IAI
Quality and Innovation

R-unit

# REC System

## Instruction Manual First Edition *ME0394-1A*




System Configuration and Specifications Chapter 1
EC Gateway Unit Chapter 2
EC Connection Unit Chapter 3
Unit connection-Installation and Wiring Chapter 4
Operation Chapter 5
Parameter Chapter 6
Troubleshooting Chapter 7



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.

The DVD enclosed with the product contains instruction manuals for IAI products.
When using the product, refer to the necessary sections of the applicable instruction manual by printing them out or displaying them on a PC.

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.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

# 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 |
| Calculator | Calculator Instruction Manual | ME0381 |

# Table of Overall Contents


## Chapter 1 System Configuration and Specifications

In this chapter, explains the overview, characteristics and each type of REC System.

## Chapter 2 EC Gateway Unit

In this chapter, explains the specifications and name of each part of the EC gateway unit.

## Chapter 3 EC Connection Unit

In this chapter, explains the specifications and name of each part of the EC connection unit.

## Chapter 4 Unit connection / Installation and Wiring

In this chapter, explains how to link units, install them and how to lay out wiring for REC System.

## Chapter 5 Operation

In this chapter, explains about control signals, how to operate and behaviours of ELECYLINDER.

## Chapter 6 Parameter

In this chapter, explains how to set up and adjust parameters.

## Chapter 7 Troubleshooting

In this chapter, explains countermeasures in case of troubles.

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# Safety Guide

The Safety Guide is intended to permit safe use of the product and thus to prevent risks and property damage.
Be sure to read it before handling the product.

## Safety Precautions for Our Products

Common safety precautions for the use of robots in various operations are indicated here.

| No. | Operation | Precautions |
|---|---|---|
| 1 | Model Selection | ● This product is not intended or designed for applications where high levels of safety are required, and so cannot guarantee that human lives will be protected. 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 or machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)<br>(3) Machinery components essential for safety (safety devices etc.)<br>● Do not use the product outside the range of the specifications. Otherwise, the product life may be drastically shortened, and product damage or facilities stoppage may occur.<br>● Do not use it in any of the following environments.<br>(1) Locations with flammable gases, ignitable objects or explosives<br>(2) Locations with potential exposure to radiation<br>(3) Locations with ambient temperature or relative humidity exceeding the specifications range<br>(4) Locations where radiant heat is applied by direct sunlight or other large heat source<br>(5) Locations where condensation occurs due to abrupt temperature changes<br>(6) Locations with corrosive gases (sulfuric acid, hydrochloric acid etc.)<br>(7) Locations exposed to significant amounts of dust, salt or iron powder<br>(8) Locations subject to direct vibration or impact<br>● For an actuator used in vertical orientation, select a model with brake. If a model without brake is selected, the moving parts may fall when the power is turned OFF, causing accidents such as injury or workpiece damage. |

| No. | Operation | Precautions |
|---|---|---|
| 2 | Transportation | ● When transporting heavy objects, do the work with two or more persons or utilize equipment such as a crane.<br>● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety.<br>● During transportation, carefully consider the carrying positions, weight, and weight balance, and be careful to avoid collisions or dropping.<br>● Use appropriate transportation measures for transport.<br>The actuators available for transportation with a crane have eyebolts attached or tapped holes to mount bolts. Follow the instructions in the instruction manual for each model.<br>● Do not climb onto the package.<br>● Do not put anything heavy that could deform the package on it.<br>● When using a crane with capacity of 1t or more, have an operator qualified for crane operation and sling work.<br>● When using a crane or equivalent equipment, make sure not to suspend loads exceeding the equipment's rated load.<br>● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. Also, check to make sure that the hook is free of damage.<br>● Do not climb on loads suspended from cranes.<br>● Do not leave loads suspended from cranes for long periods.<br>● Do not stand under loads suspended from cranes. |
| 3 | Storage and Preservation | ● For the storage and preservation environment, see the installation environment. However, give especial consideration to the prevention of condensation.<br>● Store the products so as to prevent them from falling over or down in the case of natural disasters such as earthquakes. |
| 4 | Installation and Startup | (1) Installation of robot body and controller, etc.<br>● Be sure to securely hold and fix the product (including the workpiece). If the product falls over, is dropped, or operates abnormally, it may lead to damage and injury.<br>Also, be equipped for falls over or down due to natural disasters such as earthquakes.<br>● Do not climb on or put anything on the product. Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life.<br>● When using the product in any of the places specified below, provide sufficient shielding.<br>(1) Locations where electrical noise is generated<br>(2) Locations with strong electrical or magnetic fields<br>(3) Locations with mains or power lines passing nearby<br>(4) Locations where the product may come in contact with water, oil or chemical spray |

| No. | Operation | Precautions |
|---|---|---|
| 4 | Installation and Startup | (2) Cable wiring<br>● Use IAI genuine cables for connecting the actuator and controller, and for the teaching tools.<br>● Do not scratch cables, bend them forcibly, pull them, coil them, snag them, or place heavy objects on them. Otherwise, this may lead to fire, electric shock, or abnormal operation due to leakage or conduction malfunction.<br>● Perform the wiring for the product after turning OFF the power to the unit, and avoid miswiring.<br>● When wiring DC power (+24V), be careful with the positive/negative polarity. Incorrect connections may lead to fire, product breakdown or abnormal operation.<br>● Connect the cable connector securely so that there is no disconnection or looseness. Otherwise, this may lead to fire, electric shock, or abnormal operation of the product.<br>● Never cut or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Otherwise, this may lead to fire or abnormal operation of the product. |
| | | (3) Grounding<br>● Grounding must be performed, in order to prevent electric shocks or electrostatic charge, enhance noise-resistant performance and control unnecessary electromagnetic radiation.<br>● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, be sure to use a twisted pair cable with wire thickness 0.5mm$^2$ (AWG20 or equivalent) or more for grounding work. For safeguard grounding, it is necessary to select an appropriate wire diameter for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards).<br>● Perform Class D grounding (former Class 3 grounding, with ground resistance 100Ω or below). |

| No. | Operation | Precautions |
|---|---|---|
| 4 | Installation and Startup | (4) Safety measures<br>● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety.<br>● When the product is operating or in the ready mode, take safety measures (such as the installation of safety/protection fences) so that nobody can enter the area within the robot's movable range. Contact with an operating robot may lead to death or serious injury.<br>● Be sure to install an emergency stop circuit so that the unit can be stopped immediately in an emergency during operation.<br>● Take safety measures such that turning the power ON alone will not start up the unit. Otherwise, this may cause the product to start unexpectedly, leading to injury or product damage.<br>● Take safety measures such that emergency stop cancel or recovery after power failure alone will not start up the unit. Otherwise, this may lead to injury or equipment damage.<br>● When installation or adjustment operation is to be performed, display signs such as "Operating: No Power ON!" etc. Sudden power input may cause electric shock or injury.<br>● Take measures to prevent workpieces, etc. from falling during power failures or emergency stop.<br>● Wear protection gloves, goggles and safety shoes, as necessary, to secure safety.<br>● Do not insert fingers or objects into the openings in the product. Otherwise, this may lead to injury, electric shock, product damage, or fire.<br>● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces. |
| 5 | Teaching | ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety.<br>● Perform teaching operation from outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well.<br>● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur.<br>● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly.<br>● Place a sign indicating "Operating" where it can be seen easily.<br>● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces.<br>* Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated. |

| No. | Operation | Precautions |
|---|---|---|
| 6 | Trial Operation | ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety.<br>● After teaching or programming, carry out trial operation step by step before switching to automatic operation.<br>● When trial operation is to be performed inside the safety/protection fence, use the same work procedure, determined in advance, as teaching operation.<br>● Be sure to confirm program operation at safe speeds. Otherwise, this may lead to accidents due to unexpected motion caused by program error, etc.<br>● Do not touch the terminal block or any of the various setting switches while the equipment is live. Otherwise, this may lead to electric shock or abnormal operation. |
| 7 | Automatic Operation | ● Check before starting automatic operation or restarting after operation stop that there is nobody within the safety/protection fence.<br>● Before starting automatic operation, make sure that all peripheral equipment is ready for automatic operation and that there is no alarm indication.<br>● Be sure to start automatic operation from outside the safety/protection fence.<br>● If the product produces abnormal heat, smoke, odor, or noise, immediately stop it and turn OFF the power switch. Otherwise, this may lead to fire or damage to the product.<br>● When a power failure occurs, turn OFF the power switch. Otherwise, this may lead to injury or product damage due to unexpected product motion during recovery from the power failure. |

| No. | Operation | Precautions |
|---|---|---|
| 8 | Maintenance and Inspection | ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety.<br>● Perform the work outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well.<br>● When work is to be performed inside the safety/protection fence, turn OFF the power switch as a rule.<br>● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur.<br>● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly.<br>● Place a sign indicating "Operating" where it can be seen easily.<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 dielectric strength testing. Otherwise, this may lead to damage to the product.<br>● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces.<br>● The slider or rod may be misaligned from the stop position if the servo is turned OFF. Avoid injury or damage due to unnecessary operation.<br>● Be careful not to lose the cover or any removed screws, and be sure to return the product to the original condition after maintenance and inspection work. Otherwise, this may lead to product damage or injury due to incomplete mounting.<br>* Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated. |
| 9 | Modification and Disassembly | ● Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion. |
| 10 | Disposal | ● When the product exceeds its useful life or is no longer needed, dispose of it properly as industrial waste.<br>● When removing the actuator for disposal, avoid dropping components when detaching screws.<br>● Do not put the product in a fire when disposing of it. The product may rupture or generate toxic gases. |
| 11 | Other | ● If you are equipped with a medical device such as a pacemaker, do not approach the product or its wiring, as the device may be affected.<br>● See the Overseas Standard Compliance Manual to check compliance with overseas standards if necessary.<br>● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure safety. |

# Precaution Indications

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 risk to persons and property | 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 a situation in which, while injury is not a likely result, the precautions should be observed in order to use the product appropriately. |  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 Tools 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.

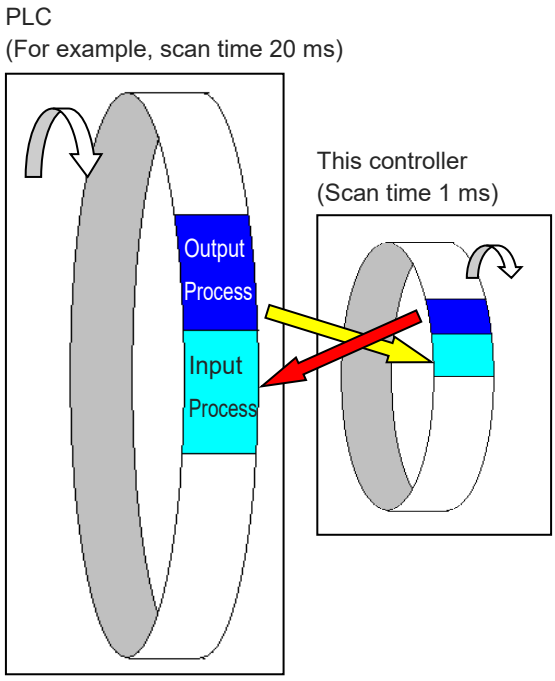
   How to save
   (1) Save to an external memory or a hard disk using PC software
   (2) Record position table and parameters in writing

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 1 ms, the PLC can only recognize once every 20 ms.

The PLC only performs the output process once every 20 ms, 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.

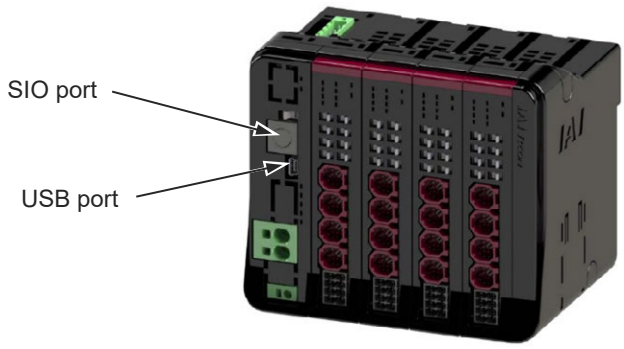
6. PLC timer setting

   The PLC timer setting should not be at minimum set value.
   If "1" is set, some PLCs turn ON somewhere between 0 and 100 ms with a 100 ms timer, or between 0 and 10 ms with a 10 ms 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 10 ms timer should be "2", and when required to set to 100 ms, use the 10 ms timer and set it to "10".

7. External communication ports

   The REC gateway unit has 2 types of communication port.
   - SIO port (RS-485 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

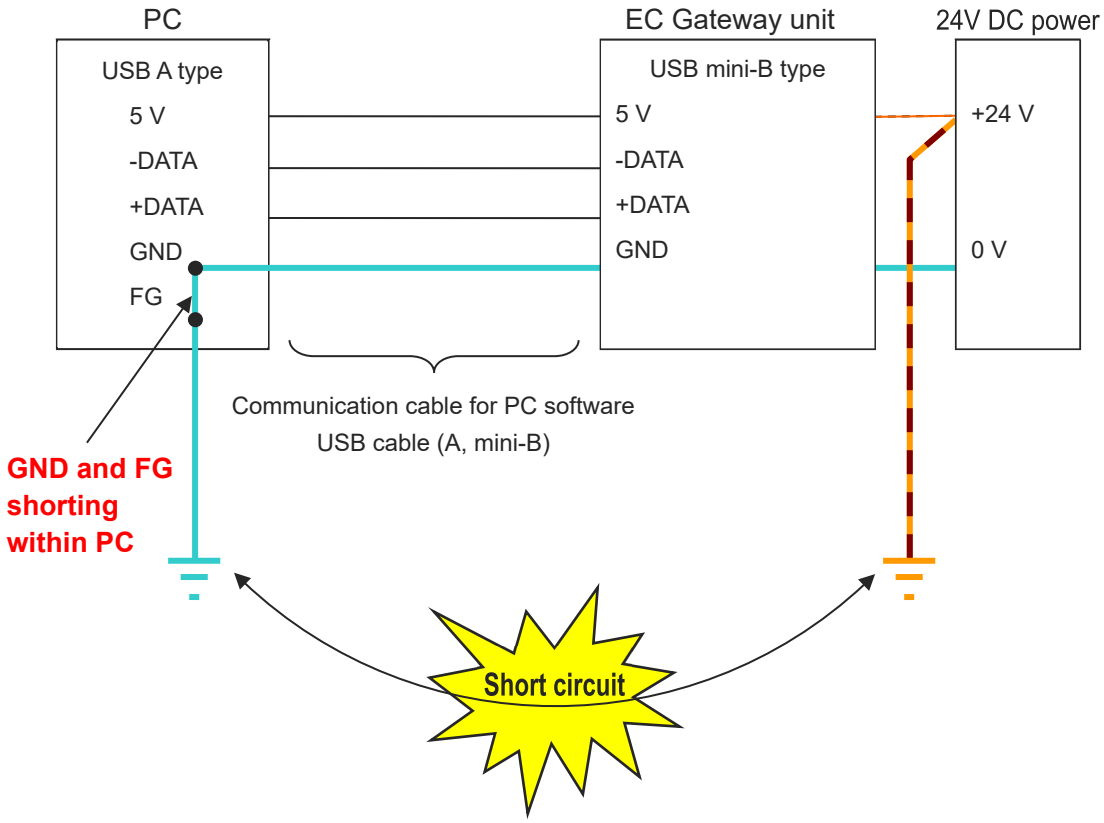



8. Caution in Use

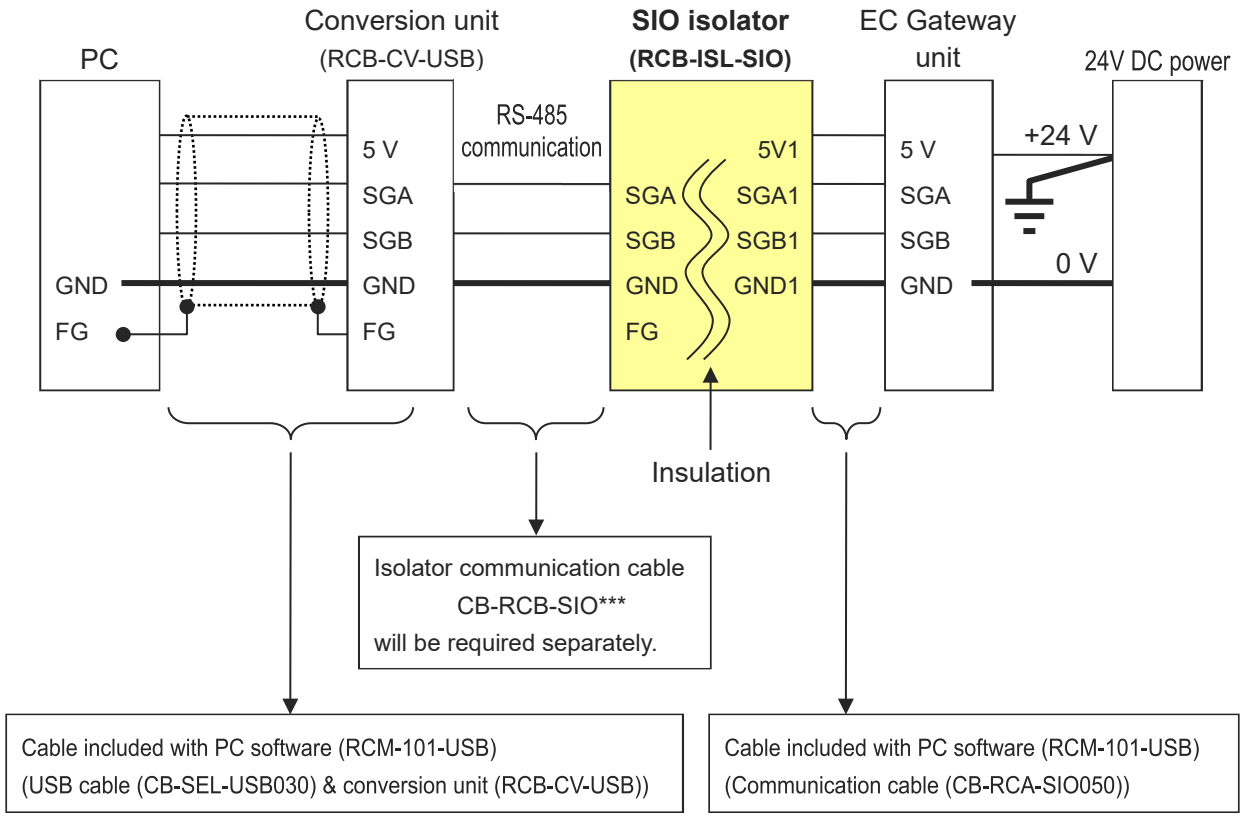
   Make sure to read the 5.3.2 Caution for REC System.
   Failure in operation could cause damage on the products and equipment.

# 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 24 VDC 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 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 gateway unit.
If a PC is connected to the gateway unit without using an SIO isolator, the power will short-circuit and cause the PC to malfunction.




## Caution

- RS-232 conversion unit (RCB-CV-MW) cannot be used.

# International Standard Compliance

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

| RoHS Directive | CE Marking | UL Certification |
|---|---|---|
| ○ | To be Complied Soon | To be Complied Soon |

* Please contact IAI for more details.

# Warranty

## 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

## 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.

## 3. Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

## 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.

## 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.

## 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

# Actuator Coordinate System

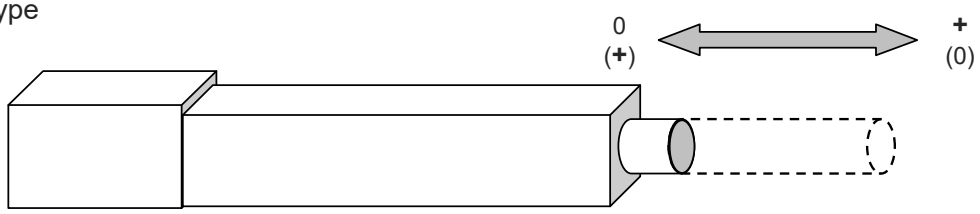
Unless indicated as home reverse specification (option), the direction of home return for the linear axis is on the motor side, the rotary axis is on the counterclockwise side, and the gripper is on the outside (open side).

## Caution

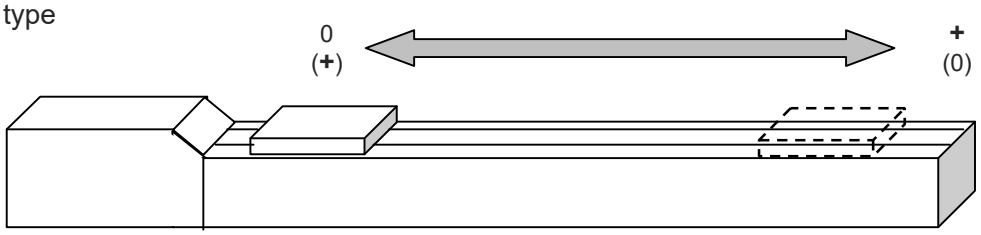
- Homing direction cannot be changed with some models.
- If it becomes necessary to reverse the homing direction after assembly to equipment, check the model of the applicable actuator to ensure that the homing direction is changeable.
- For models with which change is not possible, the actuator must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

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

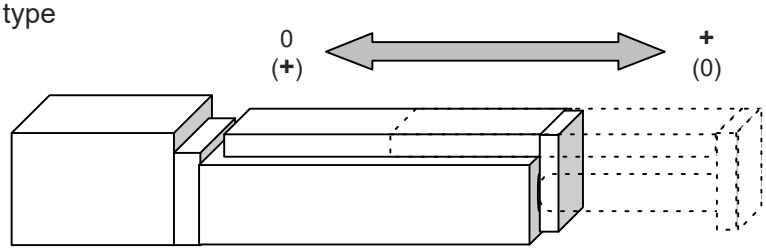
(1) Rod type




(2) Slider type

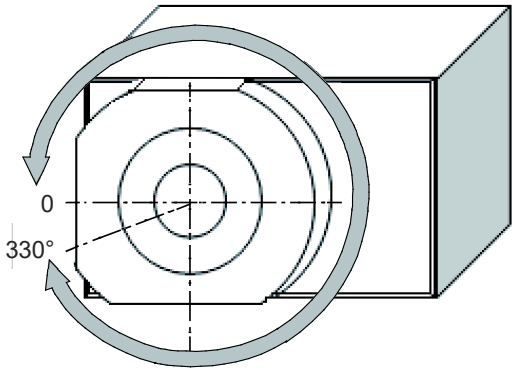



(3) Table type



(4) Rotary type

(330-degree rotation specification)



REC

Chapter 1

# System Configuration and Specifications


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1.2 Features ····· 1-2

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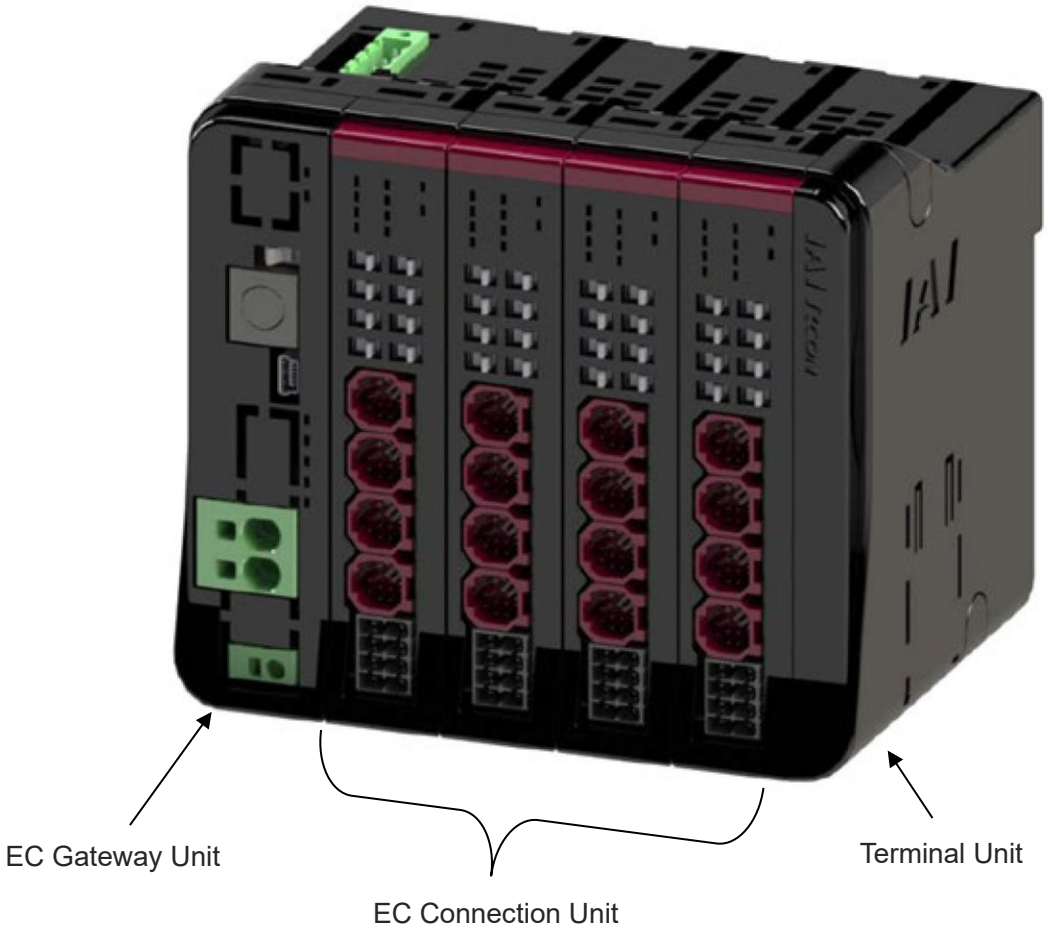
1.6.1 REC system ····· 1-16

# 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 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 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) Ultra-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 D85mm.

