connector, use the following applicable wires.




## Caution

Leak current may vary depending on the motor capacity, cable length and ambient temperature.

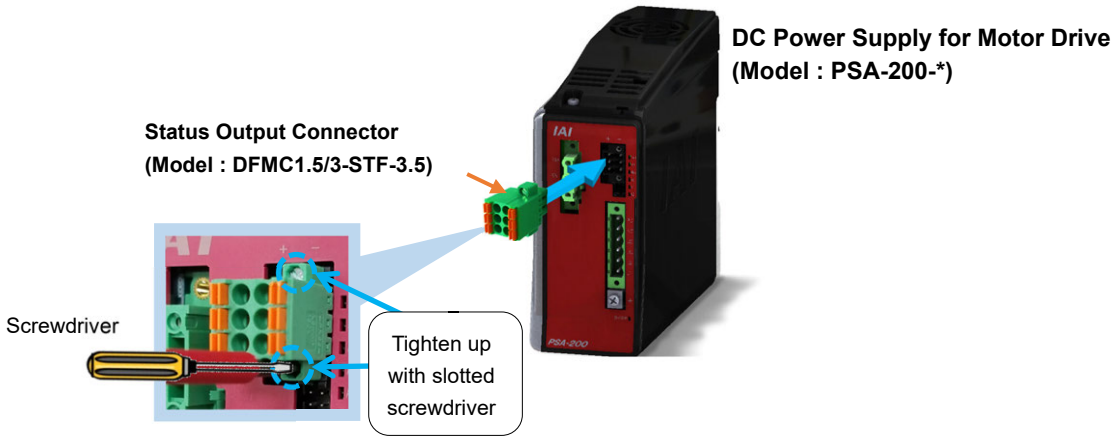
Therefore, it is required to measure leak current at the point of the leakage breaker installed when leakage protection is to be conducted.

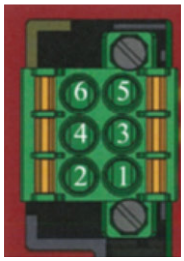
A clear purpose is necessary when selecting a leakage breaker such as to protect from fire or protection of personnel. For leakage breaker, use a high frequency applicable type (for inverter).

[2] Connectivity of Status Output Connector on DC Power Supply for Motor Drive

It should output the status of a DC power supply for motor drive. The output should be linked to LEDs for PWR, MP and ALM.

Refer below for how to attach the status output connector.




| Connector | Pin No. | Signal name | Description | Remarks |
|---|---|---|---|---|
|  | 1 | *ALM- | Alarm Contact Output | Photocoupler Insulation Open Collector Output |
| | 2 | *ALM+ | | |
| | 3 | MP- | Motor Power Supply Contact Output | |
| | 4 | MP+ | | |
| | 5 | PWR- | Control Power Supply Contact Output | |
| | 6 | PWR+ | | |

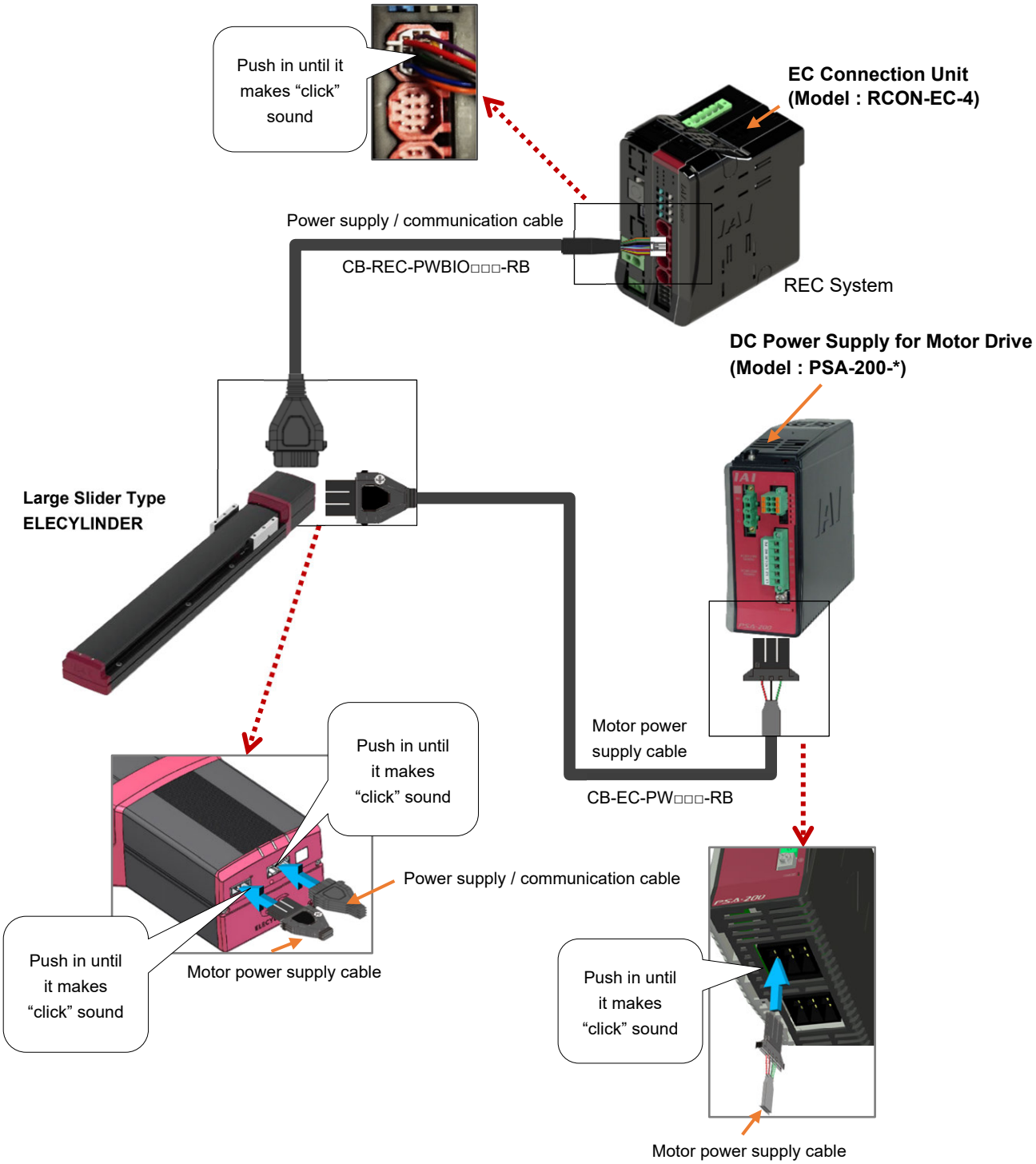
Compatible wire diameter

| Item | Specifications |
|---|---|
| Compatible wire | AWG24 to 16 |
| Max. Cable length | 10m |
| Strip length | 10.0mm |

* Use cables with their rated temperature on the isolation sheath at 60°C or higher.

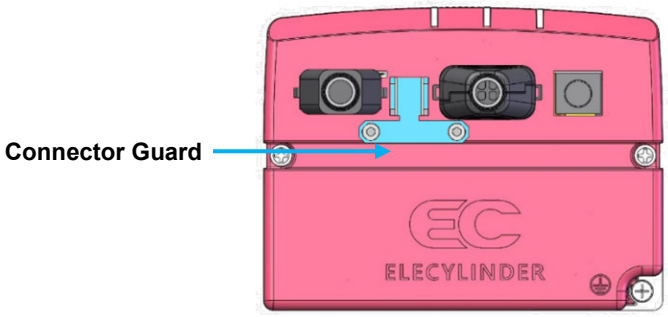
[3] Wiring between Actuator Unit and DC Power Supply for Motor Drive

Establish connection among the main unit of the large slider type ELECYLINDER, REC System and a DC power supply for motor drive.

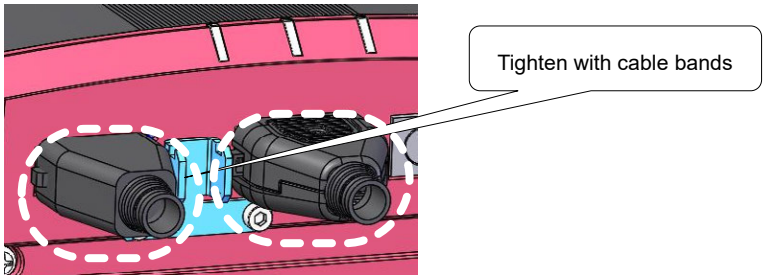


**[How to Apply Connector Guard]**

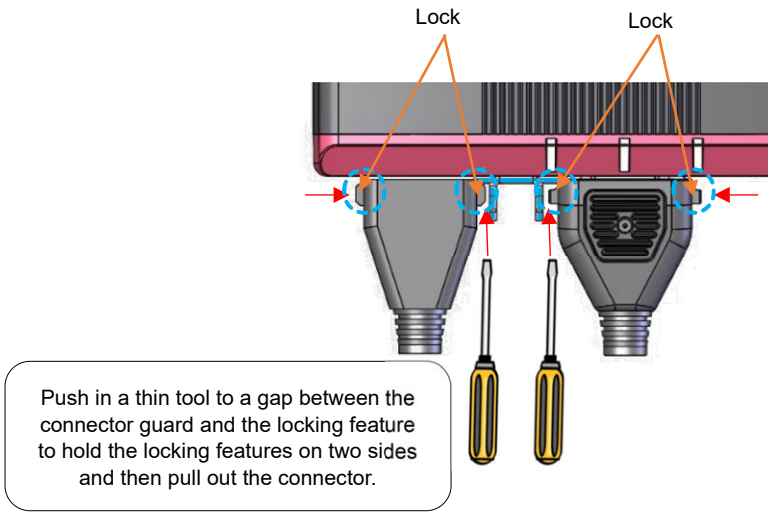
There is a connector guard equipped for the large slider type ELECYLINDER.
With the connector guard applied, a risk to accidentally pull off a cable can be avoided.




By tightening the matching parts of the connector guard and the connectors with a cable band, concern of contact error at the connectors caused by vibration on the cables can be reduced.




When pulling out the connector, insert a thin tool in a gap between the connector guard and the connector to hold the locking feature, hold the other side at the same time and then pull it out.

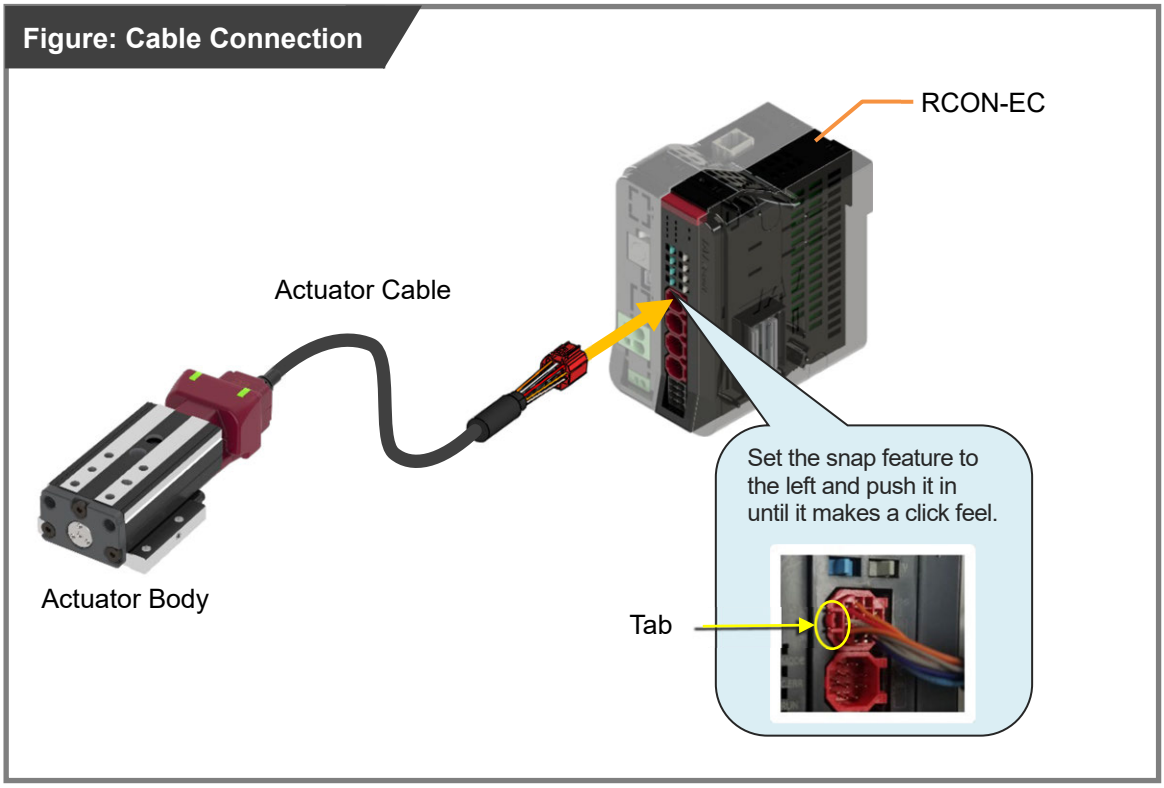


### 4.3.5 Wiring for Ultra Mini ELECYLINDER and EC Connection Unit

[1] When Connecting Directly to EC Connection Unit

Connect the actuator cable on the Ultra Mini ELECYLINDER to the EC connection unit (RCON-EC).

**Figure: Cable Connection**





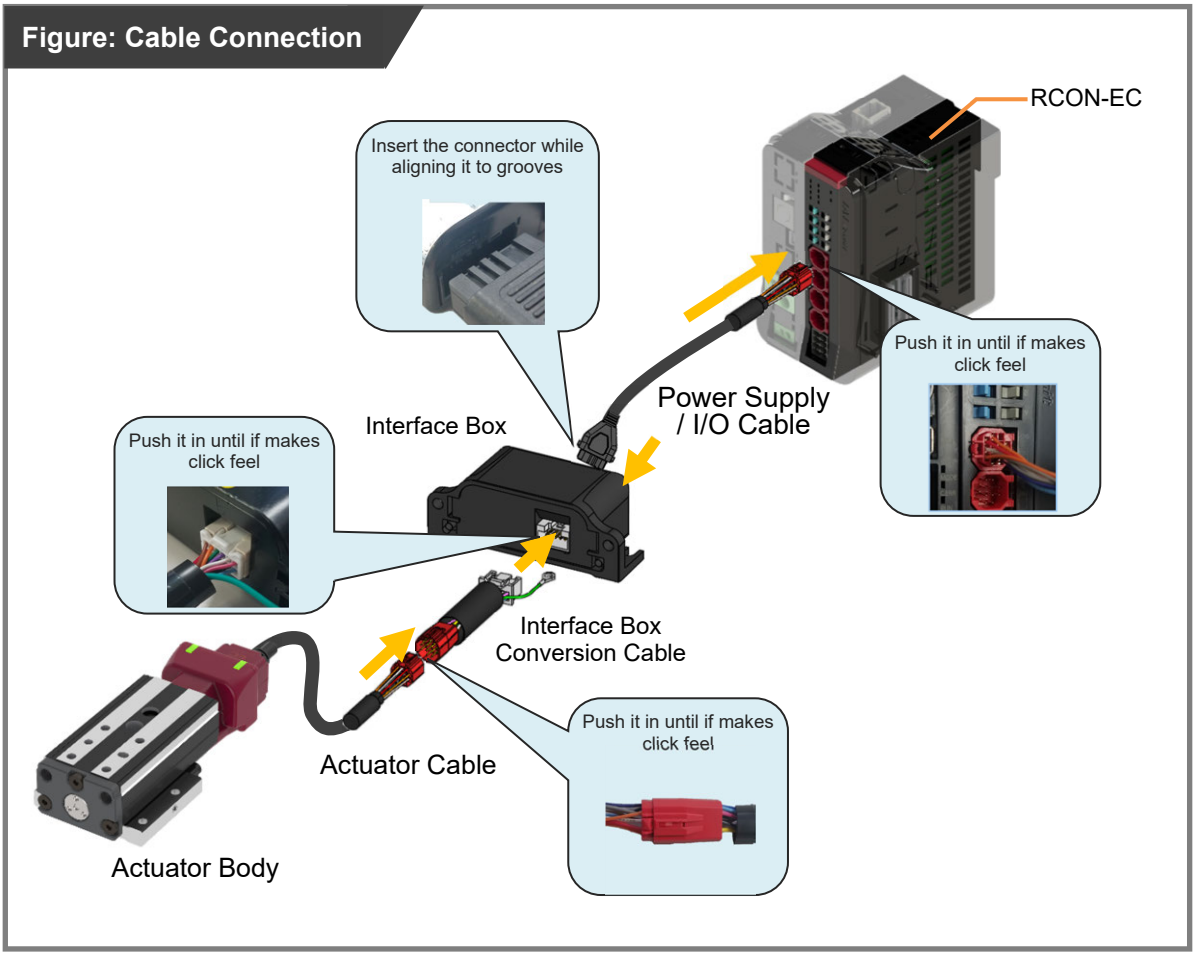

**Caution**

- There is an orientation for insertion to the connector.
  Align the orientation to the profile of the connector and push it in until it makes a click feel.

[2] When Connecting from Interface Box to RCON-EC

When connecting to an EC connection unit using an interface box, perform the wiring as shown in the figure below.

**Figure: Cable Connection**



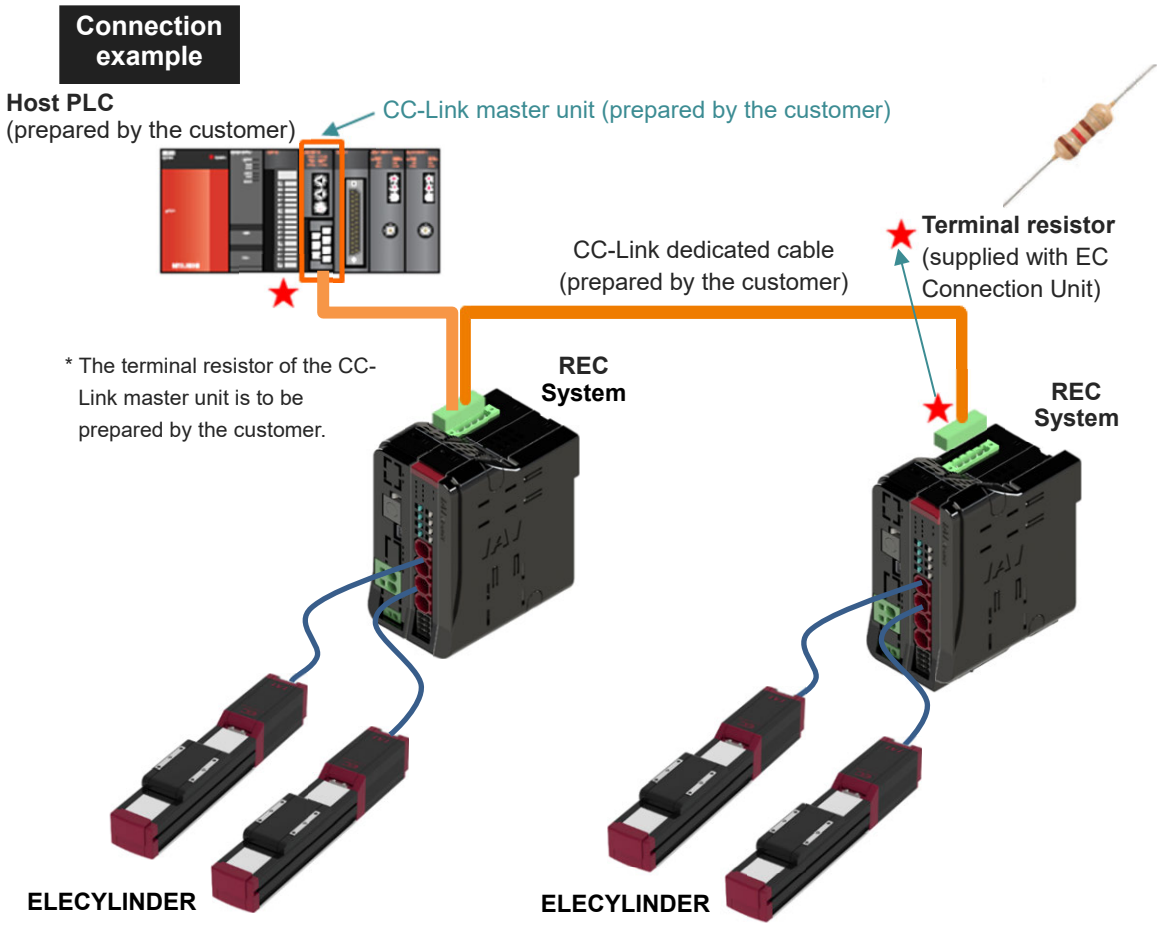

## Caution

- There is an orientation for insertion to the connector.
  Align the orientation to the profile of the connector and push it in until it makes a click feel.

### 4.3.6 Example of Wiring for Field Network

In this manual, shows an example to establish connection to the CC-Link master unit using a PLC manufactured by Mitsubishi Electric as the host PLC.

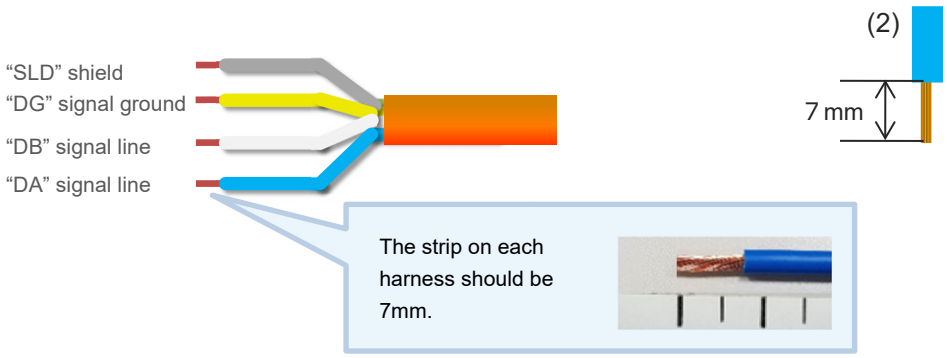
**[Connecting the Host PLC and Two REC Systems]**



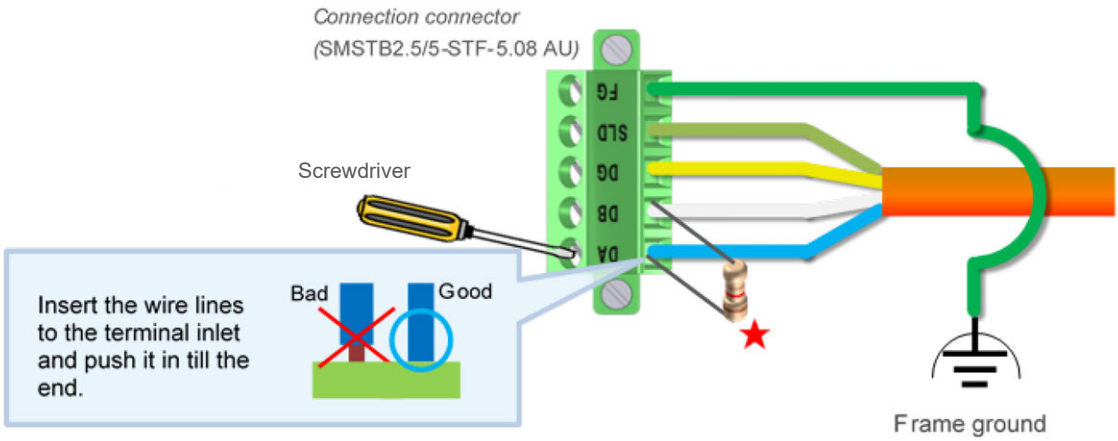
**[CC-Link Dedicated Cable and Connection Connector Wiring Method]**

(1) Prepare a CC-Link dedicated cable and remove the sheath.


(2) Remove the sheath on each harness in the CC-Link dedicated cable.



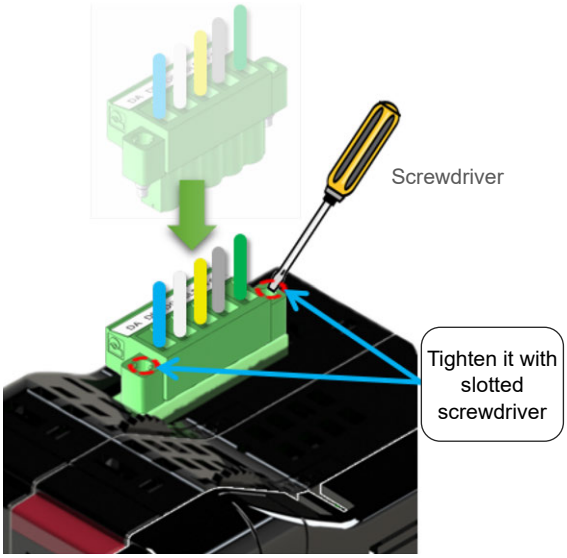

(3) Insert the stripped wiring in the shown in the figure below to the back of the connector and tighten with a flathead screwdriver.
Attach the controller attached terminal resistor between the connectors DA and DB at the network terminal end only. (★ in "Connection image" above)




## Point !

- The terminal resistor to be used may differ depending on the CC-Link dedicated cable type.
  Cable FANC-SBH (CC-Link dedicated high-performance cable): Terminal resistor: 130Ω
  Cable FANC-SB (CC-Link dedicated cable): Terminal resistor: 110Ω

(4) Have the connector wired in (3) put to the connector allocated on the CC-Link module on the main unit of REC, push the connector till the end, and then tighten it with a slotted screwdriver.





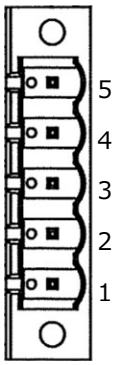

## Caution

- Conduct the CC-Link wiring on the PLC side following the instruction for the PLC and master unit to be used.

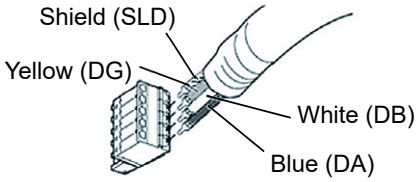
### 4.3.7 Each Field Network Wiring

For details of the connection method, follow the instruction manuals of the master unit of each field network and the PLC configured.

**[CC-Link]**

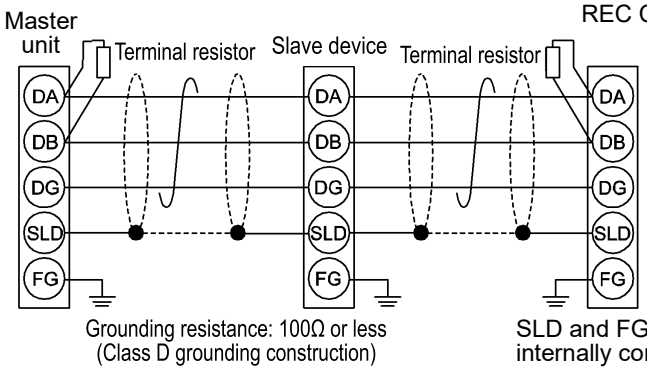



Controller side
Connector top view




| Connector name | CC-Link cable connector | Remarks |
|---|---|---|
| Cable side | MSTB2.5/5-STF-5.08 AU (Phoenix Contact) | Standard accessories |
| Controller side | MSTB2.5/5-GF-5.08 AU (Phoenix Contact) | |

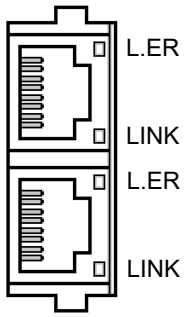
| Pin No. | Signal name (color scheme) | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | DA (blue) | Communication line A | CC-Link dedicated cable |
| 2 | DB (white) | Communication line B | |
| 3 | DG (yellow) | Digital ground | |
| 4 | SLD | Connects the shield of shielded cables<br>(5-pin FG and control power connector 1-pin FG connected internally) | |
| 5 | FG | Frame ground<br>(4-pin SLD and control power connector 1-pin FG connected internally) | |




REC CC-Link Specification

At the terminal, a terminal resistor needs to be connected.
The terminal resistor varies depending on the type of CC-Link dedicated cable.
· Cable FANC-SBH: 130Ω 1/2W
(CC-Link dedicated high performance cable)
· Cable FANC-SB: 110Ω 1/2W
(CC-Link dedicated cable)

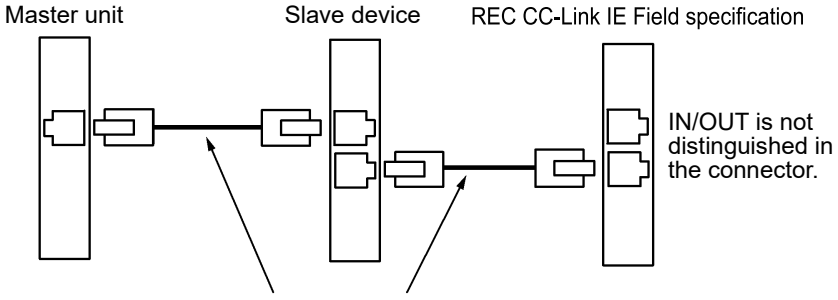
**[CC-Link IE Field]**




Controller side
Connector top view

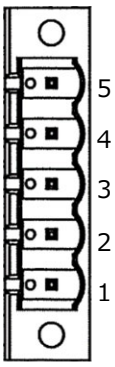
| Connector name | CC-Link IE Field cable connector | Remarks |
|---|---|---|
| Cable side | Ethernet ANSI/TIA/EIA-568-B Category 5e or higher shielded 8P8C modular plug (RJ45) | To be prepared by the customer |
| Controller side | Ethernet ANSI/TIA/EIA-568-B Category 5e or higher shielded 8P8C modular jack (RJ45) | |

| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | TD0+ | Data 0+ | For the Ethernet cable, use a straight STP cable of Category 5e or higher. |
| 2 | TD0- | Data 0- | |
| 3 | RD1+ | Data 1+ | |
| 4 | RD2+ | Data 2+ | |
| 5 | RD2- | Data 2- | |
| 6 | TP1- | Data 1- | |
| 7 | TP3+ | Data 3+ | |
| 8 | TP3- | Data 3- | |

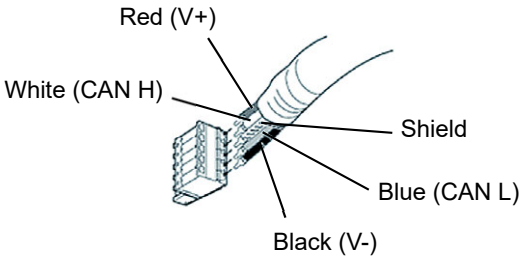



Ethernet straight cable, Category 5e or higher
Aluminum tape and braided double cutoff shielded cable recommended
(Note) Terminal resistor is not required.

**[DeviceNet]**

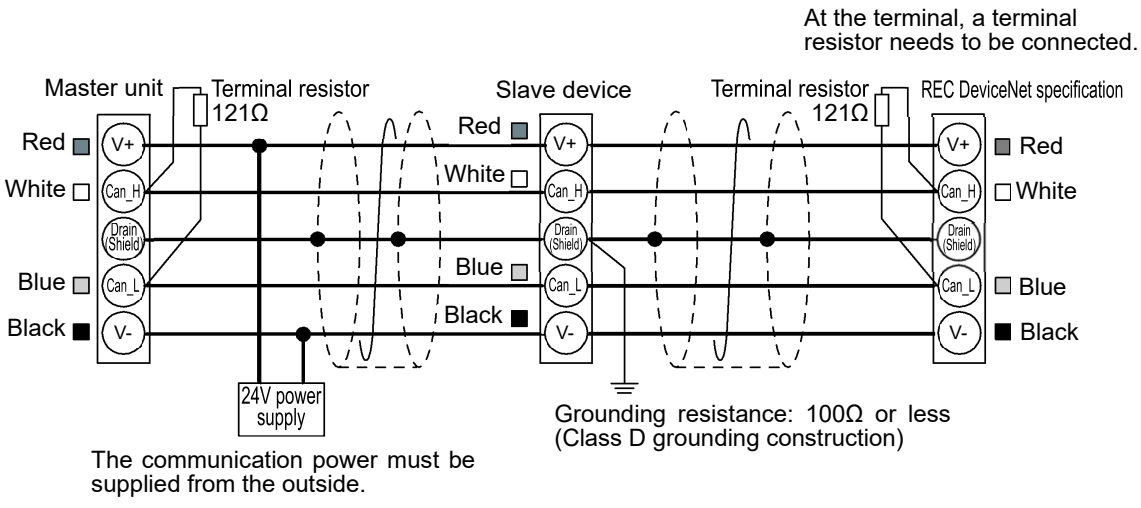



Controller side
Connector top view



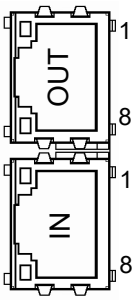

| Connector name | DeviceNet cable connector | Remarks |
|---|---|---|
| Cable side | MSTB2.5/5-STF-5.08 AU M (Phoenix Contact) | Standard accessories |
| Controller side | MSTB2.5/5-GF-5.08 AU (Phoenix Contact) | |

| Pin No. | Signal name (color scheme) | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | V- (black) | Power supply cable - side | DeviceNet dedicated cable |
| 2 | CAN L (blue) | Signal data low side | |
| 3 | - | Digital ground | |
| 4 | CAN H (white) | Signal data high side | |
| 5 | V+ (red) | Power supply cable + side | |




The communication power must be supplied from the outside.

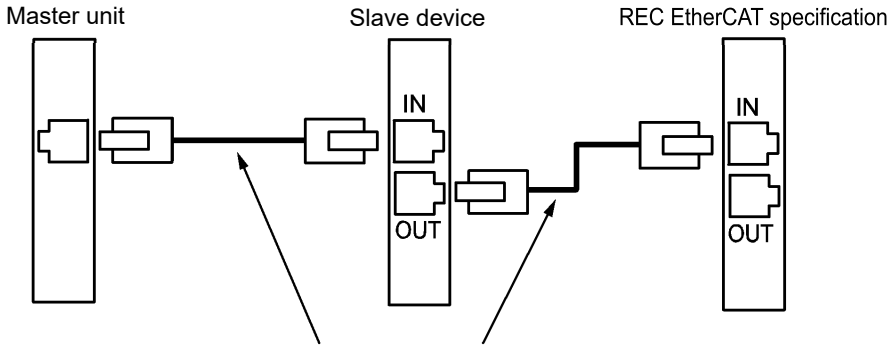
**[EtherCAT]**




Controller side
Connector top view

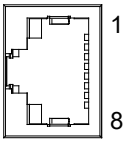
| Connector name | EtherCAT cable connector | Remarks |
|---|---|---|
| Cable side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular plug (RJ45) | To be prepared by the customer |
| Controller side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular jack (RJ45) | |

| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | TD+ | Transmit data + | For the Ethernet cable, use a straight STP cable of Category 5 or higher. |
| 2 | TD- | Transmit data - | |
| 3 | RD+ | Receive data + | |
| 4 | - | Not used | |
| 5 | - | Not used | |
| 6 | RD- | Receive data - | |
| 7 | - | Not used | |
| 8 | - | Not used | |




Ethernet straight cable, Category 5 or higher
Aluminum tape and braided double cutoff shielded cable recommended
(Note) Terminal resistor is not required.

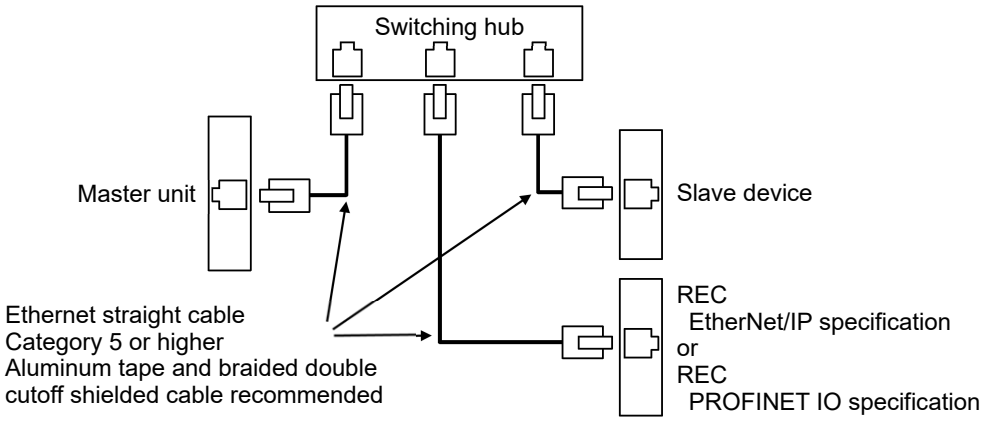
### [EtherNet/IP] [PROFINET IO]



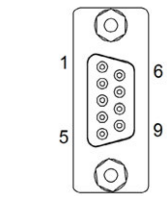

Controller side
Connector top view

| Connector name | EtherNet/IP, PROFINET IO cable connector | Remarks |
|---|---|---|
| Cable side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular plug (RJ45) | To be prepared by the customer |
| Controller side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular jack (RJ45) | |

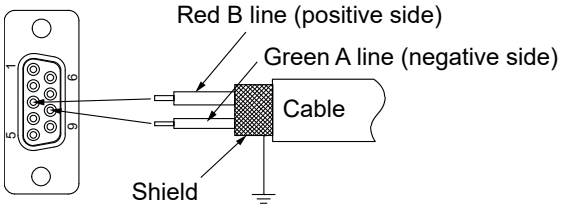
| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | TD+ | Transmit data + | For the Ethernet cable, use a straight STP cable of Category 5 or higher. |
| 2 | TD- | Transmit data - | |
| 3 | RD+ | Receive data + | |
| 4 | - | Not used | |
| 5 | - | Not used | |
| 6 | RD- | Receive data - | |
| 7 | - | Not used | |
| 8 | - | Not used | |



**[PROFIBUS-DP]**

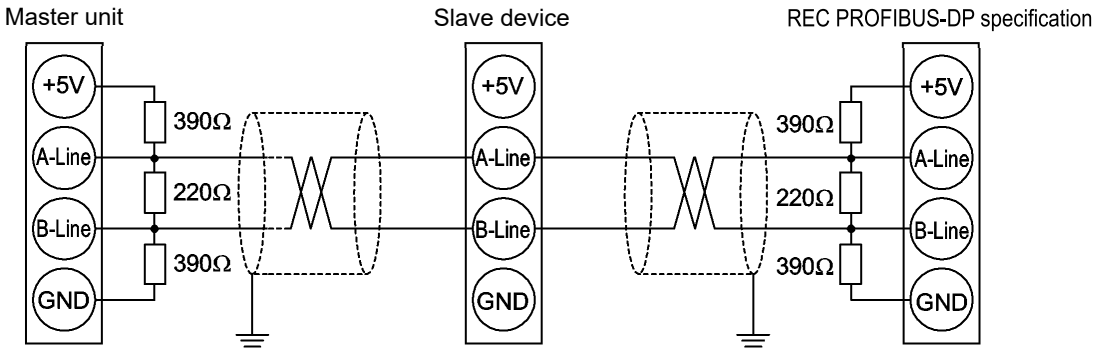



Controller side
Connector top view




| Connector name | PROFIBUS-DP cable connector | Remarks |
|---|---|---|
| Cable side | 9-pin D sub connector (male) | To be prepared by the customer |
| Controller side | 9-pin D sub connector (female) | |

| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | NC | Not connected | PROFIBUS-DP dedicated cable (Type A: EN5017) |
| 2 | NC | Not connected | |
| 3 | B-Line | Communication line B (RS485) | |
| 4 | RTS | Transmission request | |
| 5 | GND | Signal GND (insulation) | |
| 6 | +5V | +5V output (isolated) | |
| 7 | NC | Not connected | |
| 8 | A-Line | Communication line A (RS485) | |
| 9 | NC | Not connected | |



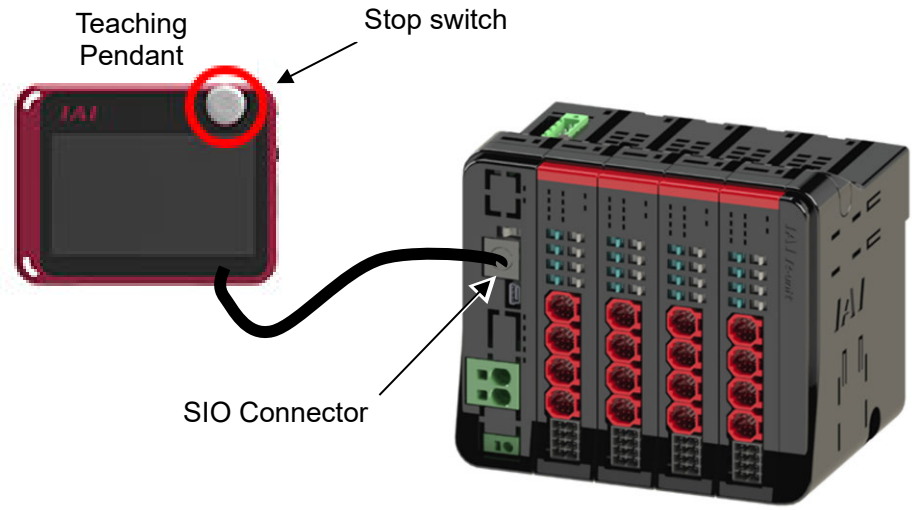

Grounding resistance: 100Ω or less
(Class D grounding construction)

### 4.3.8 Stop Circuit / Drive Cutoff Circuit

**[Stop Circuit]**

There are two ways as shown below to make a compulsory stop for ELECYLINDER in REC System.

(1) To stop all the axes of ELECYLINDER connected at once by pressing and holding the stop switch on a teaching pendant (wired connection).




(2) To stop ELECYLINDER by cutting off the motor power source with an external circuit equipped with a contact such as a relay on a circuit line between MPI* and MPO* terminals on the drive cutoff connector.

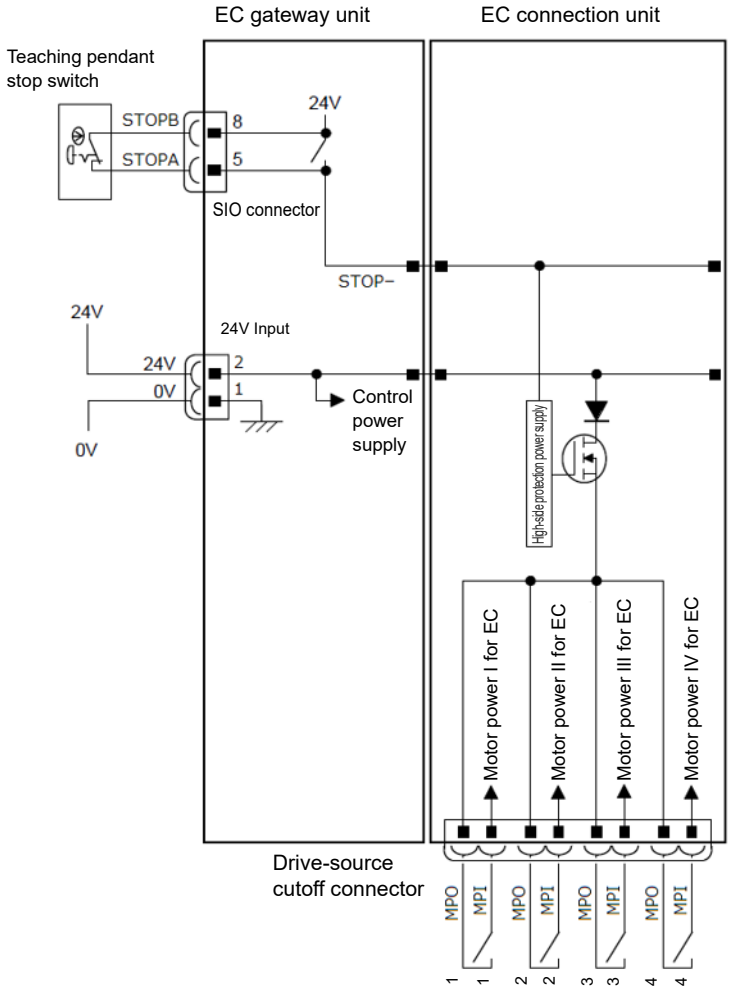
**Warning**

- The teaching pendant can stop all the actuators connected to REC system, however, it cannot stop the system.

**[Example of Wiring for Stop and Drive Cutoff]**

Shown below is a circuit related to the drive cutoff in REC System. Although REC System is supplied with 24V power from the EC gateway unit, the circuit related to the drive cutoff is on the EC connection unit side.

- Each EC connection unit possesses a drive cutoff circuit by a semiconductor to four axes all together and cuts off the motor power supply with an emergency stop switch on a teaching pendant.
- There is an interface (Drive Cutoff Connector: MPI/MPO) on each axis available for external drive cutoff equipped on each EC connection unit.
- The drive cutoff circuit by a semiconductor possesses a future for overcurrent detection and in-rush current control.



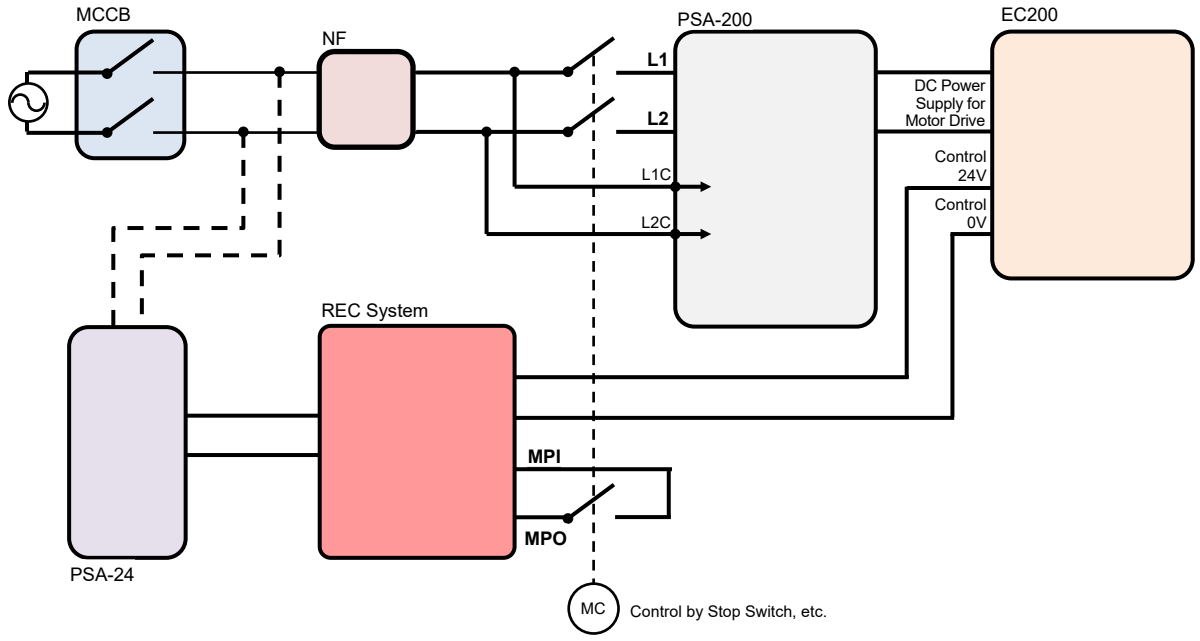

Wiring diagram: Stop and drive-source cutoff

Note 1 When there is nothing to be connected to the SIO connector, STOPA and STOPB should make short-circuit inside the controller.

**[Drive Cutoff for Large Slider Type ELECYLINDER]**

Shown below is a circuit diagram related to the drive cutoff when the large slider type ELECYLINDER is connected to the REC system.

Releasing between MPO and MPI on an EC connection unit should stop the actuator while the power to the motor kept supplied. When the drive source is to be cut off, it is necessary to cut off the AC power supply to PSA-200.




Schematic Diagram for Drive Cutoff of Large Slider Type ELECYLINDER

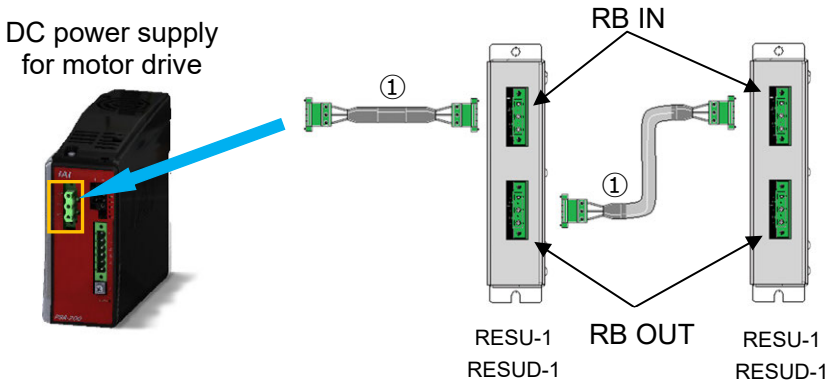
## Caution

- Have the circuit construction built to cut off between MPO and MPI on an EC connection unit and the drive power source on PSA-200 at the same time.
- In case of having an external cutoff on the drive power source on PSA-200, L1/L2 terminals should be connected with e.g. a contactor.

### 4.3.9 Regenerative Resistor Unit (Option)

The regenerative resistor unit is to be used for the drive power supply (DC power supply for motor drive) for the 200V type ELECYLINDER.
Connect the regenerative resistor unit as shown in the figure below with using the cable enclosed in the regenerative resistor unit.
(1) 1 unit connected: Connect RESU(D)-1 using enclosed cable (CB-ST-REU)
(2) 2 units or more connected: Connect RESU(D)-1 using enclosed cable (CB-ST-REU)

●Wiring image




●Specifications of Regenerative Resistor Unit

**[Model, Accessories]**

| Item | | | Accessories |
|---|---|---|---|
| Model | Screw Attachment Small Type | RESU-1 | Regenerative Resistor Unit Connection Cable (Model number: CB-ST-REU010) 1m enclosed |
| | DIN Rail Fixing Small Type | RESUD-1 | |

**[Specifications of Regenerative Resistor Unit Main Unit]**

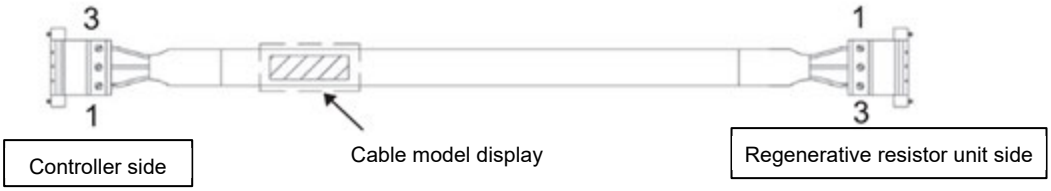
| | RESU-1, RESU-2 | RESUD-1, RESUD-2 |
|---|---|---|
| Unit Dimensions [mm] | W34 × H154 × D106.5 | W34 × H158 × D115 |
| Unit Mass | About 0.4kg | |
| Built-in Regenerative Resistance Value | 235Ω 80W | |

**[Connector, Cable]**

| Item | Description, Model | |
|---|---|---|
| Connector name | External Regenerative Resistor Connector (RB) | |
| Model | Controller side: GIC 2.5/3-GF-7.62 | Cable side: GIF 2.5/3-STF-7.62 |

| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | RB+ | Regenerative Resistor + (Motor drive DC voltage) | Dedicated cable enclosed to regenerative resistor unit |
| 2 | RB- | Regenerative Resistor - | |
| 3 | PE | Grounding Terminal | |

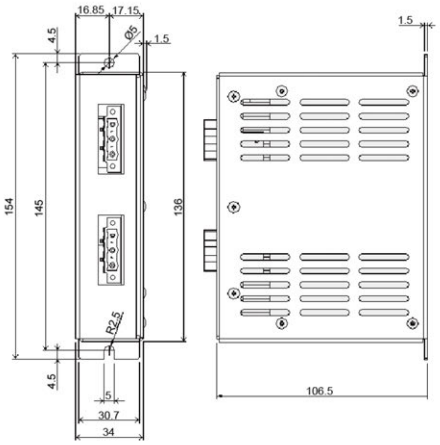
Regenerative resistor unit connection cable (CB-ST-REU□□□) □□□: Cable length
Example) 010 = 1m



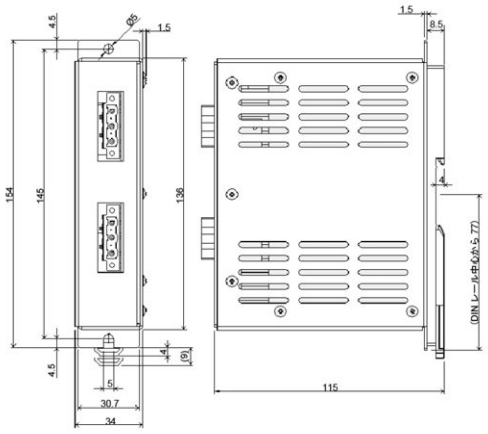

| Wiring | Color | Signal | NO. |
|---|---|---|---|
| KIV 1.0mm$^2$ (AWG17) | Light Blue | RB+ | 1 |
| | Brown | RB- | 2 |
| | Green/Yellow | PE | 3 |

| NO. | Signal | Color | Wiring |
|---|---|---|---|
| 1 | RB+ | Light Blue | KIV 1.0mm$^2$ (AWG17) |
| 2 | RB- | Brown | |
| 3 | PE | Green/Yellow | |

**[External View]**



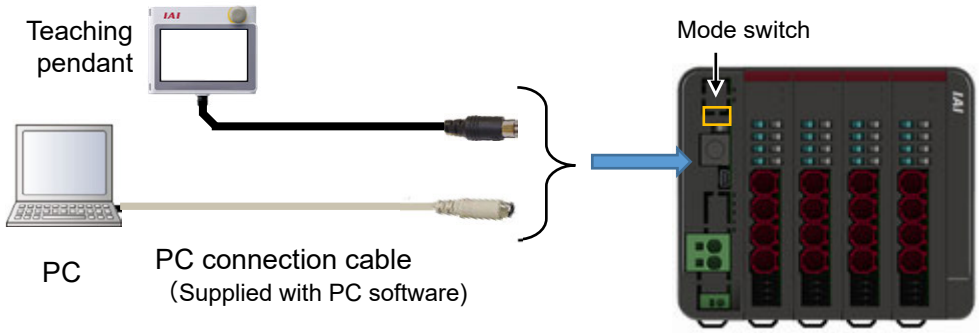

RESU-1 (Screw Attachment Small Type)




RESUD-1 (DIN Rail Fixing Small Type)

### 4.3.10 Connection the Teaching Connector

Connect a teaching pendant such as the PC software.




●Teaching connector specification

| Teaching connector | Model | Remarks |
|---|---|---|
| Controller side | TCS7587-0121077 | Supplied by Hosiden Corporation |
| Cable side | mini DIN 8 pin | |

Teaching connector


Mode switch


Refer to [3.1.4 (3) SIO Connector] for the pin assignment.

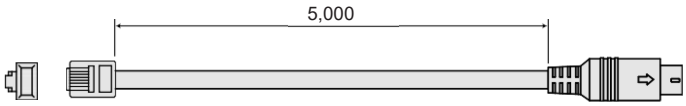
**Caution**

- Set “Operation Mode Setting Switch” to “MANU” side when a teaching tool is connected.
- Turn the power OFF before disconnecting a teaching tool.
- USB connector and teaching connector cannot be used at the same time. Teaching connector is prioritized.

●Cable Enclosed to PC Teaching Software, Conversion unit

(1) External device communication cable (CB-RCA-SIO050)　5m cable

* It is enclosed to IA-OS-C, RCM-101-MW and RCM-101-USB.




CB-RCA-SIO050 (Cable length 5m)

| Color | Signal | No. |
|---|---|---|
| Brown | 5V | 1 |
| Yellow | SGA | 2 |
| Red | GND | 3 |
| Orange | SGB | 4 |
| Blue | GND | 5 |
| Green | 5V | 6 |

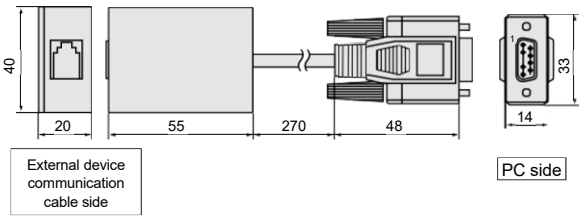
Short-Circuit Wire UL1007AWG28 (Black)

Shield not connected

| No. | Signal | Color |
|---|---|---|
| 1 | SGA | Yellow |
| 2 | SGB | Orange |
| 3 | 5V | Brown/Green |
| 4 | EMGS | - |
| 5 | EMGA | Black |
| 6 | 24V | - |
| 7 | GND | Red/Blue |
| 8 | EMGB | Black |
| FG | | Shield |

(2) RS-485 conversion adapter (RCB-CV-MW)

* It is enclosed to RCM-101-MW.

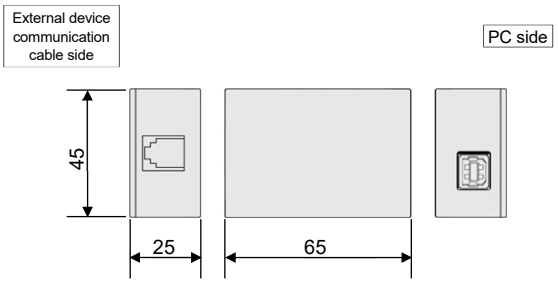



| Signal | No. |
|---|---|
| CD(DCD) | 1 |
| SD(TXD) | 2 |
| RD(RXD) | 3 |
| ER(DTR) | 4 |
| SG(GND) | 5 |
| DR(DSR) | 6 |
| RS(RTS) | 7 |
| CS(CTS) | 8 |
| RI | 9 |

RD: Receive data
SD: Transmit data
SG: Signal ground
CD: Signal Quality Detection
CTS: Available for Transfer

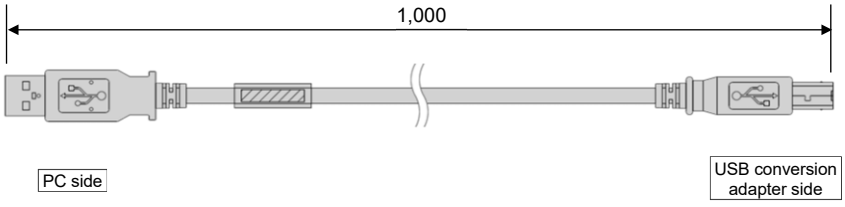
(3) USB conversion adapter (RCB-CV-USB)

* It is enclosed to IA-OS-C and RCM-101-USB.



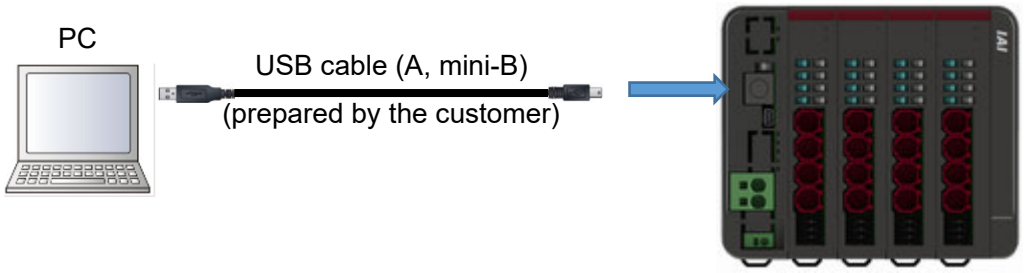

(4) USB cable (CB-SEL-USB010)

* It is enclosed to IA-OS-C and RCM-101-USB.



### 4.3.11 Connection the USB Connector

It is available to use the PC software by connecting a PC to a USB port.




●USB connection connector specification

| | | |
|---|---|---|
| **Connector to be Used** | USB mini-B | 51387-0530 (Molex) |
| **Connector name** | USB | |
| **Communication Specification** | Conformed to USB 2.0 | 480M (High Speed) /12Mbps (Full Speed) |
| **Maximum connection distance** | 5m | |
| **Connected unit** | PC (USB port) | |
| **Connection cable** | USB cable | Controller side：mini-B |

USB connection connector


Refer to [3.1.4 (4) USB connector] for the pin assignment.

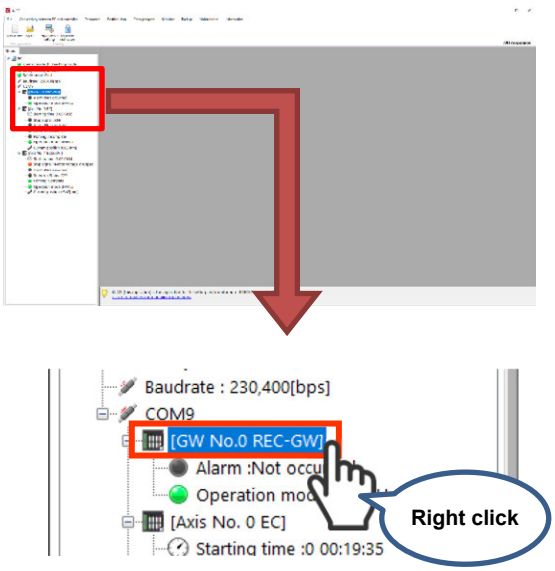
# 4.4 Gateway Parameter Setting

Each feature of REC System should be set up using the IA-OS. The screen design differs slightly depending on the OS of the PC.

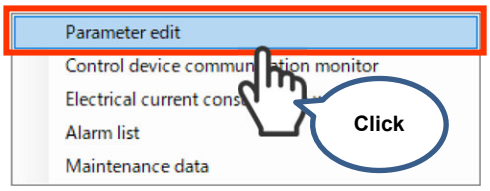
* Refer to [Quick Start Guide] for the settings of each network.
* Refer to [Appendix Gateway Parameter Setting Tool] for how to establish setting in the gateway parameter setting tool.

## 4.4.1 IA-OS Startup and Communication

1 Select Gateway Unit in the status bar in the left of the IA-OS window and right-click on it.




2 The right-click menu pops up.
Click Parameter edit.




Action

The user parameter edit window should come up.

### Caution

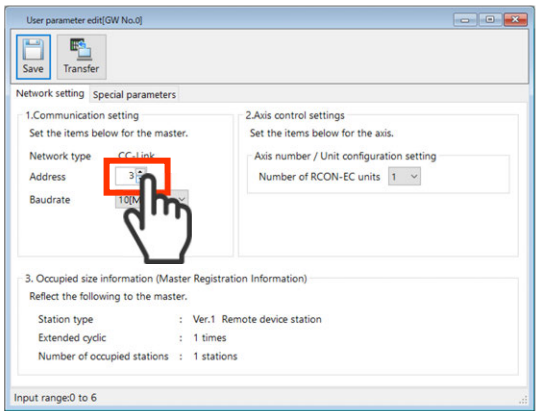
- Communication with ELECYLINDER connected to this system should not be established if the number of EC connection units in the REC system and the number of units set in this tool and transferred do not match with each other.
- Set and transfer the gateway parameters suitably according to the actual unit configuration and the number of connected units.

### 4.4.2 Parameter Edit in Gateway

1 When it is a parameter that is to be set in a numerical value, select "Setting Value".

Action

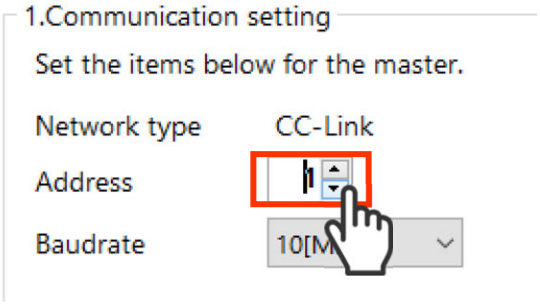
The cursor on the setting value flashes.