This contributes to the miniaturization of the control board.

(4) High performance

Adopts total frame communication for a communication cycle time within 4 ms even with 16 axes connected.

A high-heat dissipation structure is adopted to support ambient temperatures up to 55°C. (There is no need of a fan unit mounted)

(5) Enhanced preventive and predictive maintenance functions

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

In addition, there are functions for predicting the life using the internal capacitor temperature and operation time, and for monitoring decreases in fan rotation speed.

The actuator body can register individual actuator information. The individual information can be checked at IAI even if the actuator is removed from the controller and returned.

(6) Improved usability

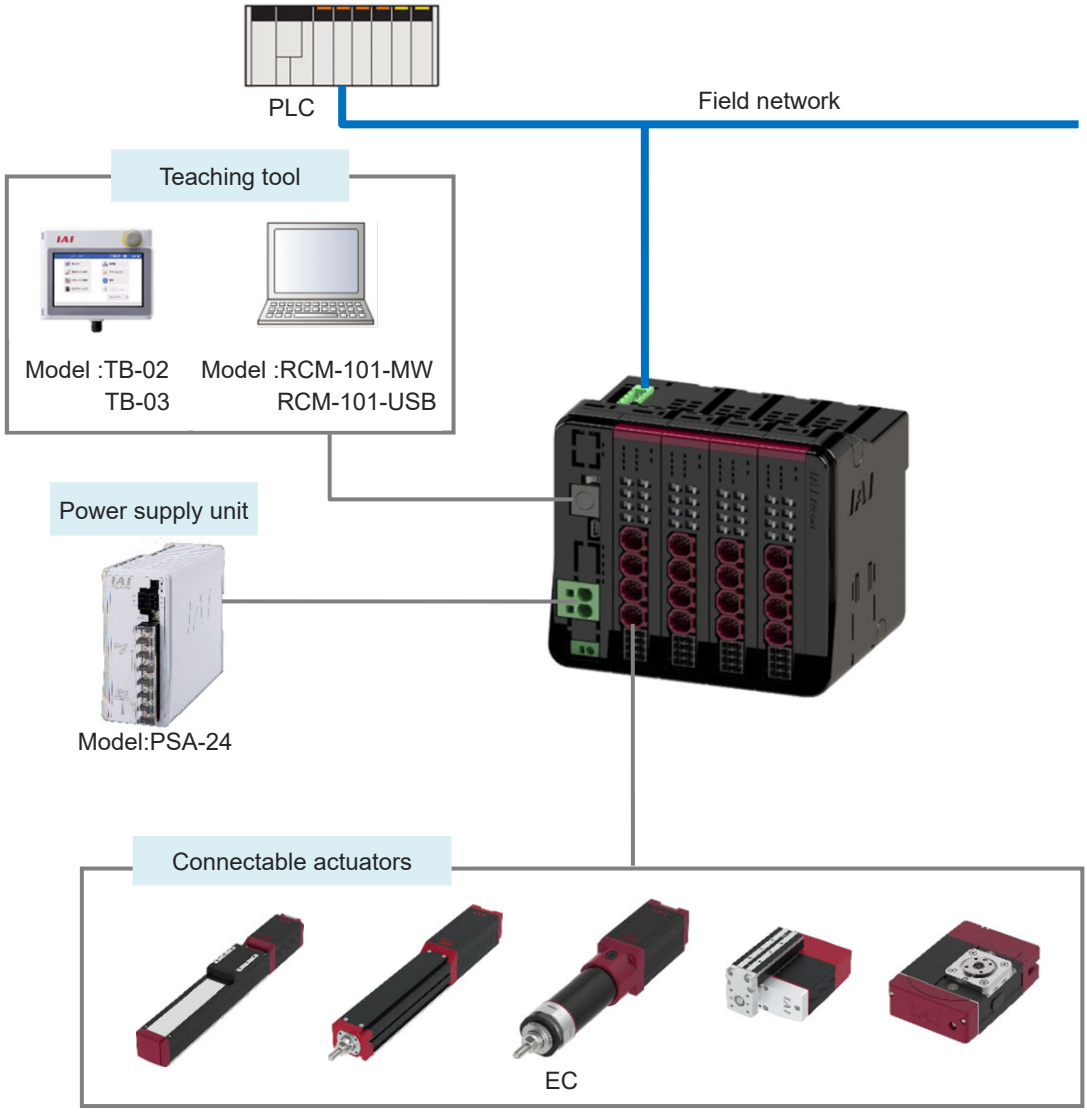
Equipped with a USB port as standard. Connection to a PC is possible using a commercial USB cable.

A JOG switch and brake release switch are equipped on the front of the driver unit.

Operation is easy even without a teaching tool.

# 1.3 System Configuration

The following shows the system configuration.



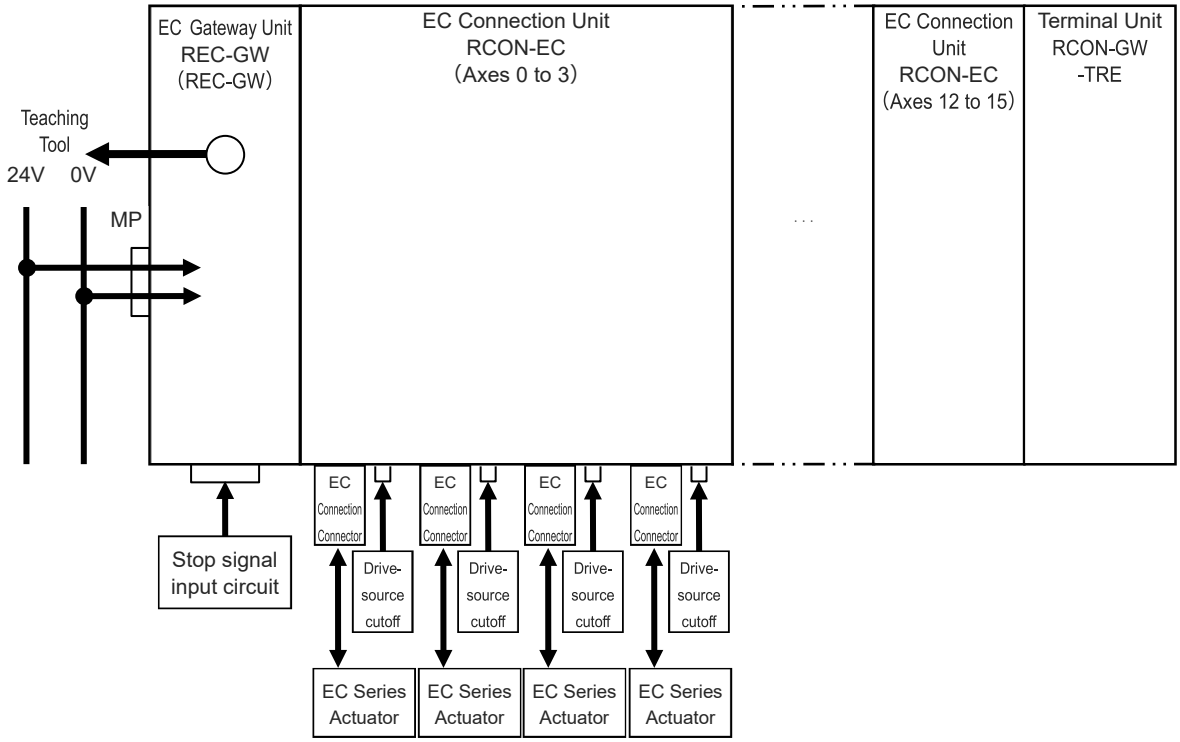
# 1.4 Configuration Unit List



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



# 1.5 Specifications

## 1.5.1 General specifications

The specifications regarding installation conditions are listed below.

| Item | Specifications |
|---|---|
| Ambient operating temperature | 0 to 55℃ |
| Ambient operating humidity | 85% RH or less, non-condensing |
| 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 57 Hz/Amplitude: 0.075mm,<br>Frequency: 57 to 150 Hz/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] | Stepper motor | Incremental | 800 |
| | | Battery-less Absolute | 800 |
| Cable length | Motor/encoder cable: 10 m 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 | RS485 |
| | | 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 | Coming soon to be certified to CE Marking and UL standard | | |

## 1.5.2 Power supply capacity

Power capacity is divided into two parts, control power capacity and motor power capacity. Power supply to each unit should be input from the 24V power supply connector on the EC gateway unit.
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.

<table>
<tr><th>Item</th><th colspan="4">Specifications</th></tr>
<tr><td>Power supply voltage</td><td colspan="4">24V DC ±10%</td></tr>
<tr><td rowspan="2">Control power capacity<br>(per unit)</td><td colspan="2">EC Gateway unit<br>(includes terminal unit)</td><td colspan="2">0.8A</td></tr>
<tr><td colspan="2">EC Connection Unit</td><td colspan="2">0.1A</td></tr>
<tr><td rowspan="5">Motor power capacity<br>(1 axis per actuator)</td><td>Motor type</td><td></td><td>Rated Current</td><td>Max. current</td></tr>
<tr><td rowspan="2">35P/42P/56P</td><td>When Power Saving Setting Invalid</td><td>2.3A</td><td>3.9A</td></tr>
<tr><td>When Power Saving Setting Valid</td><td>-</td><td>2.2A</td></tr>
<tr><td rowspan="2">28P</td><td>S3□/RR3□Type</td><td>-</td><td>2.2A</td></tr>
<tr><td>Slim and Small Type</td><td>-</td><td>1.9A</td></tr>
</table>

Current Limit Values

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

| Item | Current limit values for selection calculation |
|---|---|
| Control power (CP) | 9.0A or less |
| Motor power (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 ELECYLINDER × 16 axes …… EC Connection Unit 0.1A × 4 = 0.4A ⇒ OK

**[Motor Power Supply]**

When ELECYLINDER (with power saving mode invalid) × 16 axes

…… EC Connection Unit rated current 2.3 A × 16 axes = 91.2 A ⇒ OK

Note For those with no description of the rated current for the motor current amperage, 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.

When it is necessary to calculate the motor power supply in detail, use the “calculator software” to figure out the current amperage for ELECYLINDER. Set up the operating conditions and the operation patterns of an actuator, and it automatically calculates the necessary current amperage.
Refer to "Calculator Instruction Manual (ME0381)" for details such as how to operate.



(Reference) Selection of Circuit Breaker for Power Supply Protection

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

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

| Item | Conditions | Specifications | |
|---|---|---|---|
| In-Rush 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 in-rush current flows in is 5ms or less. Also, in parallel operation, the in-rush current is added for number of units. Confirm the characteristics when select so the breaker would not work at the in-rush current.

### 1.5.3 Inrush current

In-rush current would occur only on the EC connection unit.
The inrush current values are listed below.

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

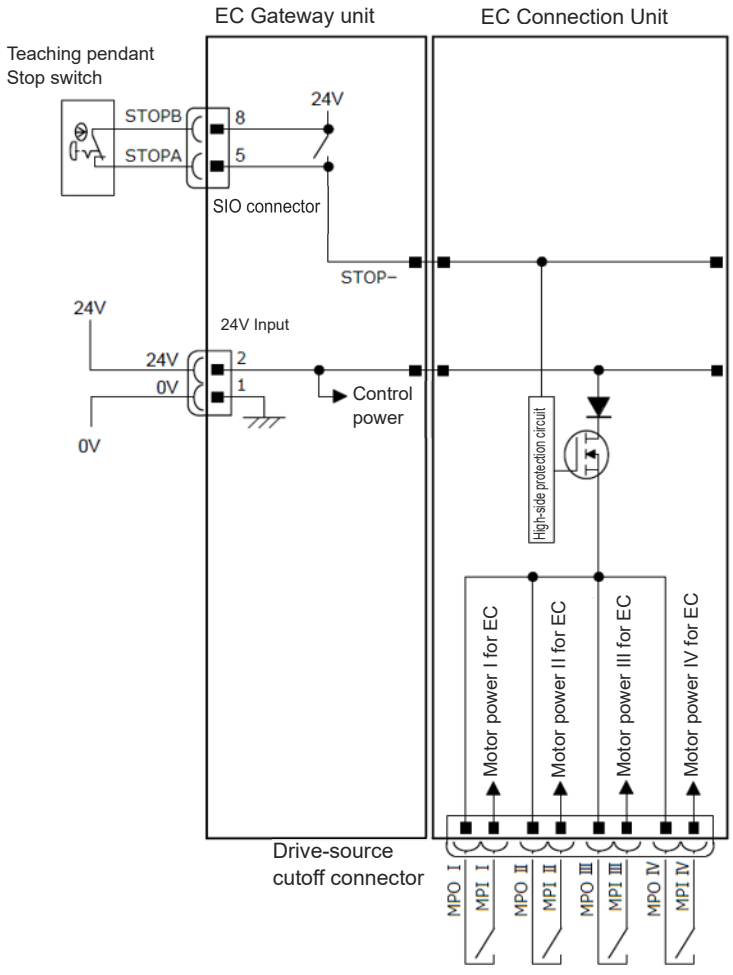
When multiple driver units are used, depending on the capacity of the 24V DC power source, a voltage drop might occur when the units are turned on.

## 1.5.4 Drive Cutoff Circuit

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.

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



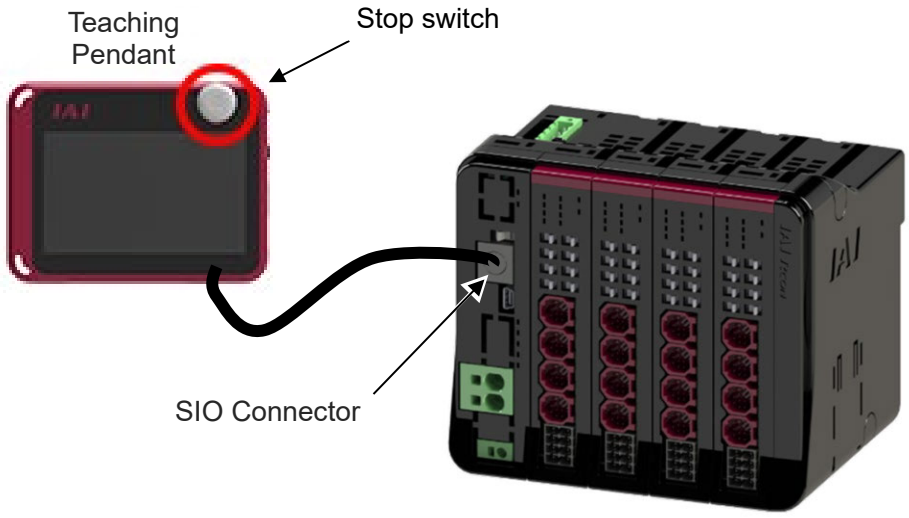

Wiring diagram: Stop and drive-source cutoff

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

**[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.

## 1.5.5 Installation conditions

**[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℃
  (If there is no fan unit, derating is available.)
  For simple absolute units and SCON, where the ambient temperature exceeds the range of 0 to 40℃
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 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]

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.

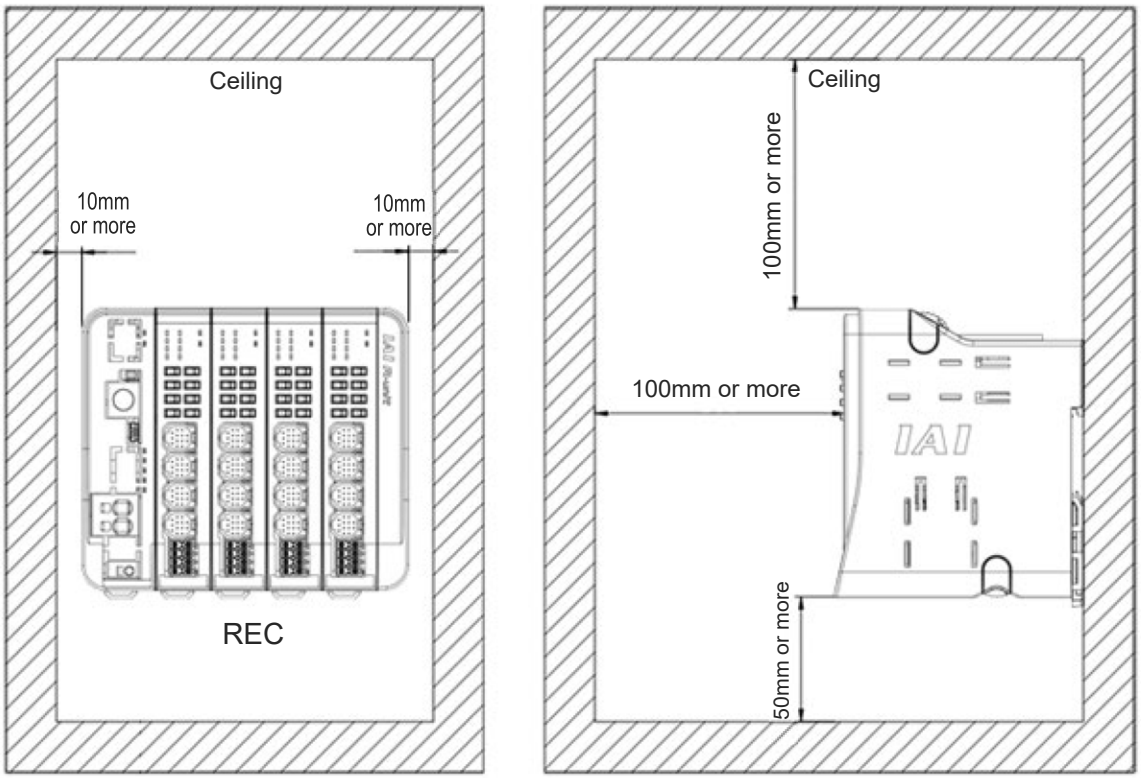
Unless especially specified, desiccant is not included in the package at shipping. If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures for the package overall from the exterior, or directly after opening the package.

**[Installation and mounting]**

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 temperatur | 0 to 55°C |
| Ground | Class D grounding |




**[Operating temperature range]**

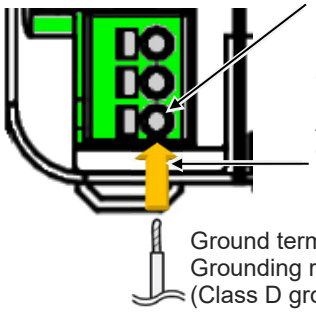
The operating temperature of the gateway unit/ EC Connection Unit is within the range of 0 to 55°C.

## 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]**

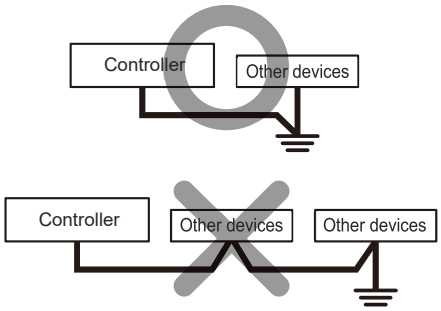
(1) Grounding for noise countermeasures (frame ground)



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: 100 Ω or less
(Class D grounding construction)




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

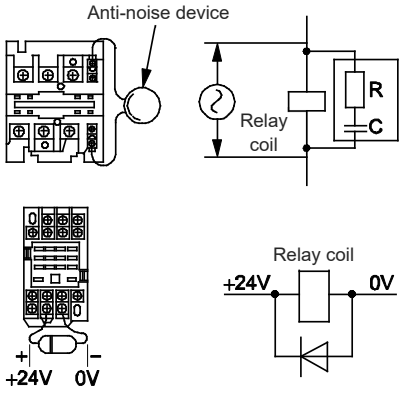
(2) Notes on wiring method

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.



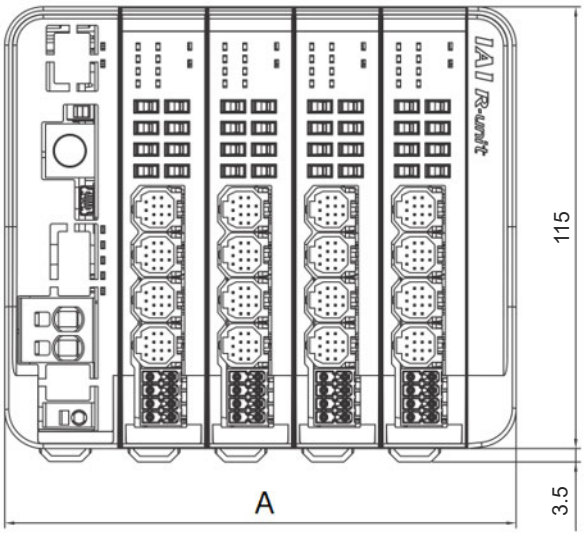
# 1.6 External dimensions

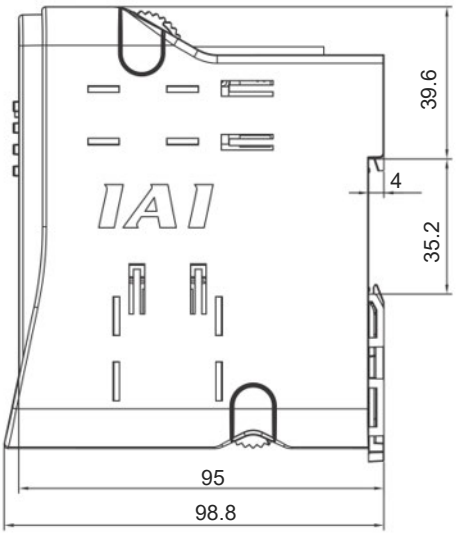


## 1.6.1 REC system

| Item | Specifications |
|---|---|
| External dimensions | W133 mm × H115 mm × D95 mm<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 |

REC

Chapter 2

# EC Gateway Unit


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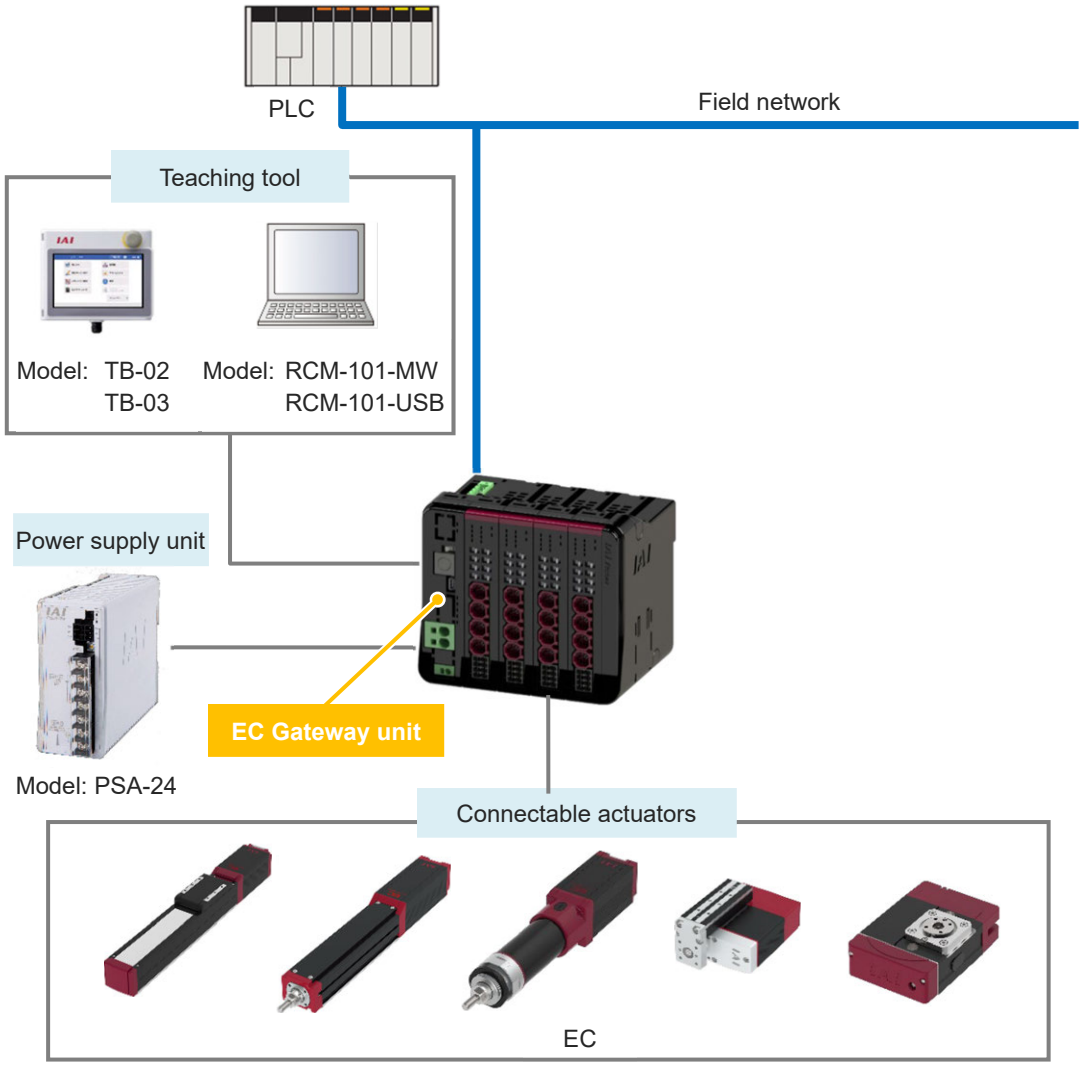
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# 2.1 Overview

The EC gateway unit is a slave station with a gateway function for connecting the ELECYLINDER to the field network of the host PLC. It supports 7 kinds of field networks (CC-Link, CC-Link IE Field, DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS-DP, PROFINET IO).