2 Input a number on the PC keyboard and press the Enter key.
The number can also be set with button operation if there is a spin box (small up and down buttons with triangle marks (▲/▼)).

Action

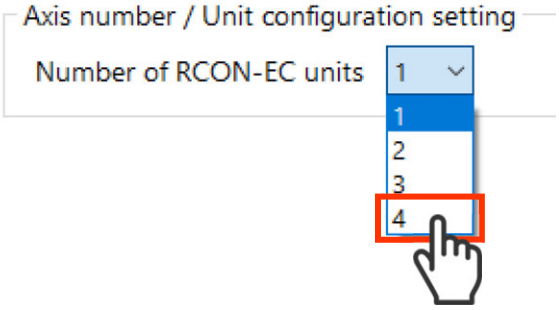
The parameter should be change.



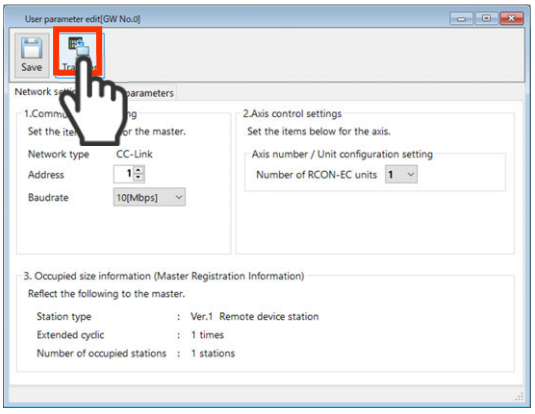

3 Select a setting if it is a parameter selected from the pulldown menu.

Action

The parameter should be change.

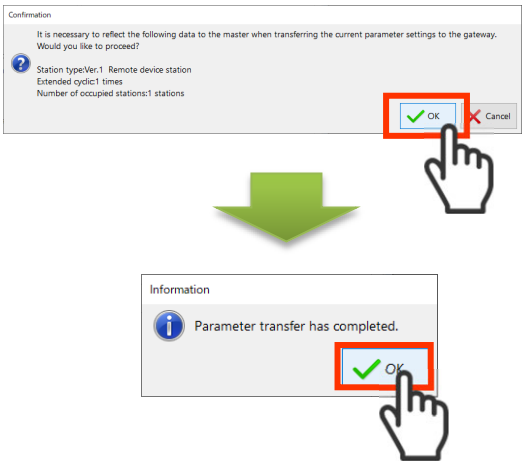



4 Once the parameter setting change is finished, click the Transfer button.

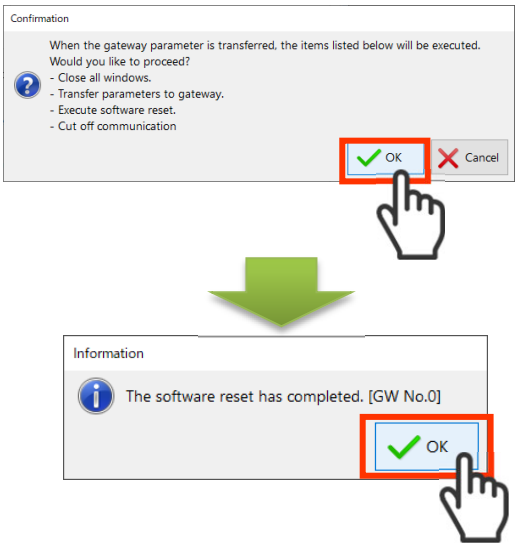


5 Follow the procedures below to transfer parameters.
Once the confirmation window for transfer to the controller appears, click OK.
Once the transfer is completed, click OK.

Note 1 The contents of display should differ depending on the type of field network to be used and detail of settings.




6 Click OK on the confirmation window, and the software reset should start.
Once the software reset is completed, click OK.



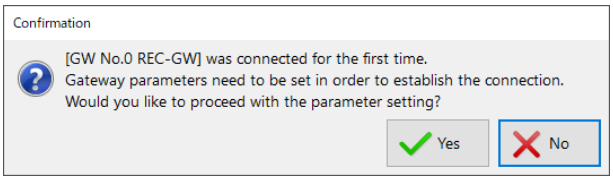

(*) For the details of each item for the gateway parameter, refer to [6.3 EC Gateway Parameter].

## Caution

- Changing parameters only should not enable the changes made.
- Conduct reboot of the power or software reset after a change is made.
  After ELECYLINDER is started up, the parameter changes should become enabled.
- Do not attempt to turn the power off while the parameters are being overwritten.
  Doing so may damage the controller.

## Supplementation

- In the first time to connect the gateway unit to IA-OS, the First Connection Confirmation screen appear.
  Click Yes and it proceeds to the setting for how many EC connection units to be connected to the gateway unit.




(Note) Make sure that you conduct the following setting at the first time of connection. Without setting how many EC connection units to be connected, communication with ELECYLINDER would not be established.

# 4.5 Confirmation and Tuning of Basic Operations

## 4.5.1 Description

Shown below, explains how to operate in PC software (Model Code: IA-OS-*) when ELECYLINDER is connected via the EC connection unit.

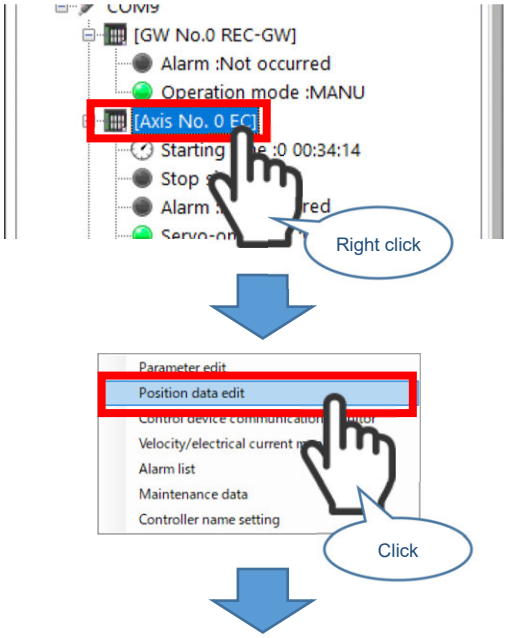
For how to check operation in the teaching pendant (TB-02/03), refer to an instruction manual of each ELECYLINDER or teaching pendant.

**The cautions regarding when connecting ELECYLINDER as stated below.**

- ELECYLINDER is not available for operation in the single solenoid system. ELECYLINDER may not operate as commanded by a host system if the setting is changed to the single solenoid system.
- SIO connectors on ELECYLINDER side cannot be used during being connected to the EC connection unit.
- ELECYLINDER will be in motor voltage drop condition (alarm in teaching tool: 203) if the teaching pendant gets into disable status by the deadman's switch.
- When the mode switch on the gateway unit is set to AUTO, it should not be available to go to the try run window of the digital speed controller for ELECYLINDER.
- If the mode switch on the gateway unit gets switched from MANU to AUTO during the try run window for the ELECYLINDER digital speed controller is displayed, the try run window should close.

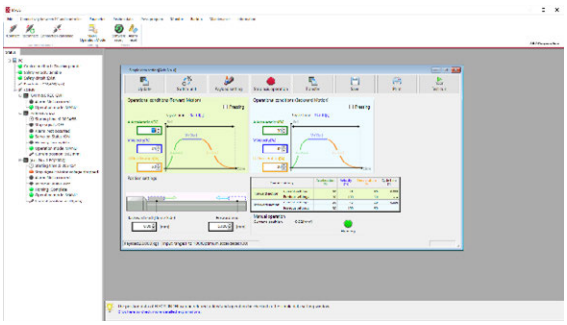
### 4.5.2 How to Display Simple Data Setup Screen

1 Right-click on an axis number in the tree view in the left of the main screen and each item should be expanded.



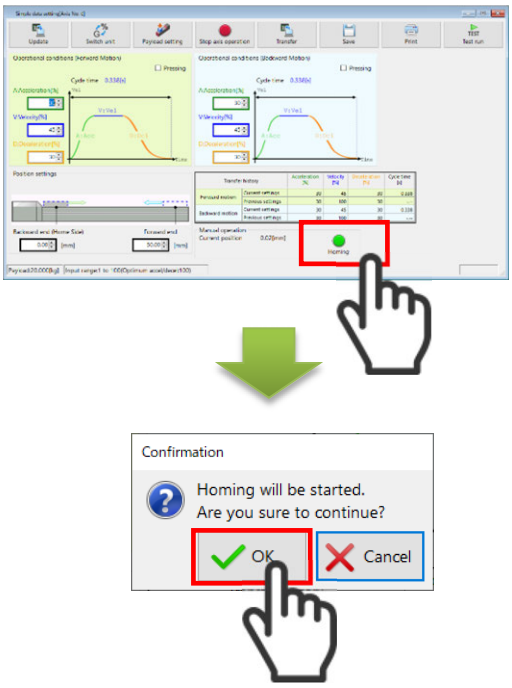

2 Click Position data edit.

3 The simple data setup screen should be displayed.

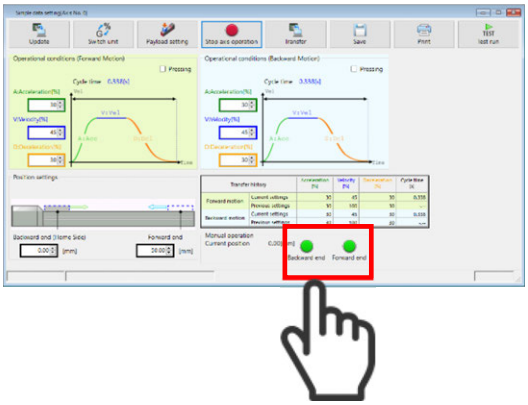


### 4.5.3 Home Return

1 Click Homing button.
When the home-return screen is displayed, click OK.
ELECYLINDER starts performing the homereturn operation.
Once the home-return operation is complete, Backward end and Forward end buttons should appear.
(Note) There is no need of having the homereturn operation for the battery-less absolute encoder type (WA).




2 Click either Forward end button or Backward end button.
ELECYLINDER starts moving forward or backward.
Stop the click during operation and the ELECYLINDER starts to decelerate and stop from that timing.



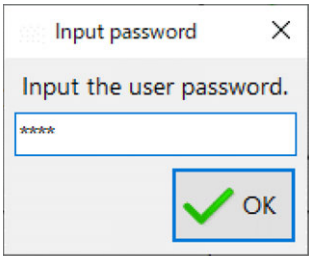
### 4.5.4 Stop Position / Operating Condition (AVD) Setting / Adjustment

ELECYLINDER is ready with the stop position and operating conditions set before delivery. Adjustment can be made to the stop position and operating conditions in the simple data setting window.



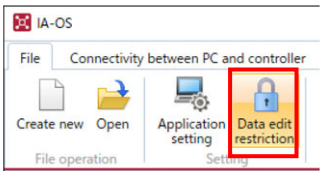
## Caution

- Make sure to touch Transfer after setting or adjusting the data.
- Switching the window without transferring should allow to get the data back. Also, without transferring, operation with Manual Run would not work.
- When the position edit password is set to other than "0000", click Transfer button and the password input window should appear. In this case, input of the password is required. Be aware that the data would not be transferred without inputting the password.



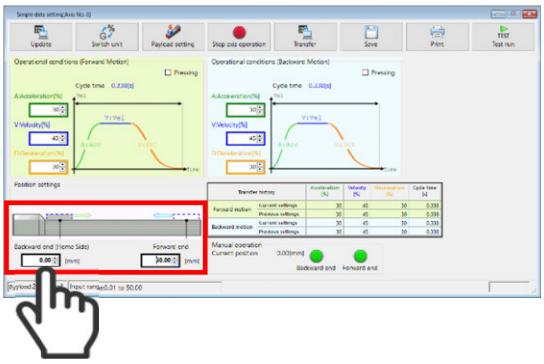

Reference

You can change the password from [File] → [Data edit restriction]. The position edit password at delivery is set to “0000”.

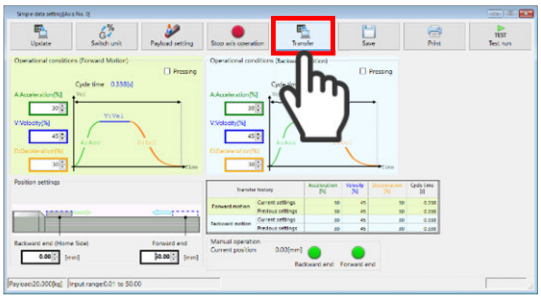


### (1) Stop Position Setting and Adjustment

1 Click at the position that you would like to set or adjust.



2 Input a number and press Enter key on your PC keyboard, and click Transfer.



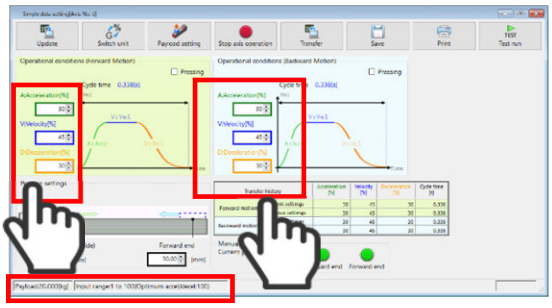
3 Check the result of the setting or adjustment by clicking Forward end button and Backward end button.
Also, stop the click during operation and the ELECYLINDER starts to decelerate and stop at that point.

### (2) Operating Condition Setting and Adjustment

The operating conditions (AVD) can be set or adjusted with the procedures shown below.
Also, there is a feature to calculate automatically the “optimum velocity and optimum acceleration / deceleration” in ELECYLINDER.
Set the “Installation Posture” and “Transferred Payload” before setting or adjusting the operating conditions.

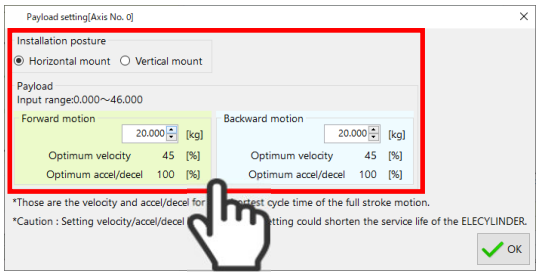
1 Click either Acceleration, Velocity or Deceleration, and the current payload setting should appear at the bottom of the screen.

A:Acceleration
V:Velocity
D:Deceleration
→AVD

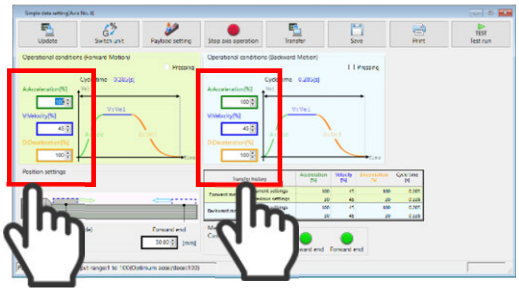


2 To set or adjust the payload setting, click Payload setting.
Payload Setting window should open.

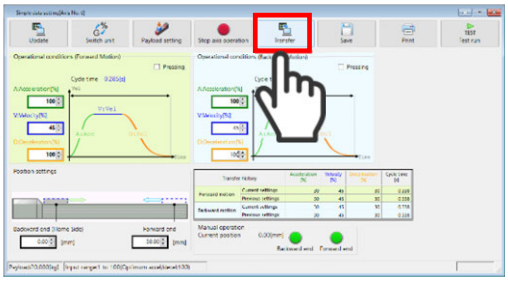
3 Select “Installation posture”, input “Payload” and click OK.
With the set conditions, the “Optimum velocity” and “Optimum accel/decel” that gives the fastest cycle time should be displayed.



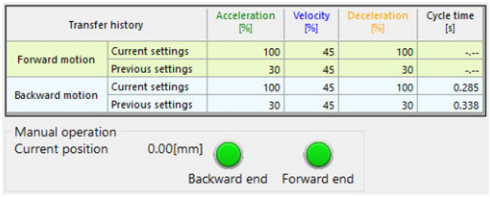
4 Click on a operating condition that you would like to set or adjust.



5 Input a number, press Enter key on your PC keyboard and click Transfer.
The number should be written to the controller and Backward end and Forward end buttons turns into green.
Also, “Transfer history” should be updated.



6 Calculation result of the cycle time in “Current settings” and “Previous settings” in “Transfer history” should be updated.
Perform operation by clicking Forward end button and Backward end button.
Check the result of the setting or adjustment.

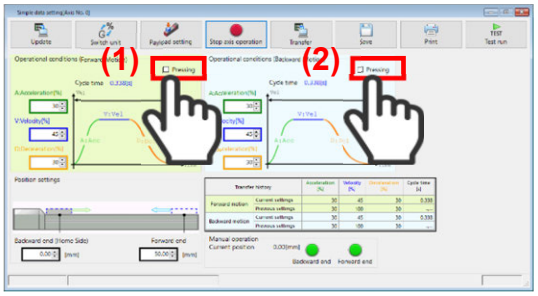



## Caution

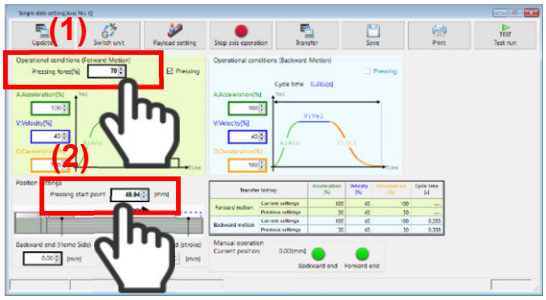
In case there is some abnormal noise, vibration or impact when operating ELECYLINDER, attempt to reduce the acceleration or deceleration.
Keep Using without reducing could cause malfunction.

### (3) Pressing Operation Setting

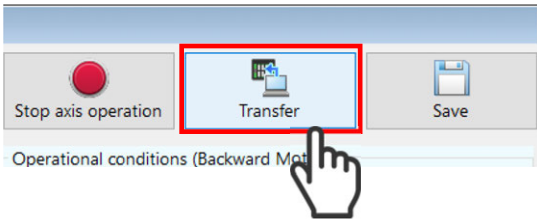
1 Click in the checkbox on “Pressing” to switch to the pressing operation window.
“Pressing” can be set to the (1) way forward and (2) way backward.
Adjust the setting considering the operating conditions.




2 Click (1) “Pressing force” and (2) “Pressing start point” and input a number.




3 Input a number, press Enter key on your PC keyboard and click Transfer.
The number should be written to the controller and Backward end and Forward end buttons turns into green.




4 Perform operation by clicking Forward end button and Backward end button.
Check the result of the setting or adjustment.

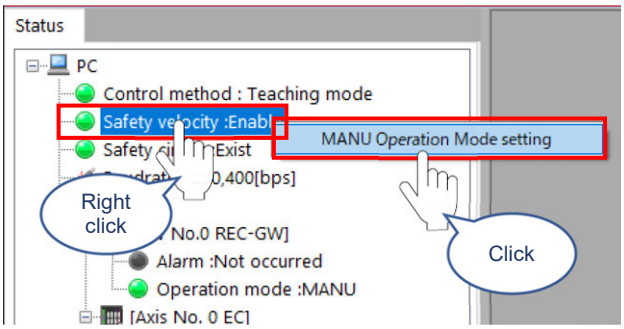
## Caution

- Pressing force displayed in [N] units are reference.
  Refer to [the instruction manual or catalog for each ELECYLINDER] for detail.
- When the pressing velocity is low, the pressing force may get unstable and the operation may get inappropriate. The pressing velocity may vary depending on models.
  Refer to [the instruction manual or catalog for each ELECYLINDER] for detail

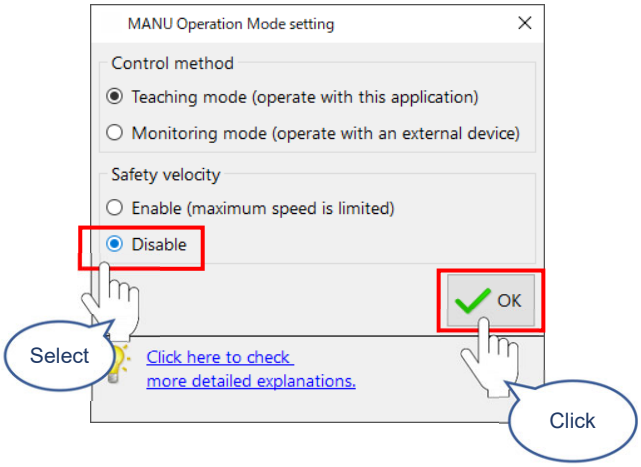
### (4) Test Run Speed

When performing a test run, check whether the "Safety velocity" function is enabled/disabled. Restriction to the speed should be applied if the safety velocity feature is activated. To perform trial run at the speed set in the position data, disable the safety velocity function using the following procedure.

1 Right-click Safety velocity :Enable in "Status" in the tree view and click MANU Operation Mode setting.




2 Select Disable of "Safety velocity" and click OK.




3 The safety speed function has been switched.

REC

# Chapter 5

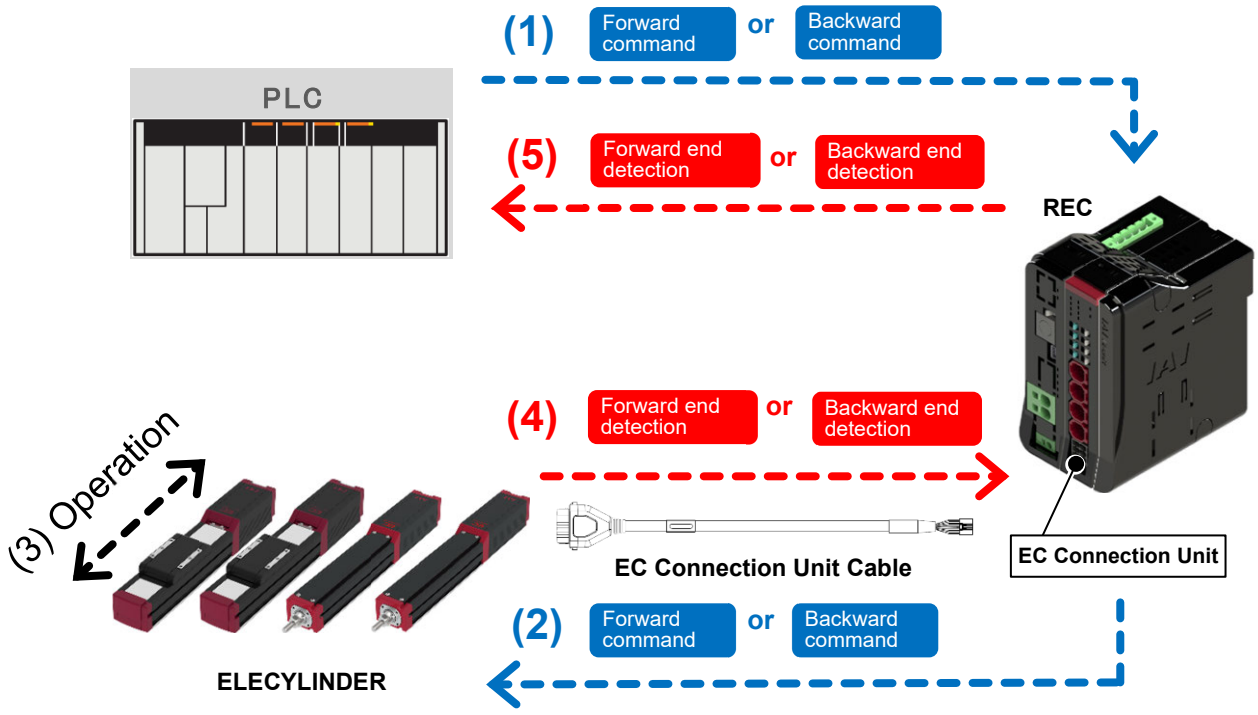
# Operation

# 5.1 Operation Function

ELECYLINDER operates by inputting signals from the host device via the REC gateway unit and flowing through the EC connection unit.
Also, the condition of ELECYLINDER can be monitored by the host device receiving the signals output from ELECYLINDER via the EC connection unit.

[Image of Connection] Connection between PLC and ELECYLINDER

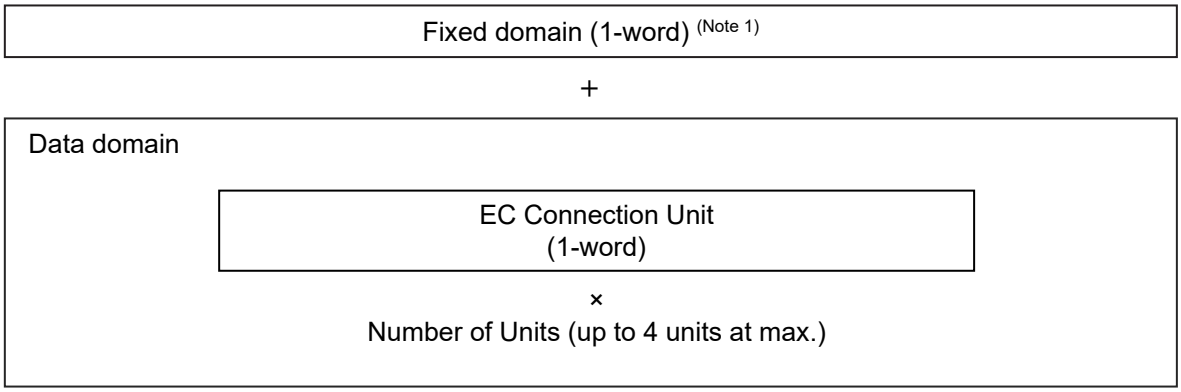
(1) Input a movement command signal from PLC to REC (EC connection unit). (forward or backward)
(2) Input the movement command signal from REC (EC connection unit) to each unit of ELECYLINDER.
(3) ELECYLINDER units start moving.
(4) A position detection signal gets output from ELECYLINDER. (Forward end or backward end)
(5) The position detection signal gets output from REC (EC connection unit) to PLC.




ELECYLINDER continues its operation while a movement command signal (ST0/ST1) is on, and a position detection signal (LS0/LS1) turns on after the operation is complete.
If the movement command signal gets turned off before the operation completes, the operation gets cancelled and an actuator decelerates and stops.
The same even applies to the home return operation.

## 5.2 Address Configuration

The construction of addresses for REC is as shown below. The domains should mainly be divided to the GW unit domains and RCON-EC domains.
The addresses occupied by the network should be constructed with 1-word of the fixed domain and the data domains varied depending on the number of units of the EC connection unit. It is not available to select an operation mode in the EC connection unit.




(1) Fixed domain configuration

| | PLC output ⇒ REC | | | REC ⇒ PLC input | | |
|---|---|---|---|---|---|---|
| | High byte | Low byte | Word count | High byte | Low byte | Word count |
| Gateway control domain | Reserved | | 1 | Gateway status signal | | 1 |

* It should be occupied as the data domain even if the power supply unit is not connected.

(2) EC connection unit data domain configuration (per unit)

| | High byte | Low byte | Word count | High byte | Low byte | Word count |
|---|---|---|---|---|---|---|
| Control signal domain | Control signal | | 1 | Status signal | | 1 |

Note 1: CC-Link and CC-Link IE Field should be the fixed domains (2-words).

### 5.2.1 Overall Address Configuration Example

In here, shows the overall address configuration when four units of the EC connection unit are connected to the REC gateway unit.
Note that CC-Link and DeviceNet should be assigned to the word addresses while PROFIBUS-DP to the byte addresses.

**[For CC-Link]**

The following page shows a CC-Link configuration example.
Fixed domain 1-word is assigned to the bit register (RX/RY), while the domain for each axis is assigned to the word register (RWr/RWw).

PLC output ⇒ REC

| Output register | High byte | Low byte |
|---|---|---|
| RY00F to 000 | Reserved | |
| RY01F to 010 | System Domains | |

REC ⇒ PLC input

| Input register | High byte | Low byte |
|---|---|---|
| RX00F to 000 | Gateway status signal | |
| RX01F to 010 | System Domains | |

| Output register | |
|---|---|
| RWw 00H | Control signal (Unit 0) |
| RWw 01H | Control signal (Unit 1) |
| RWw 02H | Control signal (Unit 2) |
| RWw 03H | Control signal (Unit 3) |

| Input register | |
|---|---|
| RWr 00H | Status signal (Unit 0) |
| RWr 01H | Status signal (Unit 1) |
| RWr 02H | Status signal (Unit 2) |
| RWr 03H | Status signal (Unit 3) |

* Regardless of the number of option units, the occupied size should be Ver. 1.10, extension cyclic multiplied by one and number of occupied stations one.

*1 The EC connection unit occupies domains and axis numbers for four axes (1-word) even though not all of four axes are connected.

**[For CC-Link IE Field]**

Fixed domain 1-word is assigned to the bit register (RX/RY), while the domain for each axis is assigned to the word register (RWr/RWw).

PLC output ⇒ REC

| Output register | High byte | Low byte |
|---|---|---|
| RY00F to 000 | Reserved | |
| RY01F to 010 | Reserved | |

REC ⇒ PLC input

| Input register | High byte | Low byte |
|---|---|---|
| RX00F to 000 | Gateway status signal | |
| RX01F to 010 | Reserved | |

| Output register | |
|---|---|
| RWw 00H | Control signal (Unit 0) |
| RWw 01H | Control signal (Unit 1) |
| RWw 02H | Control signal (Unit 2) |
| RWw 03H | Control signal (Unit 3) |

| Input register | |
|---|---|
| RWr 00H | Status signal (Unit 0) |
| RWr 01H | Status signal (Unit 1) |
| RWr 02H | Status signal (Unit 2) |
| RWr 03H | Status signal (Unit 3) |

* Regardless of the number of option units, the occupied size should be 32 points of RX/RY and 4 points of RWw/RWr.

*1 The EC connection unit occupies domains and axis numbers for four axes (1-word) even though not all of four axes are connected.

**[For DeviceNet]**

| | PLC output ⇒ REC | | REC ⇒ PLC input | |
|---|---|---|---|---|
| **Relative CH *** | **High byte** | **Low byte** | **High byte** | **Low byte** |
| 0 | Gateway control signal | | Gateway status signal | |
| 1 | Control signal (Unit 0) | | Status signal (Unit 0) | |
| 2 | Control signal (Unit 1) | | Status signal (Unit 1) | |
| 3 | Control signal (Unit 2) | | Status signal (Unit 2) | |
| 4 | Control signal (Unit 3) | | Status signal (Unit 3) | |

* Relative CH is the CH number relative to the gateway head CH

*1 The EC connection unit occupies domains and axis numbers for four axes (1-word) even though not all of four axes are connected.

**[For PROFIBUS-DP, EtherNet/IP]**

| | PLC output ⇒ REC | | REC ⇒ PLC input | |
|---|---|---|---|---|
| **Relative CH *** | **High byte** | **Low byte** | **High byte** | **Low byte** |
| 0 to 1 | Gateway control signal | | Gateway status signal | |
| 2 to 3 | Control signal (Unit 0) | | Status signal (Unit 0) | |
| 4 to 5 | Control signal (Unit 1) | | Status signal (Unit 1) | |
| 6 to 7 | Control signal (Unit 2) | | Status signal (Unit 2) | |
| 8 to 9 | Control signal (Unit 3) | | Status signal (Unit 3) | |

* Relative byte is the byte address relative to the gateway head

*1 The EC connection unit occupies domains and axis numbers for four axes (1-word) even though not all of four axes are connected.

**[For EtherCAT]**

The occupied size for EtherCAT should be fixed at 32 bytes regardless of the number of the EC connection units.

| | PLC output ⇒ REC | | REC ⇒ PLC input | |
|---|---|---|---|---|
| **Relative CH *** | **High byte** | **Low byte** | **High byte** | **Low byte** |
| 0 to 1 | Gateway control signal | | Gateway status signal | |
| 2 to 3 | Control signal (Unit 0) | | Status signal (Unit 0) | |
| 4 to 5 | Control signal (Unit 1) | | Status signal (Unit 1) | |
| 6 to 7 | Control signal (Unit 2) | | Status signal (Unit 2) | |
| 8 to 9 | Control signal (Unit 3) | | Status signal (Unit 3) | |
| to 31 | Reserved | | Reserved | |

* Relative byte is the byte address relative to the gateway head

*1 The EC connection unit occupies domains and axis numbers for four axes (1-word) even though not all of four axes are connected.

**[For PROFINET IO]**

| | PLC output ⇒ REC | | REC ⇒ PLC input | |
|---|---|---|---|---|
| **4-word Module count** | **High byte** | **Low byte** | **High byte** | **Low byte** |
| 1 | Gateway control signal | | Gateway status signal | |
| | Control signal (Unit 0) | | Status signal (Unit 0) | |
| | Control signal (Unit 1) | | Status signal (Unit 1) | |
| | Control signal (Unit 2) | | Status signal (Unit 2) | |
| 2 | Control signal (Unit 3) | | Status signal (Unit 3) | |
| | Reserved | | Reserved | |
| | Reserved | | Reserved | |
| | Reserved | | Reserved | |

*1 The EC connection unit occupies domains and axis numbers for four axes (1-word) even though not all of four axes are connected.

### 5.2.2 Gateway Status Signals

The first one word of each input and output in the EC gateway unit address configuration should be for a signal to monitor the condition of the EC gateway unit. It is not available for use of an output signal.

PLC input

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Gateway Status signal** | **b15** | **b14** | **b13** | **b12** | **b11** | **b10** | **b9** | **b8** |
| | *ALMH | - | MOD | ESTP | - | - | - | - |
| | **b7** | **b6** | **b5** | **b4** | **b3** | **b2** | **b1** | **b0** |
| | ALMC128 | ALMC64 | ALMC32 | ALMC16 | ALMC8 | ALMC4 | ALMC2 | ALMC1 |

| **Address** * | | | |
|---|---|---|---|
| CC-Link, CC-Link IE Field | DeviceNet | PROFIBUS-DP, EtherNet/IP, EtherCAT | PROFINET IO |
| - | Relative CH | Relative byte | Relative module |
| RX 0* | +0 | +0 | +0 |
| | | +1 | |

* Address is the relative address to the gateway head.
CC-Link, CC-Link IE Field, and DeviceNet have word addresses while PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses. PROFINET IO uses 4-words module addresses.
The * in CC-Link and CC-Link IE Field bit register addresses is 0 to F.
For CC-Link and CC-Link IE Field, b10 to b15 are bA to bF. (Hexadecimal notation)
For PROFIBUS-DP, EtherNet/IP, and EtherCAT, b8 to b15 are b0 to b7. (Byte addresses)

I/O signal list

| Signal type | | Bit | Symbol name | Content |
|---|---|---|---|---|
| PLC output | Control signal | 15-0 | - | Not available. |
| PLC input | Status signal | b15 | *ALMH | Turns on if an error occurs that requires the gateway to be restarted. (Likely due to a mistaken parameter setting. Confirm as needed.) |
| | | b14 | - | Not available. |
| | | b13 | MOD | Turns on if MANU is selected with the unit front operation mode setting switch, and turns off when AUTO is selected. |
| | | b12 | ESTP | It turns on with the STOP input from a teaching pendant. Once it turns on, all the connected axes get into stop status. |
| | | b11-b8 | - | Not available. |
| | | b7 | ALMC 1 to 128 | Outputs alarm codes caused by the gateway. For details, refer to [7.2 EC Gateway Unit Alarm Causes and Countermeasures] |
| | | b6 | | |
| | | b5 | | |
| | | b4 | | |
| | | b3 | | |
| | | b2 | | |
| | | b1 | | |
| | | b0 | | |

### 5.2.3 ELECYLINDER Position Table

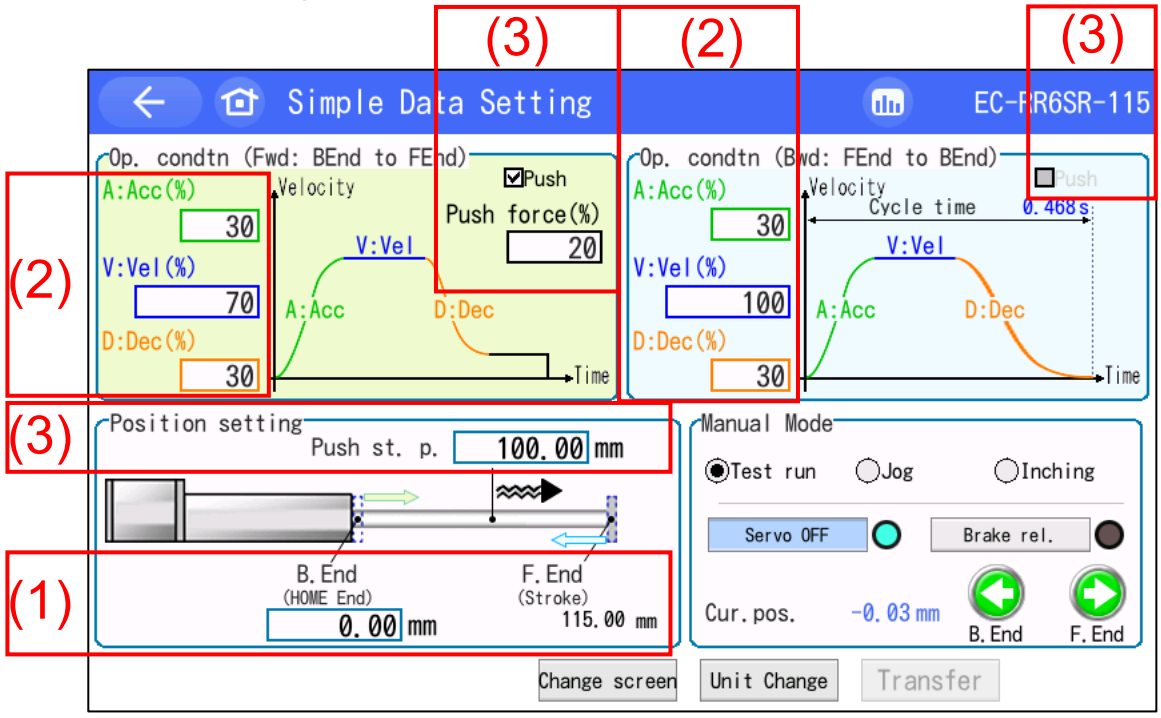
The stop position and operating condition settings are established in ELECYLINDER at the delivery.
The stop position and the operation conditions can be adjusted with a teaching tool in the simple data setting screen.

## Reference

| | | |
|---|---|---|
| How to operate in PC software | ▶ | PC software (RCM-101-*-*) instruction manual (ME0155) |
| Detail of how to operate in teaching pendant | ▶ | Touch Panel Teaching Pendant instruction manual TB-02/02D (ME0355), TB-03 (ME0376) |

Here shows an example of a screen in the teaching pendant TB-02/03 about the position table.
(The items to be set should be the same in the PC software.)

**[Simple Data Setting Screen]**




## Caution

- Make sure to touch the Transfer key after setting or adjusting the data.
- Switching the screen without making a transfer, the data will go back to that before change.
  Also, without transfer, the “Manual Mode” (B.End) or (F.End) button should not be able to activate.

(1) Backward End / Forward End [mm]

It is the coordinate values for positioning. Input values from the home position.
Registration is available in 0.01mm unit.

(2) Acceleration / Velocity / Deceleration

- Acceleration [% or G]

  Acceleration at the start of operation should be set in a value from 1 to 100%.
  Touch Unit Change and the unit switches to G and can be registered in 0.01G unit.

- Velocity [% or mm/s]

  The velocity to perform the positioning operation should be set in a value from 1 to 100%
  If there is a check mark at “Push”, it should be the movement speed from the movement start position (forward end or backward end) to the pressing start position.
  When the velocity is set to a value lower than the pressing speed, the pressing operation should be performed in the set velocity. The pressing speed should differ depending on the models. Refer to [instruction manual of each ELECYLINDER or a catalog] for detail.
  Touch Unit Change and the unit switches to mm/s and can be registered in 0.01mm/s unit.

- Deceleration [% or G]

  Deceleration at the stop of operation should be set in a value from 1 to 100%.
  If there is a check mark at “Push”, it should be the deceleration from the movement start position (forward end or backward end) to the pressing start position.
  Touch Unit Change and the unit switches to G and can be registered in 0.01G unit.

**Caution**

In case there is any abnormal noise, vibration or mechanical shock in operation of ELECYLINDER, revise and decrease the acceleration and deceleration.
Continuing to use without revising could cause malfunction.

(3) Push / Push Start Point / Push Force

- Push
  Selection can be made from “Positioning Operation” and “Pressing Operation”.
  When there is a check mark at “Push”, it should perform the pressing operation.

- Push Start Point [mm] * Displayed only in pressing operation
  It is the position to start the pressing operation. Input values from the home position.
  Registration is available in 0.01mm unit.

- Push Force [% or N] * Displayed only in pressing operation
  It is the current limit value at the pressing operation. Set in a value from 20 to 70% (Note).
  Touch [Unit Change] and input in N unit is also available.
  Note: The input range available for the pressing current limit value should differ depending on the models.
  Refer to [instruction manual of each ELECYLINDER or a catalog] for detail.

## Caution

- The push force displayed in N unit is a reference.
  Refer to [instruction manual of each ELECYLINDER or a catalog] for detail.
- When the pressing speed is set lower than the pressing speed of each model, the push force could get unstable.
  It could cause the performance not work properly.

### 5.2.4 Assignment of EC Connection Unit

The assignment of the EC connection unit should be as shown below.
The EC connection unit occupies domains for four axes (1-word) even though not all of four axes are connected.

PLC output = Axis control signal
Address *

| CC-Link, CC-Link IE Field | DeviceNet | PROFIBUS-DP, EtherNet/IP, EtherCAT | PROFINET IO |
|---|---|---|---|
| RWw m+0 | n+0 | (High byte) n+0<br>(Low byte) n+1 | p+0 |

1-word = 16 bits

| b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | RES | ST1 | ST0 | - | RES | ST1 | ST0 | - | RES | ST1 | ST0 | - | RES | ST1 | ST0 |
| Control signal (4th Axis) | | | | Control signal (3rd Axis) | | | | Control signal (2nd Axis) | | | | Control signal (1st Axis) | | | |

PLC input = Axis status signal
Address *

| CC-Link, CC-Link IE Field | DeviceNet | PROFIBUS-DP, EtherNet/IP, EtherCAT | PROFINET IO |
|---|---|---|---|
| RWr m+0 | n+0 | (High byte) n+0<br>(Low byte) n+1 | p+0 |

| b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E3RD | *ALM | LS1/PE1 | LS0/PE0 | E2RD | *ALM | LS1/PE1 | LS0/PE0 | E1RD | *ALM | LS1/PE1 | LS0/PE0 | E0RD | *ALM | LS1/PE1 | LS0/PE0 |
| Status signal (4th Axis) | | | | Status signal (3rd Axis) | | | | Status signal (2nd Axis) | | | | Status signal (1st Axis) | | | |

* m is the head register address of each unit. n is the head relative address of each unit.
p is the head module address of each unit.
CC-Link, CC-Link IE Field, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET IO uses 4-words module addresses.

**[I/O Signal List]** EC Connection Unit (ON = corresponding bit is "1", OFF = corresponding bit is "0")

| Signal type | | Bit | Symbol name | Content | Details |
|---|---|---|---|---|---|
| PLC output | Control signal (4th Axis) | b15 | - | Not available | - |
| | | b14 | RES | Alarm Cancel<br>“Alarm cancelled with on” | Page 5-15 |
| | | b13 | ST1 | Drive Forward<br>“Drives forward with on (drives forward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |
| | | b12 | ST0 | Drive Backward<br>“Drives backward with on (drives backward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |
| | Control signal (3rd Axis) | b11 | - | Not available | - |
| | | b10 | RES | Alarm Cancel<br>“Alarm cancelled with on” | Page 5-15 |
| | | b9 | ST1 | Drive Forward<br>“Drives forward with on (drives forward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |
| | | b8 | ST0 | Drive Backward<br>“Drives backward with on (drives backward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |
| | Control signal (2nd Axis) | b7 | - | Not available | - |
| | | b6 | RES | Alarm Cancel<br>“Alarm cancelled with on” | Page 5-15 |
| | | b5 | ST1 | Drive Forward<br>“Drives forward with on (drives forward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |
| | | b4 | ST0 | Drive Backward<br>“Drives backward with on (drives backward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |
| | Control signal (1st Axis) | b3 | - | Not available | - |
| | | b2 | RES | Alarm Cancel<br>“Alarm cancelled with on” | Page 5-15 |
| | | b1 | ST1 | Drive Forward<br>“Drives forward with on (drives forward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |
| | | b0 | ST0 | Drive Backward<br>“Drives backward with on (drives backward after home-return operation when home return not complete), decelerate and stop on the way with off” | Page 5-14 |

**[I/O Signal List]** EC Connection Unit (ON = corresponding bit is "1", OFF = corresponding bit is "0")

| Signal type | | Bit | Symbol name | Content | Details |
|---|---|---|---|---|---|
| PLC output | Status signal (4th Axis) | b15 | E3RD | Operation Ready<br>“On: Operation ready (servo on)” | Page 5-16 |
| | | b14 | *ALM | Alarm (break contact)<br>“ON: No alarm, OFF: Alarm generated” | Page 5-16 |
| | | b13 | LS1/PE1 | Driving Forward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the forward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |
| | | b12 | LS0/PE0 | Driving Backward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the backward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |
| | Status signal (3rd Axis) | b11 | E2RD | Operation Ready<br>“On: Operation ready (servo on)” | Page 5-16 |
| | | b10 | *ALM | Alarm (break contact)<br>“ON: No alarm, OFF: Alarm generated” | Page 5-16 |
| | | b9 | LS1/PE1 | Driving Forward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the forward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |
| | | b8 | LS0/PE0 | Driving Backward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the backward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |
| | Status signal (2nd Axis) | b7 | E1RD | Operation Ready<br>“On: Operation ready (servo on)” | Page 5-16 |
| | | b6 | *ALM | Alarm (break contact)<br>“ON: No alarm, OFF: Alarm generated” | Page 5-16 |
| | | b5 | LS1/PE1 | Driving Forward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the forward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |
| | | b4 | LS0/PE0 | Driving Backward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the backward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |
| | Status signal (1st Axis) | b3 | E0RD | Operation Ready<br>“On: Operation ready (servo on)” | Page 5-16 |
| | | b2 | *ALM | Alarm (break contact)<br>“ON: No alarm, OFF: Alarm generated” | Page 5-16 |
| | | b1 | LS1/PE1 | Driving Forward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the forward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |
| | | b0 | LS0/PE0 | Driving Backward Complete / Pressing Complete<br>“It turns on when an actuator gets in the detection range of the backward end. It turns on when pressing operation completes.” | Page 5-15 to 16 |

# 5.3 I/O Signals

## 5.3.1 Input and Output Signal Features in EC Connection Unit

The input and output signals for the EC connection unit are as shown below.
On means the applicable bit is "1" while off means "0".

**[1] Movement command input backward end/forward end (ST0/ST1)** **PLC output signal**

The ST signal function automatically switches depending on whether the unit has completed home return or not.

| Signal name | Signal abbreviation | Function overview by status | |
|---|---|---|---|
| | | Home return: Not complete | Home return: Complete |
| **Backward** | ST0 | Home return operation | Backward |
| **Forward** | ST1 | | Forward |

[Home return status: Not complete]

- When the “ST0” signal is turned ON, home return operation begins.
- When the “ST1” signal is turned ON, as with the “ST0” signal, home return operation begins.
- Turning the ST signal OFF midway through home return operation will cause a gradual stop.

[Home return status: complete]

- When the ST signal is turned ON, the ELECYLINDER moves “Backward” or “Forward”.
- While the ST signal is ON, operation will continue until the “Backward end” or “Forward end” is reached.
- Turning the ST signal OFF midway through operation will cause a gradual stop.

### Caution

- If stopped when the LS or PE signals are not ON, the ELECYLINDER may be stopped on the way to the backward or forward end, or it may have stopped at the backward or forward end during pressing operation with no contact.
  We recommend first inputting the “ST0” signal and then performing the following actions after returning to the backward end.
- If battery-less absolute specification (option) is selected, the home return complete status is retained.
  However, if the “Change home return direction” or “Adjust home position” parameters are changed, home return status will be not-complete; perform homing (absolute reset).

**[2] Alarm cancel input (RES)** **PLC output signal**

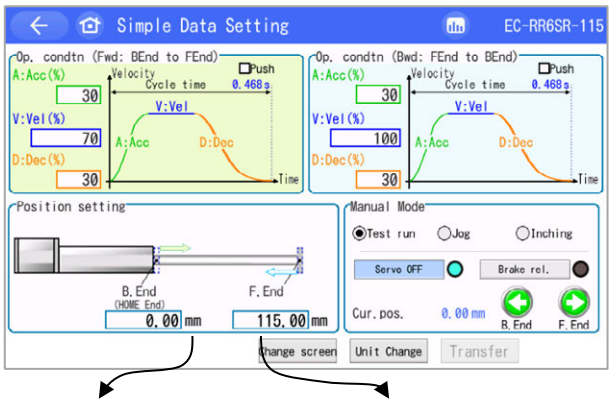
- When the “RES” signal is turned ON, the currently triggered alarm will be canceled.
- Alarm cancel may not be possible depending on the alarm itself.
  Refer to [7.3.2 Troubleshooting for Alarm Groups] for detail.

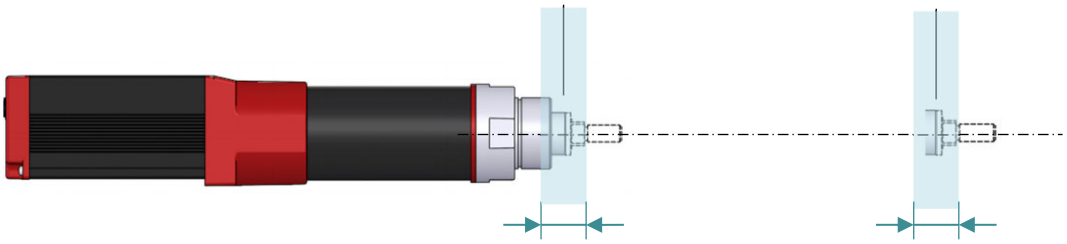
**[3] Position detection output backward end/forward end (LS0/LS1)** **PLC input signal**

- The LS signals perform the same operation as an air cylinder automatic switch.
  They are not positioning complete signals.
- The LS signals turn ON when the ELECYLINDER current position is within the detection range configured at the backward and forward ends.
- They turn ON when within the detection range regardless of whether the servo is ON or OFF.

The backward end and forward end set values' relationship to “LS0” and “LS1” signals ON is as follows.

In this example, the LS signal detection range is ±0.10mm.



[LS0 detection range]
-0.10 to 0.10mm

[LS1 detection range]
199.90 to 200.10mm

To adjust the LS signal detection range, open the “Parameter screen”.
Parameter No.2
“AutSwitch“LS” Signl Detctn Rng Adjst” can be used to make adjustments.

**[4] Pressing complete output backward end/forward end (PE0/PE1)** **PLC input signal**

- Turns ON when "pressing complete" is determined during pressing operation.
- Turns OFF if no contact can be made.

**[5] Alarm output (*ALM)** **PLC input signal**

- Turns ON when the ELECYLINDER is in normal status.
  Turns OFF when an alarm occurs.
- Always monitor the *ALM signal using the host device.
  If it turns OFF, immediately take appropriate safety countermeasures with the equipment as a whole.

**[6] Operation ready (E*RD)** **PLC input signal**

- It turns on when the operation is ready (servo on). (when communication established in normal condition between RCON-EC and EC)
- It shows "*" = 0: 1st axis on EC connection unit ready for operation
  1: 2nd axis on EC connection unit ready for operation
  2: 3rd axis on EC connection unit ready for operation
  3: 4th axis on EC connection unit ready for operation

### 5.3.2 Caution for REC System

Described below is a caution in REC System use.

- The EC connection unit occupies domains for four axes (1-word) even though not all of four axes are connected. Also, an axis number that an axis is not connected should not be pulled one number forward.
- SIO connector on ELECYLINDER connected to the EC connection unit cannot be used.
- The jog switch on the EC connection unit should perform forward end and backward end movements with the data set in the position data. It should perform the home-return operation before an operation to both forward and backward end movements if the home-return operation is not completed.
- As the jog switch to be activated/inactivated should be set in the gateway parameter, the setting should be reflected to all the EC connection units at once.
- If the deadman's switch on a teaching pendant connected to the EC gateway unit is set disabled, ELECYLINDER gets into the motor voltage drop condition.
- The time spent during a movement command (ST* signal) sent from the PLC reaches the EC gateway and then sent to the EC connection unit, and a command is issued to ELECYLINDER should take approximately 20ms.
- A command from a teaching tool may delay for 40ms or more at maximum in one time of communication in some conditions of REC System.
- When ELECYLINDER equipped with a Digital Speed Controller is connected to the EC connection unit;
  1) the screen would not be able to move to the trial run screen for the Digital Speed Controller if the mode switch on the EC gateway unit is set AUTO.
  2) the trial run screen on the Digital Speed Controller should close if the mode switch on the EC gateway unit is set MANU → AUTO while the trial run screen is kept open.
- When a screen to operate an actuator is open on a teaching tool or a Digital Speed Controller, an operation by the jog switch should not be available. When a screen to operate an actuator get open on a teaching tool or a Digital Speed Controller during an operation by the jog switch, the actuator should decelerate and stop.

* If the communication gets disconnected while a screen to operate an actuator on a teaching tool, an operation by the jog switch should be kept prohibited. In order to set it back to the condition that an operation by the jog switch is available, have either of rebooting the power, connecting the teaching tool again, having the screen to operate the actuator open and closed, or conducting the software reset on ELECYLINDER. (It will not have the jog switch kept prohibited if ELECYLINDER is equipped with a Digital Speed Controller type.)

- Switching from MANU to AUTO while an operation command being input from the PLC should allow the command signal accepted and make operation.
  Turn an operation command off when set to MANU or stopping a program so it would not start operating at the timing to switch from MANU to AUTO.
- ELECYLINDER is not available for operation in the single solenoid system. Make sure to apply the double solenoid system.

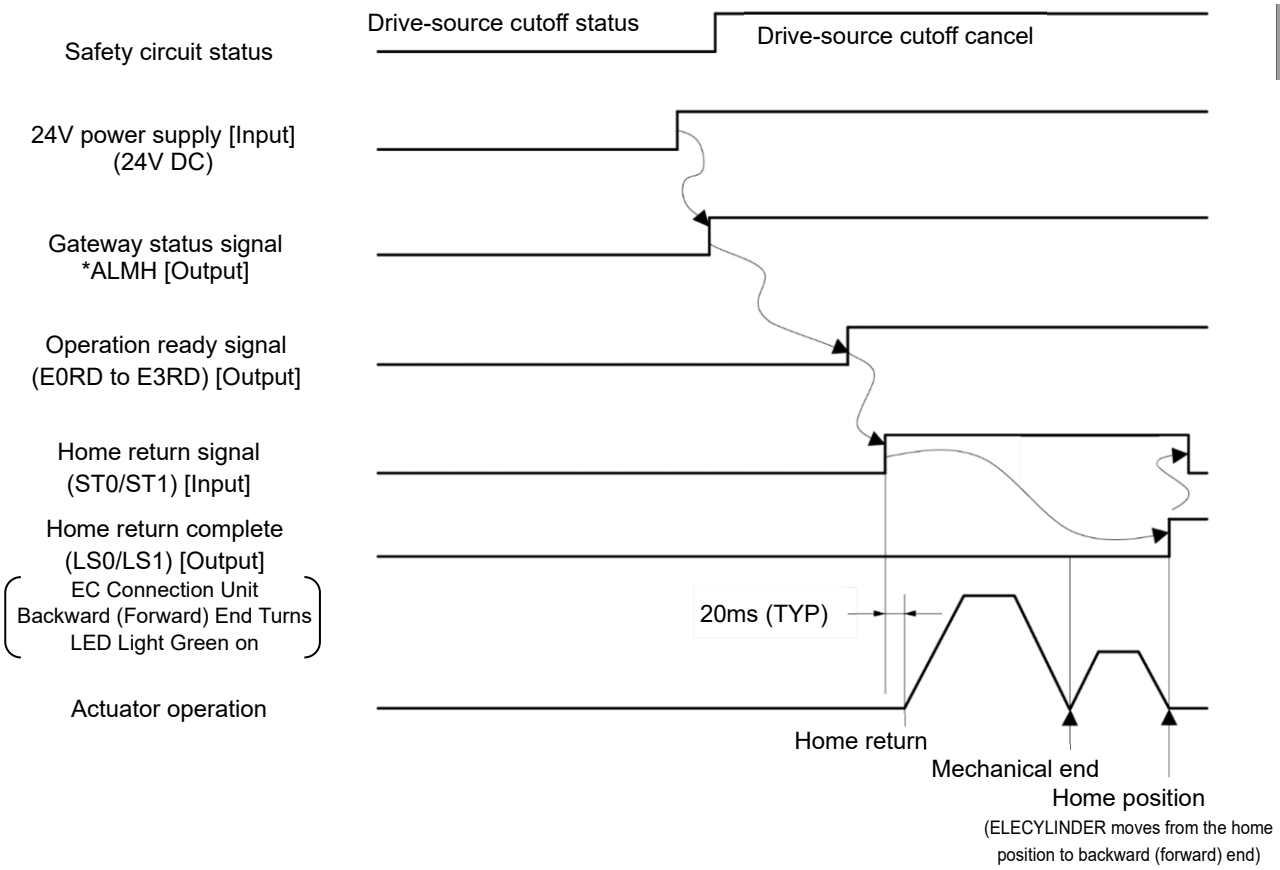
### 5.3.3 Timing of Basic Operation

The procedure from turning on the REC system to the home return command is as follows.

(1) Supply 24V power (24V DC).

(2) Confirm that the gateway status signal "*ALMH" and operation ready signals "E0RD" to "E3RD" are turned on, and then input either backward signal "ST0" or forward signal "ST1". (Note)

Note: Once the power is supplied, the servo on ELECYLINDER automatically turns on.




For details on the gateway status signal, refer to [5.2.2 Gateway Status Signals (page 5-6)].

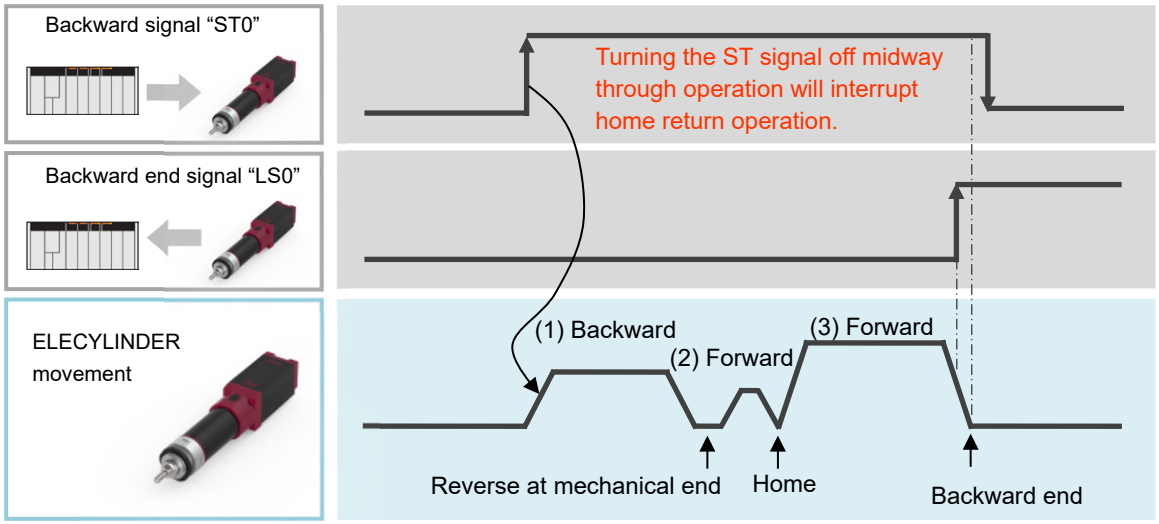
### 5.3.4 Basic Operations of ELECYLINDER

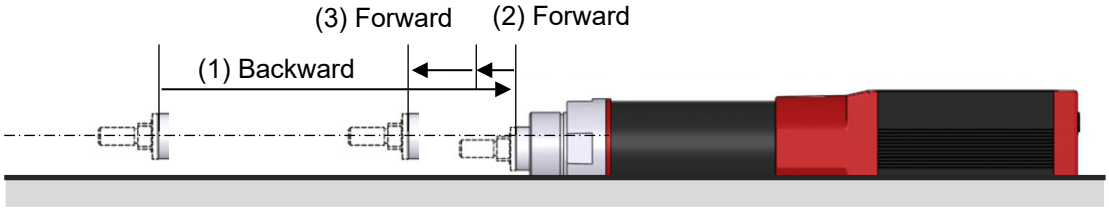
**[Home return operation / positioning operation]**

Turning the “ST0” signal on when home return is not complete will first trigger home return operation.

After a momentary stop at the home position, it will then move to the backward end. As well, when the “ST1” signal is turned on, the unit will move to the forward end after home return operation.

However, for battery-less absolute specification, the operation is complete when home return operation is done.




(1) When the “ST0” signal is turned on, backward motion begins towards the mechanical end.
The movement speed is 20mm/s.

(2) Once the mechanical end is struck, the direction will be reversed and forward motion will begin.
The unit will move forward until the home position, then stop.

(3) After that, it will continuously move forward until the backward end, where it stops as operation is complete.

**Caution**

In the home reverse specification (model: NM), home return operation is in the reverse direction.

This shows the PLC timing chart for operating the ELECYLINDER.
The basic process is as follows.


**[Basic timing chart]**

**Output** ELECYLINDER → output signals to PLC

**Input** PLC → input signals to ELECYLINDER

| Category | | Signal abbreviation | Timing chart | Remarks |
|---|---|---|---|---|
| 1 | **Power** | Power ON | EC Connection Unit SYS LED: On | 24V DC power supply is turned on. |
| 2 | Output | *ALM E*RD | | *ALM: Turns on if no alarm has been triggered. E*RD: It turns on when operation ready status (servo on) |
| 3 | Input | ST0 | Δt1 | When the ST0 signal is turned on, home return operation begins. |
| 4 | Output | LS0 | Δt2 EC Connection Unit Backward End LED: On | Home return operation is complete and the unit moves to the backward end. |
| 5 | Input | ST1 | Δt2 | Moves to the forward end. |
| 6 | Output | LS1 | EC Connection Unit Forward End LED: On | Moved to the forward end. |
| 7 | Input | ST0 | Δt2 | Moves to the backward end. |
| 8 | Output | LS0 | | Moved to the backward end. |
| 9 | After this, "**5**" to "**8**" repeat. | | | |

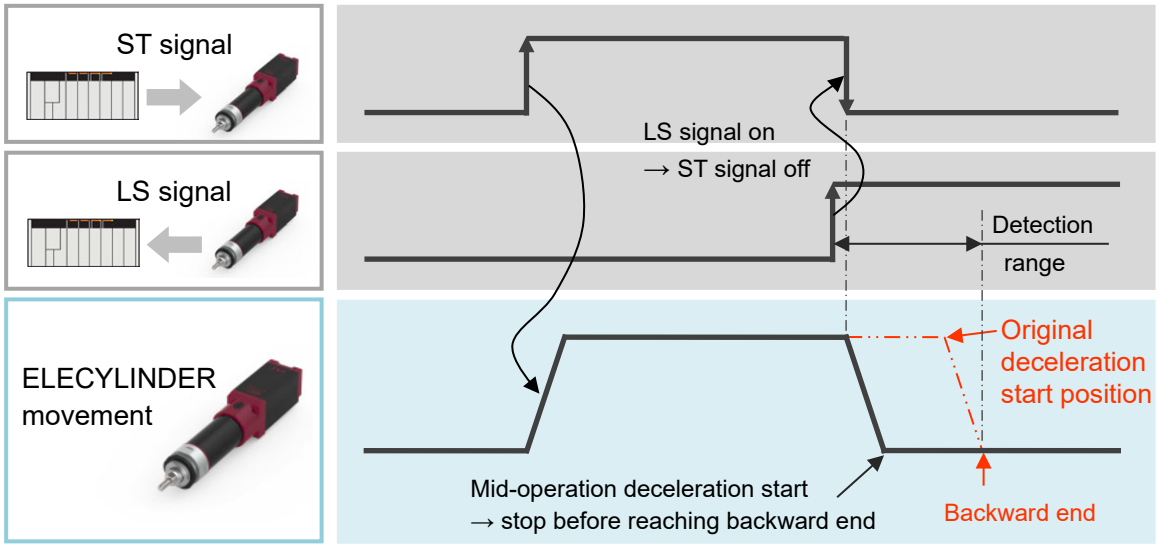
Δt1: Wait approximately 0.5 seconds from when the E*RD signal turns on before inputting the first command.