By connecting the EC connection units (RCON-EC) to REC System, it is available to connect 16 axes at the maximum.



# 2.2 How to Read the Model Number



The model of the EC gateway unit is as follows.

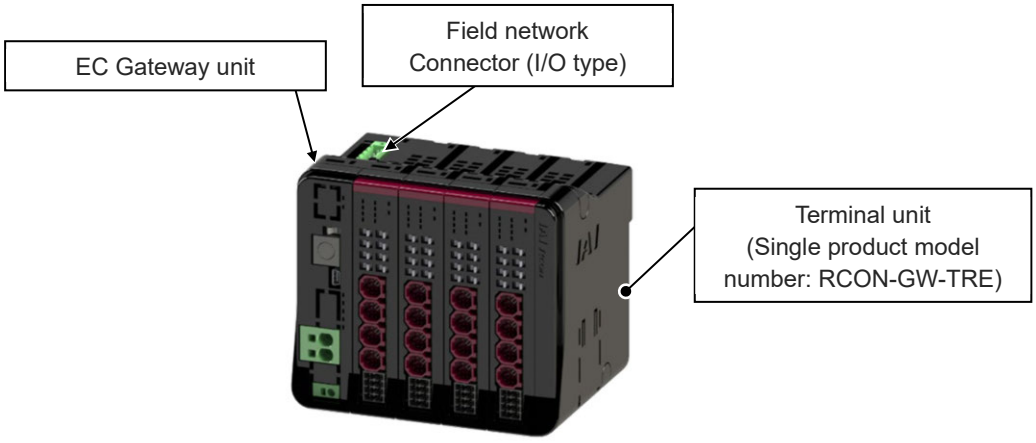
## EC Gateway unit model

REC – [Type] – [I/O Type] – [Options]

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

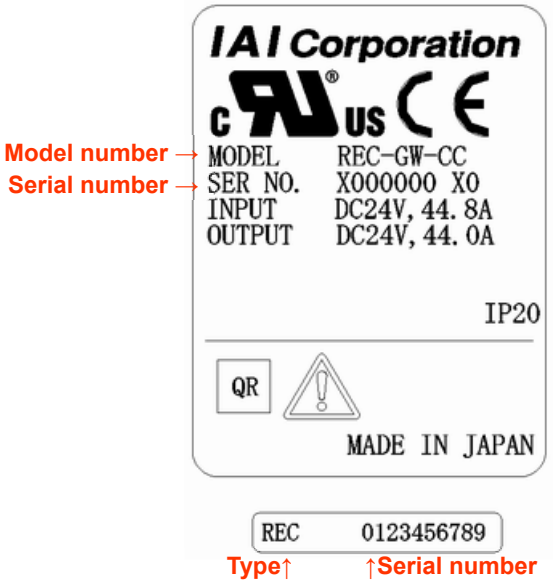
| I/O Type | |
|---|---|
| CC | CC-Link connection specification |
| CIE | CC-Link IE Field connection specification |
| DV | DeviceNet connection specification |
| EC | EtherCAT connection specification |
| EP | EtherNet/IP connection specification |
| PR | PROFIBUS-DP connection specification |
| PRT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

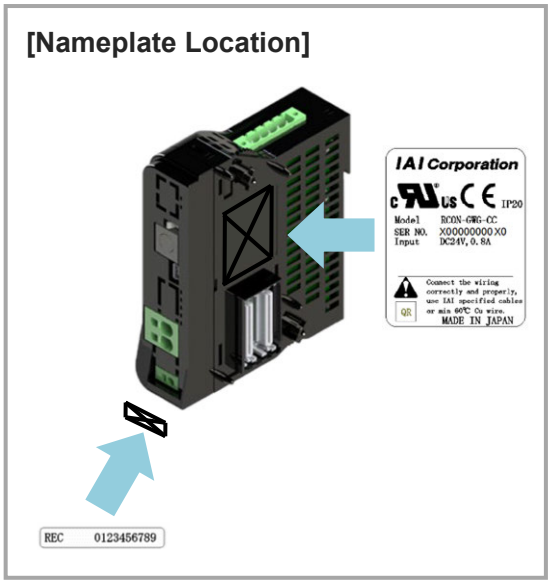
| Options | |
|---|---|
| TRN | Without terminal unit |



## 2.2.1 How to read the model nameplate

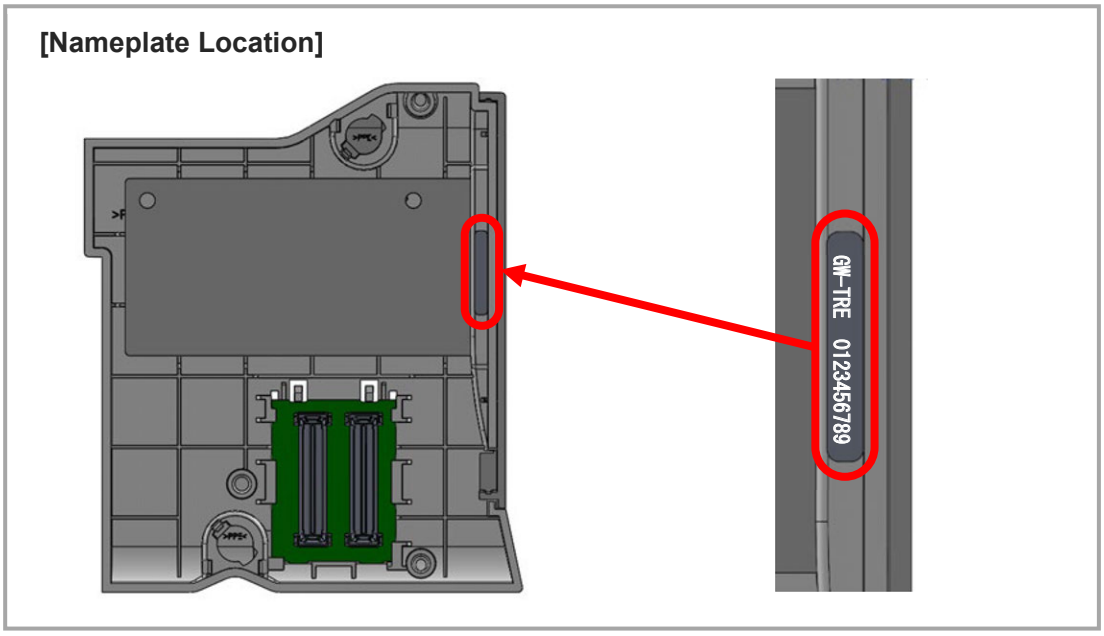
**[EC Gateway Unit]**




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

**[Terminal Unit]**



# 2.3 EC Gateway Unit and Accessories



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 |
|---|---|---|---|
| EC Gateway unit |  | 1 | Model example:<br>REC-GW-CC |
| Terminal unit |  | 1 | Single product model number:<br>RCON-GW-TR<br>(Not supplied with TRN specification) |
| System I/O connector |  | 1 | Single product model number:<br>DFMC1.5/5-ST-3.5<br>(Phoenix Contact) |
| Field network connector |  | 1 | Depends on I/O type |
| First Step Guide |  | 1 | ME0395 |
| Safety Guide |  | 1 | M0194 |
| Instruction Manual DVD |  | 1 | |

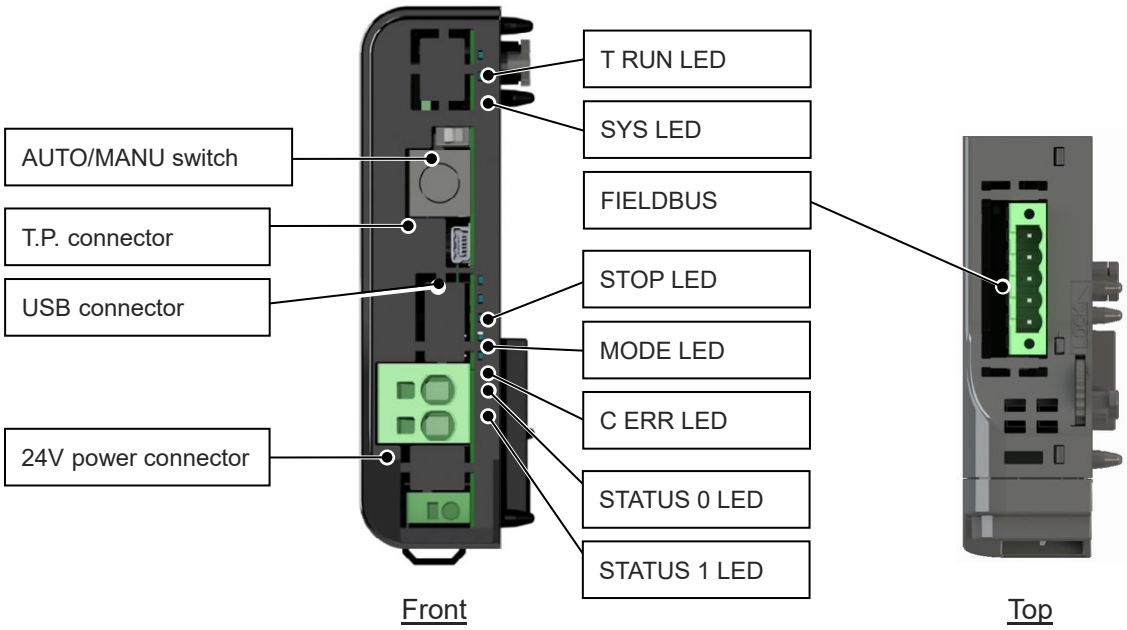
# 2.4 Part Names/Functions and External Dimensions

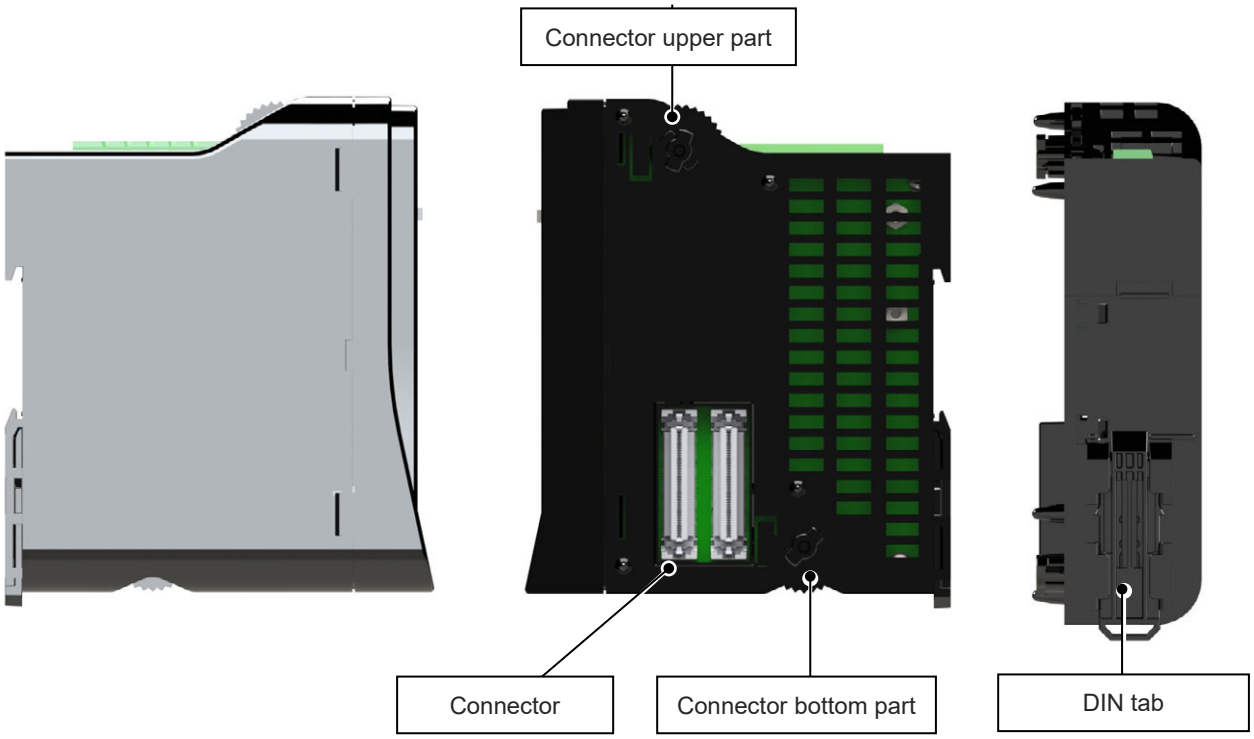
## 2.4.1 Part names





REC-GW






Left side　　Right side　　Rear

### 2.4.2 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 "2.5 Field Network General Specifications)" |
| STATUS 1 | – | – | Differs with field network<br>Refer to "2.5 Field Network General Specifications)" |

### 2.4.3 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.

### 2.4.4 SIO connector

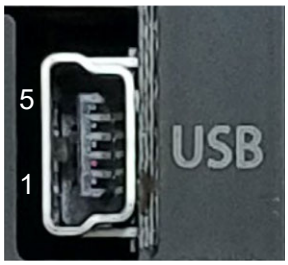
A connector for connecting the teaching pendant to PC software.
PC software can also be connected with a USB.




| Pin No. | Signal name | Description |
|---|---|---|
| 1 | TP_SD+ | Teaching pendant/PC RS-485 differential signal + side |
| 2 | TP_SD- | Teaching pendant/PC RS-485 differential signal - side |
| 3 | T5V | Teaching pendant 5 V output |
| 4 | ENB | Enable signal input |
| 5 | STOPA | Stop line A |
| 6 | T24V | Teaching pendant 24 V output |
| 7 | GND | 0 V |
| 8 | STOPB | Stop line B |
| 9 (shell) | GND | 0 V |

### 2.4.5 USB connector

It is a connector to be connected to the PC software or gateway parameter configuration tool.
For use, it is necessary to install the USB connection driver for RCON.
For how to install the driver, refer to “PC software Instruction Manual (ME0155)”.

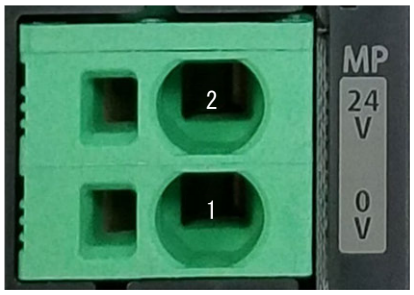



Connector name: 51387-0530 (Molex)

| Pin No. | Signal name | Description |
|---|---|---|
| 1 | VBUS | USB power |
| 2 | D- | USB signal line - |
| 3 | D+ | USB signal line + |
| 4 | NC | Not connected |
| 5 | GND | 0 V |
| Shell | GND | 0 V |

### 2.4.6 24V power connector

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




| Pin No. | Signal name | Description |
|---|---|---|
| 1 | GND | 0 V |
| 2 | MP | Motor power +24 V input |

Motor power connector compatible wire

| Item | Specifications |
|---|---|
| Compatible wire | AWG20 to 8 (Copper Wire) |
| Strip length | 15.0mm |
| Rated Temperature on Isolation Coating | 60 °C or more |

**Caution**

- Select a wire with thickness that tolerates the rated current total value obtained in "1.5.3 Specifications/Power supply capacity ".

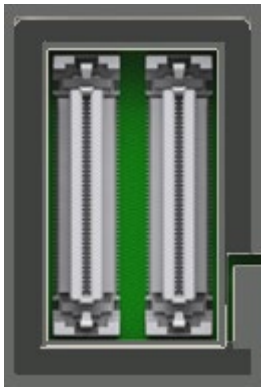
### 2.4.7 Field network connector

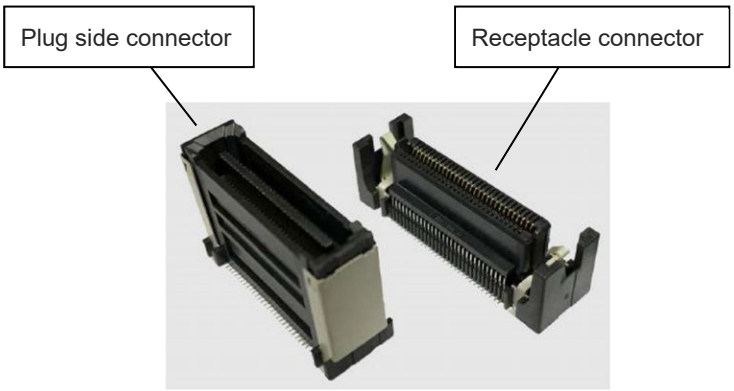
A connector for connecting to field networks. Field network details are listed in "2.5 Field Network General Specifications)".




### 2.4.8 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.

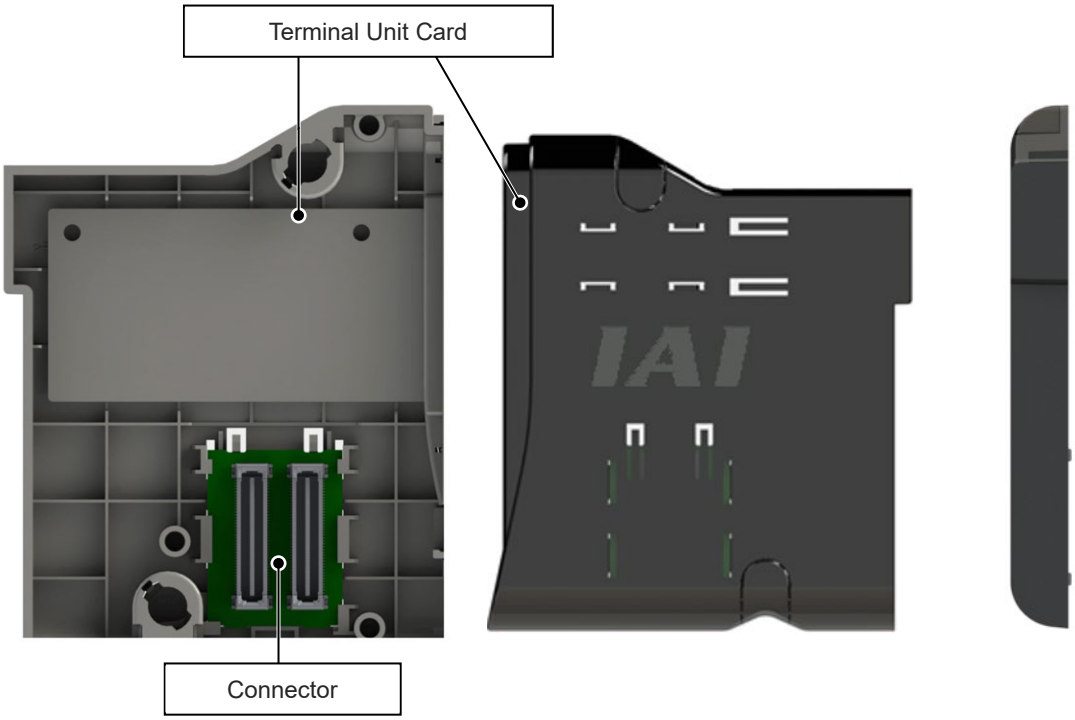




## 2.4.9 Terminal unit



RCON-GW-TRE

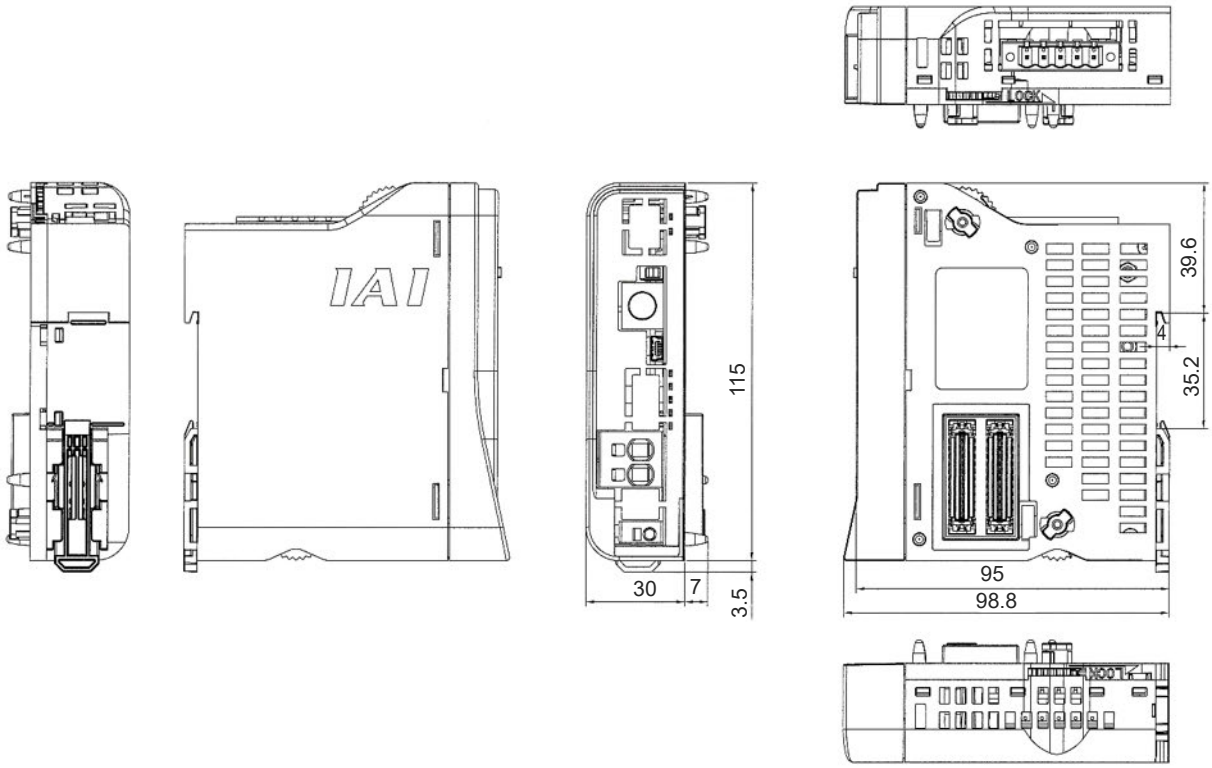



Left side　　Right side　　Rear

## 2.4.10 External dimensions

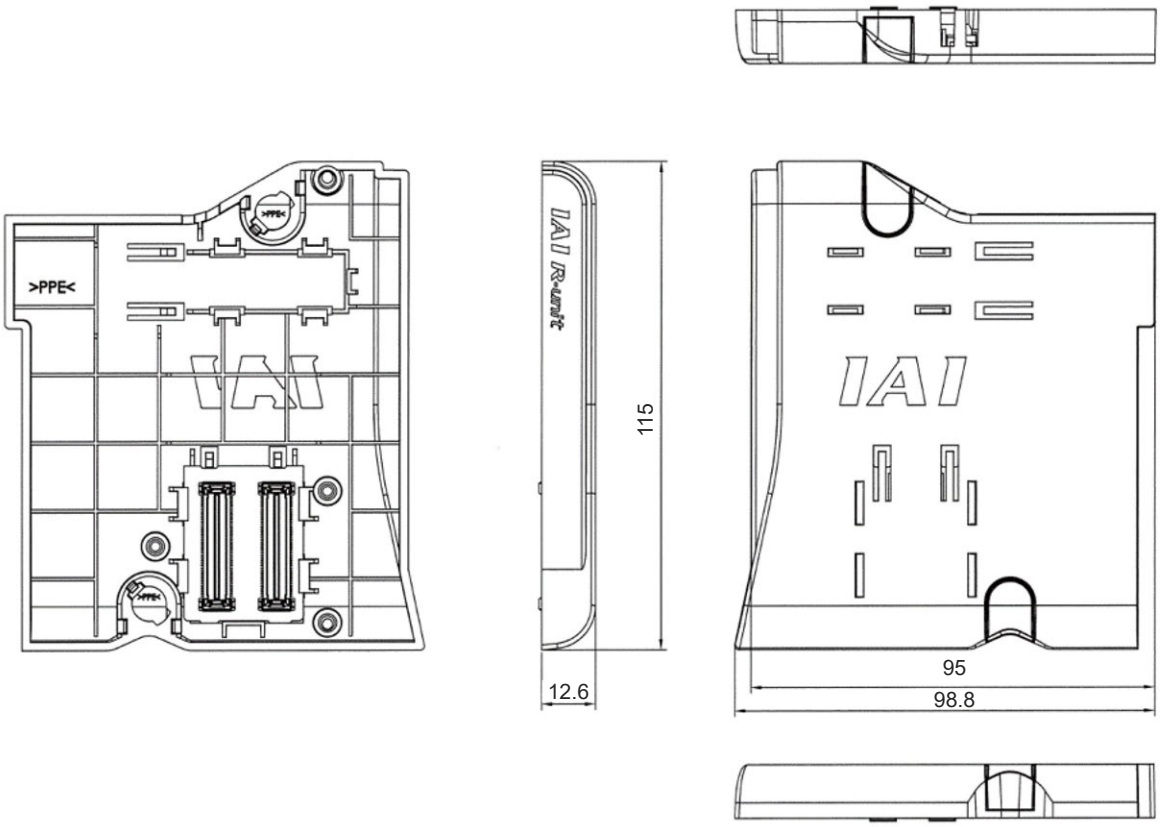
EC Gateway unit

| Item | Specifications |
|---|---|
| External dimensions | W 30 mm × H 115 mm × D 95 mm |
| Mass | About 135g |
| External view | See figure below |



Terminal unit

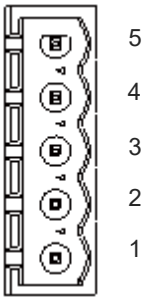
| Item | Specifications |
|---|---|
| External dimensions | W 12.6 mm × H 115 mm × D 95 mm |
| Mass | About 48g |
| External view | See figure below |



# 2.5 Field Network General Specifications



## 2.5.1 CC-Link



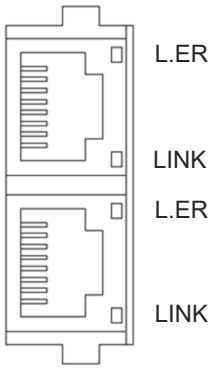

Cable connector name: MSTB2.5/5-STF-5.08 AU (Phoenix Contact)

| Pin No. | Signal name | Description |
|---|---|---|
| 1 | DA | Signal line A |
| 2 | DB | Signal line B |
| 3 | DG | Digital ground |
| 4 | SLD | Connects the shield of shielded cables<br>(This connector's 5-pin FG and the control power connector's 1 pin FG are connected internally) |
| 5 | FG | Frame ground<br>(This connector's 4-pin SLD and the control power connector's 1 pin FG are connected internally) |

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 (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 (0.4 s blinking) | Value of station number or baud rate setting changed when reset canceled |
| | | | Light OFF | 1. Normal communication<br>2. Hardware reset in progress |

## 2.5.2 CC-Link IE Field

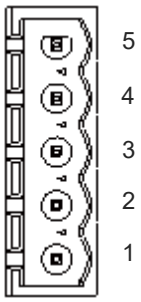



Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5e or higher, shielded 8P8C modular plug (RJ45)
* It is to be prepared by the customer.