Δt2: The time taken for the ELECYLINDER actually to reach the forward or backward end after the LS signal turns on. Consider Δt2 when giving instructions for the next operation from the PLC to the ELECYLINDER.
The wider the detection range gets, the longer that Δt2 gets.
Also, Δt2 varies depending on the communication time among PLC ⇔ EC connection unit ⇔ ELECYLINDER, size of payload and acceleration/deceleration.

Note: The home-return operation is not to be conducted for the battery-less absolute (option).

Turning the ST signal off midway through operation will cause a gradual stop.
For example, be careful of the following point with a large LS signal detection range.

If the sequence is set to turn the ST signal off immediately after the LS signal turns on, the ELECYLINDER may not have reached the forward/backward end.

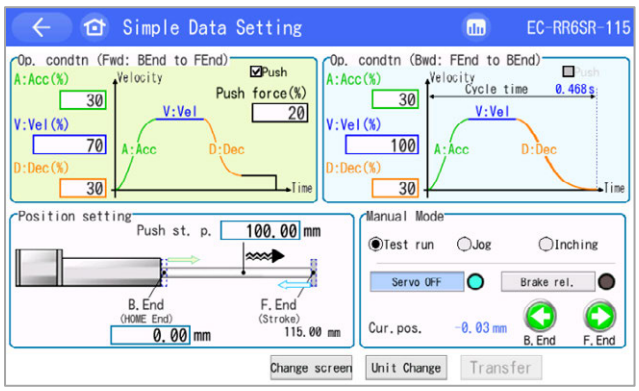



## Caution

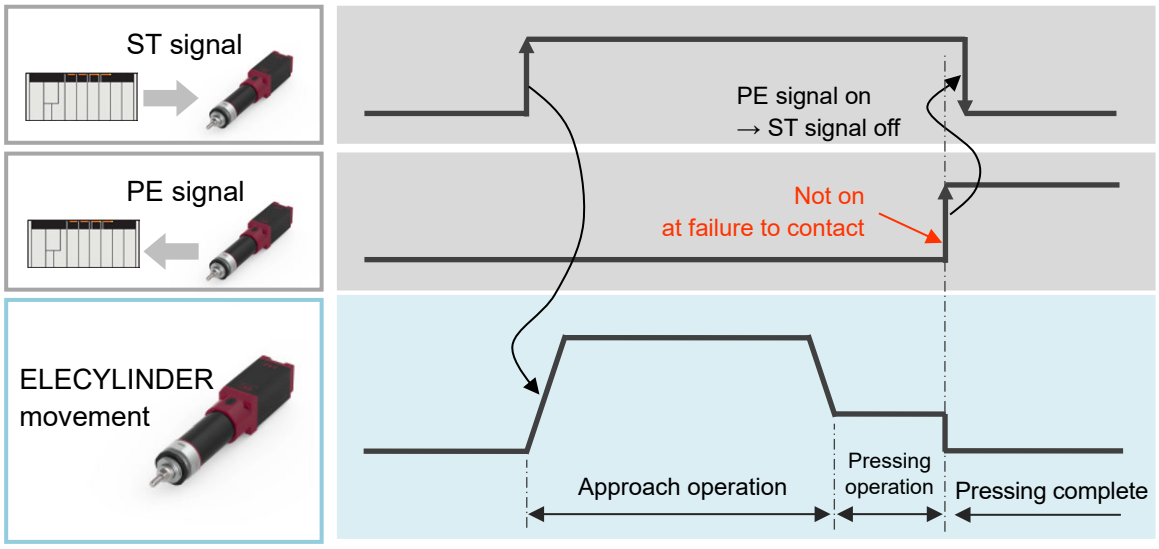
- Turning the ST signal on again after the gradual stop causes the ELECYLINDER to begin operation again.
- Within the detection range, the LS signal turns on even if the ELECYLINDER is mid-operation.
- Make sure that “ST0” and “ST1” signal do not turn on simultaneously.
  This may result in unpredictable operation.

**[Pressing operation]**

Establish the setting for the operating conditions and position setting in the Simple Data Setting screen before performing the pressing operation.



The basic time chart is as follows.




## Caution

- The pressing operation speed should differ depending on the models.
  Refer to [instruction manual of each ELECYLINDER or a catalog] for detail.
- The workpiece remains pressed after the pressing is completed.
  If the workpiece moves or pushes back, it may be pressed even further.
- Hitting a workpiece during the approaching operation will cause "Alarm Group A: Overload Alarm".

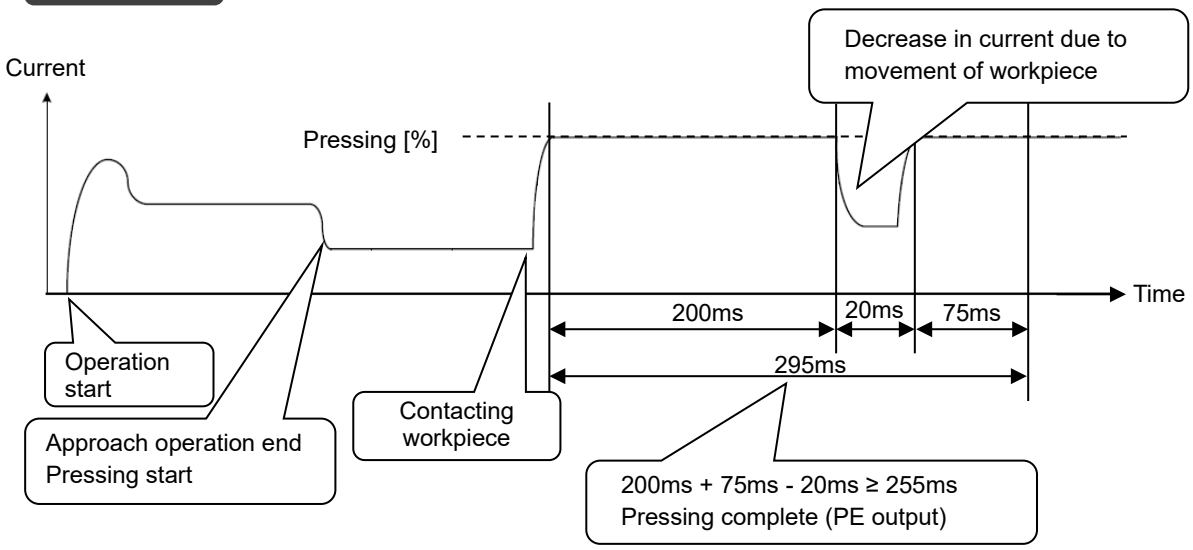
The torque (current limit value) configured for “Push force” in the Simple Data Setting screen judges completion of pressing operation.

When the ELECYLINDER is performing pressing operation, satisfying the following conditions will produce a judgment of pressing complete, turning on the PE signal.

(Accumulated time in which current has reached pressing value [%]) -
(Accumulated time in which current is less than pressing value [%]) ≥ 255ms



**Reference**




**Reference**

Points of caution for when the workpiece is not struck (no contact) and the movement to forward end or backward end is complete. Consider a host device sequence or detection method based on the content below.

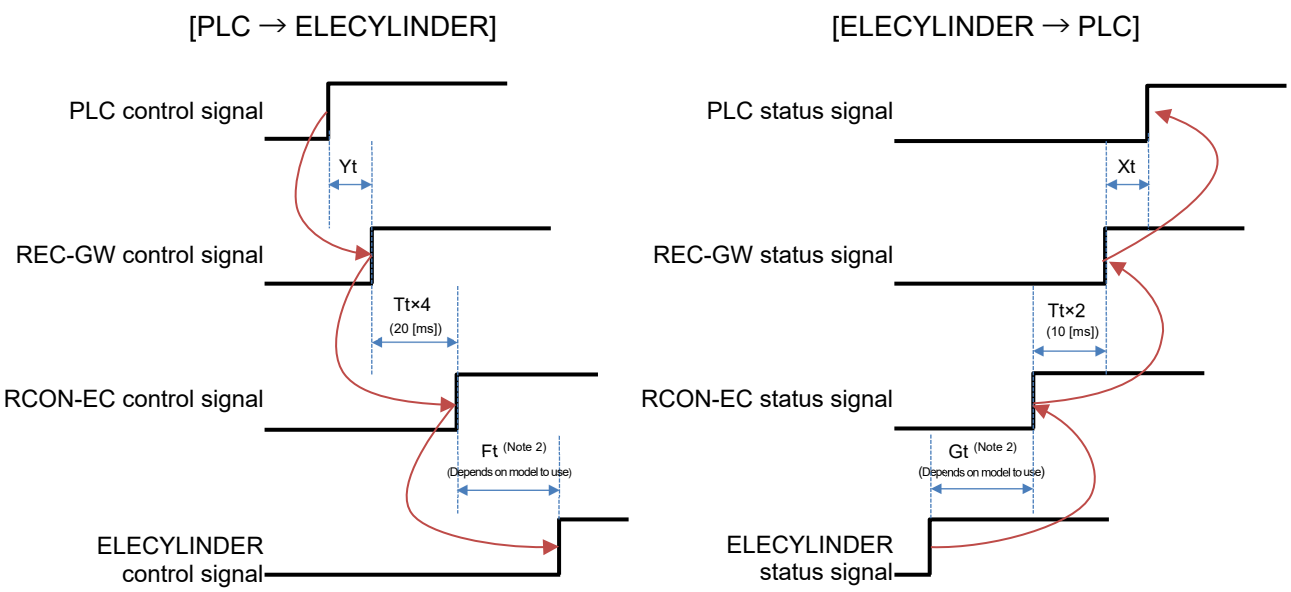
- If no contact is made, the PE signal will not turn on.
  A timer is required to determine if no contact has been made.
- After a non-contact operation, the unit will stop in the pressing operation status.
- If the workpiece shifts once pressing complete is determined and the PE signal is on, the ELECYLINDER will start another approach operation with the PE signal still on.
  If the workpiece cannot be pressed again, it will remain on even with no contact.

### 5.3.5 Timing for Input and Output Signals

The maximum response time from the control signal gets turned on till it reaches ELECYLINDER and the status signal from ELECYLINDER returns to PLC when an actuator is operated in a PLC sequence program can be expressed with formulas shown below.
Also, PLC should be the master station and the gateway unit should be the remote I/O station.

PLC → Max. Response Time of ELECYLINDER : Yt + (Tt × 4) + Ft
ELECYLINDER → Max. Response Time of PLC : Gt + (Tt × 2) + Xt

Tt = Transmission Time (5ms)
Yt = Master Station→Remote I/O Station Transmission Latency
Xt = Remote I/O Station→Master Station Transmission Latency
} Field Network Transmission Latency (Note 1)
Ft = ELECYLINDER Input Filter (Note 2)
Gt = RCON-EC Input Filter (Note 2)




Note 1 For the field network transmission latencies of the master station and REC system, refer to the instruction manual of each field network master unit or PLC.

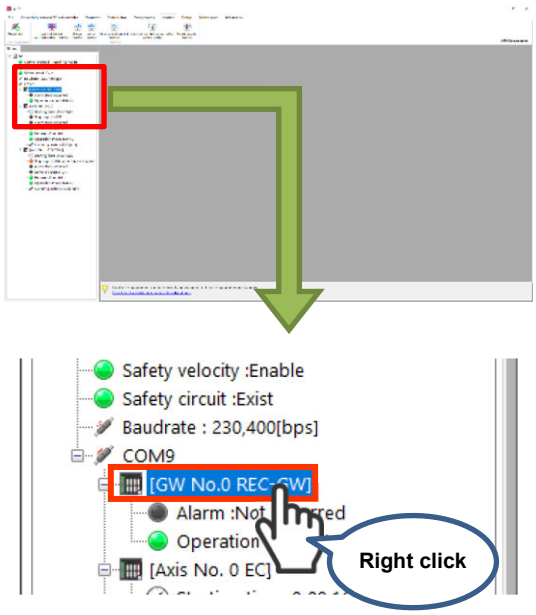
Note 2 Ft and Gt values vary depending on the ELECYLINDER model and the RCON-EC connection method.
-Models other than Ultra Mini ELECYLINDER: 6 to 26ms
-When connecting Ultra Mini ELECYLINDER to RCON-EC via the interface box: Up to 26ms
-When connecting Ultra Mini ELECYLINDER directly to RCON-EC: up to 40ms

# 5.4 Network Data Monitor

## 5.4.1 Launch of Network Data Monitoring

Below, explains how to set it up.

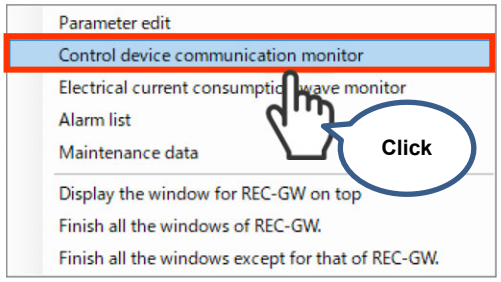
1 Select Gateway Unit in the status bar in the left of the IA-OS screen and right-click on it.




2 The right-click menu pops up.
Click Control device communication monitor.

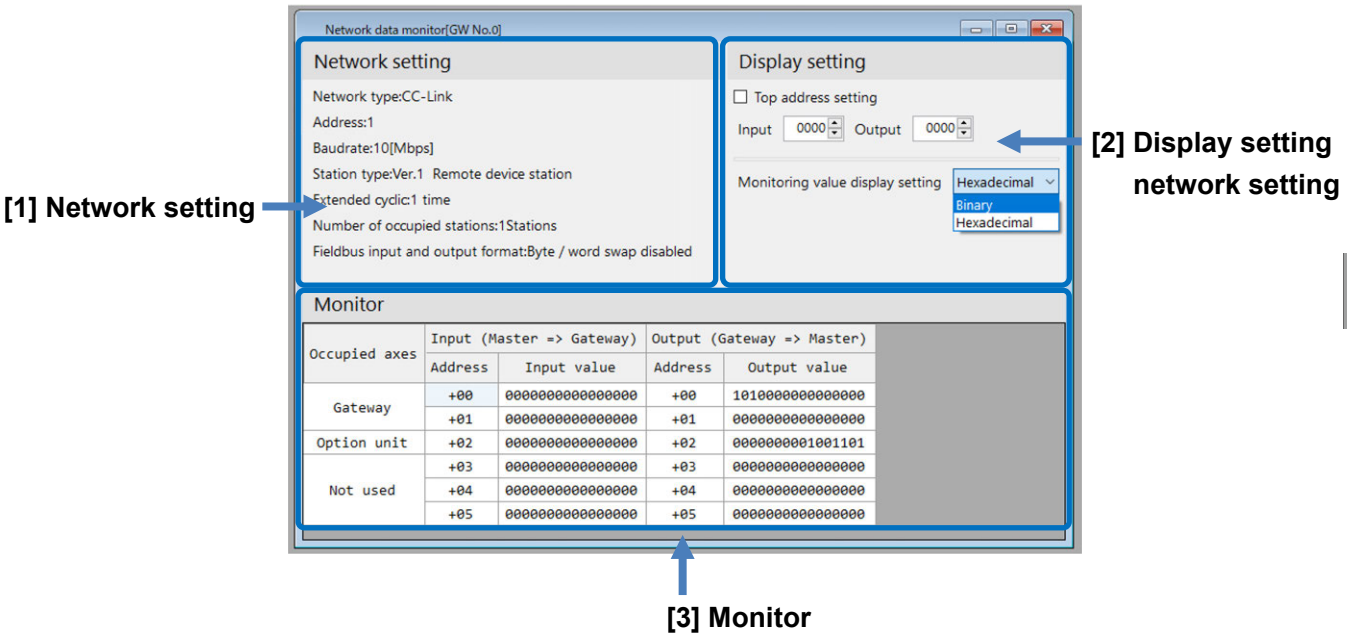
Action

The network data monitoring screen should be displayed.



### 5.4.2 Features in Network Data Monitoring

Here, explains each feature in the network data monitoring screen.




**[1] Network setting**

When connection is established with the host such as PLC in the field network, the link status should be displayed.

In case the monitoring would not start or there is a problem in the received data, check if the network setting and PLC setting are matched.

**[2] Display setting network setting**

Address display setting and display setting of monitoring values are available.

- Top address setting

  Input values in input and output and then put a check mark in the top address setting. Each of positive offset values input should be displayed.

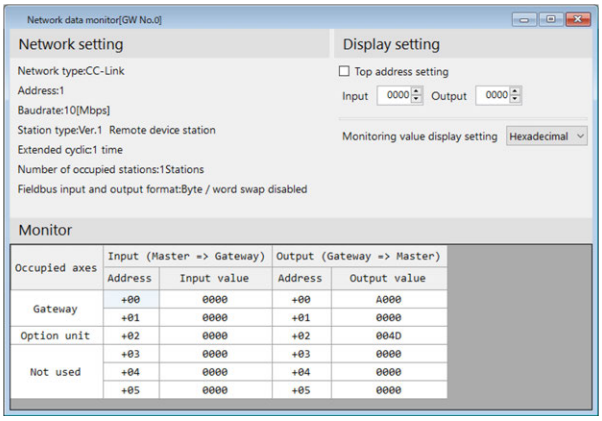
  Establish the setting accordingly to the PLC addresses used. The offset value with the top of the obtained data set as "0" should be displayed normally.

- Monitoring value display setting

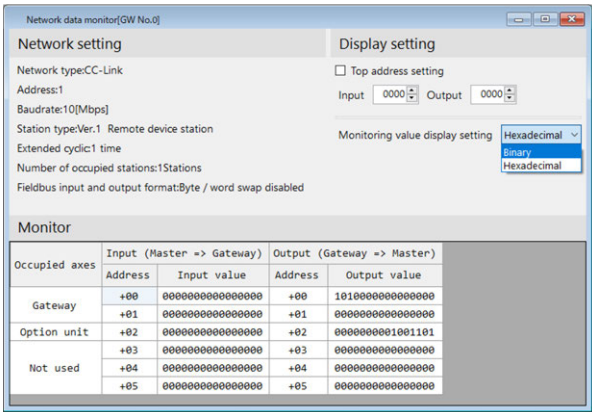
  Input and output values can be switched between hexadecimal and binary numbers. Set it to numbers that is easy to compare with those in PLC side.

### [3] Monitor

The input and output values exchanged with the host device such as PLC should be displayed.




Hexadecimal display screen




Binary number display screen

# 5.5 Operation Noise Tuning

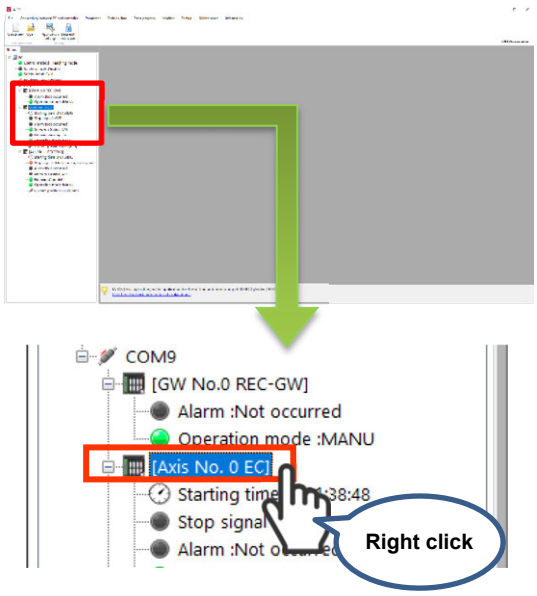
The operation noise of ELECYLINDER can be tuned.
When there is abnormal noise, especially when during stop or in low speed (50mm/s or less), there is extreme high noise, the abnormal noise may get improved by raising the setting level. Also, by pulling down the setting level, low operation noise may be able to be reduced.

Levels from 0 to 14 are available for setting in the operation noise tuning screen.
However, setting the level too high may cause vibration.

Below, explains how to set it up.

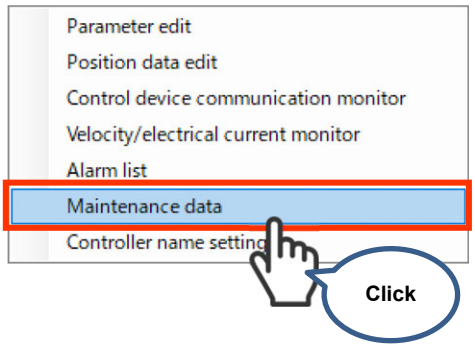


1 Select Gateway Unit in the status bar in the left of the IA-OS screen and right-click on it.

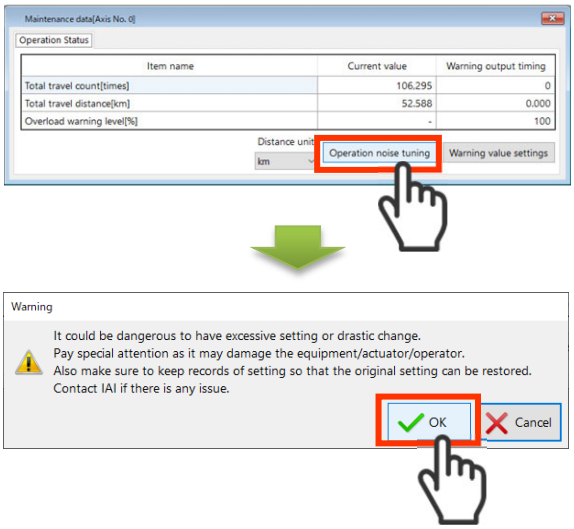



2 The right-click menu pops up.
Click Maintenance data.

Action
The maintenance data screen should be displayed.



3 Click Operation noise tuning.
The warning screen comes up next,
Click OK.

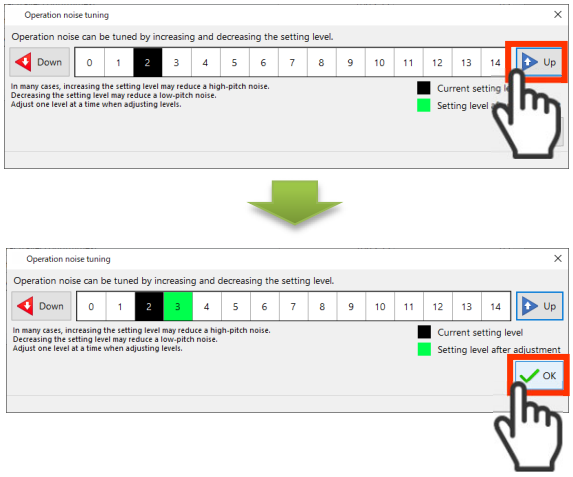



Action

The Operation noise tuning pops up.

4 Setting the level up and down to tune the operation noise.
Click Up to up the setting level
and Down to down it.
Decide the setting level and then click OK.

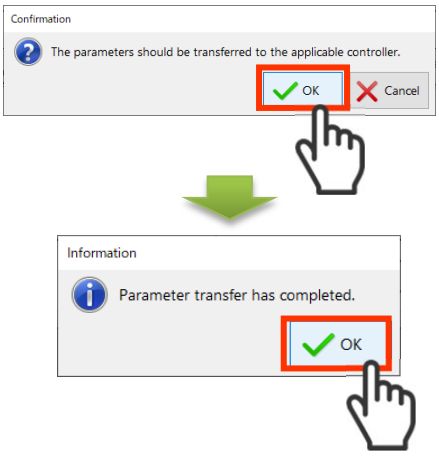
(Note) Operation noise should be tuned by shifting level one by one.



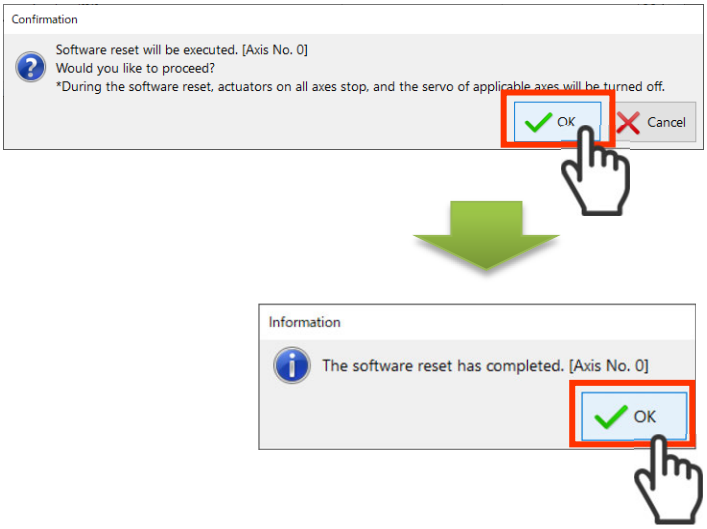

Action

The parameter should be change.

5 Follow the procedures below to transfer parameters.
Once the confirmation screen for transfer to the controller appears, click OK.
Once the transfer is completed, click OK.



6 Click OK on the confirmation screen, and the software reset should start.
Once the software reset is completed, click OK.




## Caution

- Changing parameters only should not enable the changes made.
- Conduct reboot of the power or software reset after a change is made.
  After ELECYLINDER is started up, the parameter changes should become enable.
- Do not attempt to turn the power off while the parameters are being overwritten.
  Doing so may damage the controller.

R E C

Chapter 6

# Parameter

## 6.1 Caution Related to Parameters

Parameters are the data to establish settings and tune them in accordance with systems and applications.
As it gives critical impact to operation, wrong setting could cause wrong operation.

Also, when making a change, back up the data before making the change so it can be set back.
Also, have a backup on the data after the change.
It will be necessary in investigation on cause of malfunction or when ELECYLINDER is replaced.

**Caution**

When a change or setup is to be made in accordance with a system or application, make sure that you understand well about the control systems.
Consult with IAI if you have anything uncertain.

# 6.2 How to Change Parameters

Parameter change can be made using a teaching pendant or PC software. In this chapter, introduces how to operate using IA-OS.

Reference

| | |
|---|---|
| How to operate in PC software | ●PC Software Instruction Manual (ME0155) |
| Detail of how to operate in teaching pendant | ●Teaching Pendant Instruction Manual (ME0355) |
| Detail of how to operate in Touch panel teaching pendant | ●Touch Panel Teaching Pendant Instruction Manual (ME0375, ME0376) |

## 6.2.1 Parameter Edit in Gateway

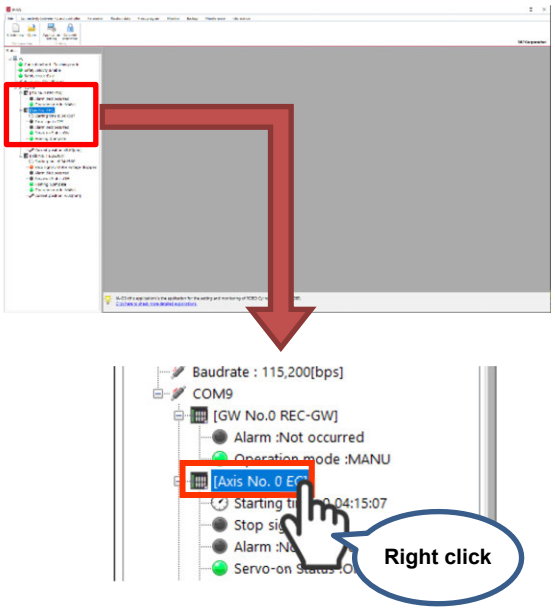
Refer to [4.4.2 Parameter Edit in Gateway] for how to edit/change parameters in the EC gateway unit.

### Caution

- Changing parameters only should not enable the changes made.
- Conduct reboot of the power or software reset after a change is made.
  After ELECYLINDER is started up, the parameter changes should become enable.
- Do not attempt to turn the power off while the parameters are being overwritten.
  Doing so may damage the controller.

### 6.2.2 Parameter Edit in ELECYLINDER

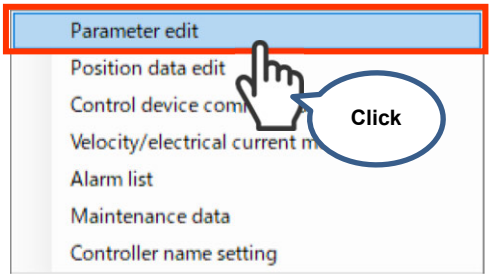
1 Select an axis that you would like to edit in the status bar in the left of IA-OS screen, and right-click on it.




2 The right-click menu pops up.
Click Parameter edit.

Action

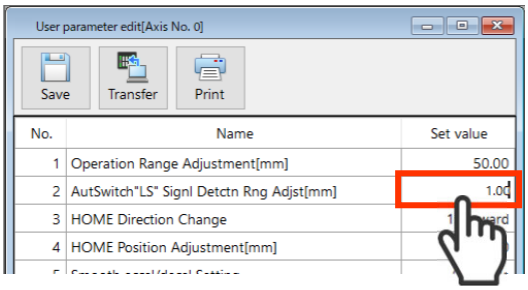
The user parameter edit screen should come up.




3 When it is a parameter that is to be set in a numerical value, select "Set value".

Action

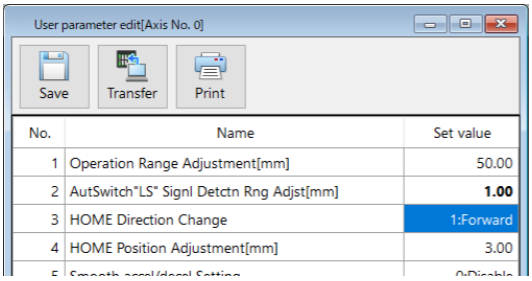
The cursor on the setting value flashes.




4 Input a number on the PC keyboard and press the Enter key.

Action

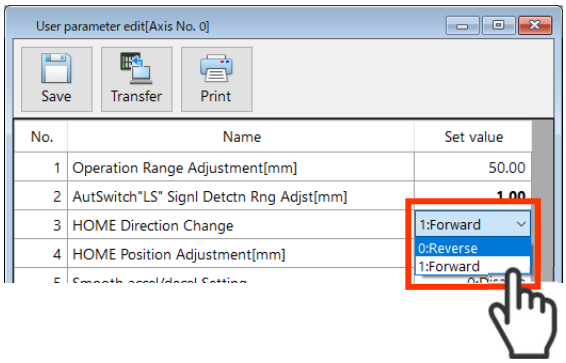
The parameter should be change.