LED display

| Name | Panel notation | Display color | Status | Description |
|---|---|---|---|---|
| STATUS 0 | MS | Green | Light ON | Normal operation |
| | | | Light OFF | Hardware error generated |
| | | Orange | Light ON | Error generated |
| | | | Light OFF | Normal operation |
| STATUS 1 | NS | Green | Light ON | Cyclic transmission ON |
| | | | Blinking | Cyclic transmission OFF |
| | | | Light OFF | Cyclic transmission not yet implemented, fragmented |
| | | Orange | Light ON | Receive data error |
| | | | Light OFF | Receive data normal |
| LINK | – | Green | Light ON | Link up |
| | | | Light OFF | Link down |
| L.ER | – | Orange | Light ON | Receive data error |
| | | | Light OFF | Receive data normal |

## 2.5.3 DeviceNet



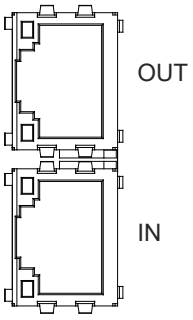

Cable connector name: MSTB2.5/5-STF-5.08 AU M (Phoenix Contact)

| Pin No. | Pin color scheme | Description |
|---|---|---|
| 1 | Black | Power supply cable - side |
| 2 | Blue | Signal data Low side |
| 3 | – | Digital Ground |
| 4 | White | Signal data High side |
| 5 | Red | Power supply cable + side |

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 |

## 2.5.4 EtherCAT

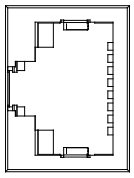



Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5 or higher, shielded
8P8C modular plug (RJ45)
* It is to be prepared by the customer.

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: 200 ms / OFF: 200 ms |
| | | | Blinking (2 times) | Watchdog timer/timeout<br>ON: 200 ms x 2 / OFF: 1,000 ms |
| | | | Light OFF | Initialized status |
| STATUS 1 | RUN | Green | Light ON | Normal operation (OPERATION) status |
| | | | Blinking (continuous) | PRE-OPERATION status<br>ON: 200 ms / OFF: 200 ms |
| | | | Blinking (1 time) | SAFE OPERATION status<br>ON: 200 ms / OFF: 1,000 ms |
| | | Orange | Blinking | Signal component (module) error |

## 2.5.5 EtherNet/IP

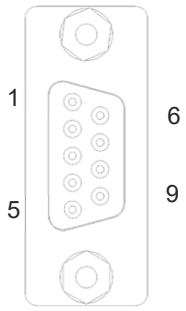


Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5 or higher, shielded
8P8C modular plug (RJ45)
* It is to be prepared by the customer.

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 |

## 2.5.6 PROFIBUS-DP




Cable side connector name: 9-pin D sub connector (male)

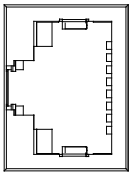
* It is to be prepared by the customer.

| Pin No. | Signal name | Description |
|---|---|---|
| 1 | NC | Not connected |
| 2 | NC | Not connected |
| 3 | B-Line | Signal line B (RS-485) |
| 4 | RTS | Transmission request |
| 5 | GND | 0 V (isolated) |
| 6 | +5 V | +5 V output (isolated) |
| 7 | NC | Not connected |
| 8 | A-Line | Signal line A (RS-485) |
| 9 | NC | Not connected |
| Housing | FG | Frame ground (control power connector 1-pin FG connected internally) |

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 information error |
| | | Green/orange | Light OFF | Offline |

## 2.5.7 PROFINET IO



Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5 or higher, shielded
8P8C modular plug (RJ45)
* It is to be prepared by the customer.

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 |

R E C

Chapter 3

# EC Connection Unit


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3.2 How to Read the Model Number ····· 3-2

3.2.1 How to read the model nameplate ····· 3-3

3.3 Components ····· 3-4

3.4 Part Names/Functions and External Dimensions ····· 3-5

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3.4.6 Drive source shutoff connector ····· 3-11

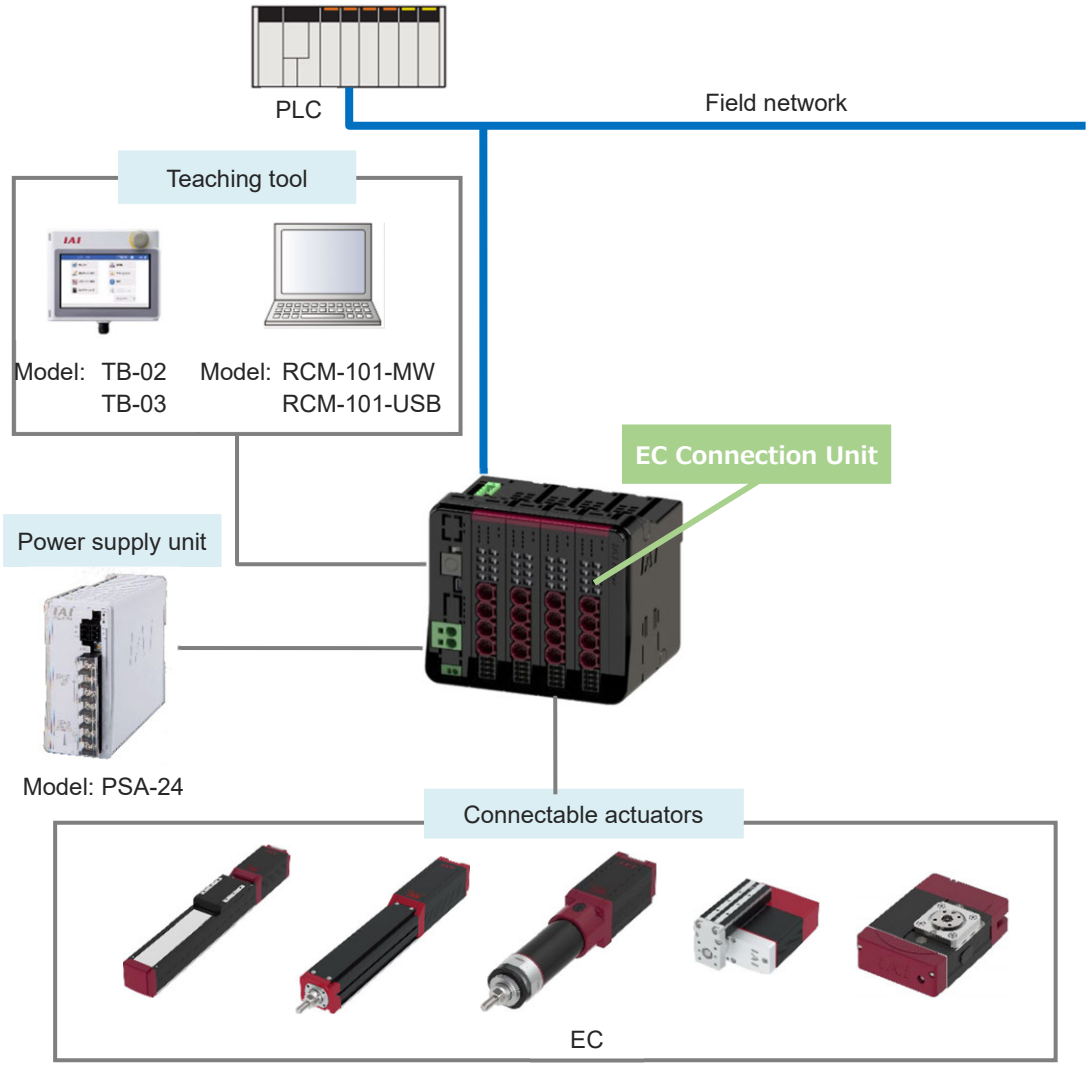
3.4.7 Connectors ····· 3-12

3.4.8 External dimensions ····· 3-13

# 3.1 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 How to Read the Model Number

## EC Connection Unit model

RCON – [Type] – [Number of Axes]

Type
- EC: ELECYLINDER

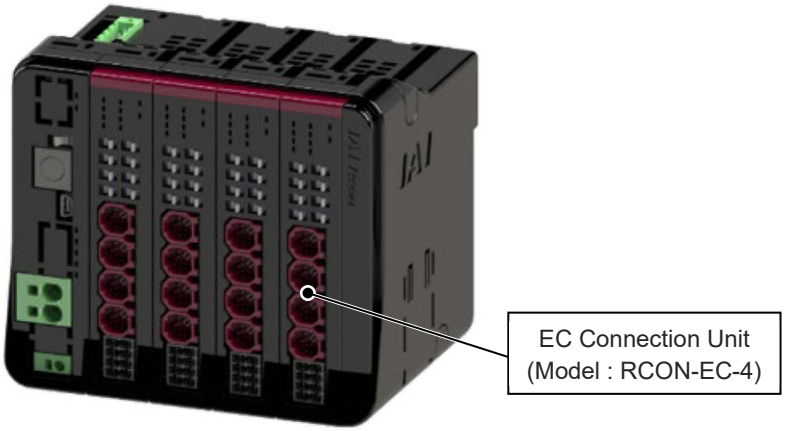
Number of Axes
- 4: Four-axis type

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

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

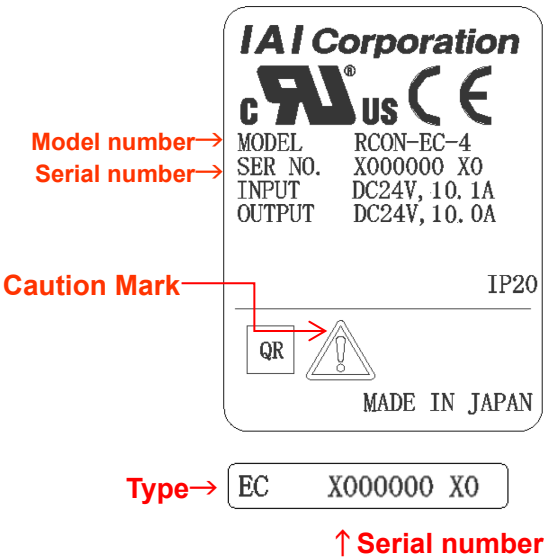
<Series> <Type> <Lead> < Motor Joint Type> < Stroke> < Cable Length> <Option>

ACR: RCON-EC connection type

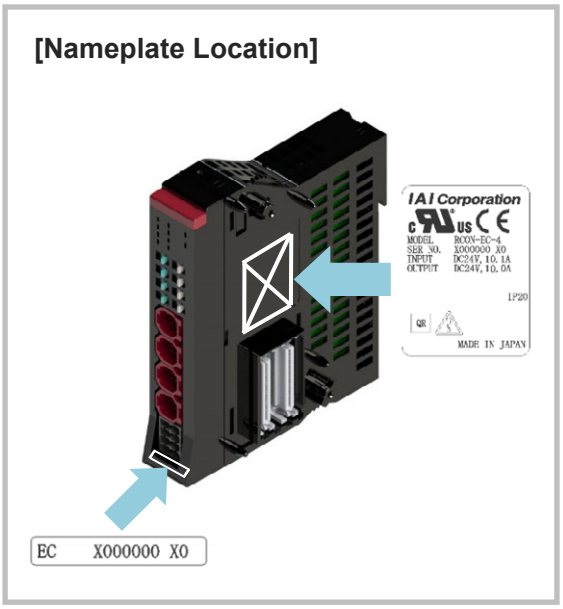


## 3.2.1 How to read the model nameplate

**[EC Connection Unit]**




**[Nameplate Location]**




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

# 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.

**[EC Connection Unit]**

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

# 3.4 Part Names/Functions and External Dimensions

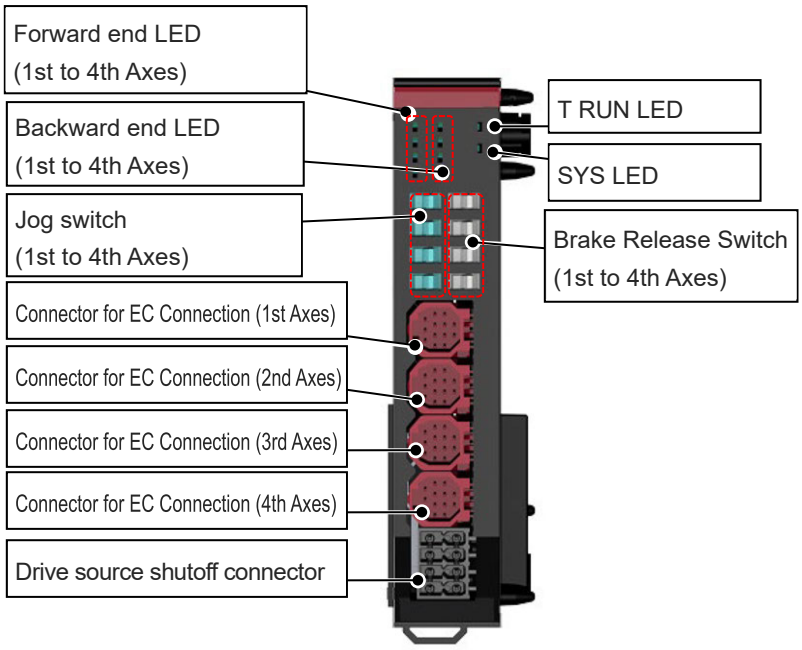
**[EC Connection Unit]**

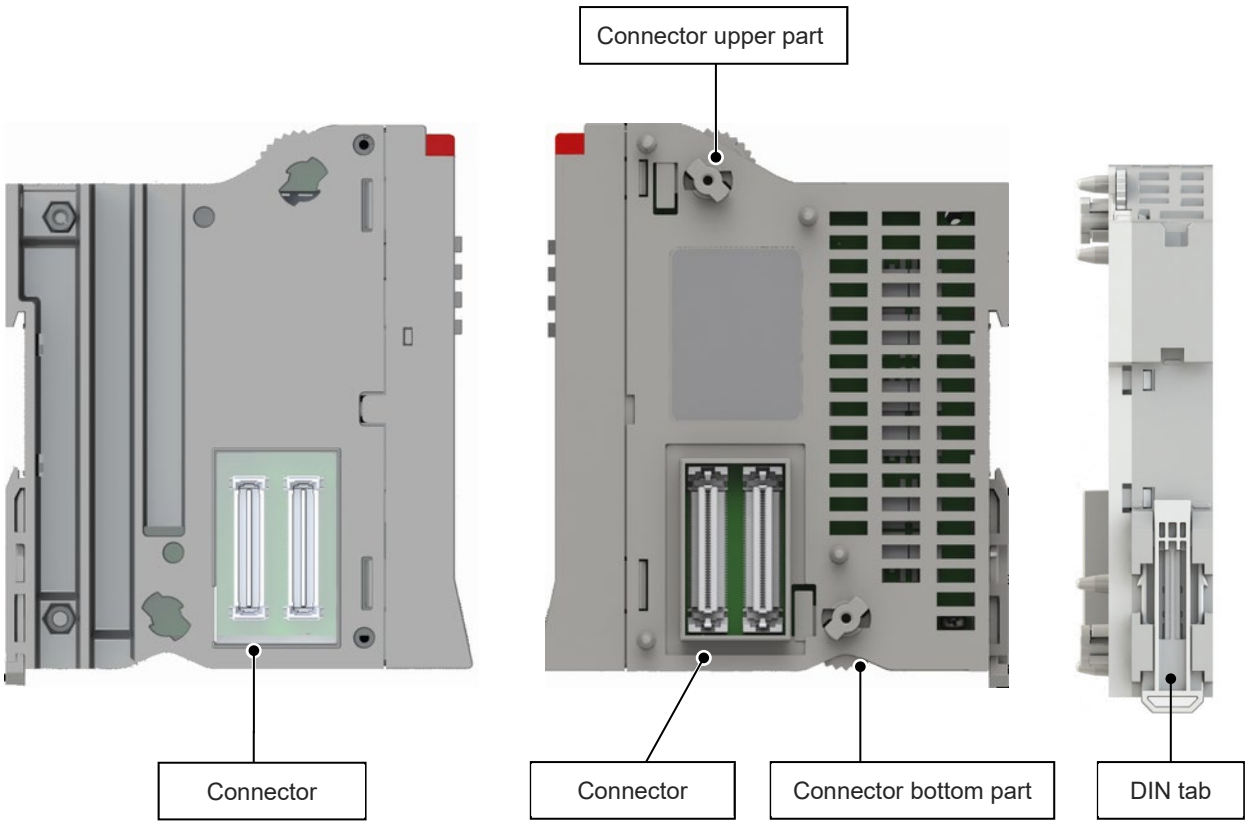
## 3.4.1 Part names





RCON-EC





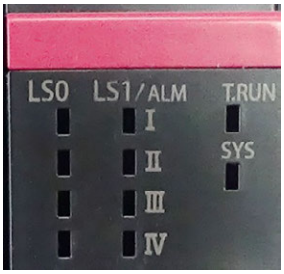

Left side

Right side

Rear

### 3.4.2 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 | Servo ON |
| | | Blinking | Servo OFF |
| | Red | Light ON | Alarm triggered<br>STOP signal input OFF (Drive source cutoff triggered) |
| LS1/ALM<br>(Ⅰ = 1st axes,<br>Ⅱ = 2nd axes,<br>Ⅲ = 3rd axes,<br>Ⅳ = 4th axes) | Green | Light ON | Movement to Forward End Complete |
| | | Blinking | Stop |
| | Red | Light ON | Alarm triggered |
| LS0<br>(Ⅰ = 1st axes,<br>Ⅱ = 2nd axes,<br>Ⅲ = 3rd axes,<br>Ⅳ = 4th axes) | Green | Light ON | Movement to Backward End Complete |
| | | Blinking | Stop |



### 3.4.3 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 valid only in MANU Mode. It should be invalid 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 invalid should make the jog switches on all the units of the EC connection unit connected to the EC gateway inactivated. (It is set to “Valid” in the initial setting.)



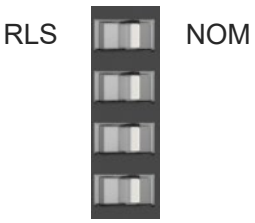

| Symbol | Description |
|---|---|
| JOG+ | Jog operation to positive direction (target position registered as forward end in position data) |
| JOG- | Jog operation to negative direction (target position registered as backward end in position data) |

## 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.

### 3.4.4 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) |

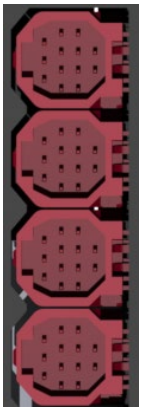


## Warning

- 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.

### 3.4.5 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.

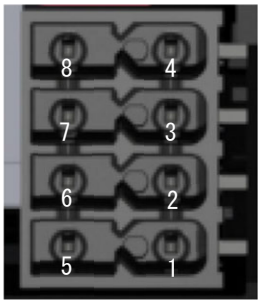


**[RCON-EC]**

| Pin No. | Signal name | Description |
|---|---|---|
| 1 | 24V (MP) | Motor power +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 |

### 3.4.6 Drive source shutoff connector

Drive-source cutoff input. Drive source can be cut off by individual axes.




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

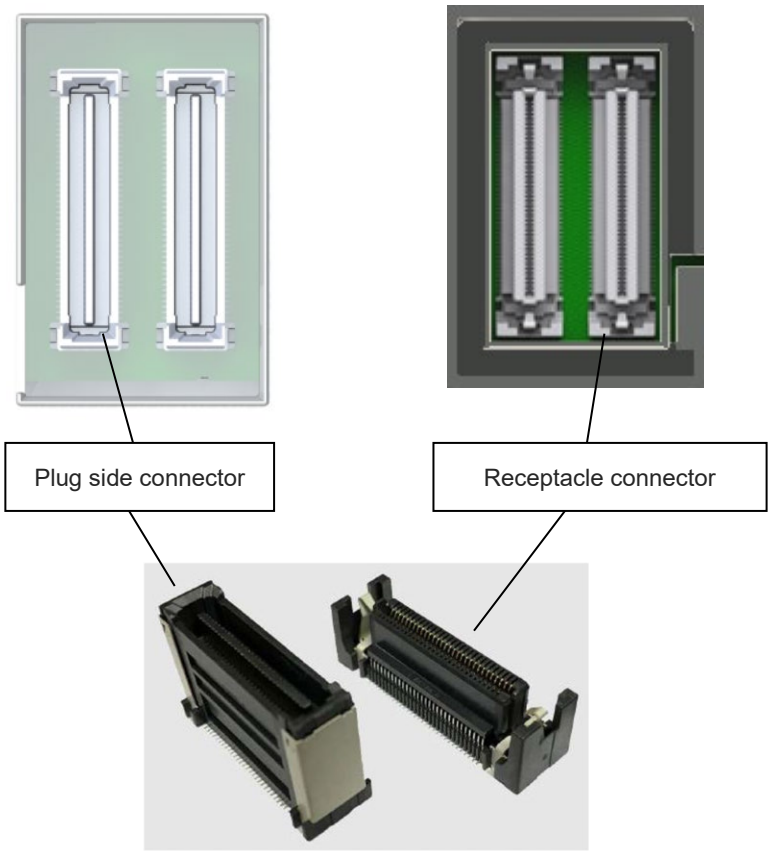
| Pin No. | Signal name | Description |
|---|---|---|
| 1 | MPO_3 | Motor power output 4th axes |
| 2 | MPO_2 | Motor power output 3rd axes |
| 3 | MPO_1 | Motor power output 2nd axes |
| 4 | MPO_0 | Motor power output 1st axes |
| 5 | MPI_3 | Motor power input 4th axes |
| 6 | MPI_2 | Motor power input 3rd axes |
| 7 | MPI_1 | Motor power input 2nd axes |
| 8 | MPI_0 | Motor power input 1st axes |

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 |

### 3.4.7 Connectors

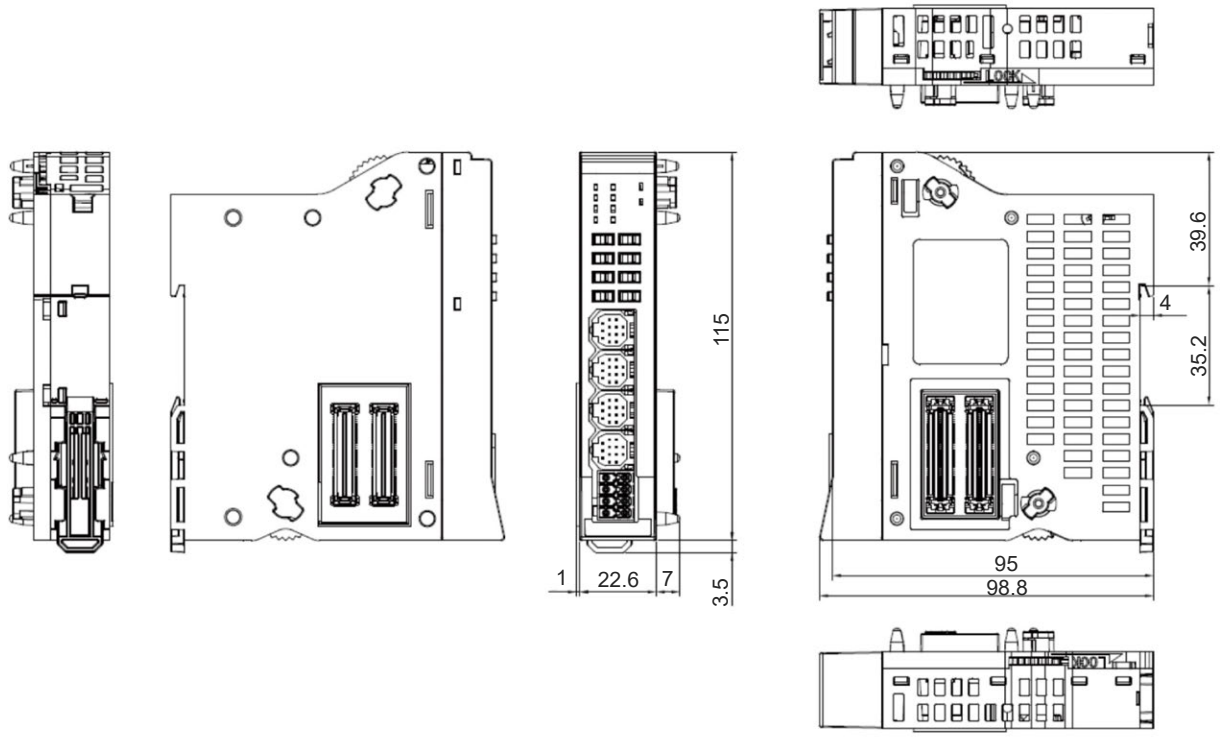
A connector for use between units. Two identical connectors are used. The connectors have a floating structure that absorbs connector misalignment due to housing mating or mounting misalignment between connectors.