5 Select a setting if it is a parameter selected from the pulldown menu.

Action

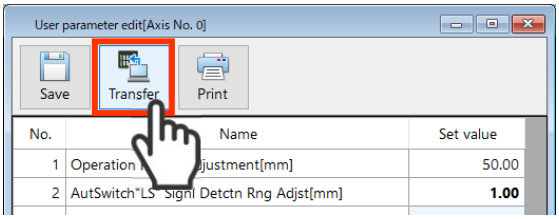
The parameter should be change.



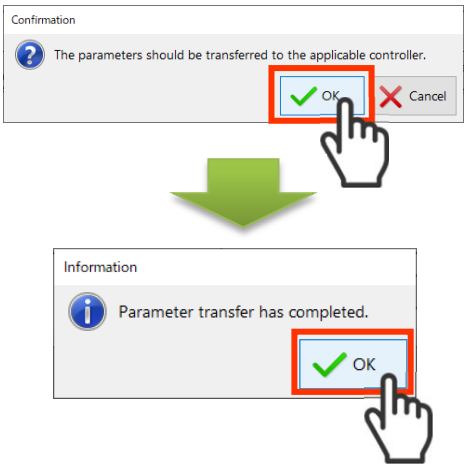

6 Once the parameter setting change is finished, click the Transfer button.

Action

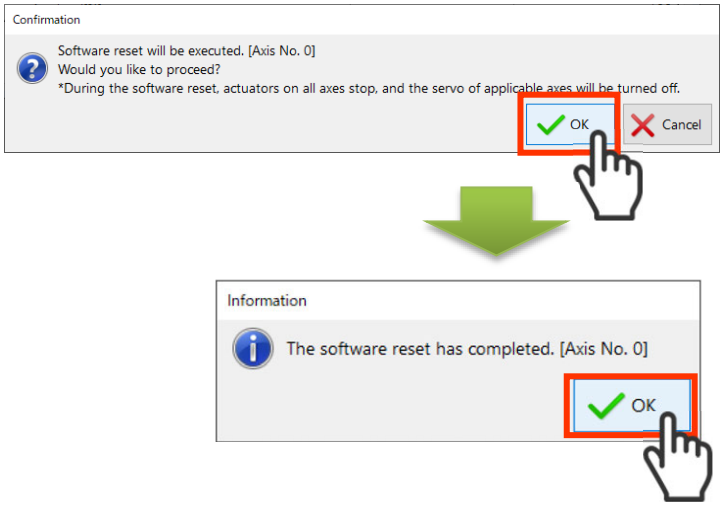
A confirmation screen for parameter transfer should appear.




7 Follow the procedures below to transfer parameters.
Once the confirmation screen for transfer to the controller appears, click OK.
Once the transfer is completed, click OK.



8 Click OK on the confirmation screen, and the software reset should start.
Once the software reset is completed, click OK.




## Caution

- Changing parameters only should not enable the changes made.
- Conduct reboot of the power or software reset after a change is made.
  After ELECYLINDER is started up, the parameter changes should become enable.
- Do not attempt to turn the power off while the parameters are being overwritten.
  Doing so may damage the controller.

# 6.3 EC Gateway Parameter

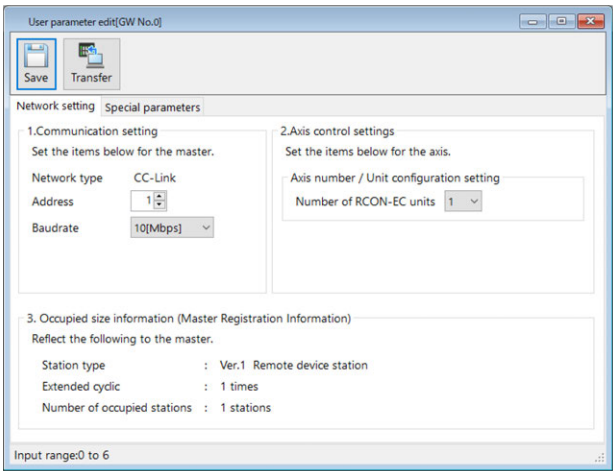
## 6.3.1 Configuration of EC Gateway Parameters

There are two types as follows in the REC gateway parameters.

[1] Network setting

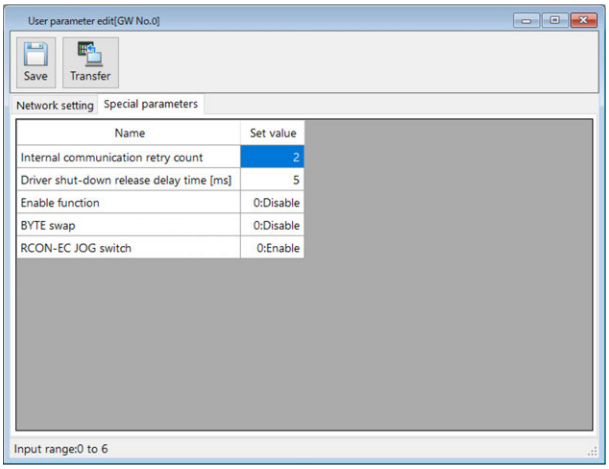
"Communication setting", "Axis control settings" and "Occupation size information (Master Registration Information)" should be displayed.

Establish the setting in accordance with the master depending on the connected network type.




[2] Special parameters

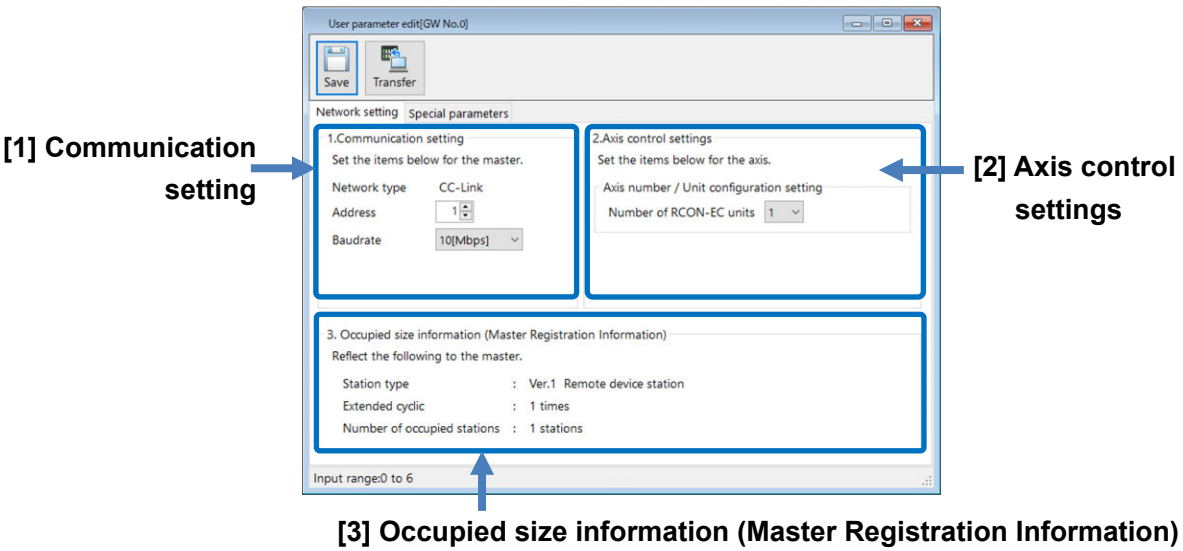
Parameter settings related to processes in the gateway unit can be established.




The switchover of the parameter setting screen can be done by clicking "Network setting" and "Special prameters" tags.

### 6.3.2 Network Setting

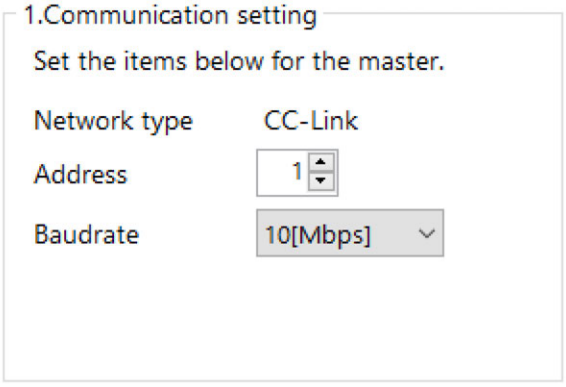
Here, explains the content in the network setting screen.




**[1] Communication setting**

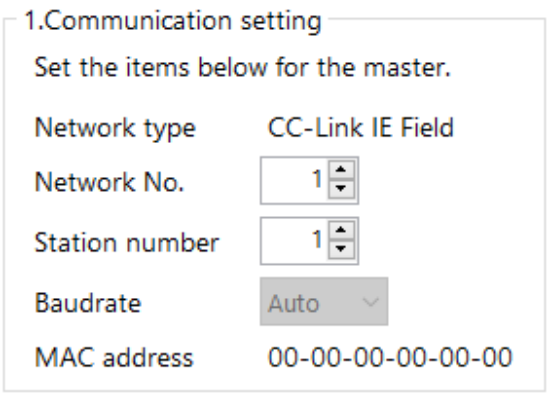
The content of display should differ depending on the used driver or network. Establish the setting in accordance with the master.

[CC-Link]




| Item | Default Setting | Settable Range |
|---|---|---|
| Network type | CC-Link | Not Available for Change |
| Address | 1 | 1 to 64 |
| Baudrate | 156kbps | Select: 156kbps/ 625kbps/ 2.5Mbps/ 5Mbps/ 10Mbps |

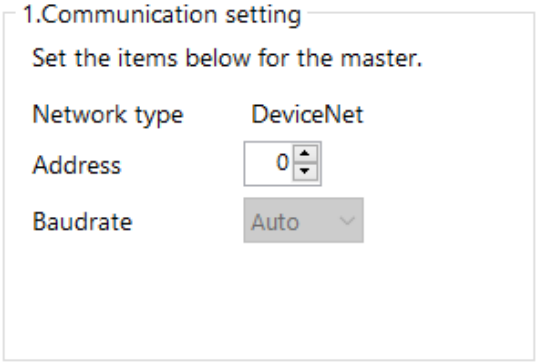
[CC-Link IE Field]




| Item | Default Setting | Settable Range |
|---|---|---|
| Network type | CC-Link IE Field | Not Available for Change |
| Network No. | 1 | 1 to 239 |
| Station number | 1 | 1 to 120 |
| Baudrate | Auto | Setting Not Necessary (Fixed at 1Gbps) |
| MAC address (*1) | Specific to Product | Setting Not Available |

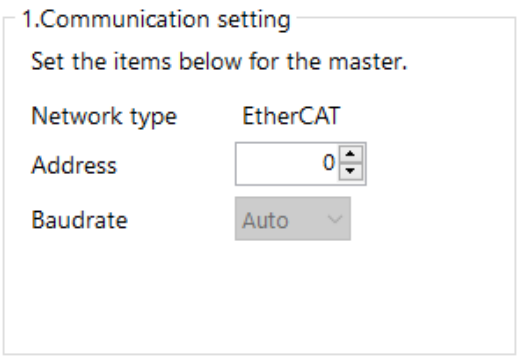
*1 It is the specific identification number (setting not available) assigned to the network module.

[DeviceNet]



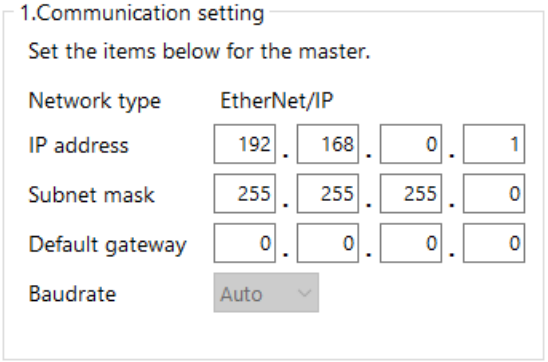

| Item | Default Setting | Settable Range |
|---|---|---|
| Network type | DeviceNet | Not Available for Change |
| Address | 0 | 0 to 63 |
| Baudrate | Auto | Setting Not Necessary<br>(Follows automatically to master setting) |

[EtherCAT]



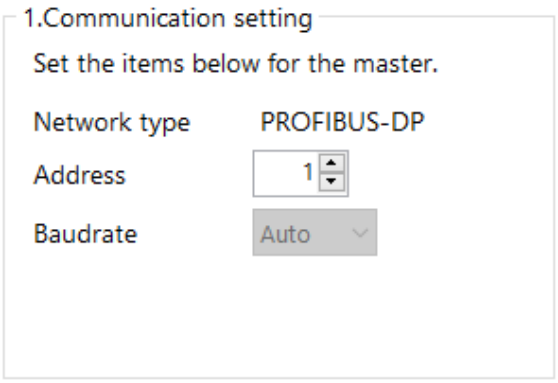

| Item | Default Setting | Settable Range |
|---|---|---|
| Network type | EtherCAT | Not Available for Change |
| Address | 0 | 0 to 65,535 |
| Baudrate | Auto | Setting Not Necessary<br>(Follows automatically to master setting) |

[EtherNet/IP]



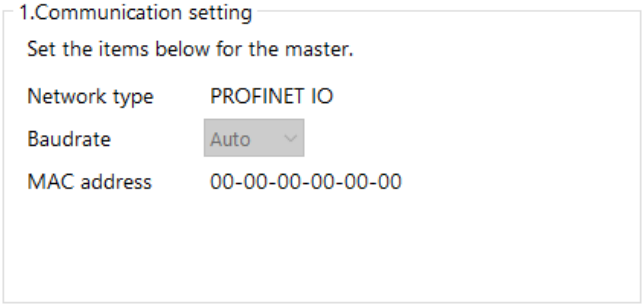

| Item | Default Setting | Settable Range |
|---|---|---|
| Network type | EtherNet/IP | Not Available for Change |
| IP address | 192.168.0.1 | 0.0.0.0 to 255.255.255.255 |
| Subnet mask | 255.255.255.0 | 0.0.0.0 to 255.255.255.255 |
| Default gateway | 0.0.0.0 | 0.0.0.0 to 255.255.255.255 |
| Baudrate | Auto | Setting Not Necessary<br>(Automatic negotiation) |

[PROFIBUS-DP]




| Item | Default Setting | Settable Range |
|---|---|---|
| Network type | PROFIBUS-DP | Not Available for Change |
| Address | 0 | 0 to 65,535 |
| Baudrate | Auto | Setting Not Necessary (Fixed at 1Gbps) |

[PROFINET IO]




| Item | Default Setting | Settable Range |
|---|---|---|
| Network type | PROFINET IO | Not Available for Change |
| Baudrate | Auto | Setting Not Necessary (Fixed at 100Mbps) |
| MAC address (*1) | Specific to Product | Not Available for Change |

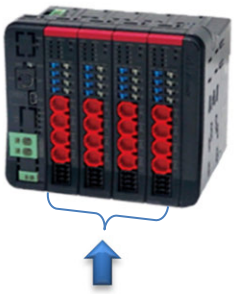
*1 It is the specific identification number (setting not available) assigned to the network module.

**[2] Axis control settings**

The number of the EC connection units connected to the gateway unit should be set up.
The content of setting should be the same regardless of network.

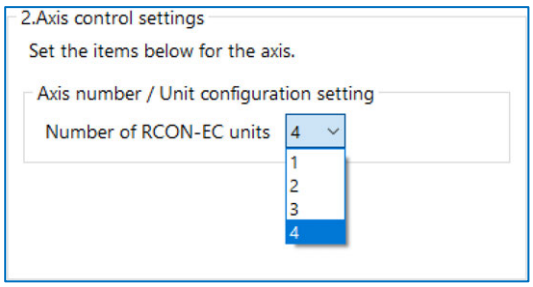
| Name | Unit | Input range | Default initial value setting |
|---|---|---|---|
| Number of RCON-EC units | - | 1 to 4 | Depend on number of connected RCON-EC (set at initial connection) |

Setting example



RCON-EC: 4 units

As there are 4 units of RCON-EC, set "4".



### [3] Occupied size information (Master Registration Information)

[CC-Link]

The occupied size information should be fixed as below.

3. Occupied size information (Master Registration Information)

Reflect the following to the master.

| | | |
|---|---|---|
| Station type | : | Ver.1 Remote device station |
| Extended cyclic | : | 1 times |
| Number of occupied stations | : | 1 stations |

[CC-Link IE Field]

The occupied size information should be fixed as below.

3. Occupied size information (Master Registration Information)

Reflect the following to the master.

| | | |
|---|---|---|
| Station type | : | Intelligent Device Station |
| RX/RY | : | 32 bits (4bytes) |
| RWw/RWr | : | 4 words (8bytes) |

[DeviceNet]

The occupied size information should differ depending on the number of the EC connection units (RCON-EC) to be connected.

Shown below is an example of occupied size information when four units of the EC connection units are connected.

3. Occupied size information (Master Registration Information)

Reflect the following to the master.

| | | |
|---|---|---|
| Output size | : | 10 bytes |
| Input size | : | 10 bytes |

[EtherCAT]

The occupied size information should be fixed as below.

3. Occupied size information (Master Registration Information)

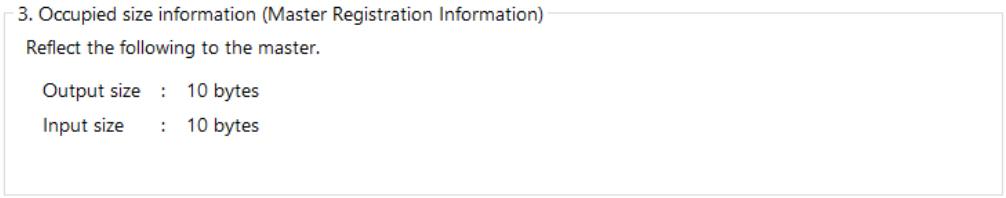
Reflect the following to the master.

| | | |
|---|---|---|
| Output size | : | 32 bytes |
| Input size | : | 32 bytes |

[EtherNet/IP]

The occupied size information should differ depending on the number of the EC connection units (RCON-EC) to be connected.

Shown below is an example of occupied size information when four units of the EC connection units are connected.

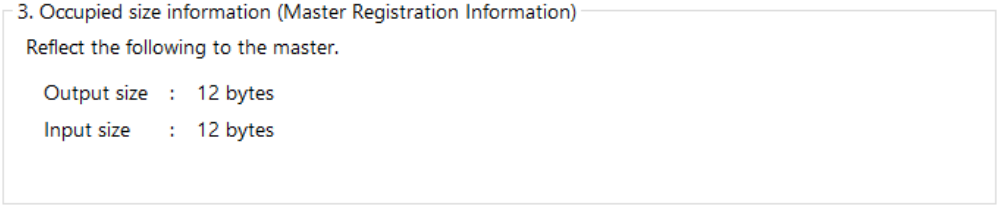





[PROFIBUS-DP]

The occupied size information should differ depending on the number of the EC connection units (RCON-EC) to be connected.

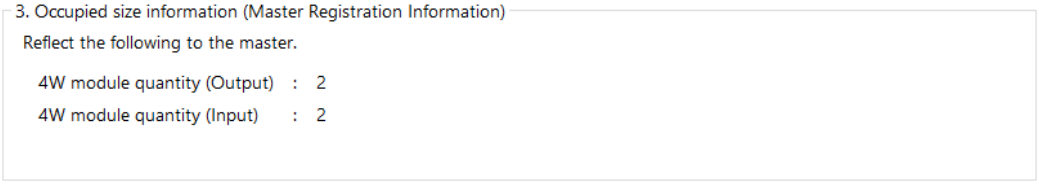
Shown below is an example of occupied size information when four units of the EC connection units are connected.




[PROFINET IO]

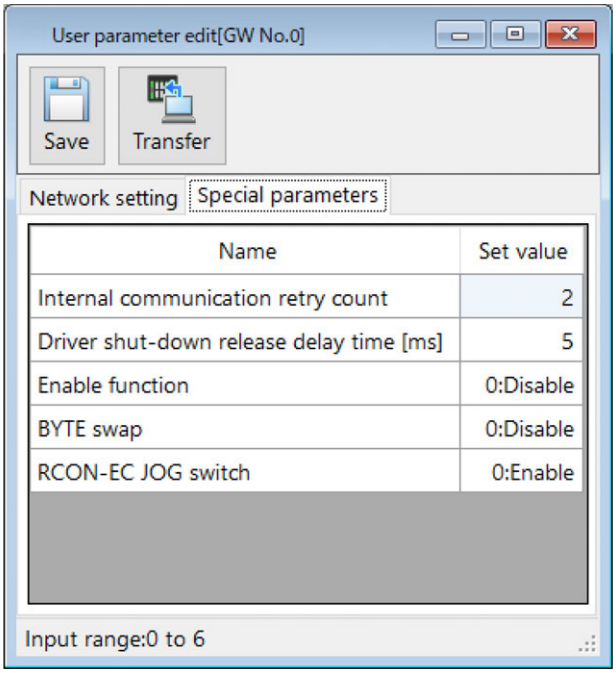
The occupied size information should differ depending on the number of the EC connection units (RCON-EC) to be connected.

Shown below is an example of occupied size information when four units of the EC connection units are connected.



### 6.3.3 Special Parameters

**[1] Special parameters list**




| Name | Unit | Input range | Default initial value setting | Described Page |
|---|---|---|---|---|
| Internal communication retry count | - | 0 to 6 | 0 | 6-15 |
| Driver shut-down release delay time [ms] | ms | 0 to 65,535 | 5 | 6-15 |
| Enable function | - | 0: Disable<br>1: Enable | 0: Disable | 6-16 |
| BYTE swap | - | 0: Disable<br>1: Enable | 0: Disable | 6-16 |
| RCON-EC JOG switch | - | 0: Disable<br>1: Enable | 0: Disable | 6-17 |

### [2] Details of Special Parameters

#### [Internal communication retry count]

| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| - | Internal communication retry count | - | 0 to 6 | 0 |

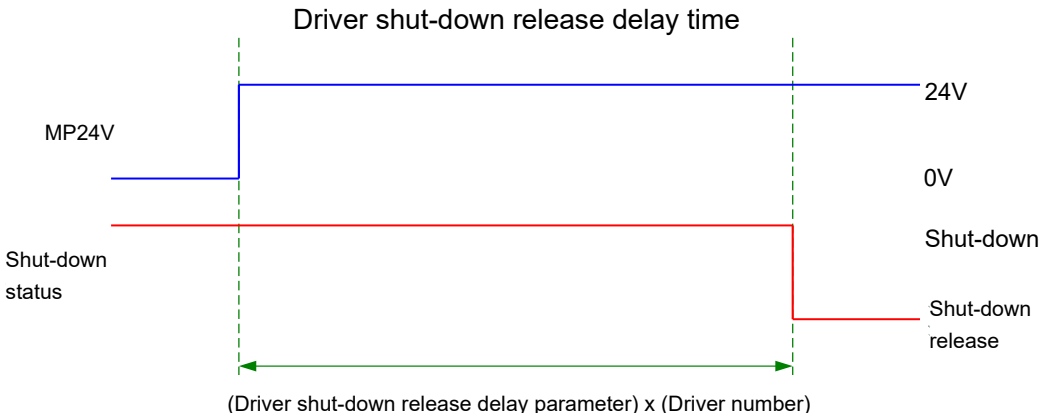
The setting for the internal communication retry count to connected axes in AUTO should be established.
The gateway should generate Slave Axis Communication Error (ERR_T) when communication cannot be established for number of times set in this count in a row.



#### [Driver shut-down release delay time [ms]]

| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| - | Driver shut-down release delay time [ms] | ms | 0 to 65,535 | 5 |

The latency (interval) setting when supplying power in order to each driver unit should be established.
This is to be used in purpose to reduce inrush current by sliding the timing of supplying power to each axis.
This feature should become disable when "0" is set in Driver shut-down release delay time.

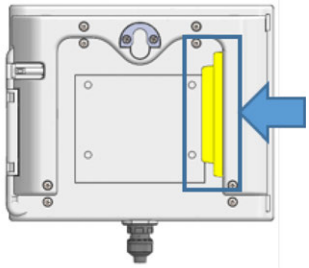


**[Enable function]**

| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| - | Enable function | - | 0: Disable, 1: Enable | 0: Disable |

Switchover of enabled/disabled of the enable when a touch panel teaching pendant is connected should be performed.
Set it to disabled when using a teaching pendant with no enable switch or the enable feature is not to be used.

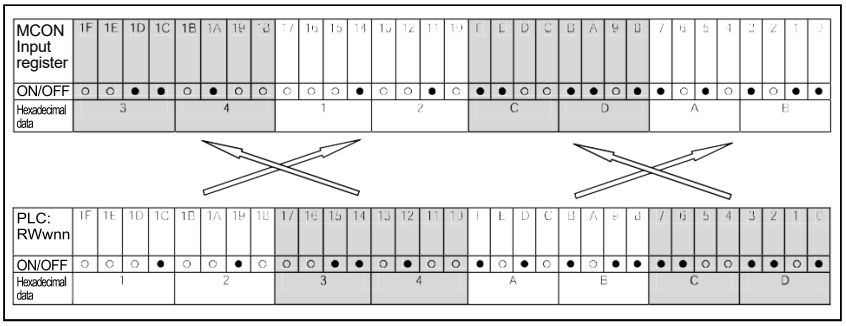
Touch panel teaching pendant

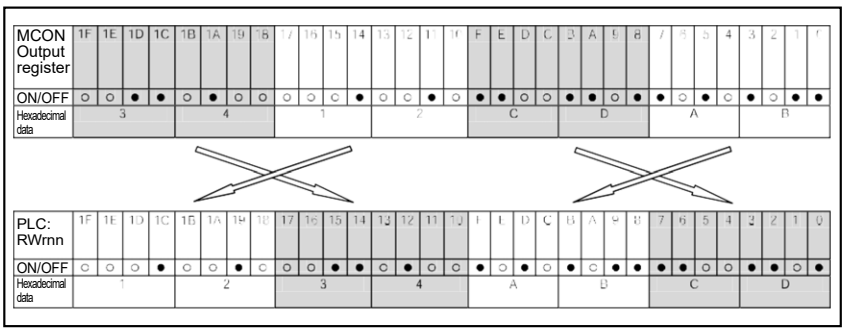



**[BYTE swap]**

| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| - | BYTE swap | - | 0: Disable, 1: Enable | 0: Disable |

Set up the byte swap.
The transferred data can be swapped between upper and lower in the unit of byte. Establish the setting in accordance with the connected host device as necessary.

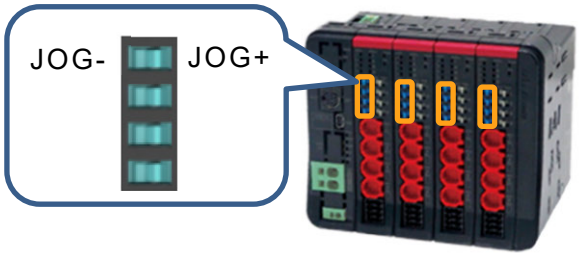


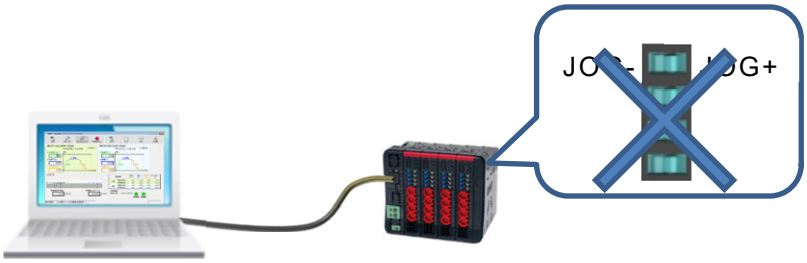
### [5] RCON-EC JOG switch

| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| - | RCON-EC JOG switch | - | 0: Disable, 1: Enable | 0: Disable |

Select enabled/disabled of the features of the jog switch equipped on the RCON-EC unit.




Set it to disabled and an actuator would not operate even if operating the jog switch.
The jog switch should get disabled also when a screen that is able to operate actuators with a teaching tool or the parameter edit screen is open.



# 6.4 ELECYLINDER Parameter

## 6.4.1 ELECYLINDER Parameter List

| No. | Name | Unit | Input range | Default setting at shipping | Reference Page |
|---|---|---|---|---|---|
| 1 | Operation range adjustment | mm | 0 to 9,999.69 | Max. stroke | 6-19 |
| 2 | Auto switch "LS" signal detection range adjustment | mm | Actuator depended to 9,999.99 | 0.10 | 6-20 |
| 3 | Change home return direction | - | Reverse, Forward | According to ELECYLINDER specifications | 6-21 |
| 4 | Home position adjustment | mm | 0 to 9,999.99 | According to ELECYLINDER specifications | 6-22 |
| 5 | Smooth accel/decel setting | - | Disable, Enable | Disable | 6-23 |
| 6 | Current control setting at stop | - | Disable, Powerful stop Enable, Energy-saving stop | Disable | 6-24 |
| 7 | Wireless function setting | - | Disable, Enable | Enable | 6-25 |
| 8 | Power-saving setting | - | Disable, Enable | Disable | 6-25 |
| 9 | Select electromagnetic valve system (operation system) | - | Double, Single | Double (Not Available for Change) | ---- |
| 10 | LED lighting method Auto SW setting | - | Disable, Enable | Disable | 6-26 |

### Caution

- No.1/3/4 default setting at shipping differ according to ELECYLINDER specifications.
- No.7 Wireless function setting parameter is not displayed on ELECYLINDERs without wireless circuit boards (no WL, WL2 in the option model number).
- Do not attempt to change No.9 Select electromagnetic valve system (operation system) parameter from Double.
  It may cause the unit not operate as commanded by a host system in Single.
- No. 10 LED Lighting Method is a parameter available for setting only on the Ultra Mini ELECYLINDER (EC-SL3□, GDS3L, GDB□ and T3□).

### 6.4.2 ELECYLINDER Parameter Details

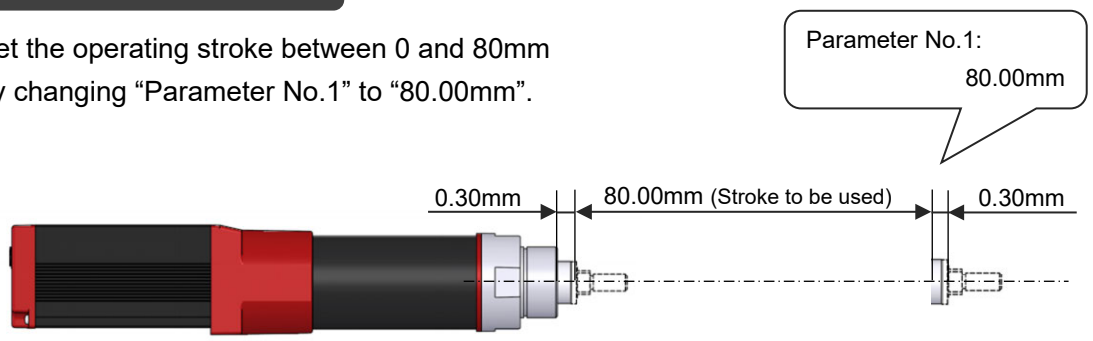
**[Operation range adjustment (Parameter No. 1)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 1 | Operation range adjustment | mm | 0 to 9,999.69 | Max. Stroke |

- The ELECYLINDER operation range can be adjusted to suit your system.
- The minimum setting unit is 0.01mm.
- Set to your desired stroke length.
  The controller automatically adds 0.30mm and controls/monitors the operation range.

**Setting example**

Set the operating stroke between 0 and 80mm by changing “Parameter No.1” to “80.00mm”.




**Caution**

- Set within the ELECYLINDER movable range.
  Setting to a value that exceeds the maximum stroke will result in collision with the forward side mechanical stopper.
- This may damage the ELECYLINDER, workpiece or peripheral devices.

**[Auto switch "LS" signal detection range adjustment (Parameter No. 2)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 2 | Auto switch "LS" signal detection range adjustment | mm | Actuator depended to 9,999.99 | 0.10 |

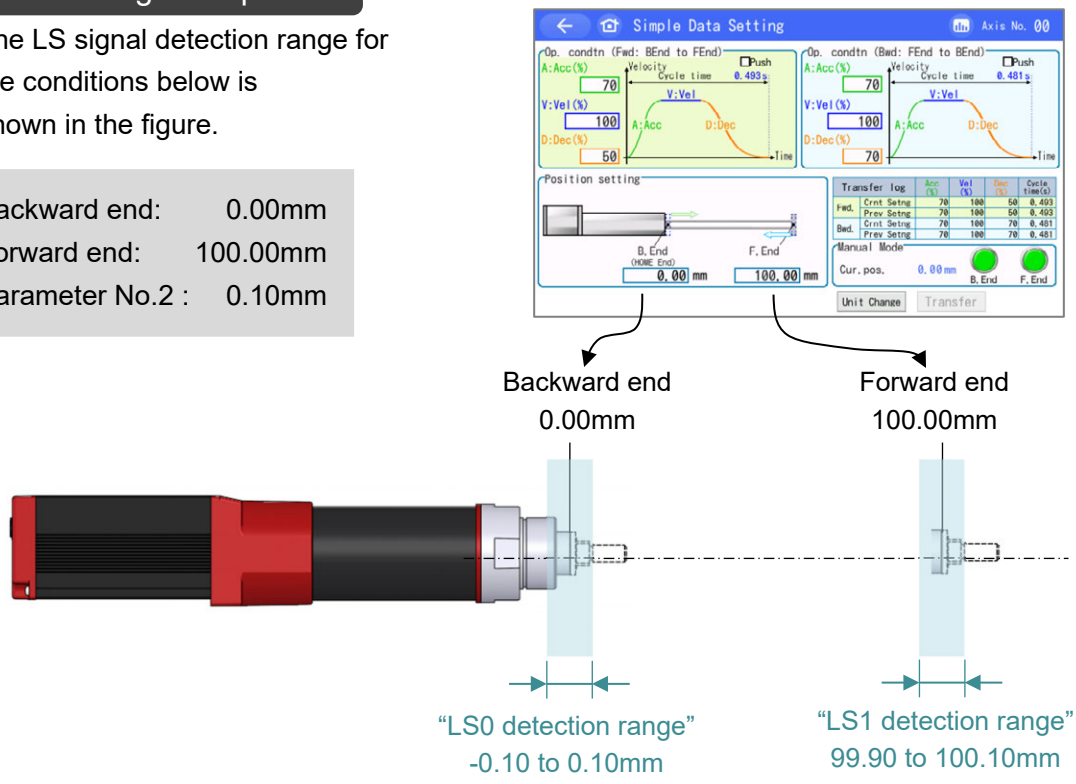
- Sets the backward complete/forward complete ON trigger range relative to the backward end/forward end.
- When the ELECYLINDER enters the detection range, the backward complete or forward complete signal turns ON.
- The minimum setting unit is 0.01mm.



## Setting example

The LS signal detection range for the conditions below is shown in the figure.

Backward end: 0.00mm
Forward end: 100.00mm
Parameter No.2 : 0.10mm




## Caution

- A value smaller than the minimum resolution cannot be set.
  Minimum resolution [mm/p] = ball screw lead [mm/r] / 800 [p/r]

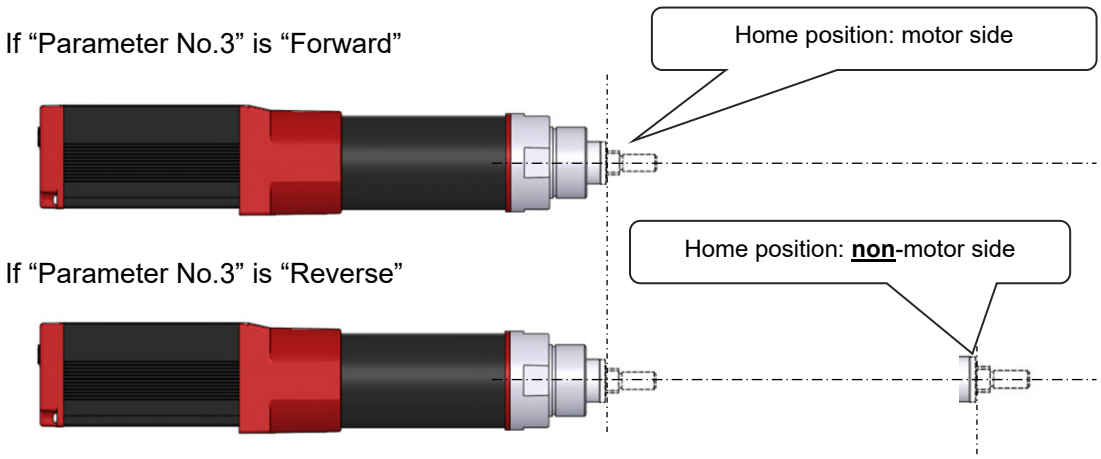
**[Change home return direction (Parameter No. 3)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 3 | Change home return direction | - | Reverse, Forward | According to ELECYLINDER specifications |

- Setting is established at delivery based on the ELECYLINDER specifications. It is not necessary to adjust the setting in normal use.
- The home return operation direction can be selected.
- To set the opposite direction, switch to the opposite setting value. ("Forward" → "Reverse" or "Reverse" → "Forward")
- For standard specification, the motor side is home.



Setting example




## Caution

- Changing the home return direction reverses the operation direction.
- After changing this parameter, always perform home return reset (absolute reset).
- Even if the operation direction is reversed, check that the moving parts do not interfere with any other objects.
  If the moving parts collide, they may damage the ELECYLINDER, workpiece or peripheral devices.
- Changing the home return direction after purchasing will cause a mismatch with the ELECYLINDER model number. Make sure to change parameters again if the controller or body is replaced.

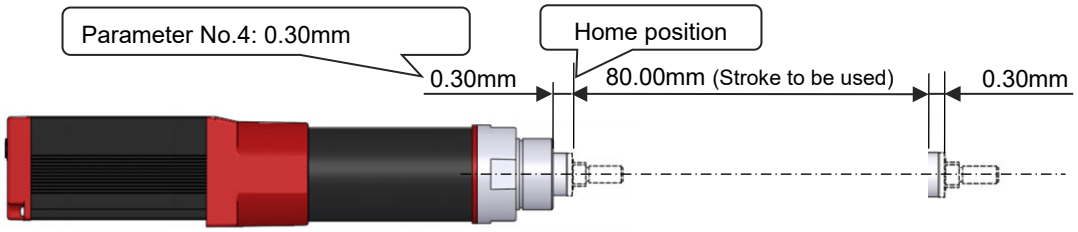
**[Home position adjustment (Parameter No. 4)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 4 | Home position adjustment | mm | 0 to 9,999.99 | According to ELECYLINDER specifications |

- It is basically recommended to use with the settings as they are at delivery.
- Sets the distance between the home side mechanical stopper and the home position.
- The minimum setting unit is 0.01mm.
- Adjustment with this parameter is possible in the following situations.
  (1) To match the ELECYLINDER home position and the mechanical home position after assembly into equipment.
  (2) To adjust the new home position upon reversing the default home return direction after purchase.
  (3) To eliminate a slight deviation from the previous home position generated after replacing the ELECYLINDER.

**Setting example**

If “Parameter No.4” is “0.30mm”,
the relationship between mechanical stopper and home position is as follows.



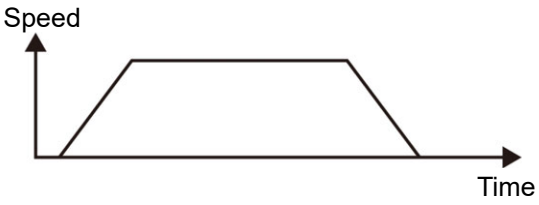
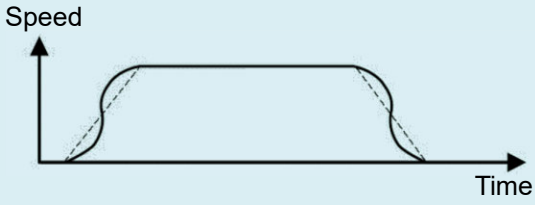

## Caution

- If adjusting Parameter No.4, simultaneously adjust Parameter No.1.
  "Parameter No.1: Operation range adjustment" uses the home position as the datum.
- Do not set Parameter No.4 to a value smaller than the default setting at shipping.
  This may result in abnormal home return operation, alarm triggering or abnormal operation. If the value must be set small, please contact IAI.
- After changing this parameter, always perform home return reset (absolute reset).

**[Smooth accel/decel setting (Parameter No. 5)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 5 | Smooth accel/decel setting | - | Disable, Enable | Disable |

- The movement waveform for ELECYLINDER operation can be selected.
- When “Enable”, accel/decel operation becomes smoother (less abrupt).
  This softens the shocks of acceleration/deceleration without delaying the operation time.
- If “Disable”, the above functionality is not enable.

| Setting | Acceleration/deceleration pattern | Operation waveform image |
|---|---|---|
| Disable | Trapezoid |   |
| Enable | S-motion |   |



## Caution

- For operation in which the acceleration time or deceleration time exceeds 2 seconds, do not “Enable” smooth accel/decel settings.
  Normal operation will not be possible.
- Avoid momentary stops during acceleration or deceleration operation.
  Sudden changes (acceleration) will occur, which may be dangerous.

**[Current control setting at stop (Parameter No. 6)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 6 | Current control setting at stop | - | Disable : Powerful stop<br>Enable : Energy-saving stop | Disable |

- The control method for ELECYLINDER stop can be selected.
- If “Disable”, a constant current value will be transmitted to the motor, stopping it. This limits fine vibration when stopping, bringing the unit to a complete stop.
- If “Enable”, a current appropriate to the load will be transmitted to the motor, stopping it. This limits the amount of power consumed while stopping.
- If abnormal noise or vibration occurs during a gradual stop, setting to “Enable” may fix the issue. Moreover, setting to “Enable” can also fix issues in which the command position cannot quite be attained.

## Caution

- If “Disable”, even if a pulse deviation within ±2 from the target position remains, movement towards the target position will not continue.
- If “Enable”, if a pulse deviation of ±1 or more from the target position remains, movement towards the target position will continue.

**[Wireless function setting (Parameter No. 7)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 7 | Wireless function setting | - | Disable, Enable | Enable |

- Either Enable or Disable can be selected for the ELECYLINDER wireless function.
- When “Enable” is selected, wireless communication between the ELECYLINDER and the Touch Panel Teaching Pendant is possible.
- When “Disable” is selected, wireless communication between the ELECYLINDER and the Touch Panel Teaching Pendant is not possible. There is no transmission or reception of wireless communication radio waves.



## Caution

- This parameter is not displayed on ELECYLINDERs without wireless circuit boards (no WL, WL2 in the option model number).

**[Power-saving setting (Parameter No. 8)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 8 | Power-saving setting | - | Disable, Enable | Disable |

- Either Enable or Disable can be selected for the ELECYLINDER power-saving setting.
- When “Enable”, the power capacity can be reduced up to 40% compared to “Disable” mode, but the maximum speed, maximum acceleration/deceleration, and payload decrease in comparison.
  For details, refer to each ELECYLINDER instruction manual of [Lead and Payload (Power-saving: Enable)], [Stroke and Max. Speed (Power-saving: Enable)], and [Payload by Speed/Acceleration (Power-saving: Enable)]
- When “Disable”, the maximum speed, maximum acceleration/deceleration, and payload increase compared to “Enable” mode.
  For details, refer to each ELECYLINDER instruction manual of [Lead and Payload (Power-saving: Disable)], [Stroke and Max. Speed (Power-saving: Disable)], and [Payload by Speed/Acceleration (Power-saving: Disable)]

**[LED lighting method Auto SW setting (Parameter No.10)]**

| No. | Name | Unit | Input range | Default setting at shipping |
|---|---|---|---|---|
| 10 | LED lighting method Auto SW setting | - | Disable, Enable | Disable |

- LED display on the ELECYLINDER unit body should become able to display the forward/backward ends like the auto switch on the air cylinder as well as the display of operating status of the actuator that it presently does.
- Set it to "Disable (Initial Setting on Delivery from Factory)" and it works as the status LED display (servo-on status, emergency stop, light malfunction, etc.) as it normally does.
- Set it to "Enable" and it works to display operation completion such as "forward/backward ends", "pressing complete" and "miss-pressing detected" as well as the ordinary status LED display.

Setting to "Disable"

| LED on Left | LED on Right | Color | Operation Status |
|---|---|---|---|
| × | × | — | Power OFF |
| | | | Servo OFF |
| ● | ● | OR | In initializing process at power supply |
| ★ | × | GR | Wireless connection establishment in process |
| ★ | × | RD | Wireless Hardware Error |
| × | ● | RD | Alarm |
| × | | | In emergency stop |
| × | ★⇔★ | GR/RD | Light malfunction alarm |
| × | ● | GR | Servo ON |

Setting to "Enable"

| LED on Left | LED on Right | Color | Operation Status |
|---|---|---|---|
| Following displays can be added as well as "conventional" LED displays. | | | |
| ● | × | OR | Backward end [LS0] |
| × | ● | OR | Forward end [LS1] |
| ★ | × | OR | Pressing complete in backward end orientation [PE0] |
| × | ★ | OR | Pressing complete in forward end orientation [PE1] |
| ● | × | OR | Miss-pressing detected in backward end orientation |
| × | ● | OR | Miss-pressing detected in forward end orientation |

●: Light ON, ★: Blinking, ×: Light OFF

## Caution

- No. 10 LED Lighting Method is a parameter available for setting only on the Ultra Mini ELECYLINDER (EC-SL3□, GDS3L, GDB□ and T3□).
- When Connecting Interface Box:
  The LED display on the interface box shows the actuator status and wireless communication status in case of setting "Disable" regardless of the parameter setting.

REC

Chapter 7

# Troubleshooting

# 7.1 Troubleshooting

If a problem occurs, check the following points first in order to ensure quick recovery and prevent recurrence of the problem.

(1) Check the status LED of each REC system device
Check the LED status on the EC gateway unit, EC connection unit or ELECYLINDER main body. When using the 200V motor type ELECYLINDER, check the status LED lamp for the motor drive DC power supply.
Refer to [instruction manual for each ELECYLINDER] for details of LED display on the main unit of ELECYLINDER.

(2) Check for abnormality in the host device (PLC, etc.)

(3) Check the control power supply, motor power supply and field network power supply voltages.
Check for momentary power failure, voltage drop, power failure, etc.

(4) Confirm the generated alarm
Check the alarm information with the teaching tool.

(5) Check the connectors for disconnection or incomplete connection

(6) Check the cables for connection error, disconnection or snagging.
Cut off the main power supply of the equipment (to avoid electric shock) and remove the cables around the measurement point (to avoid conductivity through the surrounding circuit) before checking the conductivity.

(7) Check the network terminal resistor mounting status and resistance

(8) Check the I/O signals
Use a teaching tool to check for inconsistency or abnormality in the input/output signal status of the host device and REC system.

(9) Check the noise elimination measures (grounding, connection of noise suppressor, etc.)

(10) Check the events leading to the occurrence of the problem, as well as the operating conditions at the time of occurrence

(11) Analyze the cause

(12) Countermeasures

**Caution**

- When proceeding with troubleshooting, exclude normally functioning parts from the targets to narrow down the causes.
- First, check (1) to (12) so that countermeasures can be taken swiftly.

# 7.2 Causes and Countermeasures for EC Gateway Unit Alarms

## 7.2.1 Causes and Countermeasures of Individual Alarms

The alarm codes will be read out in gateway status signal 0 ALMC1 to 128 (b0 to b7).
For details, refer to [5.2 Address Configuration (page 5-2)].
(Note) Alarm codes displayed on the gateway parameter setting tool have "8" added at the beginning of the alarm codes listed below.
(Example) If the alarm code is 43, it will be displayed as 843.

| Alarm code | Alarm name | Causes/countermeasures |
|---|---|---|
| 50<br>(850) | Field network communication error (ERR-C) | Cause: Field network link error. If a latch is set with the gateway parameter setting tool while this error is generated, actuator operation will stop in error status and commands will be ignored until the cancel signal is received.<br>Countermeasure: Check field network settings (node address, baudrate, etc.), wiring, etc. |
| 61<br>(861) | Dependent axis communication internal error (transmission) | Cause: REC internal communication error. Communication failure with EC connection unit connecting actuator axes.<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |
| 62<br>(862) | Dependent axis communication internal error (reception) | Cause: REC internal communication error. Communication failure with EC connection unit connecting actuator axes.<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |
| 80<br>(880) | GW parameter error | Cause: Gateway parameters are abnormal.<br>Countermeasure: Check connected axes, operation mode, etc. with gateway parameter setting tool. |
| 81<br>(881) | Parameter check sum error | Cause: REC internal memory data may be damaged.<br>Countermeasure: Reset with the gateway parameter setting tool, or if backup is available, write in the backup data. |
| 9B<br>(89B) | Field network module error | Cause: Field network module failure is possible.<br>Countermeasure: Contact IAI if this reoccurs even after turning ON the power again. |
| 9C<br>(89C) | Field network module undetected | Cause: Communication circuit board for field network could not be confirmed.<br>1) Communication circuit board is not inserted.<br>2) Malfunction of communication circuit board<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |
| 9D<br>(89D) | Field network module initialization timeout | Cause: Initialization of field network module did not complete after a given period of time.<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |

| Alarm code | Alarm name | Causes/countermeasures |
|---|---|---|
| A0<br>(8A0) | Excessive control power supply voltage | Cause: Control power supply voltage exceeded the overvoltage judgment value (120% of 24V DC = 28.8V).<br>1) 24V DC power supply voltage is high<br>2) Malfunction of parts inside the EC gateway unit<br>3) During acceleration/deceleration or servo on, etc,, consumption current rises momentarily. When remote sensing function is used with power of barely sufficient current capacity, overvoltage may occur in response to the current change.<br>Countermeasure: 1) 2) Check power supply voltage.<br>3) Consider using a power supply with sufficient current capacity, or avoid using the remote sensing function.<br>If voltage value is normal, contact IAI. |
| A1<br>(8A1) | Control power supply voltage drop | Cause: Control power supply voltage went below the voltage drop judgment value (70% of 24V DC = 16.8V).<br>1) 24V DC power supply voltage is low<br>2) Malfunction of parts inside the EC gateway unit<br>Countermeasure: Check power supply voltage.<br>If voltage value is normal, contact IAI. |
| A7<br>(8A7) | External wiring power supply voltage drop | Cause: EC gateway unit control power supply voltage has dropped to or below 16.8V (70% of 24V DC).<br>1) Control power supply voltage drop<br>2) Malfunction of parts inside the EC gateway unit<br>Countermeasure: 1) Confirm that voltage of 24V DC ±10% is being applied to the EC gateway unit control power connector. If the voltage is low, the 24V DC power supply may have failed.<br>2) Contact IAI. |
| BB<br>(8BB) | RCON-EC unit initial communication error | Cause: There was a communication error occurred in the initial communication in the total frame communication destination to the EC connection unit.<br>1) A link connector is not appropriately connected<br>2) Internal signal line is broke<br>3) There is no terminal unit mounted, or a terminal unit not connected properly<br>4) Communication error due to noise influence<br>Countermeasure: 1) 2) Check that the link among units is well established. Disconnect the link among units once and reconnect it. In case the failure occurs even after rebooting the power, contact IAI.<br>3) Mount a terminal unit, or confirm that the connection of a terminal unit is well established.<br>4) Take a countermeasure for noise in such a way as to change the cable layout. |
| D1<br>(8D1) | Inapplicable Option Unit Connected | Cause: An option unit not applicable was connected.<br>Countermeasure: Connect an option unit that is applicable. |
| D2<br>(8D2) | Inconstancy in number of RCON-EC units | Cause: 1) The number of connected EC connection units differs from the number of connection unit set in the gateway parameter.<br>2) The number of EC connection units has exceeded the maximum connectable number (4 units).<br>Countermeasure: 1) Match the number of the EC connection units and the number of units in the setting.<br>2) Set the number of EC connection units within four units. In case it exceeds four units, have two or more units of the EC gateway unit. |

| Alarm code | Alarm name | Causes/countermeasures |
|---|---|---|
| DC (8DC) | RCON-EC unit communication errors | Cause: There was a communication error in the total frame communication between the EC gateway unit and EC connection units.<br>1) A link connector is not appropriately connected<br>2) Internal signal line is broke<br>3) A terminal unit is not connected properly<br>4) Communication error due to noise influence<br>Countermeasure: 1) 2) Check that the link among units is well established. Disconnect the link among units once and reconnect it. In case the failure occurs even after rebooting the power, contact IAI.<br>3) Confirm that the connection of a terminal unit is well established.<br>4) Take a countermeasure for noise in such a way as to change the cable layout. |
| DD (8DD) | RCON-EC Unit Communication Error | Cause: Units may not be correctly connected.<br>1) Connector or SCON cable connector is not correctly connected.<br>2) Internal signal line is broke.<br>3) There is no terminal unit mounted.<br>Countermeasure: 1) 2) Check that the link among units is well established. Disconnect the link among units once and reconnect it. In case the failure occurs even after rebooting the power, contact IAI.<br>3) Mount the terminal unit or terminal connector. |
| FA (8FA) | Unit connection check signal error | Cause: Abnormal reset detected in gateway board interior CPU.<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |
| FFF | CPU error | A log created when power is turned ON (not an error) |

# 7.3 Causes and Countermeasures for ELECYLINDER Alarms

## 7.3.1 Alarm Group

The alarm groups and warnings occurred in ELECYLINDER are as show below.

For details and countermeasures, refer to the next section, [Troubleshooting for alarm groups].

| Alarm group | Content | Main content and typical countermeasures | |
|---|---|---|---|
| A | Overload alarm | [Content]<br>[Countermeasure] | Moving parts stopped abnormally.<br>Make sure that there are no obstructions or obstacles. |
| B | Motor error alarm | [Content]<br>[Countermeasure] | Motor abnormality occurred.<br>Replace the motor. |
| C | ELECYLINDER control unit error alarm | [Content]<br>[Countermeasure] | ELECYLINDER control unit abnormality occurred.<br>Replace the ELECYLINDER control unit. |
| D | ELECYLINDER control unit-encoder error alarm | [Content]<br>[Countermeasure] | An abnormality occurred between the ELECYLINDER control unit and encoder.<br>Turn the power off and then on again.<br>If the unit still does not recover, replace the motor or ELECYLINDER control unit. |
| E | Power supply voltage / Power supply capacity error alarm | [Content]<br>[Countermeasure] | ELECYLINDER control unit abnormality occurred.<br>Check the power supply voltage or capacity for any abnormality. |

| Alarm group | Content | Main content and typical countermeasures | |
|---|---|---|---|
| Warning | Maintenance warning | [Content]<br>[Countermeasure] | The maintenance period has come to an end.<br>Perform maintenance for the unit. |

### 7.3.2 Troubleshooting for Alarm Groups

ELECYLINDER alarms are classified into "alarms" and "warnings" depending on the content.
"Alarms" are grouped into 5 types.
An alarm on the motor drive DC power supply should occur for the 200V servomotor type ELECYLINDER.

| Alarm level | SV/ALM LED | * ALM signal | Situation when generated | Clearing method |
|---|---|---|---|---|
| Alarm | Red ON | OFF | Servo OFF after gradual stop | Cleared by resetting the alarm.<br>If it cannot be cleared by resetting the alarm, turn off the power, then turn it on again. |
| Warning | Green/red alternate blinking | ON | Continued operation | ● Maintenance Warnings 1/2 (Total travel count/Total travel distance) are cleared by updating the set values in the maintenance information screen.<br>●Maintenance Warnings 3/4 (Overload Warning/Exceeded Capacitor Assumed Life Alarm) should be cancelled by conducting the alarm reset.<br>* Maintenance Warning 4 should occur again after reboot. |

* ELECYLINDER should get into the motor voltage drop condition (Alarm displayed on teaching pendant: 203) if an emergency stop switch on a teaching pendant connected to the EC gateway unit is pressed and held or the condition gets into the disable condition with the deadman's switch.

**Caution**

- Clear alarms only after investigating and resolving the cause.
- If the same alarm recurs after clearance, it is highly probable that the cause of the alarm has not been resolved.
- If the cause of the alarm cannot be resolved or the alarm cannot be cleared after resolving the cause, contact IAI.

**[Alarm group A: Overload alarm]**

Moving parts of ELECYLINDER stopped abnormally while moving to the target position.

| No. | Cause | Countermeasure |
|---|---|---|
| 1 | Operation may not be possible due to contact with or snagging on external obstacles. | Remove any external obstacles or other external loads. |
| 2 | The ELECYLINDER may be being used under conditions exceeding the specifications described in the catalog. | Check the specification values such as payload, acceleration/deceleration and speed, and adjust them appropriately. |
| 3 | Causes may include foreign matter, brake failure or motor failure. | Visually check for the "depletion of grease on the ball screw/guide inside the ELECYLINDER" or "intrusion of foreign matter", etc.<br>If this is the case, clean the inside of the ELECYLINDER and replenish the grease. |
| | | Remove the motor and check the sliding movement of the ELECYLINDER body.<br>If there is no abnormality in the sliding motion, there is a possibility of motor or brake failure.<br>Replacement of the motor is recommended. |
| 4 | The base may have been distorted when mounting the ELECYLINDER, increasing the sliding resistance of the guide. | The ELECYLINDER mounting surface should be a machined surface or a plane with similar accuracy, with flatness within 0.05mm/m.<br>Refer to [the instruction manual for each ELECYLINDER] for the recommended tightening torque of the bolt for fixing the base. |
| 5 | For 24V power supply drive:<br>The peak power capacity of the 24V power supply is less than 4.2A. | Use a power supply with peak current of 4.2A or higher (per axis). |
| 6 | For 200V servo motor:<br>The power voltage to the 100V AC (or 200V AC) has dropped. | Check the power voltage to 100V AC (or 200V AC).<br>If it is dropped, take a measure to bring the power voltage in the specification.<br>It the cable is AWG14 or lower, use a cable with AWG14. |
| 7 | As a cable size less than AWG18 is applied for the power supply line, the resistance is too high. Or, there is a contact error on the connection terminal and the peak current would not flow. | Apply a cable with AWG18 for the power supply line.<br>Also, check if there is a looseness, contact error or line breakage on the connection terminals or connectors. |
| 8 | The deceleration distance was insufficient and the calculation result of the arrival position exceeded the operation range of the ELECYLINDER due to the "next movement command" being issued too soon during operation with "Smooth accel/decel setting" enabled. | Adjust the timing of the "next movement command" so that the command will be given after the first movement is completed. |
| 9 | Power supply was turned on while the moving parts of the ELECYLINDER were immobilized or pressed against the mechanical stopper. | Resolve the state of immobilization.<br>If the unit is pressed against the mechanical stopper, move it at least 5mm away, then turn on the power again. |

**[Alarm group B: Motor error alarm]**

Motor error occurred.

| No. | Cause | Countermeasure |
|---|---|---|
| 1 | The internal temperature of the motor may be too high. | Improve the surrounding environment of the motor so that the ambient temperature is 40°C or less.<br>If the abnormality is resolved upon turning the power back on after the ambient temperature is lowered, the internal temperature may have been excessive.<br>[Countermeasure examples]<br>Remove the heat source/turn OFF the heat source/install a fan/install a temperature shield/improve thermal conductivity of the base/install a heat dissipation fin, etc. |
| 2 | The ELECYLINDER may be being used under conditions exceeding the specifications described in the catalog. | Check the specification values such as payload, acceleration/deceleration and speed, and adjust them appropriately. |
| 3 | If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the motor has failed. | Replacement of the motor is required.<br>In that case, please contact IAI. |

**[Alarm group C: ELECYLINDER control unit error alarm]**

ELECYLINDER control unit error occurred.

| No. | Cause | Countermeasure |
|---|---|---|
| 1 | The ELECYLINDER control unit is affected by the noise of a peripheral device and cannot operate normally. | Shut down the power supply of the peripheral device and operate only with the ELECYLINDER, then check to see whether this alarm persists.<br>If it does not, there is a possibility that the ELECYLINDER is affected by the noise from the peripheral device.<br>Reconsider the noise countermeasures (grounding, power line wiring, electrostatic shielding, etc.) for the peripheral device. |
| 2 | If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the ELECYLINDER control unit (Controller) has failed. | Replace the controller cover assembly.<br>→For the replacement method, refer to [the instruction manual for each ELECYLINDER]. |

**[Alarm group D: ELECYLINDER control unit-encoder error alarm]**

An error occurred between the ELECYLINDER control unit and encoder.

| No. | Cause | Countermeasure |
|---|---|---|
| 1 | In case the alarm gets generated even after rebooting the power, it could be concerned that there is a contact error at a connector on the cable between the ELECYLINDER control part and the motor. | Shut the power down and take off the connectors on the cable inside ELECYLINDER, and insert again firmly till it stops.<br>If this does not improve the situation, the cable may be disconnected, in which case the connection cable should be replaced. |
| 2 | The specifications of the replaced ELECYLINDER control unit and the motor may not match.<br><br>[Example]<br>An incremental specification motor and battery-less absolute specification ELECYLINDER control unit have been combined by mistake | Shut off the power supply and make sure that the specifications of the replaced motor and ELECYLINDER control unit are both "battery-less absolute specification" or "incremental specification".<br>→For the replacement method, refer to [the instruction manual for each ELECYLINDER]. |
| 3 | The communication between the ELECYLINDER control unit and encoder is affected by the noise of a peripheral device and cannot operate normally. | Shut down the power supply of the peripheral device and operate only with the ELECYLINDER, then check to see whether this alarm persists.<br>If it does not, there is a possibility that the ELECYLINDER is affected by the noise from the peripheral device.<br>Reconsider the noise countermeasures (grounding protection, power line wiring, electrostatic shielding, etc.) for the peripheral device. |
| 4 | If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the motor or ELECYLINDER control unit has failed. | Replace the motor or controller cover assembly.<br>→For the replacement method, refer to [the instruction manual for each ELECYLINDER].<br>* Instruction manuals with no description of how to replace the motor, it cannot be replaced by a customer. Contact IAI. |
| 5 | Change made to Parameter No. 3 or No. 4. | Have the home-return operation conducted after the alarm reset. |

**[Alarm group E: Power supply voltage/Power supply capacity error alarm]**

An error occurred in the power supply voltage and capacity supplied to the rear of the ELECYLINDER.

| No. | Cause | Countermeasure |
|---|---|---|
| 1 | The ELECYLINDER may be being used under conditions exceeding the specifications described in the catalog. | Check the specification values such as payload, acceleration/deceleration and speed, and adjust them appropriately. |
| 2 | The power supply voltage has been detected outside the range of 21.6 to 26.4V. | [Countermeasure 1]<br>Inspect with a tester to see whether the power supply voltage is in the range of 21.6 to 26.4V.<br>If it is out of range, the 24V DC power supply voltage has insufficient capacity.<br>Refer to our catalog for the required capacity and improve the power supply environment. |
| | | [Countermeasure 2]<br>Confirm that the length of the power supply I/O cable is 10m or less or the diameter is not thinner than the appropriate.<br>Confirm that the wiring layout is appropriate. |
| 3 | If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the ELECYLINDER control unit has failed. | Replace the controller cover assembly.<br>→For the replacement method, refer to [the instruction manual for each ELECYLINDER]. |

**[Alarms in Motor Drive DC Power Supply PSA-200]**

There was an error occurred on the motor drive DC power supply PSA-200.

| No. | Alarm | Cause | Countermeasure |
|---|---|---|---|
| 1 | Motor power supply voltage drop | The output voltage has dropped below the threshold. | (1) Check the motor drive DC power supply PSA-200. (Check power voltage and so on)<br>(2) There is a concern of malfunction of motor drive DC power supply PSA-200. |
| 2 | Fan error detected | The fan revolution has dropped or stopped. | (1) Check the connection of the fan unit.<br>(2) Replace the fan unit. |
| 3 | Regenerative discharge excess power | The regenerative discharge of the internal regenerative resistor has risen above the threshold. | (1) Add a regenerative resistor unit. |
| 4 | Motor power excess voltage | The output voltage has risen above the threshold. | (1) Check the motor drive DC power supply PSA-200. (Check power voltage and so on)<br>(2) Add a regenerative resistor unit. |
| 5 | PCB temperature error | The temperature sensor on the PC board has detected overheat. | (1) Check the total wattage of the connected actuators.<br>(2) Check the ambient environmental temperature.<br>(3) Add a regenerative resistor unit. |
| 6 | Power device overheated | The temperature sensor on the PC board has detected overheat. | (1) Check the total wattage of the connected actuators.<br>(2) Check the ambient environmental temperature.<br>(3) Add a regenerative resistor unit. |
| 7 | Critical malfunction | An error out of those from No. 1 to No. 6 that is unavailable to recover has been detected. | Replace the motor drive DC power supply unit. |

**[Warning: Maintenance warning 1]**

This is an alert that the target value of the "total travel count" set by the customer has been reached.

| No. | Cause | Countermeasure |
|---|---|---|
| 1 | For safe use and long service life of the ELECYLINDER, periodic lubrication is recommended.<br><br>* To disable this warning, change the target value to 0. | [Countermeasure 1]<br>Perform maintenance and inspection such as greasing.<br>→For how to grease, refer to [the instruction manual for each ELECYLINDER]. |
| | | [Countermeasure 2]<br>When updating this function, be sure to set the target value to a value larger than the current value. |

* Refer to [Maintenance Information] in an instruction manual of each ELECYLINDER for how to set up the maintenance warnings.