## 3.4.8 External dimensions

**[EC Connection Unit]**

| Item | Specifications |
|---|---|
| External dimensions | W 22.6 mm × H 115 mm × D 95 mm |
| Mass | About 123g |
| External view | See figure below |



REC

Chapter 4

# Unit connection / Installation and Wiring


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4.2 Unit connection / Installation ····· 4-3

4.2.1 Unit connection restrictions ····· 4-3

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4.2.3 Unit mounting ····· 4-5

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# 4.1 Tools to Use

The tools used for constructing and starting up the REC system are PC software or a teaching pendant, and the gateway parameter configuration tool.
In this chapter, explains the EC connection unit (RCON-EC).

**[PC software]**

- 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]**

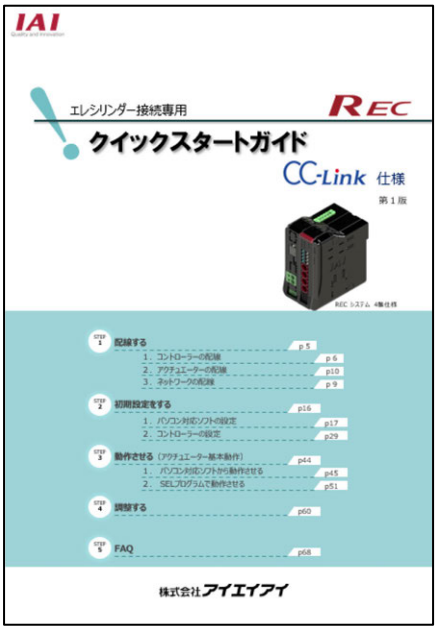
- Ver.3.1.7.0 or later

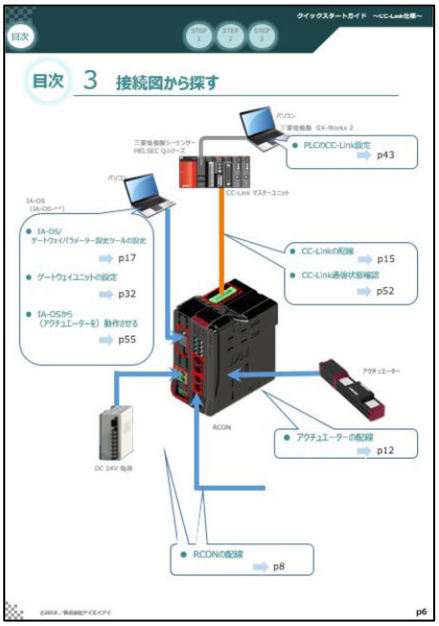
The gateway parameter configuration tool is included in the PC software, but you can also download the latest version from our website.
For the operation of PC software and teaching pendant, refer to the following instruction manual.

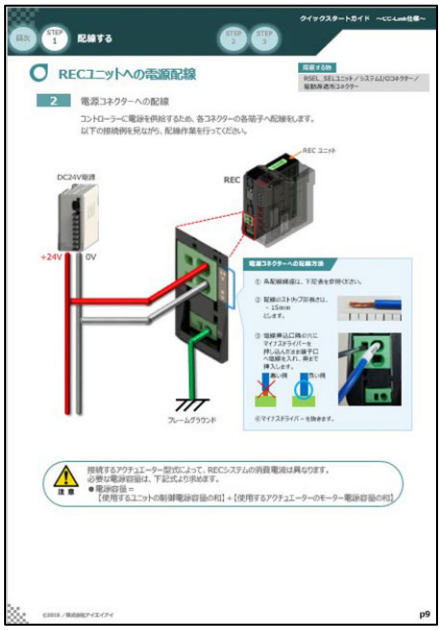
## Reference

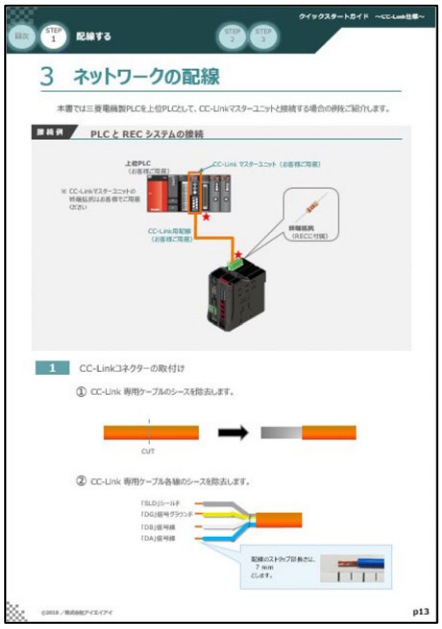
| | | |
|---|---|---|
| PC software operating method | ▶ | PC software (RCM-101-*-*) manual (ME0155) |
| Teaching pendant operating method | ▶ | Touch Panel Teaching Pendant manual TB-02/02D (ME0355), TB-03 (ME0376) |

For an example of using and details the gateway parameter configuration tool, refer to "5.4 How to Use the Gateway Parameter Configuration Tool (page 5-24)"
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)



# 4.2 Unit connection / Installation

## 4.2.1 Unit connection restrictions

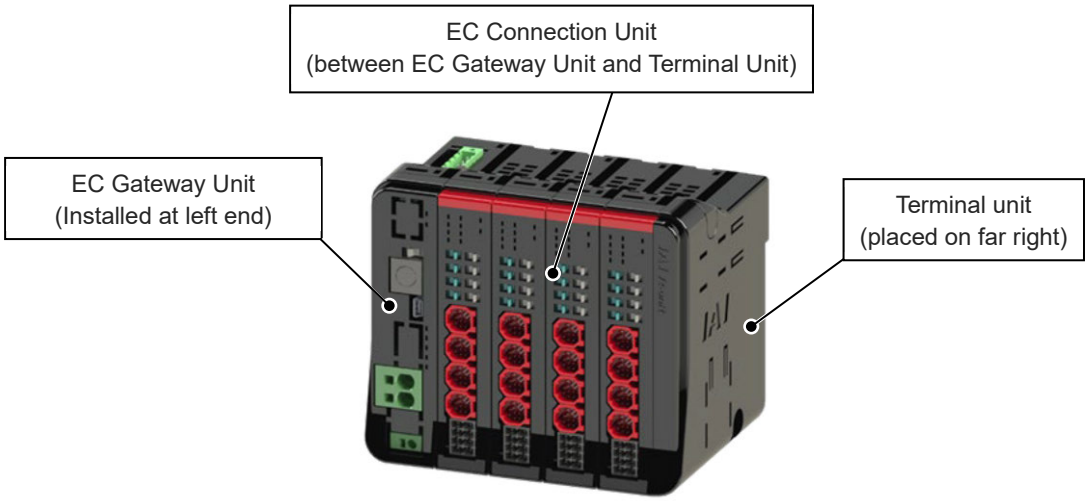
The REC system has the following restrictions.
Check the following descriptions and then make a selection for each unit.



(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.

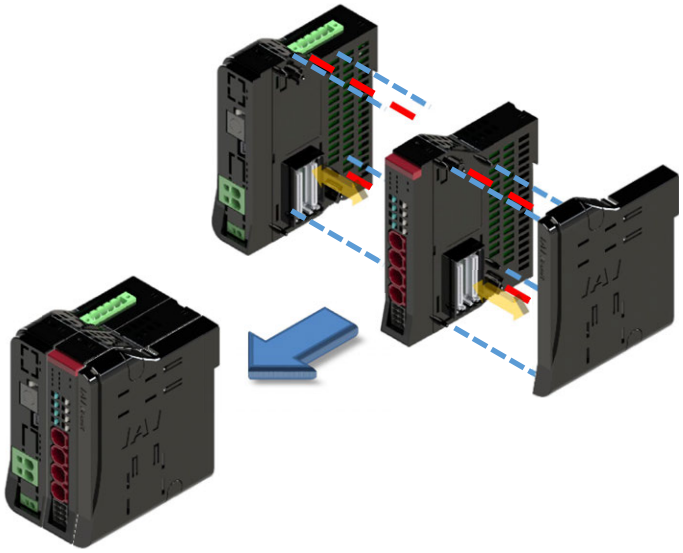



(2) Number of Connectable Units of EC Connection Unit

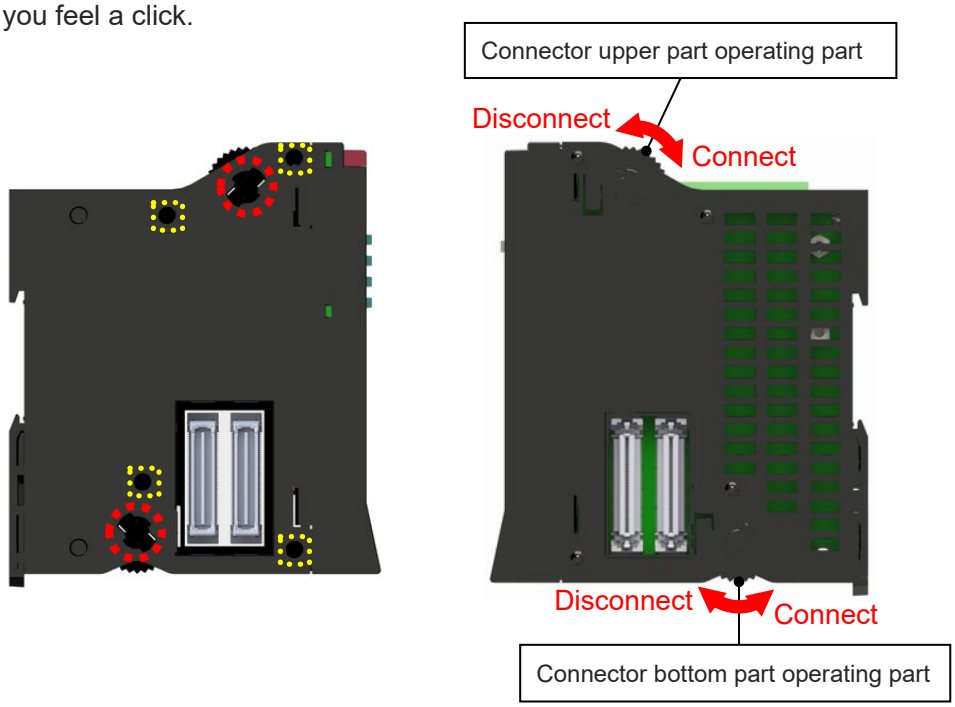
Up to 16 axes can be controlled with each EC gateway unit.
Even though the EC connection units have a structure capable to be connected with no upper limit, have them connected up to four units (16 axes) at the maximum. (EC connection unit occupies the domains and axis numbers for four axes per unit 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.

### 4.2.2 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.

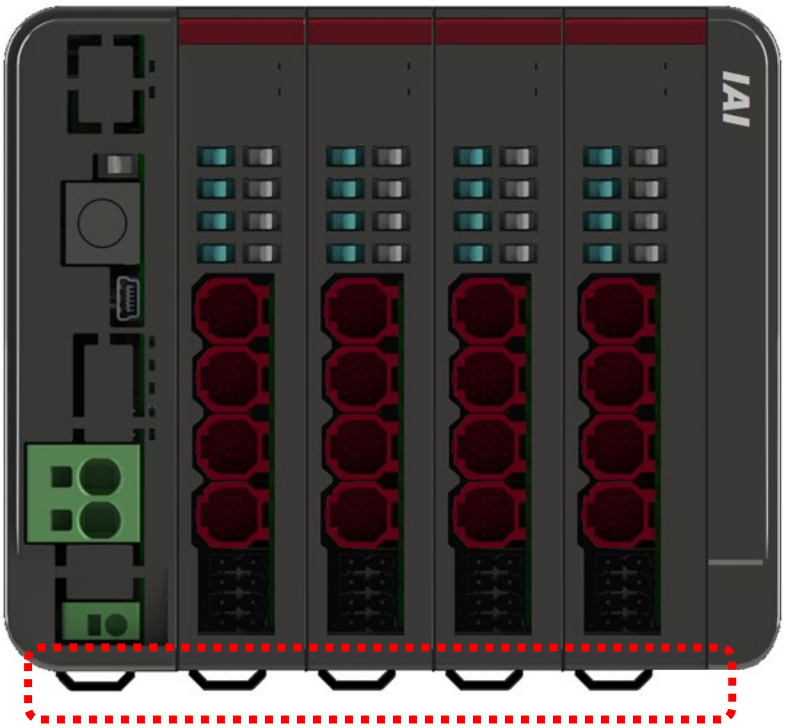


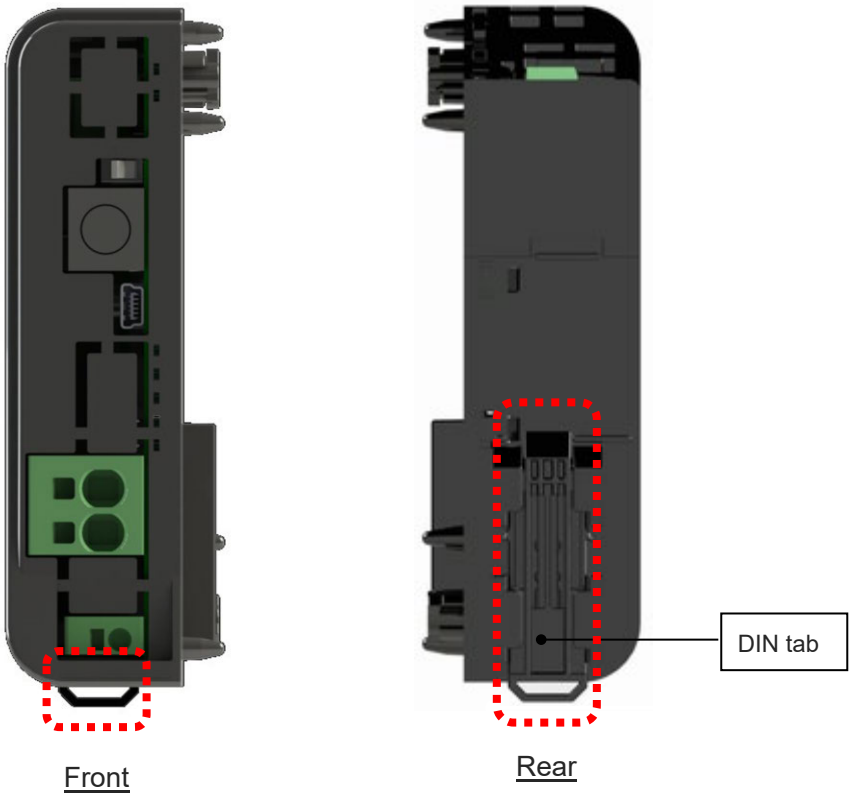
(1) Turn the operating parts of the connector upper/bottom part towards the panel and position on the panel end.
(2) The 2 sections circled with a dashed line and the 4 positioning bosses within the square dotted lines are used as a total of 6 mating sections for positioning 2 units.
(3) When positioning 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.



### 4.2.3 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.

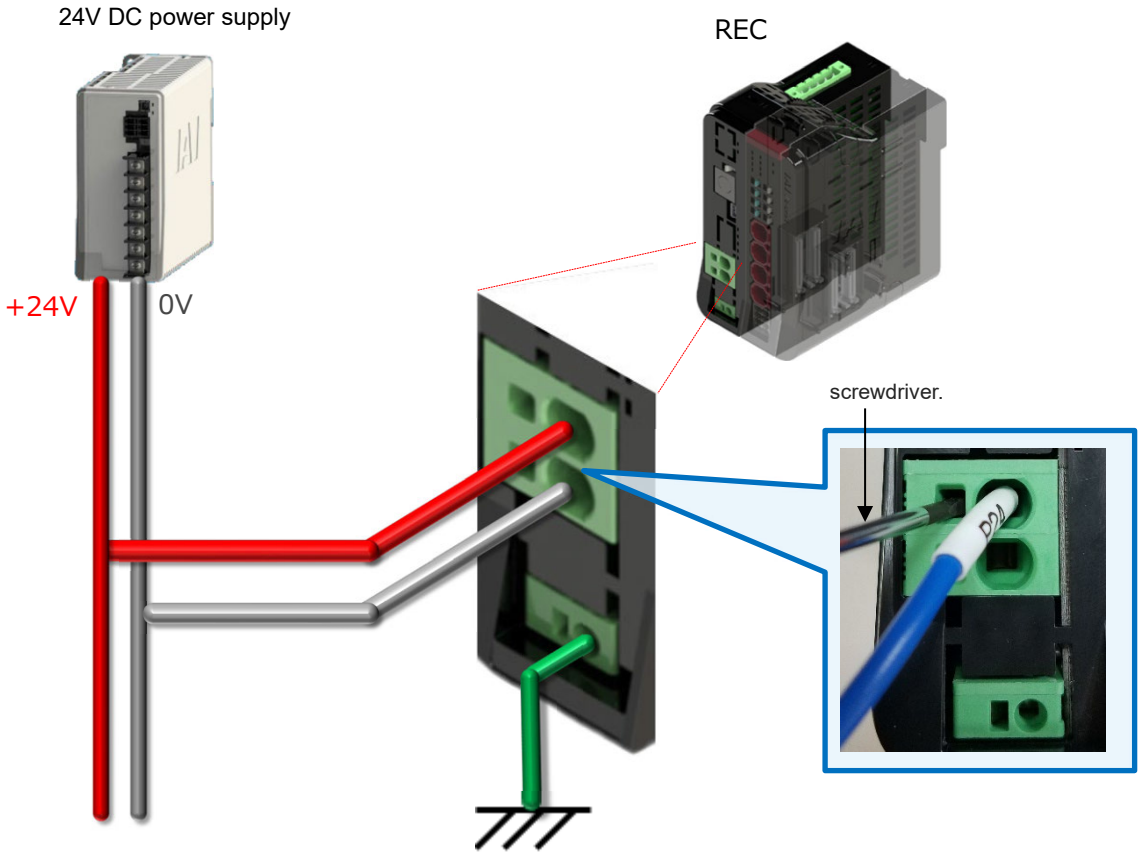


# 4.3 Wiring method

## 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.



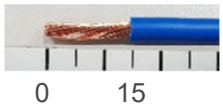

**[Wiring method to power connector]**

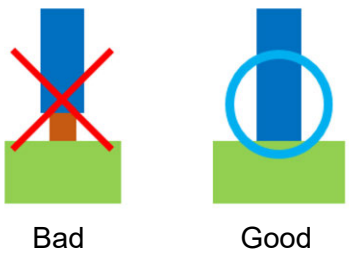
(1) Refer to the table below for the wire diameter for each cable.

(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 "1.5.3. Power supply capacity".



## Caution

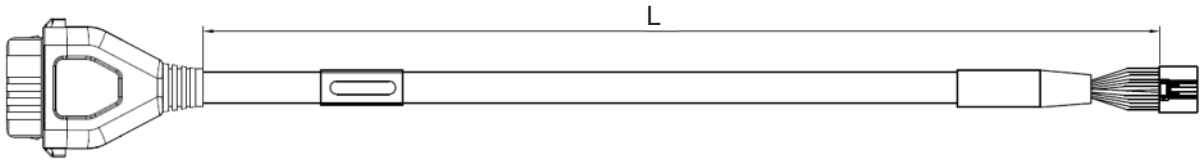
Use wires with diameter large enough for allowable current higher than the current actually used.

Smaller diameter of the cables than applicable could cause abnormal high heat when flowing current. This could melt the coating on cables and set a fire.

## 4.3.2 REC System Connection Cable

**[EC Connection Unit Cable (Common for All Types)]**

Standard Connector Cable Code : CB-REC-PWBIO□□□-RB *□□□ : cable length (L)
Example) 030 = 3 m

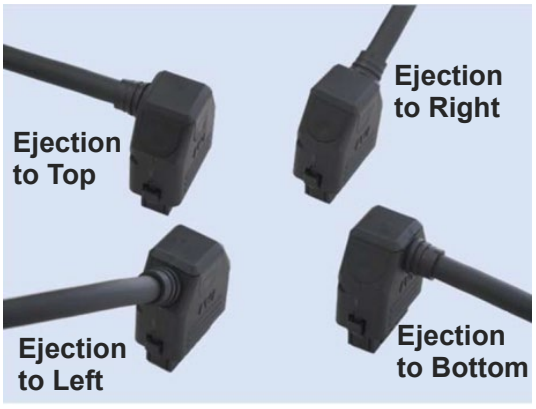



ELECYLINDER side EC Connection Unit side



4-way Connector Cable Code : CB-REC2-PWBIO□□□-RB



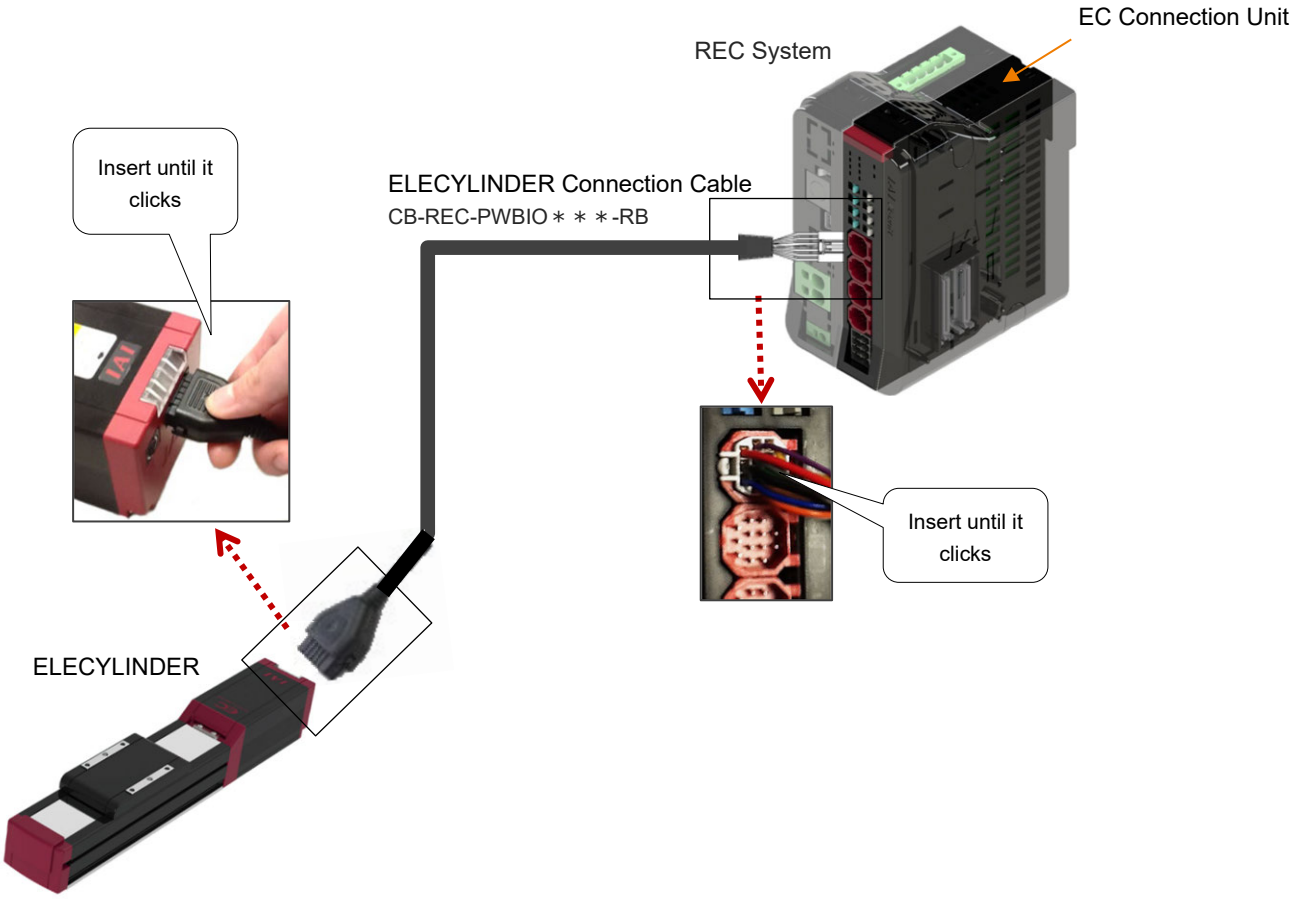



**Free Choice of Eject Direction from 4 Ways**

* 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

### 4.3.3 Wiring between Actuator 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.

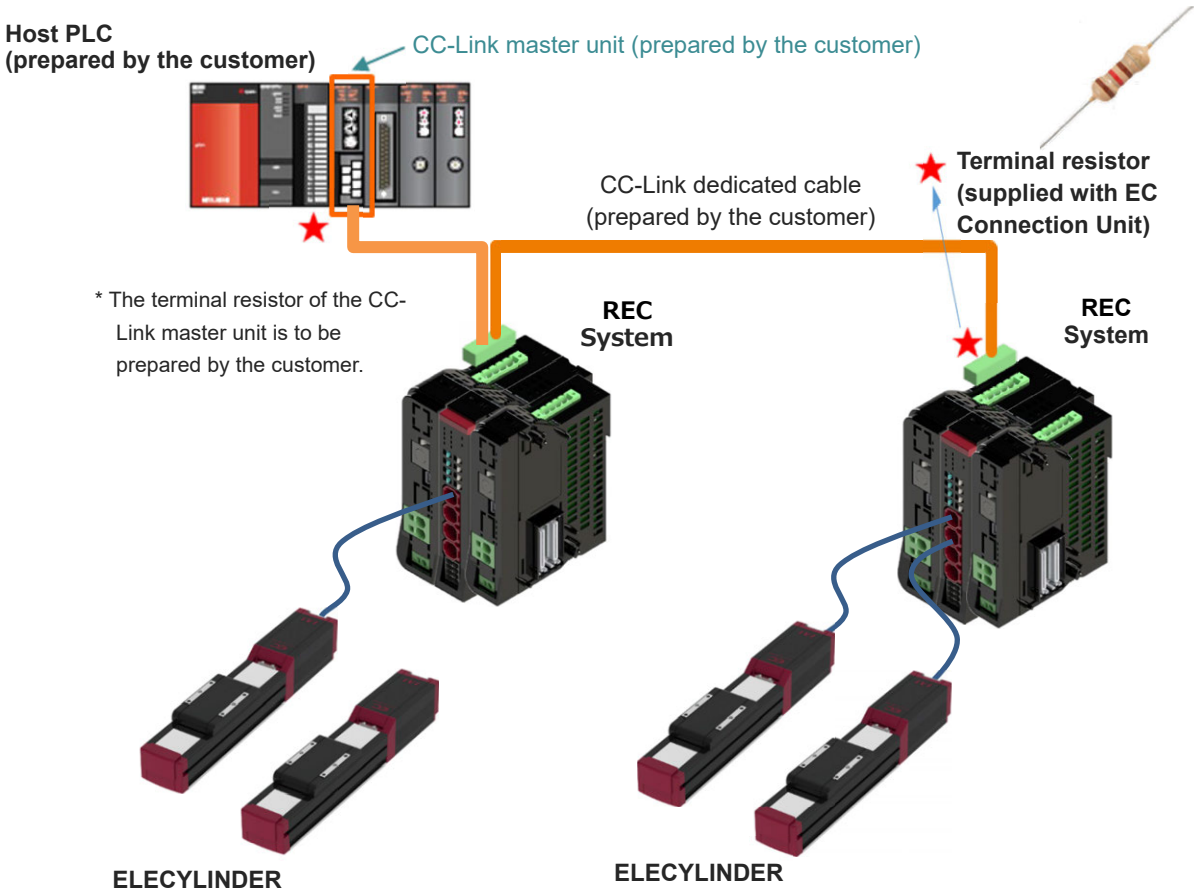


### 4.3.4 Example of Wiring for Field Network

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 systems]**

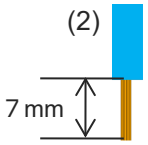
**Connection example**



**[CC-Link dedicated cable and cable connector wiring method]**

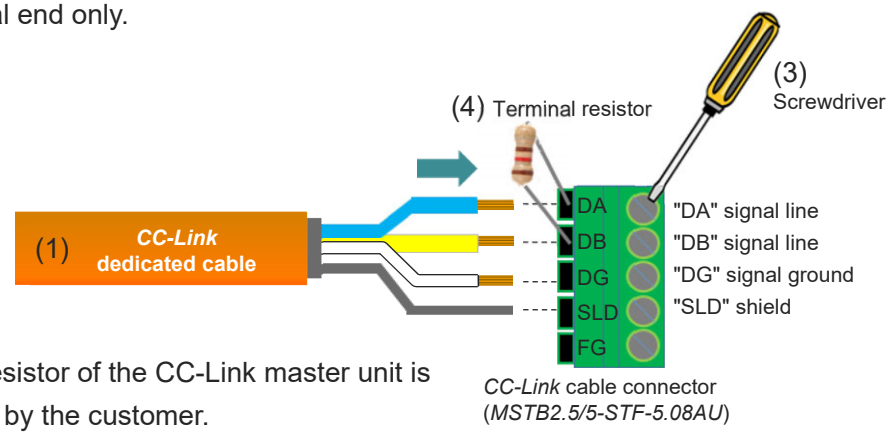
(1) Prepare a CC-Link dedicated cable.

(2) Strip 7mm of insulation from each wire end.




(3) Insert the stripped wiring in the direction of the arrow in the figure below to the back of the connector and tighten with a flathead screwdriver.

(4) (★ in "Connection image" above)
Attach the controller attached terminal resistor (Note 1) between the connectors DA and DB at the network terminal end only.




* The terminal resistor of the CC-Link master unit is to be prepared by the customer.

(5) Other CC-Link dedicated cables are wired in the same manner as in (1) to (4).

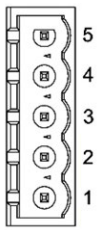
## Point !

- 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: 130 Ω
  Cable FANC-SB (CC-Link dedicated cable): Terminal resistor: 110 Ω

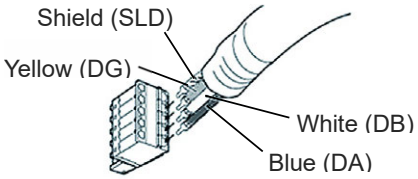
## 4.3.5 Each field network wiring

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

**[CC-Link]**

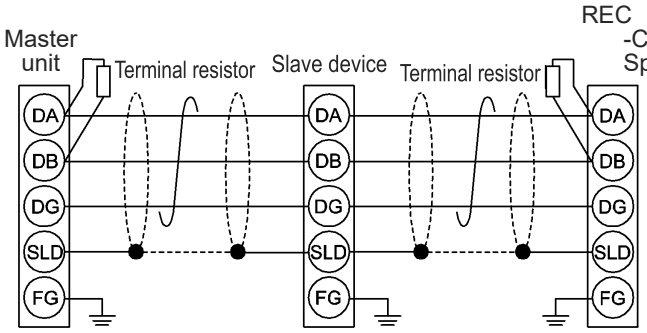



Controller side
Connector top view



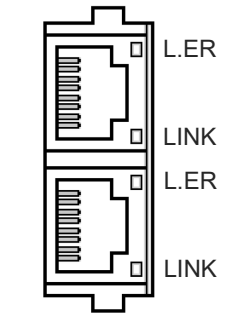

| Connector name | CC-Link cable connector | Remarks |
|---|---|---|
| Cable side | MSTB2.5/5-STF-5.08 AU (Phoenix Contact) | Standard accessories |
| Controller side | MSTB2.5/5-GF-5.08 AU (Phoenix Contact) | |

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




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: 130 Ω 1/2 W
(CC-Link dedicated high performance cable)
· Cable FANC-SB: 110 Ω 1/2 W
(CC-Link dedicated cable)

**[CC-Link IE Field]**

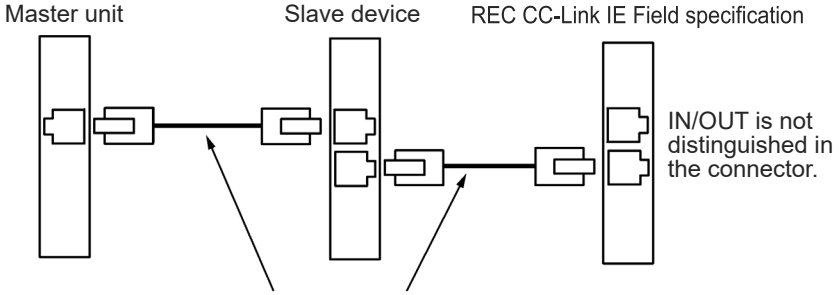



Controller side
Connector top view



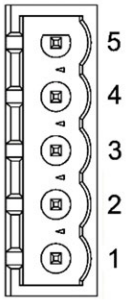
| Connector name | CC-Link IE Field cable connector | Remarks |
|---|---|---|
| Cable side | Ethernet ANSI/TIA/EIA-568-B Category 5e or higher shielded 8P8C modular plug (RJ-45) | To be prepared by the customer |
| Controller side | Ethernet ANSI/TIA/EIA-568-B Category 5e or higher shielded 8P8C modular jack (RJ-45) | |

| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | TD+ | Transmit data + | For the Ethernet cable, use a straight STP cable of Category 5e 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 | |

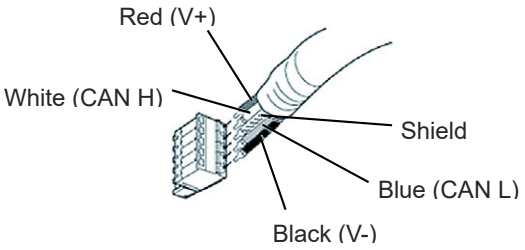



Ethernet straight cable, Category 5e or higher
Aluminum tape and braided double cutoff shielded cable recommended
(Note) Terminal resistor is not required.

**[DeviceNet]**

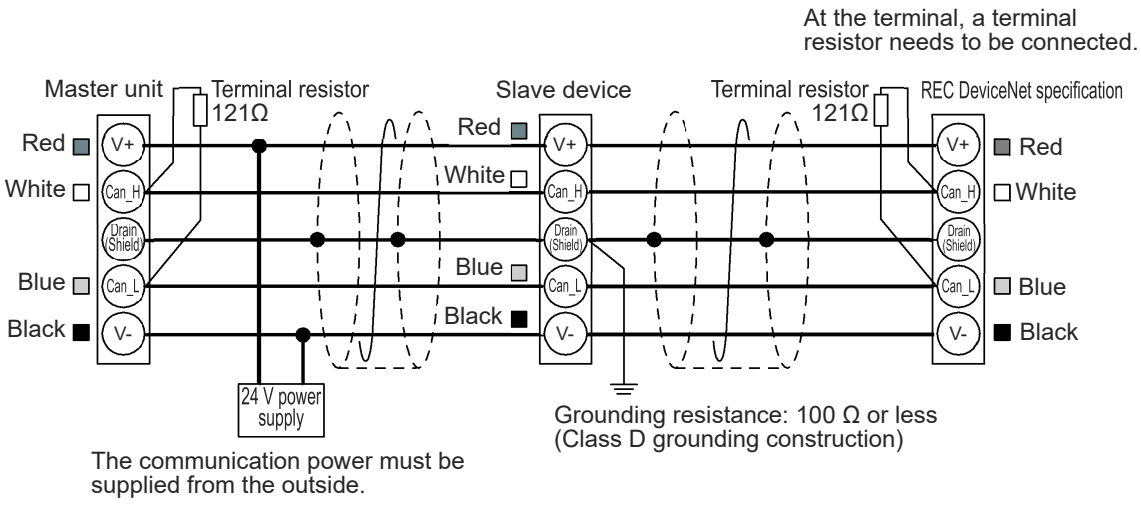



Controller side
Connector top view

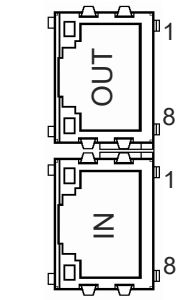



| Connector name | DeviceNet cable connector | Remarks |
|---|---|---|
| Cable side | MSTB2.5/5-STF-5.08 AU M (Phoenix Contact) | Standard accessories |
| Controller side | MSTBA2.5/5-GF-5.08 AU (Phoenix Contact) | |

| 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 | |



**[EtherCAT]**

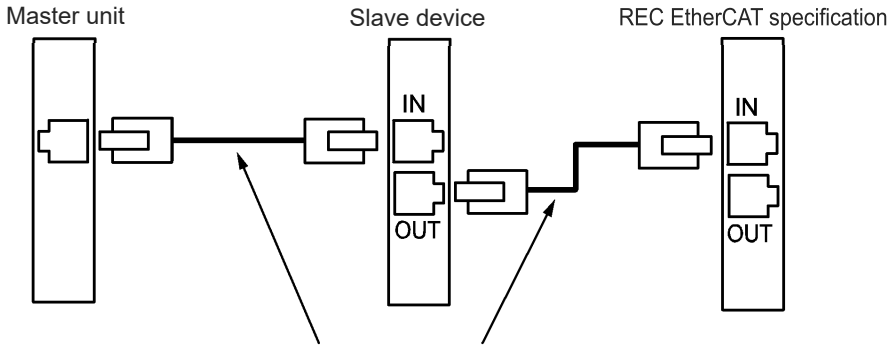



Controller side
Connector top view



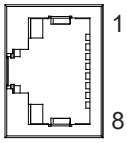
| Connector name | EtherCAT cable connector | Remarks |
|---|---|---|
| Cable side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular plug (RJ45) | To be prepared by the customer |
| Controller side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular jack (RJ45)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

| 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]**

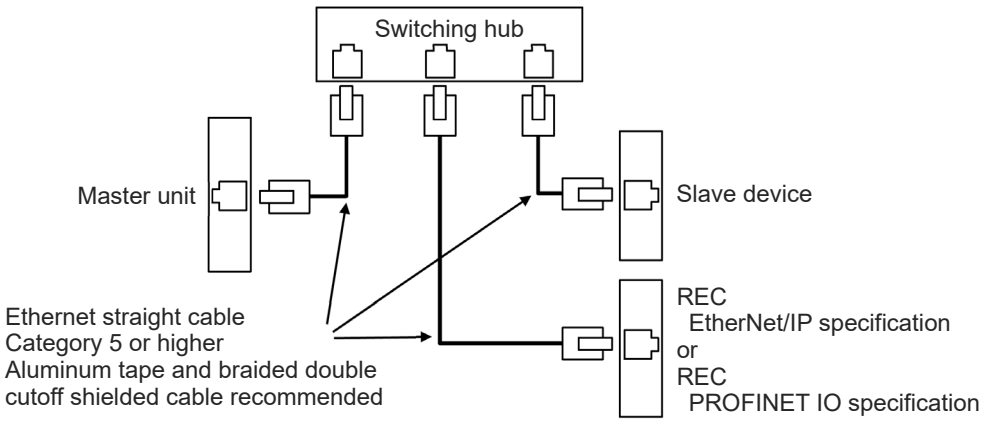



Controller side
Connector top view

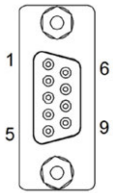


| Connector name | EtherNet/IP, PROFINET IO cable connector | Remarks |
|---|---|---|
| Cable side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular plug (RJ45) | To be prepared by the customer |
| Controller side | Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C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

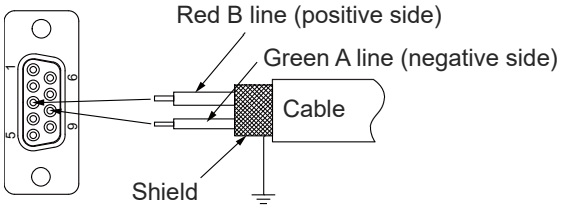
| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | TD+ | Transmit data + | For the Ethernet cable, use a straight STP cable of Category 5 or higher. |
| 2 | TD- | Transmit data - | |
| 3 | RD+ | Receive data + | |
| 4 | – | Not used | |
| 5 | – | Not used | |
|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



**[PROFIBUS-DP]**

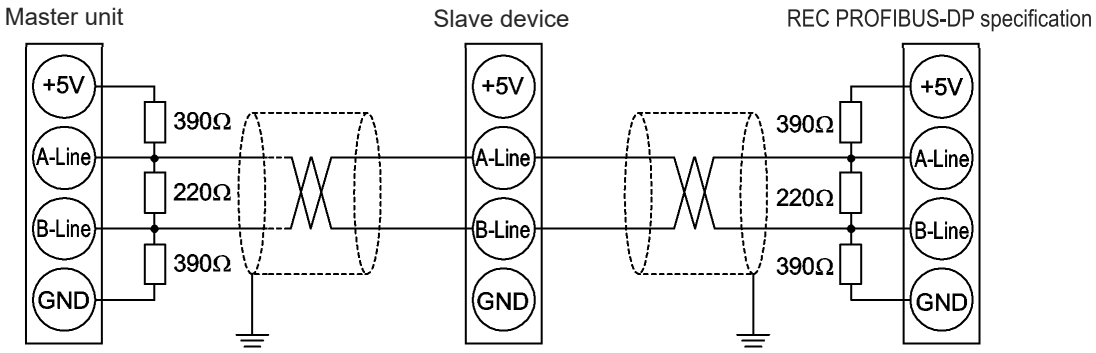



Controller side
Connector top view




| 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) | |

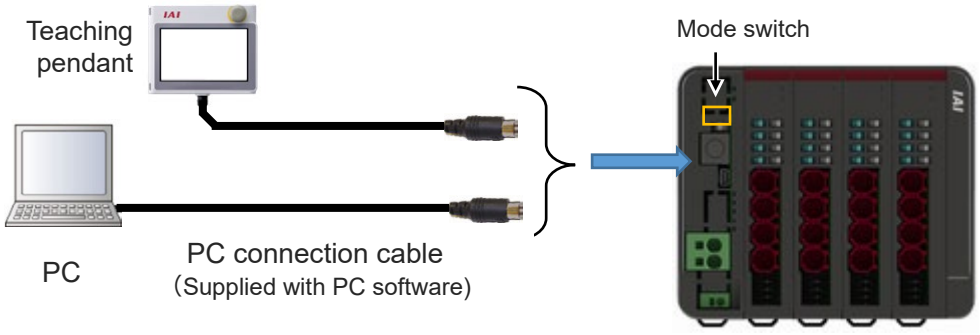
| Pin No. | Signal name | Description | Compatible wire diameter |
|---|---|---|---|
| 1 | NC | Not connected | PROFIBUS-DP dedicated cable (Type A: EN5017) |
| 2 | NC | Not connected | |
| 3 | B-Line | Signal line B (RS-485) | |
| 4 | RTS | Transmission request | |
| 5 | GND | Signal GND (insulation) | |
| 6 | +5 V | +5 V output (isolated) | |
| 7 | NC | Not connected | |
| 8 | A-Line | Signal line A (RS-485) | |
| 9 | NC | Not connected | |




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

### 4.3.6 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



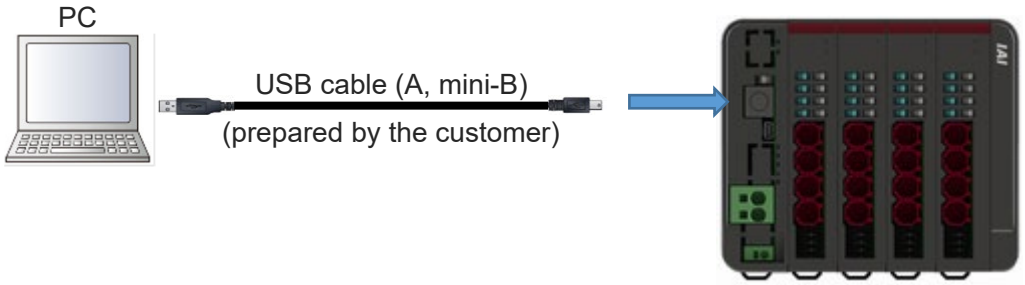

Refer to "2.4.4 SIO Connector" for the pin assignment.

**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.

### 4.3.7 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 "2.4.5 USB connector" for the pin assignment.

REC

# Chapter 5

# Operation


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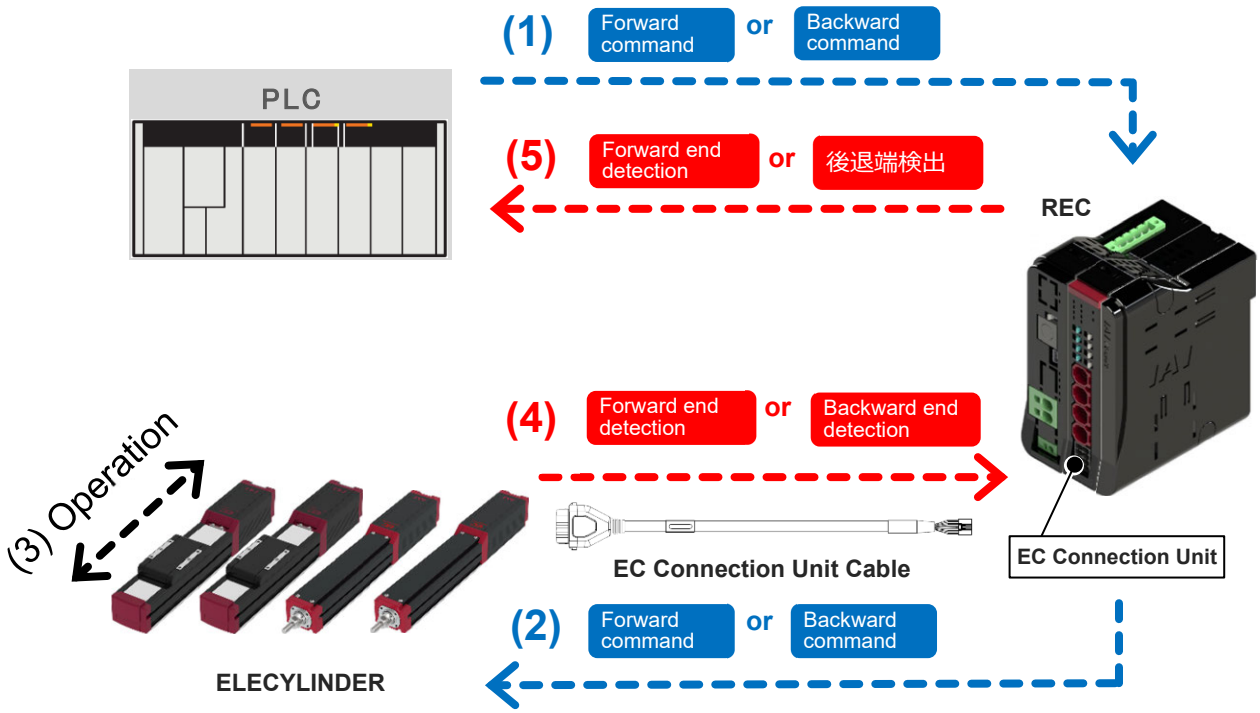
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# 5.1 Operation Function

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

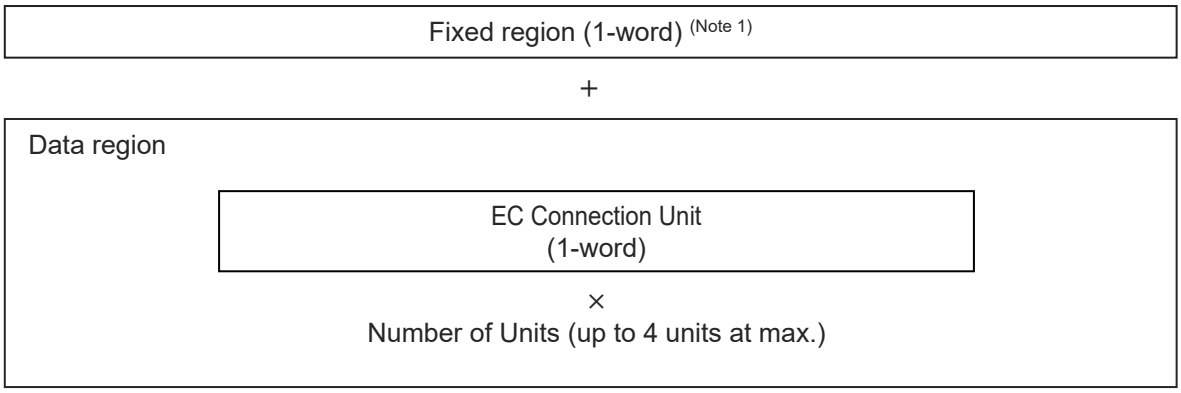
(1) Input a movement signal (forward or backward) from PLC to REC (EC connection unit).
(2) Input the movement signal from REC (EC connection unit) to each unit of ELECYLINDER.
(3) ELECYLINDER units start moving.
(4) A position detection signal gets output from ELECYLINDER. (Forward end or backward end)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

# 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 one 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 region configuration

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

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

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

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

## 5.2.1 Overall address configuration example

In here, shows the overall address construction 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 8-word region is assigned to the bit register (RX/RY), while the region for each axis is assigned to the word register (RWr/RWw).