**[Warning: Maintenance warning 2]**

This is an alert that the target value of the "total travel distance" set by the customer has been reached.

| No. | Cause | Countermeasure |
|---|---|---|
| 1 | For safe use and long service life of the ELECYLINDER, periodic lubrication is recommended.<br><br>* To disable this warning, change the target value to 0. | [Countermeasure 1]<br>Perform maintenance and inspection such as greasing.<br>→For how to grease, refer to [the instruction manual for each ELECYLINDER]. |
| | | [Countermeasure 2]<br>When updating this function, be sure to set the target value to a value larger than the current value. |

* Refer to [Maintenance Information] in an instruction manual of each ELECYLINDER for how to set up the maintenance warnings.

**[Warning: Maintenance warning 3]**

This is an alert that the target value of the "overload warning level" set by the customer has been reached.

| No. | Content | Causes and countermeasures |
|---|---|---|
| 1 | Before the ELECYLINDER stops operation due to the "overload alarm", follow the troubleshooting procedure and conduct visual inspection and maintenance.<br><br>* To disable this warning, change the "overload warning level" in "Maintenance Information" to 100%. | [Causes]<br>The warning may be caused by the depletion of grease on the ball screw/guide inside the ELECYLINDER, intrusion of foreign matter, brake failure, motor failure, contact with peripheral equipment, etc. |
| | | [Countermeasure 1]<br>Visually check for the "depletion of grease on the ball screw/guide inside the ELECYLINDER" or "intrusion of foreign matter", etc.<br>If this is the case, clean the inside of the ELECYLINDER and replenish the grease.<br>→Refer to [the instruction manual of each ELECYLINDER] for the cleaning method. |
| | | [Countermeasure 2]<br>Remove the motor and check the sliding movement of the ELECYLINDER body.<br>If there is no abnormality in the sliding motion, there is a possibility of motor or brake failure.<br>Replacement of the motor is recommended.<br>For some models, the motor cannot be replaced by the customer. In that case, please contact us. |

* Refer to [Maintenance Information] in an instruction manual of each ELECYLINDER for how to set up the maintenance warnings.

**[Warning: Maintenance warning 4] (Dedicated for EC 200V type)**

This is an alert that the target value of the "overload warning level" set by the customer has been reached.

| No. | Content | Causes and countermeasures |
|---|---|---|
| 1 | The capacitor mounted on the controller PC board has reached its life. | It is not that the capacity of the capacitor is zero (dry-up) when the alarm has occurred, but it is recommended to replace the controller PC board as soon as possible. |

REC

Chapter 8

# Maintenance and Inspection

# 8.1 Periodic Inspection

In order to use the REC system functions in the best possible condition, it is necessary to perform daily or periodic inspections.

## Danger

- Do not touch the terminal while live. This may result in electric shock.
- Always shut off the REC system power supply before cleaning or assembling/disassembling the unit. Electric shocks may result if the power is not shut off.
- Malfunctions may result if the unit connections are tightened loosely.

## Caution

- Do not disassemble or modify any unit. This may result in breakdowns, malfunctions, injury or fire.
- Always shut off the REC system power supply before attaching or removing modules, power supply communication cables or motor power supply cables. If not shut off, module breakdowns or malfunctions may result.
- Before touching a unit, always touch a grounded metallic part to discharge any static electricity accumulated on the body. If static electricity is not discharged, module breakdowns or malfunctions may result.
- As there are heated parts on the power supply die-casted parts and inside the power supply in PSA-200, have enough time for cooling after the power is shut down before having the inspection work.
- To not attempt to touch the terminal parts for 10 minutes after the power is shut off as there is a risk of electric shock. Make sure to confirm that the battery charge status LED lamp is turned off before starting the inspection work.

## 8.2 Periodic Inspection Items

The REC systems contain electronic components that may degrade due to the operating environment and require periodic inspection.
It is standard to conduct periodic inspection once every 6 months to one year, but the interval should be shortened in accordance with ambient environment.

| No. | Inspection items | Inspection details | Judgment criteria | Countermeasures |
|---|---|---|---|---|
| 1 | Power supply | Measure between the power supply terminal block to check that the voltage fluctuation is within the reference range | Within voltage fluctuation range 24V ±10% | Adjust so that the power supply voltage falls within the judgment criteria. |
| 2 | Ambient environment | Ambient temperature (If used in a panel, the panel temperature is the ambient temperature) | 0 to 55°C | Measure the ambient temperature with a thermometer and adjust the environment so that it falls within the ambient operating temperature. |
| | | Ambient humidity (Panel humidity if using in a panel) | 85%RH or less Non-condensing or freezing | Measure the ambient temperature with a thermometer and adjust the environment so that it falls within the ambient operating temperature. |
| | | Atmosphere | No corrosive or flammable gas | Check with an odor or gas sensor. |
| | | | No splatters of water, oil, or chemicals | Remove and shield. |
| | | | No accumulated dust, debris, salt, or metal powder | Remove and shield. |
| | | Directly exposed to sunlight? | Out of direct sunlight | Shield. |
| | | Subjected to direct vibrations or impacts? | Vibration damping and shock-resistant specifications should be within the range | Install a cushion, etc., for vibration damping and shock resistance. |
| | | Close to a noise source? | None | Move the noise source further away or take shielding countermeasures. |
| 3 | Mounting status | Mounting state on each DIN rail | No slack in unit mounting | Re-attach and lock. |
| 4 | Connection status | Units firmly connected? | The connector should be tightened firmly | Tighten so that it is no longer loose. |
| | | Wiring connectors loose? (Motor encoder cable, field network cable and stop circuit, etc.) | No looseness | Insert until the lock engages. |
| | | Wiring cable frayed? | No visual abnormalities | Check visually and replace the cable. |

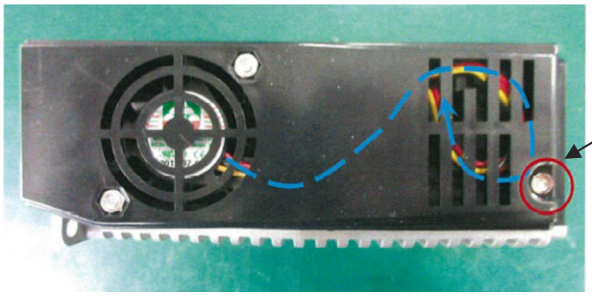
## 8.3 Replacing

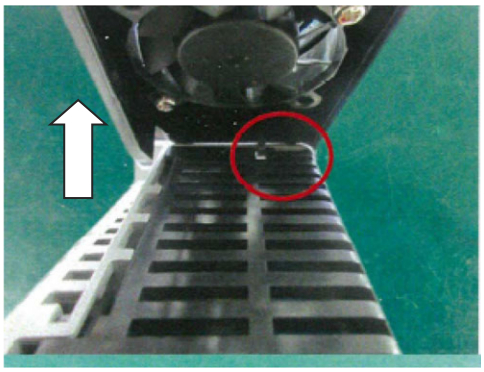
Pay attention to the following precautions when replacing units after discovering a fault during inspection.

- Unit replacement should be conducted with the power off.
- After replacement, check that the new unit does not have any errors.
- If returning a faulty unit for repairs, write out the nature of the error in as much detail as possible and attach it to the product.
- Be sure to back up position data, parameters and PLC data just in case something goes wrong.

### 8.3.1 Replacing Fan on Motor Drive DC Power Supply (PSA-200)

(1) Remove the hex socket head cap screw and take off the fan unit.

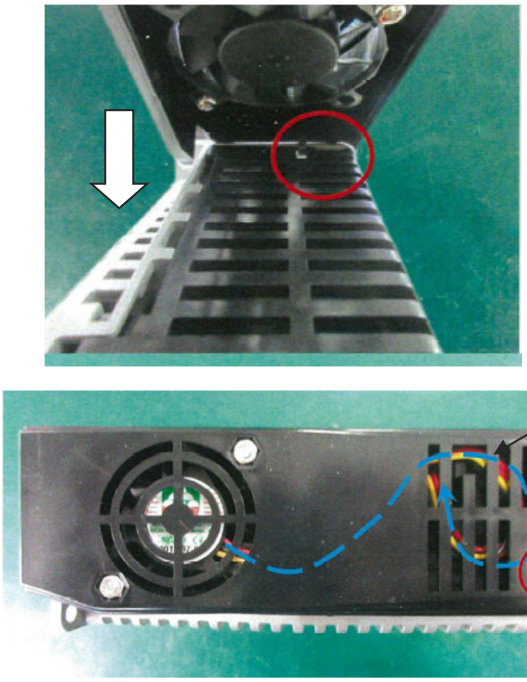


(2) Take the black connector on the fan unit off the connector on the top of the power supply.

(3) Connect the black connector on the replacement fan unit to the connector on the top of the power supply.

(4) Set the cable on the fan unit referring to the figure below, and hang the hook on the back to the hole on the power supply.
Affix the fan unit with using the hex socket head cap screw.




(Note) Pay attention to the cable not to stick it out to the front of the slit on the fan unit.

| Fan unit model |
| --- |
| PSA-FNB |

Accessory: Hex Socket Head Cap Screw M3×6

## 8.4 Consumable Parts

The life of components used in the REC system is as follows.

| Item | Guidelines for life | Preventative maintenance function | Predictive maintenance function | Condition |
|---|---|---|---|---|
| Electrolytic capacitor | 5 years | ○ | - | Ambient temperature 55°C, rated operating mode |
| Fan unit | 3 years | - | ○ | Ambient temperature 55°C |

* Consumable parts are mounted on the motor drive DC power supply (PSA-200).

R E C

Chapter 9

# Appendix

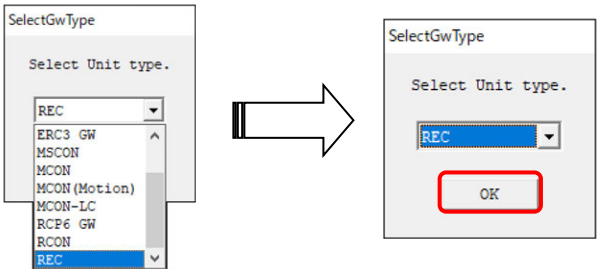
# 9.1 Gateway Parameter Setting Tool

The gateway setup for the REC system can also be performed in the gateway parameter setting tool. The screen design differs slightly depending on the OS of the PC.

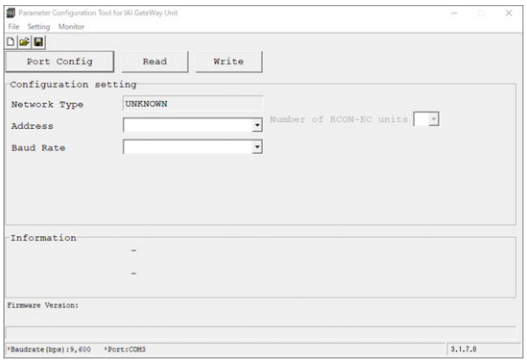
* Refer to [6.3.2 Network Setting] for the settings of each network.

## 9.1.1 Tool Startup

1 After turning on the REC system, starting the gateway parameter setting tool will display the following screen. Select "REC" and press OK.




2 The main screen will be displayed. Even if the gateway unit cannot be detected, the main screen will be displayed. When you press Read on this screen, parameters will be imported from the detected gateway unit.
Press the Write button to transfer the parameters. However, note that they cannot be transferred if the address or baud rate is not selected.




Main screen (initial state)

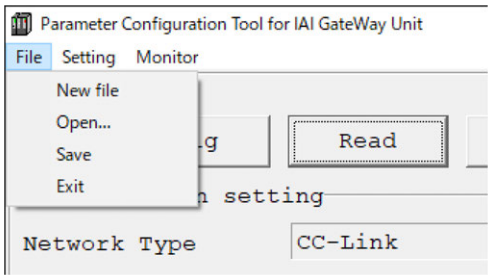

Main screen (After Parameters Read in)

## Caution

- Communication with ELECYLINDER connected to this system should not be established if the number of EC connection units in the REC system and the number of units set in this tool and transferred do not match with each other.
- Set and transfer the gateway parameters suitably according to the actual unit configuration and the number of connected units.

## 9.1.2 Menu Descriptions

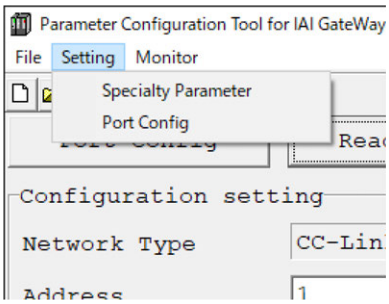
**[File menu]**




On the main screen, click on the “File” menu on the upper left to display the menu items as shown above.

- New file : Creates a new network parameter.
- Open… : Opens the saved parameter file and reflects it to the main screen.
- Save : Saves the parameters held by the tool to a file.
- Exit : Terminates the tool.

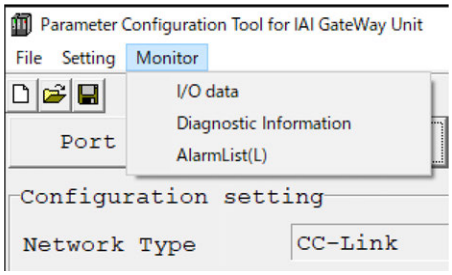
**[Settings menu]**




Click the "Setting" menu in the upper left of the main screen to display the settings menu items.

- Specialty Parameter : Sets parameters related to gateway unit processing.
  Refer to [9.1.3 Explanation of Features in Special Parameter Setting]
- Port Config : Sets the baud rate between the tool and PC and the COM port number.

**[Monitor menu]**

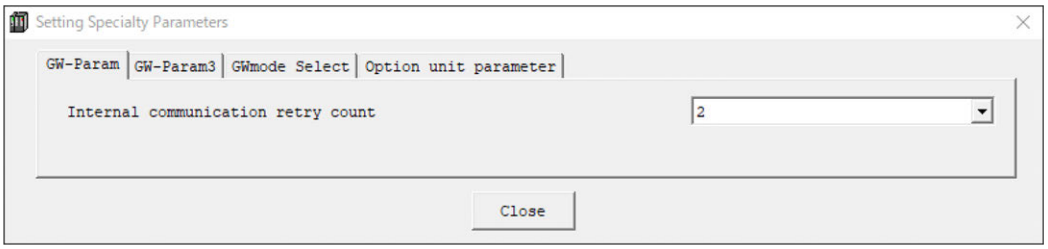



Click the “Monitor” menu in the upper left of the main screen to display the monitor menu items.
(Note) “Monitor” cannot be selected before reading in the parameters.

- I/O data : Displays the communication contents between the host PLC and gateway unit.
  Refer to ["I/O Data (register monitor)" on page 9-7]
- Diagnostic Information : Option unit information should be displayed.
  Refer to ["Diagnostic information" on page 9-8]
- AlarmList(L) : Imports and displays the alarm list held in the gateway unit.
  Refer to ["Alarm list" on page 9-8]

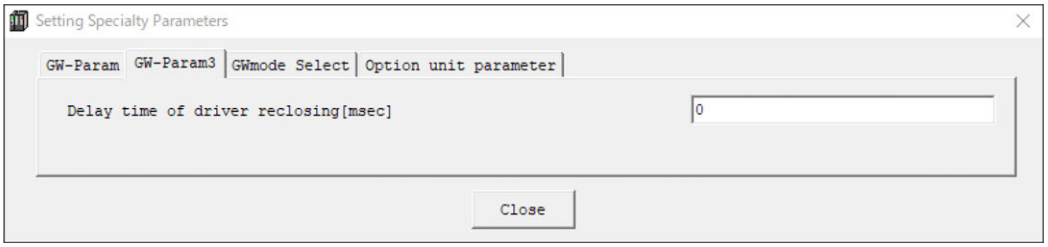
### 9.1.3 Explanation of Features in Special Parameter Setting

**[GW-Param]**



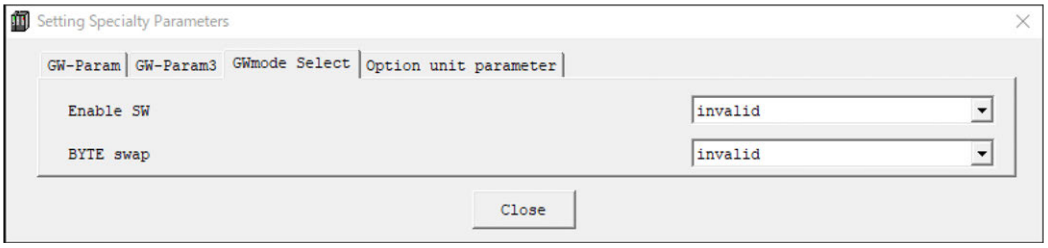

• Internal communication retry count : In AUTO, this is used to set the number of communication retries with the connected axis.

**[GW-Param3]**



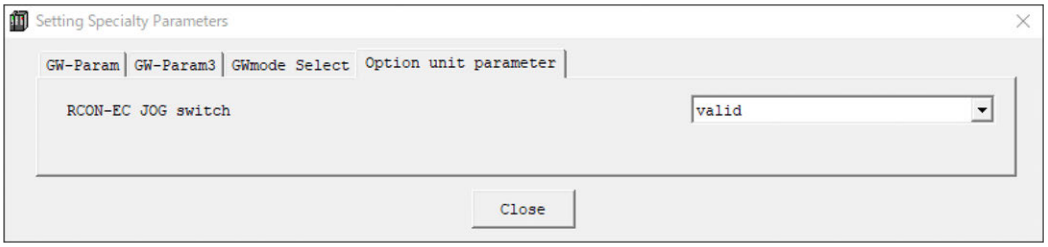

• Delay time of driver reclosing : Latency (interval) when supplying power to each unit of the EC connection unit one by one should be set.
It is used for the purpose of reducing inrush current by shifting the timing of power supplied to each axis.
The initial value for the latency is 5ms for each unit.

**[GWmode Select]**



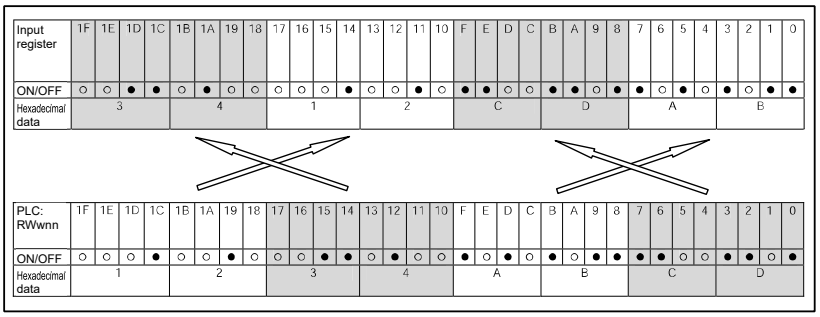

- Enable SW : Selects whether to valid/invalid the enable switch of the TP.
  While this parameter is activated, the enable signal gets valid.
- BYTE swap : Set the byte swap. Refer to ["Byte swap" on page 9-6]

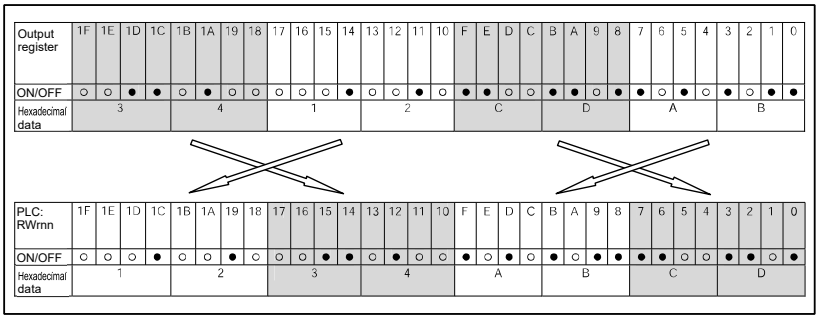
**[Option unit parameter]**




- RCON-EC JOG switch: : Select whether to valid/invalid the jog switch on the EC connection unit.
  The setting to valid/invalid should be reflected to all the units of the EC connection unit that are connected to the gateway unit.

Byte swap : Swaps the master and slave bytes of transmitted/received data.
Set according to the master to be connected as necessary.

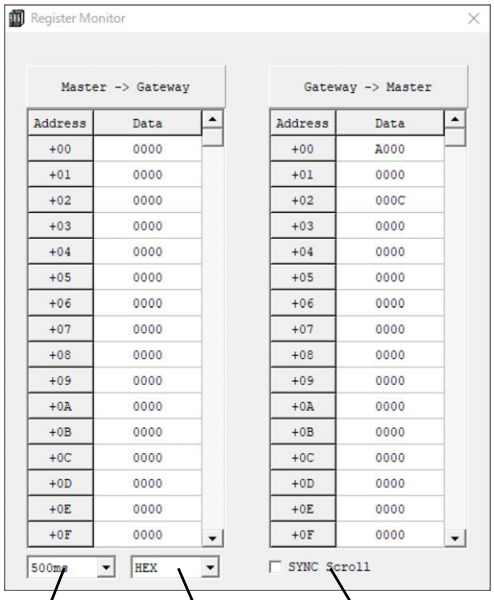



●: ON
○: OFF

### 9.1.4 Explanations of Monitoring Menu Features

**[I/O data (register monitor)]**

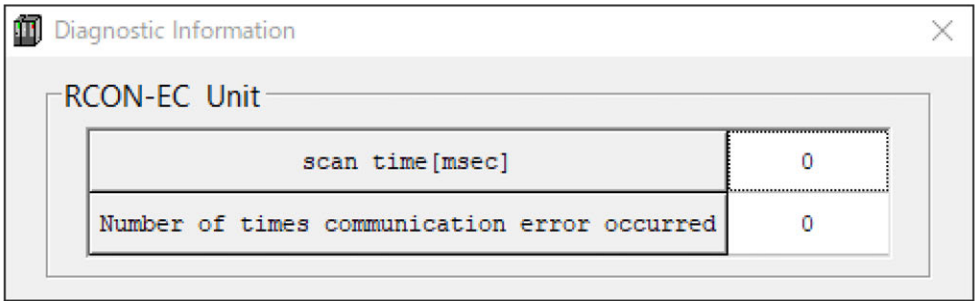



Data reading cycle  Display switch  Synchronous scroll

The data that the gateway received from the master and transmission data returned to the master are displayed on this register monitor screen.

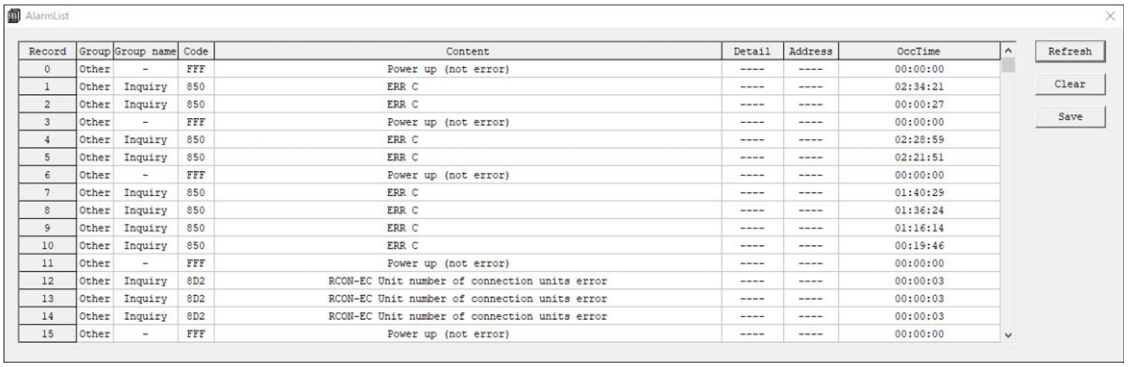
- Data read cycle : Select the update cycle of the display data between 100 and 500ms
- Display switch : Select either binary or hexadecimal display
- SYNC Scroll : When checked, the transmitted/received data will be scrolled at the same time

**[Diagnostic Information]**




The counts of the scan time and communication error occurrence in the EC connection units should be displayed.

**[Alarm list]**




Press [Refresh] to read out the alarm list again from the gateway unit.
Press [Clear] to delete all alarm lists held by the gateway unit.
Press [Save] to save the alarm list held by the gateway unit in CSV format.
For the alarm details, refer to [Chapter 7 Troubleshooting].

REC

# Chapter 10

# Warranty

## 10.1 Warranty Period

Whichever of the following periods is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to a specified location
- 2,500 operational hours

## 10.2 Scope of the Warranty

Our products are covered by warranty when all of the following conditions are met.
Faulty products covered by warranty will be replaced or repaired free of charge:

(1) The breakdown or malfunction in question pertains to our product as delivered by IAI or our authorized dealer.
(2) The breakdown or malfunction in question occurred during the warranty period.
(3) The breakdown or malfunction in question occurred while the product was in use for an appropriate purpose under the operating conditions and operating environment specified in the instruction manual and catalog.
(4) The breakdown or malfunction in question was caused by a specification defect, malfunction, or poor product quality.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

(1) Anything other than our product
(2) Modification or repair performed by a party other than IAI (unless approved by IAI)
(3) Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
(4) Natural disaster, unnatural disaster, incident or accident for which we are not liable
(5) Natural fading of paint or other symptoms of aging
(6) Wear, depletion or other expected results of use
(7) Operation noise, vibration or other subjective sensations not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

## 10.3 Honoring the Warranty

As a rule, the product must be consigned to IAI for repair under warranty.

## 10.4 Limited Liability

(1) We assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
(2) We assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

## 10.5 Conformance with Applicable Standards/Regulations, etc., and Application Conditions

(1) If our product is combined with another product or any system, equipment, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc.
In such a case we assume no liability for the conformance of our product with the applicable standards, etc.
(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications.
Contact IAI if you must use our product for any of these applications:
  (1) Medical equipment used to maintain, control or otherwise affect human life or physical health
  (2) Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
  (3) Machinery components essential for safety (safety devices etc.)
  (4) Equipment used to handle cultural assets, art or other irreplaceable items
(3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

## 10.6 Other Items Excluded from Warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:
  (1) Guidance for mounting/adjustment and witnessing of test operation
  (2) Maintenance and inspection
  (3) Technical guidance and education on operating/wiring methods, etc.
  (4) Technical guidance and education on programming and other items related to programs

# Revision History

| Revision date | Revised content |
|---|---|
| 2020.02 | First Edition |
| 2020.06 | Second Edition<br>• Intro-14 International Standard Compliance Complied with CE<br>• 1.2 Explanations revised in features content<br>• 1.5.2 Corrected the maximum current value of the compact type of 28P motor with power supply capacity<br>• 1.5.4 Contents added regarding Drive cutoff for large slider type ELECYLINDER<br>• 2.3 Contents changed for EC gateway unit and enclosures<br>• 3.4.2 Change made to explanation for SYS in LED display<br>• 4.1 IA-OS added the tools to use<br>• 4.3.2 Instruction added for how to build up 4-way connector cable<br>• 4.3.4 Change made to wiring detail in Large Slider Type ELECYLINDER and EC Connection Unit<br>• 4.3.5 CC-Link connection cable Corrected the green color<br>• 4.3.6 Corrected of pin assignment contents of CC-Link IE Field<br>• 5.3.1 Corrected the explanation that [6] operation ready<br>• 5.3.5 Contents added to Timing for Input and Output Signals<br>• General Image correction, Correction made |
| 2020.12 | Edition 2B<br>• Description added stating ELECYLINDER is available for operation only in double solenoid system<br>• 1.5.1, 1.5.5 Change made to range of ambient humidity for use<br>• 1.5.4, 3.4.6 Correction made to signal name of drive cutoff connector<br>• 5.3.5 Correction made to timing chart for output signals |
| 2021.01 | Edition 2C<br>• 1.5.2 Supply Current Note added and corrected for supply current of ELECYLINDER |
| 2021.07 | Edition 2D<br>• Intro-13 Contents in notation changed in accordance with REC-GW and RCON-EC-4 complied with UL<br>UL certification conditions added<br>• Intro-16 to 18 Gripper added to actuator coordinate system, change made to illustration |
| 2021.11 | Edition 3A<br>• Change made the operating method explanation window to IA-OS.<br>• 2.3.2 Power supply type of DC power supply for motor drive (PSA-200) added |

| Revision date | Revised content |
|---|---|
| 2021.11 | • 2.3.3 Max. Number of Connectable Axes for Motor Drive DC Power Supply (PSA-200) added<br>• 2.3.6 Number of Connectable Regenerative Resistor Units (Option) (Reference) added<br>• 3.3 DC Power supply for motor drive (PSA-200) added<br>• 4.1 Preparation Before Startup added<br>• 4.2.1 About installation and mounting added<br>• 4.2.1 Noise countermeasures and mounting method added<br>• 5.4 Network data monitor added<br>• 6.2 How to Change Parameters added<br>• 6.3 EC Gateway Parameter added<br>• 6.5 Operation Noise Tuning added<br>• Chapter 9 Appendix added<br>• 9.1 The explanation of the Gateway Parameter Setting Tool is posted. |
| 2022.03 | Edition 4A<br>• Contents added for Ultra Mini ELECYLINDER<br>• Table revised for 24V DC current amperage, gripper and rotary added<br>• 2.3.5 Correction made about in-rush current of PSA-200<br>• 4.1.3 Contents changed about installation work of IA-OS<br>• 4.3.6 Description added for how to wire extra small ELECLYNDER, later section numbers lifted down<br>• 5.5 Operation sound tuning moved from Chapter 6<br>• 6.4 Parameter No. 10 LED Lighting Method Auto SW Setting added |

Manual No.: ME0394-4A (March 2022)

IAI
Quality and Innovation


## IAI Corporation

Head Office: 577-1 Obane Shimizu-KU Shizuoka City Shizuoka 424-0103, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

Technical Support available in USA, Europe and China

## IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL (310) 891-6015 FAX (310) 891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL(847) 908-1400 FAX (847) 908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL (678) 354-9470 FAX (678) 354-9471
website: www.intelligentactuator.com

## IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL 06196-88950 FAX 06196-889524
website: www.iai-automation.com

## IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL 021-6448-4753 FAX 021-6448-3992
website: www.iai-robot.com

## IAI Robot (Thailand) Co., Ltd.

825 PhairojKijja Tower 7th Floor, Debaratana RD., Bangna-Nuea, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456
website: www.iai-robot.co.th




22.03.000