PLC output ⇒ REC

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

REC ⇒ PLC input

| Input register | High byte Low byte |
|---|---|
| RX00F ~ 000 | Gateway status signal |
| RX01F ~ 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) |

*1 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.

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

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

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

PLC output ⇒ REC

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

REC ⇒ PLC input

| Input register | High byte Low byte |
|---|---|
| RX00F ~ 000 | Gateway status signal |
| RX01F ~ 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.

*2 The EC connection unit occupies domains and axis numbers for four axes (one 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 (one 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 (one 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 (one 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 (one 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 construction 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 address relative 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-word 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

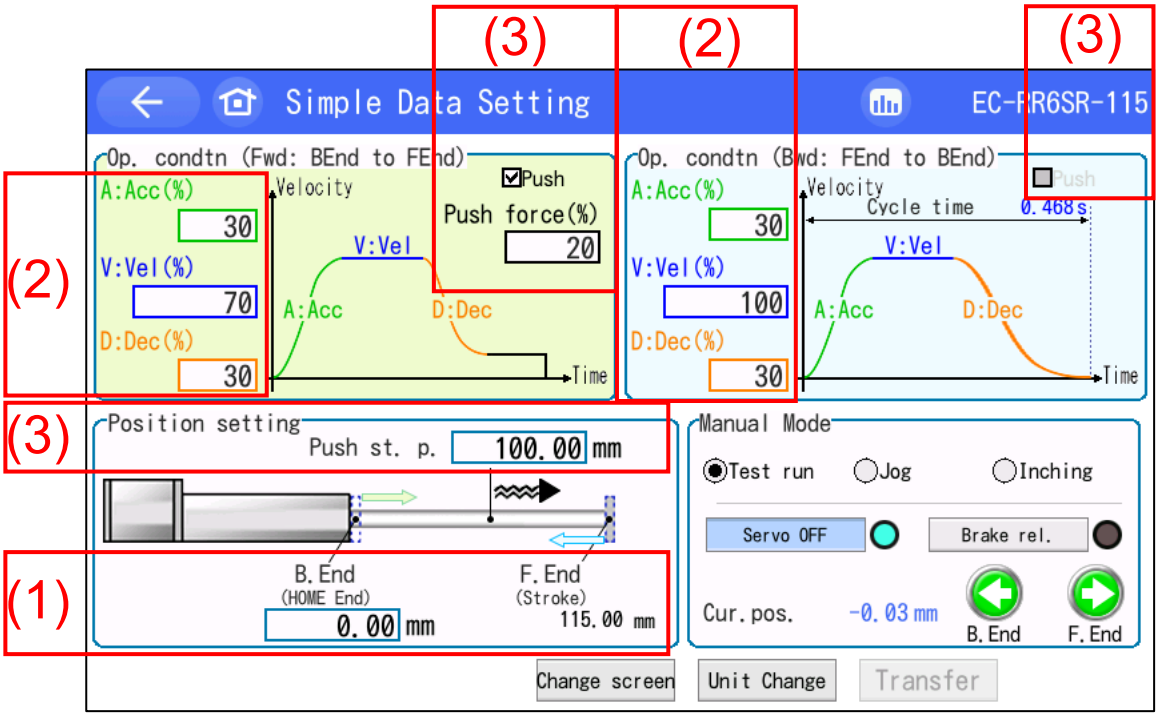
The stop position and operating condition settings are established in ELECYLINDER at the delivery.
The stop position and the operation conditions can be adjusted with a teaching tool in the simple data setting window.

## Reference

| | | |
|---|---|---|
| PC software operating method | ▶ | PC software (RCM-101-*-*) manual (ME0155) |
| Teaching pendant operating method | | Touch Panel Teaching Pendant 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 Window]**




## 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 Operation” 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 [Switch Unit] 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 “Pressing”, 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 an instruction manual of each ELECYLINDER or a catalog for detail.
  Touch [Switch Unit] 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 “Pressing”, it should be the deceleration from the movement start position (forward end or backward end) to the pressing start position.
  Touch [Switch Unit] 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) Pressing / Pressing Start Point / Pressing Force

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

- Pressing 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

- Pressing 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 [Switch Unit] 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 an instruction manual of each ELECYLINDER for detail.



## Caution

- The pressing force displayed in N unit is a reference.
  Refer to an 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 pressing 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 (one 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 (3th 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 (3th 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-word module addresses.

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

| Signal type | | Bit | Signal 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 (3th 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 | Signal name | Content | Details |
|---|---|---|---|---|---|
| PLC input | 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 (3th 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] and [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 clear input (RES) PLC output signal**

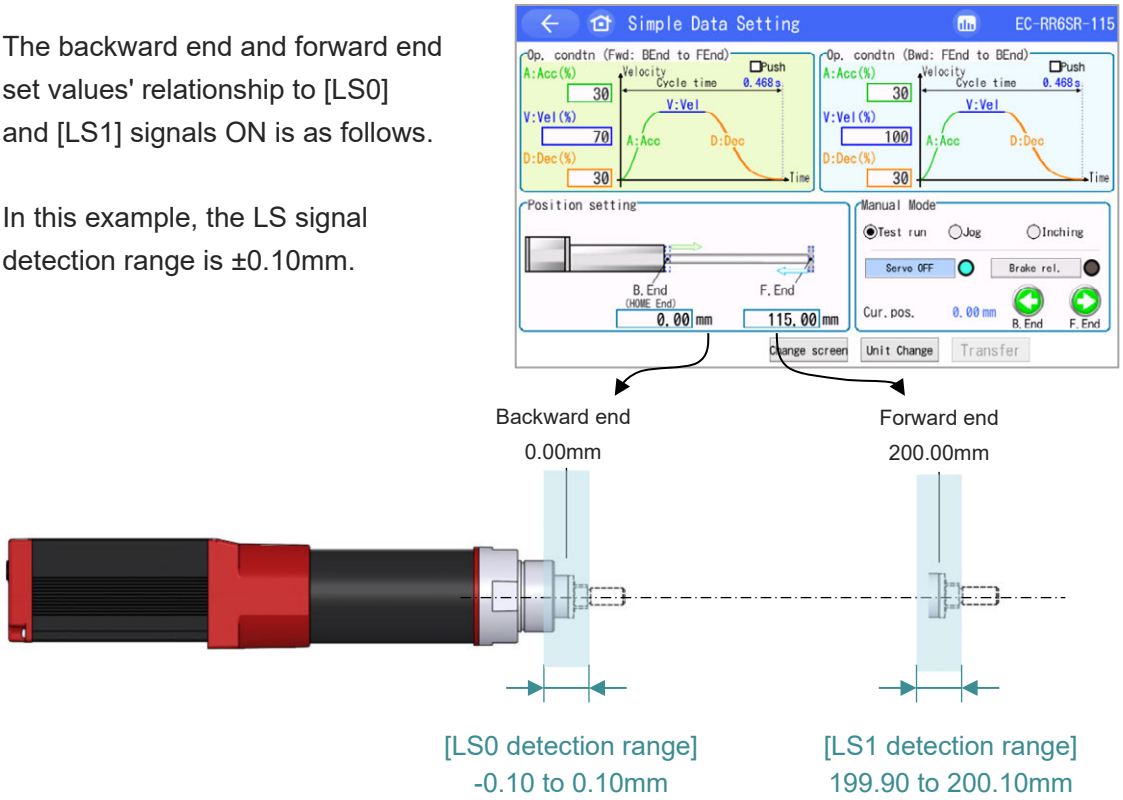
- When the [RES] signal is turned ON, the currently triggered alarm will be cleared.
- Alarm clear may not be possible depending on the alarm itself.
  Refer to "7.3.2 Troubleshooting for alarm groups" for detail.

**[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 current ELECYLINDER 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.




To adjust the LS signal detection range, open the [Edit parameters window].
Parameter No.2
[Auto switch LS signal detection range adjustment] 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 master 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 (one 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 rearward end movements with the data set in the position data. It should perform the home-return operation before an operation to both forward and rearward 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 pendant 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 window for the Digital Speed Controller if the mode switch on the EC gateway unit is set AUTO.
  2) the trial run window on the Digital Speed Controller should close if the mode switch on the EC gateway unit is set MANU → AUTO while the trial run window is kept open.
- When a window 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 window 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 window 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 window 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.)

- 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.

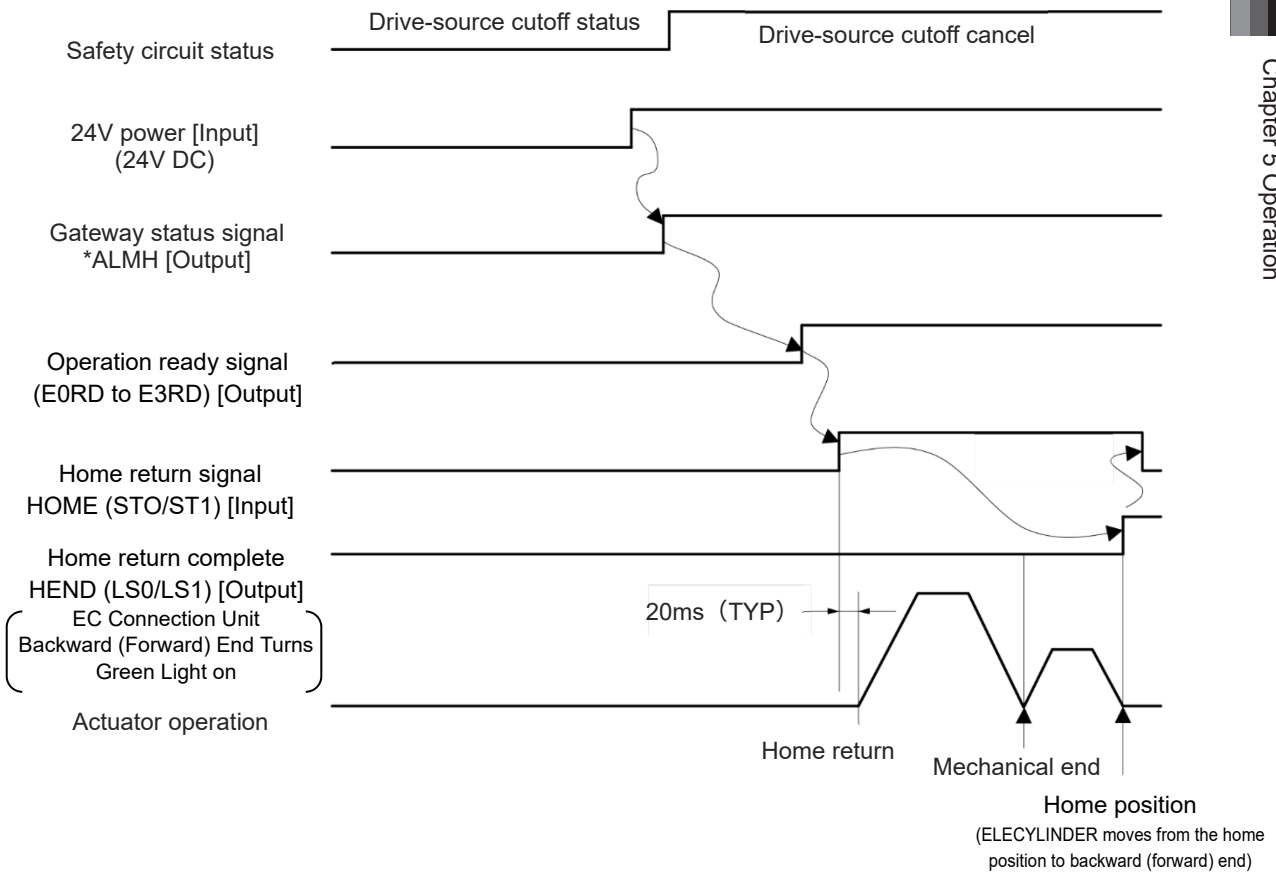
### 5.3.3 Timing of basic operation

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 standby complete signals "E0RD" to "E3RD" are turned on, and then input either forward or backward signal "ST0/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 Address Configuration / Gateway control / status signal (page 5-6)".

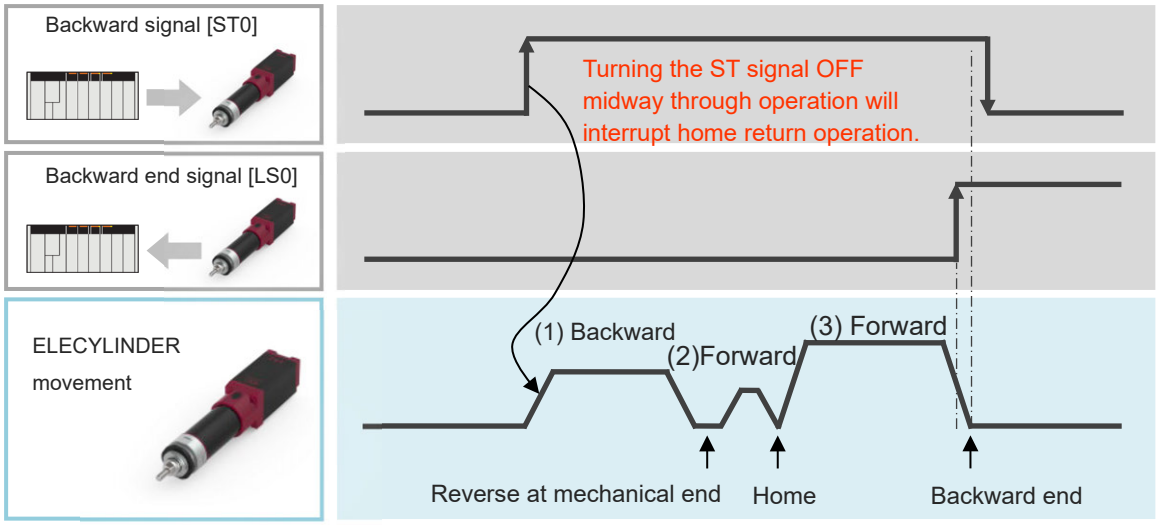
## 5.3.4 Basic Operations of ELECYLINDER

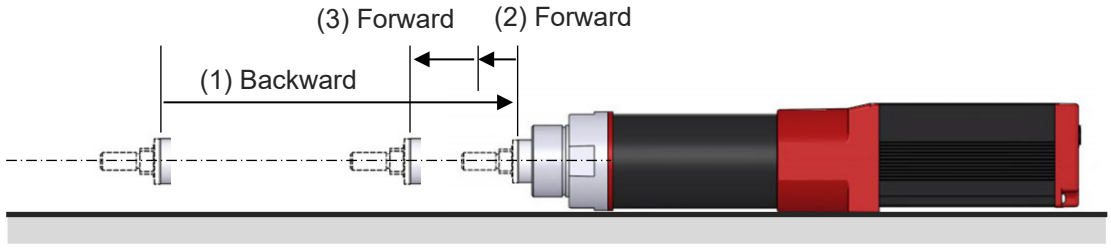
**[Home return operation/positioning operation]**

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 encoder 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

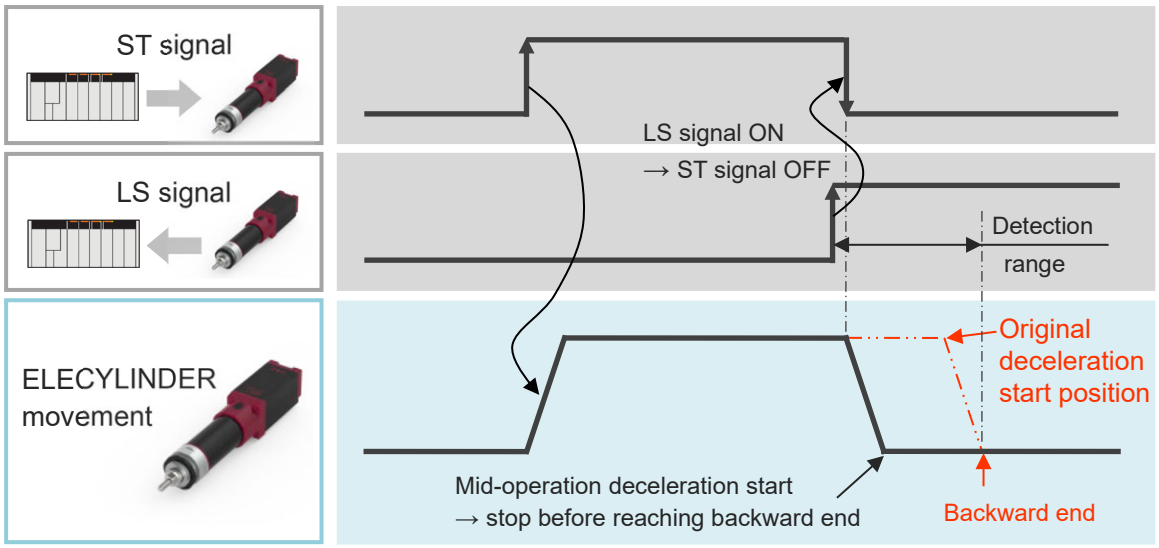
| Category | | Signal abbreviation | Timing chart | Remarks |
|---|---|---|---|---|
| 1 | **Power** | Power ON | EC Connection Unit<br>SYS LED : On | 24V DC power supply is turned ON. |
| 2 | Output | *ALM<br>E*RD | | *ALM:Turns ON if no alarm has been triggered.<br>E*RD: It turns on when operation ready (servo on) |
| 3 | Input | ST0 | Δt1 | When the [ST0] signal is turned ON, home return operation begins. |
| 4 | Output | LS0 | Δt2<br>EC Connection Unit<br>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<br>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.
Also, Δt2 varies depending on the communication time among PLC ⇔ EC connection unit ⇔ ELECYLINDER, size of payload and acceleration/deceleration.

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.

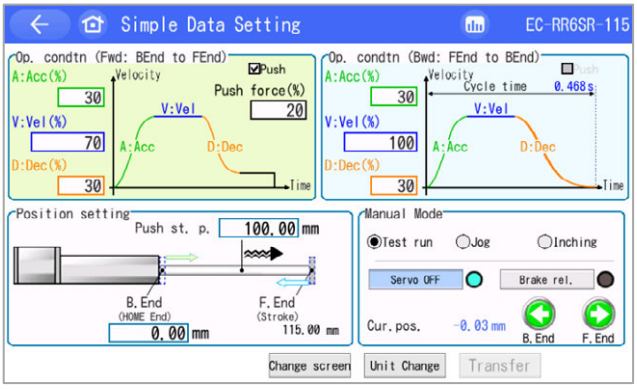



## Caution

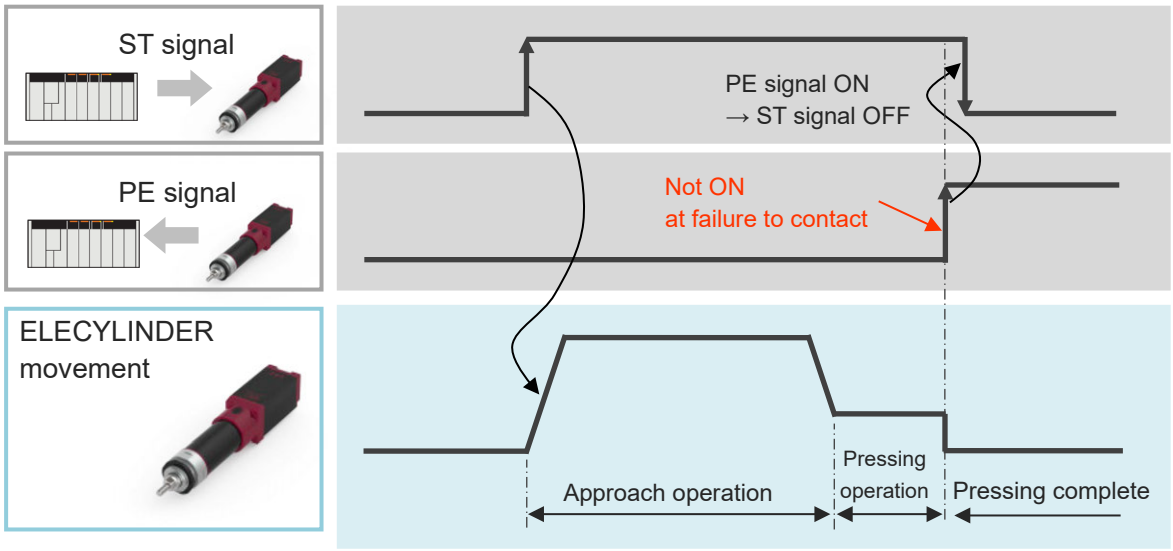
- Turning the ST signal ON again after the gradual stop causes the ELECYLINDER to begin operation again.
- Within the detection range, the LS signal turns ON even if the ELECYLINDER is mid-operation.
- Make sure that [ST0] and [ST1] do not turn ON simultaneously.
  This may result in unpredictable operation.

**[Pressing operation]**

Establish the setting for the operating conditions and position setting in the simple data setting window before performing the pressing operation.



The basic time chart is as follows.




## Caution

- The pressing speed should differ depending on the models.
  Refer to an 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".

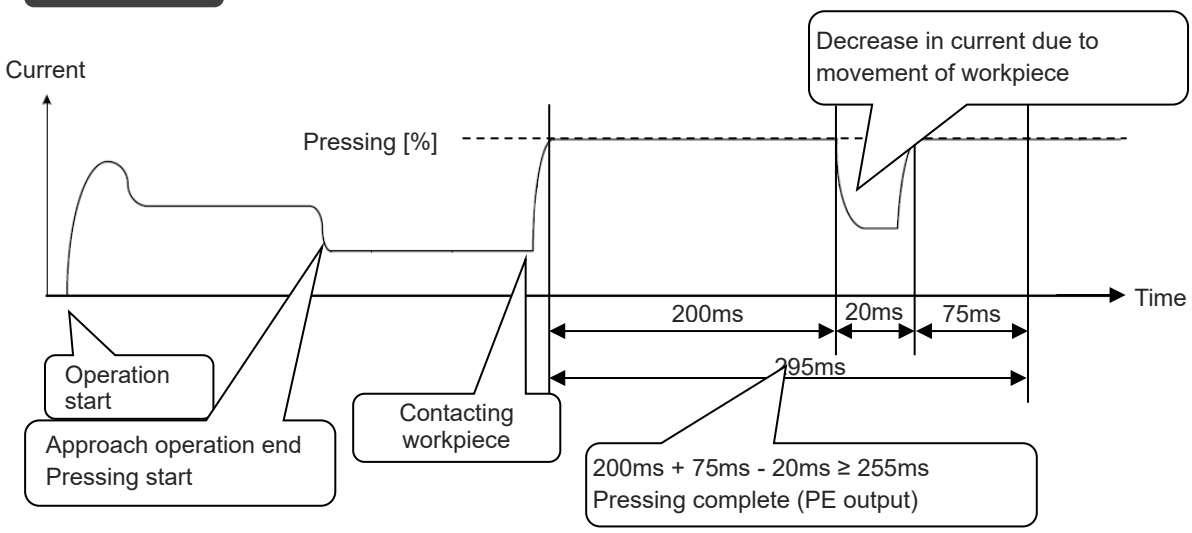
The torque (current limit value) configured for [Pressing force] in the Simple Data Setting screen judges completion of pressing operation.

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 master device sequence or detection method based on the content below.

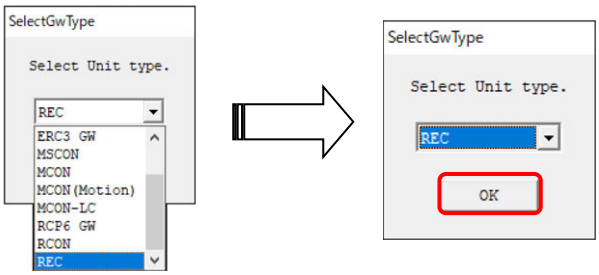
- If no contact is made, the PE signal will not turn ON.
  A timer is required to determine if no contact has been made.
- After a non-contact operation, the unit will stop in the pressing operation status.
- If the workpiece shifts once pressing complete is determined and the PE signal is ON, the ELECYLINDER 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.

# 5.4 Gateway Parameter Configuration Tool

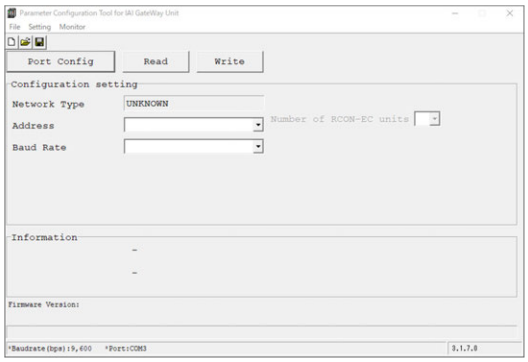
Each feature of REC System should be set up using the gateway parameter setting tool. The screen design differs slightly depending on the OS of the PC.
* Refer to "Quick Start Guide" for the settings of each network.

## 5.4.1 Tool startup

1 After turning on the REC system, starting the gateway parameter configuration 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 "Import" on this screen, parameters will be imported from the detected gateway unit.
Press the "Transfer" button to transfer the parameters. However, note that they cannot be transferred if the address or communication speed is not selected.




Main screen (initial state)



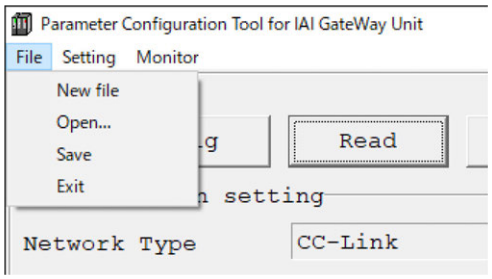

Main screen (After Parameters Read in)

## Caution

- When the number of the EC connection units in REC System and the number of units set in this tool and transferred are not consistent, RC/EC PC software cannot be connected.
- Set and transfer the gateway parameters suitably according to the actual unit configuration and the number of connected units.

## 5.4.2 Menu descriptions

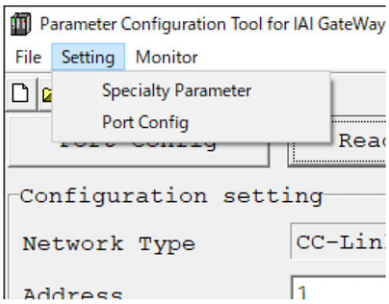
**[File menu]**




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.

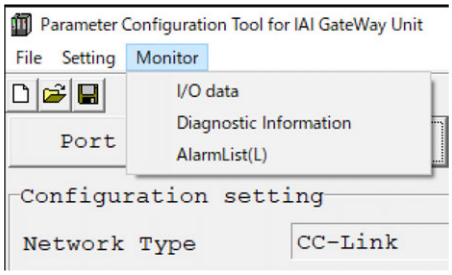
**[Settings menu]**




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 5.4.3 Explanation of Features in Special Parameter Setting]
- Port Config : Sets the communication speed between the tool and PC and the COM port number.

**[Monitor menu]**

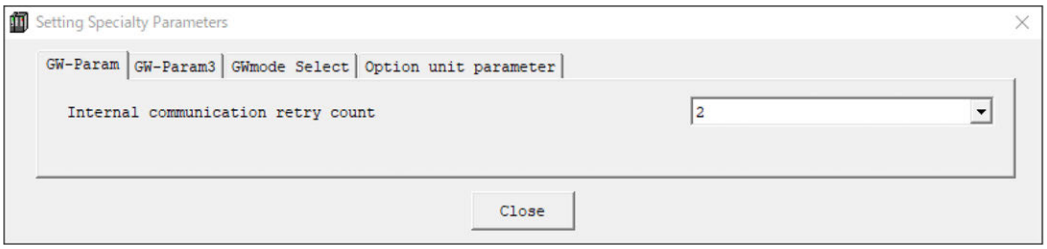



Click the [Monitor] menu in the upper left of the main screen to display the monitor menu items.
(Note) [Monitor] cannot be selected before reading in the parameters.

- I/O data : Displays the communication contents between the host PLC and gateway unit.
  [See "I/O Data (register monitor)" on page 5-30]
- Diagnostic Information : Option unit information should be displayed.
  [See "Diagnostic information" on page 5-31]
- AlarmList (L) : Imports and displays the alarm list held in the gateway unit.
  [See "Alarm list" on page 5-31]

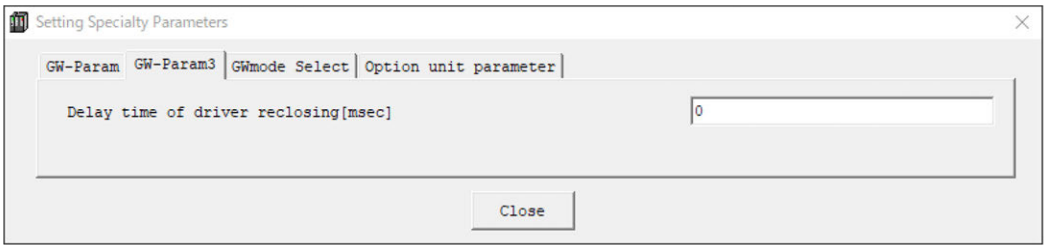
### 5.4.3 Explanation of Features in Special Parameter Setting

**[GW parameters]**



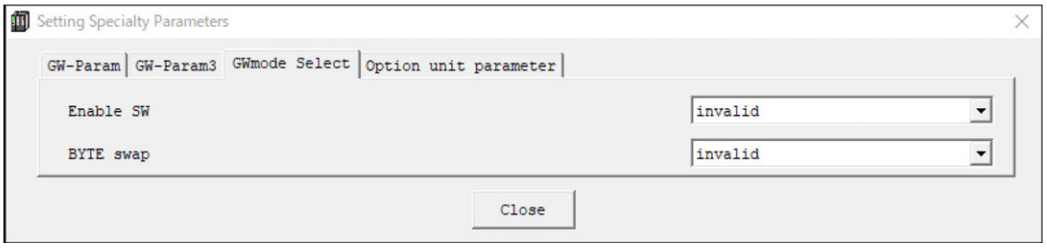

• Internal communication retry count : In AUTO, this is used to set the number of communication retries with the connected axis.

**[GW parameters 3]**




• 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.

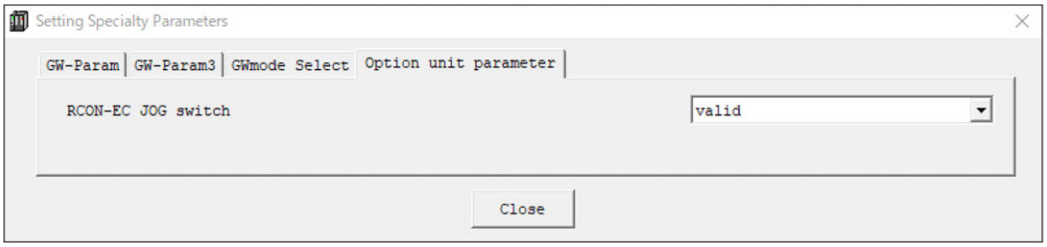
**[GW mode selection]**




• Enable SW : Selects whether to enable/disable the enable switch of the TP. While this parameter is activated, the enable signal gets valid.

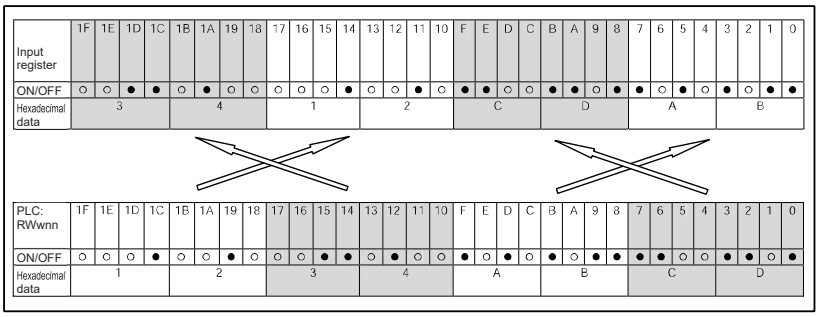
• Byte swap : Set the byte swap. [See "Byte swap" on page 5-29]

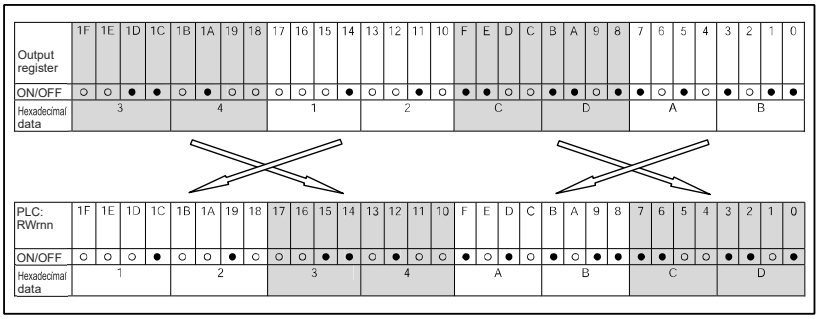
**[Option Unit Parameter]**




• RCON-EC JOG Switch: : Select whether to activate/inactivate the jog switch on the EC connection unit.
The setting to activate/inactivate 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.

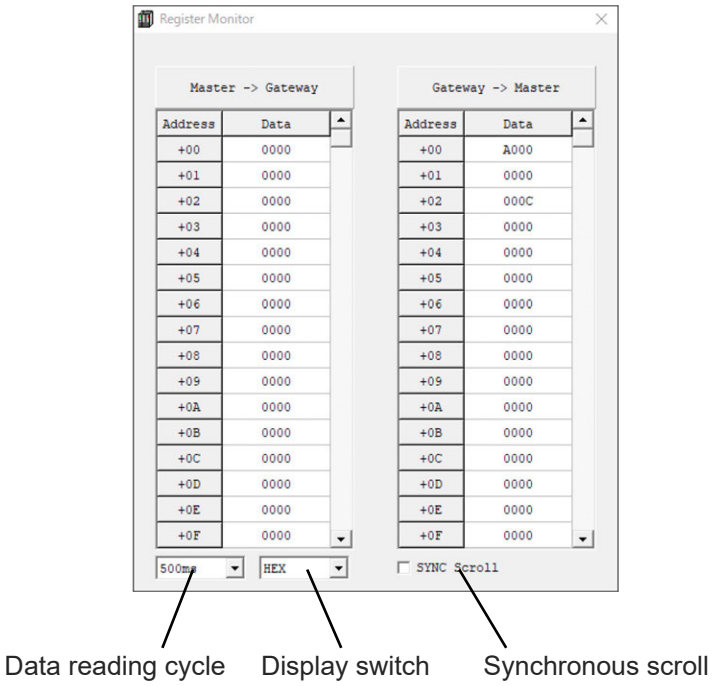



●: ON
○: OFF

## 5.4.4 Explanations of Monitoring Menu Features

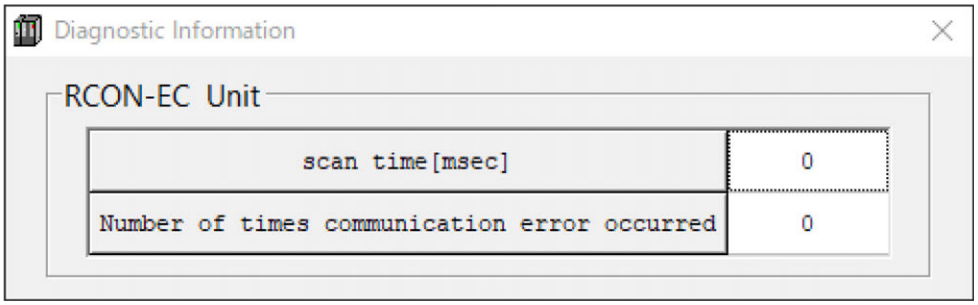
**[I/O data (register monitor)]**




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

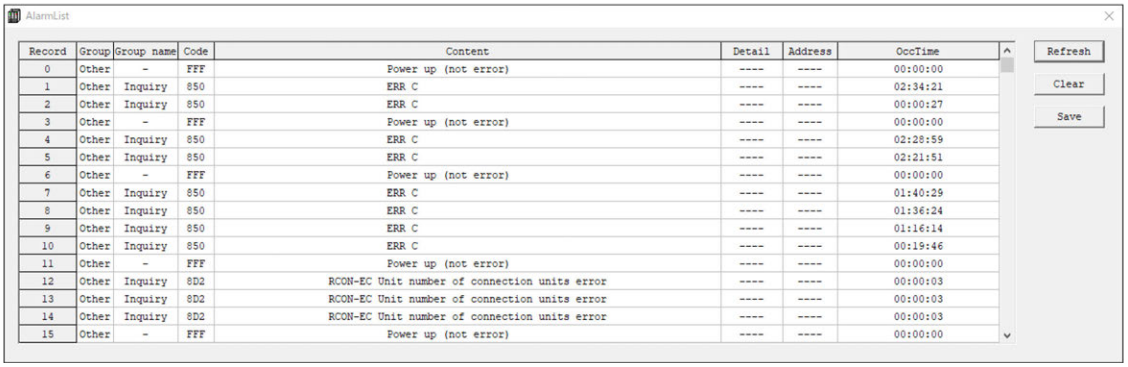
- Data read cycle : Select the update cycle of the display data between 100 and 500 ms
- Display switch : Select either binary or hexadecimal display
- SYNC Scroll : When checked, the transmitted/received data will be scrolled at the same time

**[Diagnostic information]**




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

**[Alarm list]**




| Record | Group | Group name | Code | Content | Detail | Address | OccTime |
|---|---|---|---|---|---|---|---|
| 0 | Other | - | FFF | Power up (not error) | ---- | ---- | 00:00:00 |
| 1 | Other | Inquiry | 850 | ERR C | ---- | ---- | 02:34:21 |
| 2 | Other | Inquiry | 850 | ERR C | ---- | ---- | 00:00:27 |
| 3 | Other | - | FFF | Power up (not error) | ---- | ---- | 00:00:00 |
| 4 | Other | Inquiry | 850 | ERR C | ---- | ---- | 02:28:59 |
| 5 | Other | Inquiry | 850 | ERR C | ---- | ---- | 02:21:51 |
| 6 | Other | - | FFF | Power up (not error) | ---- | ---- | 00:00:00 |
| 7 | Other | Inquiry | 850 | ERR C | ---- | ---- | 01:40:29 |
| 8 | Other | Inquiry | 850 | ERR C | ---- | ---- | 01:36:24 |
| 9 | Other | Inquiry | 850 | ERR C | ---- | ---- | 01:16:14 |
| 10 | Other | Inquiry | 850 | ERR C | ---- | ---- | 00:19:46 |
| 11 | Other | - | FFF | Power up (not error) | ---- | ---- | 00:00:00 |
| 12 | Other | Inquiry | 8D2 | RCON-EC Unit number of connection units error | ---- | ---- | 00:00:03 |
| 13 | Other | Inquiry | 8D2 | RCON-EC Unit number of connection units error | ---- | ---- | 00:00:03 |
| 14 | Other | Inquiry | 8D2 | RCON-EC Unit number of connection units error | ---- | ---- | 00:00:03 |
| 15 | Other | - | FFF | Power up (not error) | ---- | ---- | 00:00:00 |

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".

R E C

Chapter 6

# Parameter

6.1 Parameter list ····· 6-1

6.2 Parameter Details ····· 6-2

# 6.1 Parameter list

| No. | Name | Unit | Input range | Default setting at shipping | Reference Page |
|---|---|---|---|---|---|
| 1 | Operation range adjustment | mm | 0 to 9,999.69 | Maximum stroke | 6-2 |
| 2 | Auto switch "LS" signal detection range adjustment | mm | Actuator Depended to 9,999.99 | 0.10 | 6-3 |
| 3 | Change home return direction | - | Reverse, forward | According to ELECYLINDER specifications | 6-4 |
| 4 | Home position adjustment | mm | 0 to 9,999.99 | According to ELECYLINDER specifications | 6-5 |
| 5 | Smooth accel/decel setting | - | Disabled, enabled | Disabled | 6-6 |
| 6 | Current control setting at stop | - | Disabled, Powerful stop Enabled, Energy-saving stop | Disabled | 6-7 |
| 7 | Wireless function setting | - | Disabled, enabled | Enabled | 6-8 |
| 8 | Power-saving setting | - | Disabled, enabled | Disabled | 6-8 |



## Caution

- No. 1/3/4 default factory settings 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).

# 6.2 Parameter Details

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

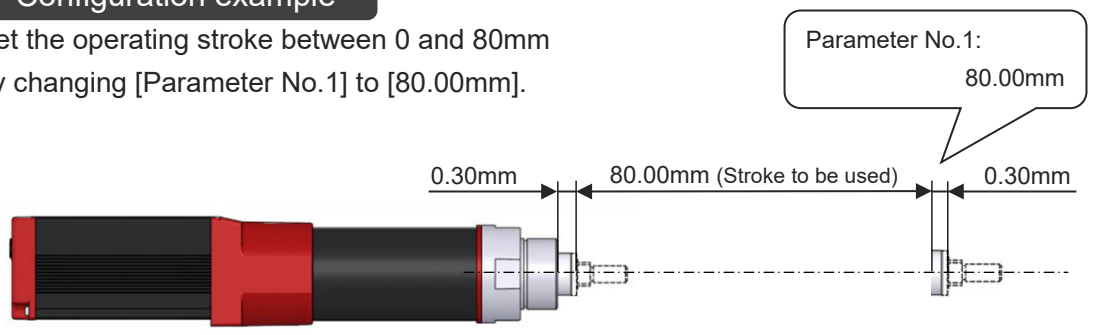
| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| 1 | Operation range adjustment | mm | 0 to 9,999.69 | Max. Stroke |

- 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.



## Configuration 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 initial value setting |
|---|---|---|---|---|
| 2 | Auto switch "LS" signal detection range adjustment | mm | Actuator Depended to 9,999.99 | 0.10 |

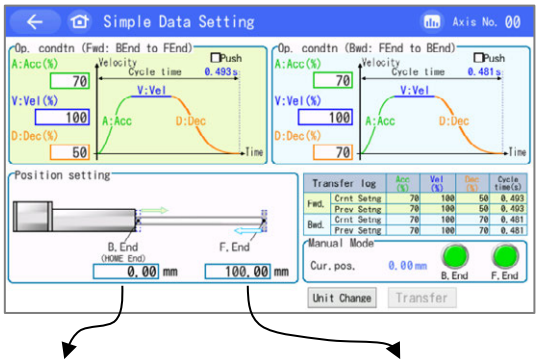
- Sets the backward complete/forward complete ON trigger range relative to the backward end/forward end.
- When the ELECYLINDER enters the detection range, the backward complete or forward complete signal turns ON.
- The minimum setting unit is 0.01mm.

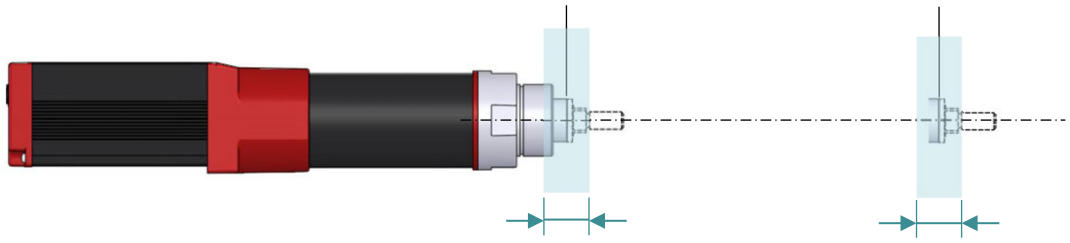


## Configuration example

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



Backward end
0.00mm

Forward end
100.00mm

[LS0 detection range]
-0.10 to 0.10mm

[LS1 detection range]
99.90 to 100.10mm

## Caution

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

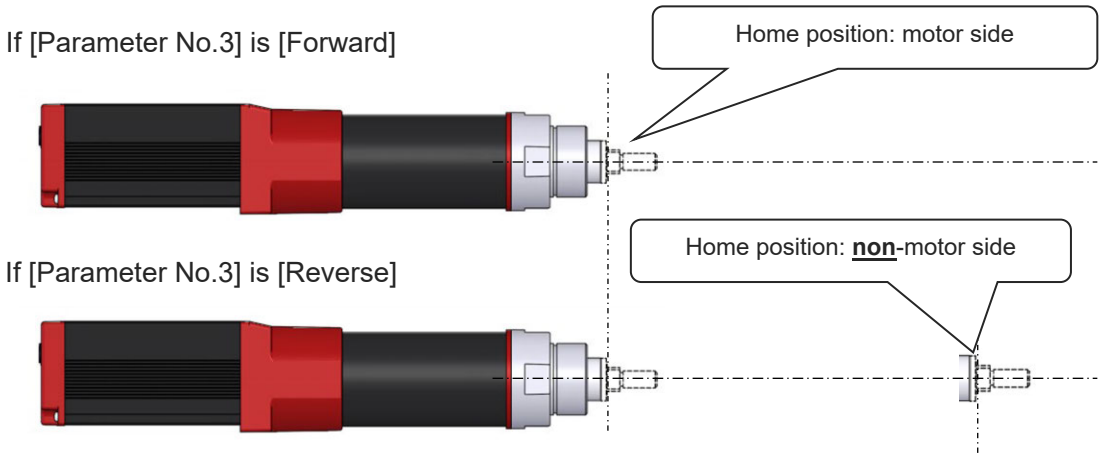
**[Change home return direction (Parameter No. 3)]**

| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| 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.



Configuration 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)]**

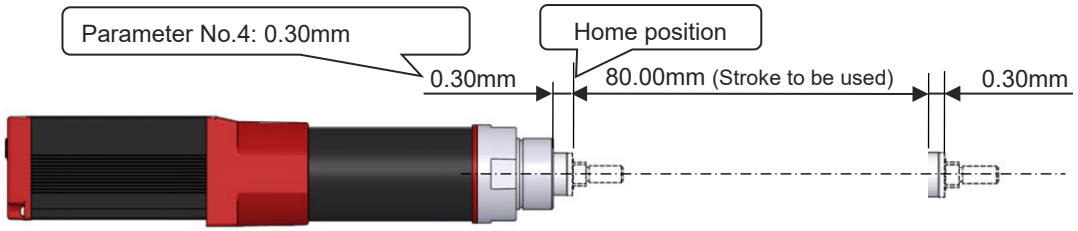
| No. | Name | Unit | Input range | Default initial value setting |
|---|---|---|---|---|
| 4 | Home position adjustment | mm | 0 to 9,999.99 | According to ELECYLINDER specifications |

- 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.



## Configuration example

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



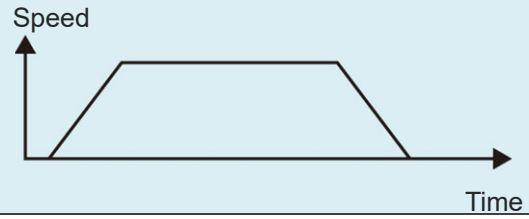
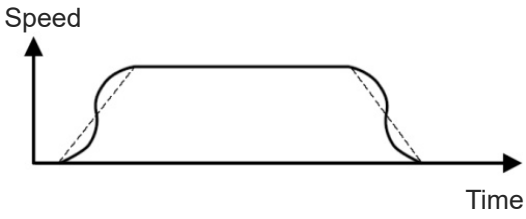

## Caution

- If adjusting Parameter No.4, simultaneously adjust Parameter No.1.
  Operation range adjustment with parameter No.1 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 initial value setting |
|---|---|---|---|---|
| 5 | Smooth accel/decel setting | – | Disabled, enabled | Disabled |

- The movement waveform for ELECYLINDER operation can be selected.
- When [Enabled], accel/decel operation becomes smoother (less abrupt). This softens the shocks of acceleration/deceleration without delaying the operation time.
- If [Disabled], the above functionality is not enabled.

| Setting | Acceleration/deceleration pattern | Operation waveform image |
|---|---|---|
| Disabled | Trapezoid |   |
| Enabled | 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 initial value setting |
|---|---|---|---|---|
| 6 | Current control setting at stop | – | Disabled : Powerful stop<br>Enabled : Energy-saving stop | Disabled |

- The control method for ELECYLINDER stop can be selected.
- If [Disabled], 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 [Enabled], 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 [Enabled] may fix the issue. Moreover, setting to [Enabled] can also fix issues in which the command position cannot quite be attained.





## Caution

- If [Disabled], even if a pulse deviation within ±2 from the target position remains, movement towards the target position will not continue.
- If [Enabled], 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 initial value setting |
|---|---|---|---|---|
| 7 | Wireless function setting | – | Disabled, Enabled | Enabled |

- Either Enabled or Disabled can be selected for the ELECYLINDER wireless function.
- When [Enabled] is selected, wireless communication between the ELECYLINDER and the Touch Panel Teaching Pendant is possible.
- When [Disabled] 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 initial value setting |
|---|---|---|---|---|
| 8 | Power-saving setting | – | Disabled, Enabled | Disabled |

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

REC

Chapter 7

# Troubleshooting


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# 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.
(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 pendant 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 EC Gateway Unit Alarm Causes and Countermeasures

## 7.2.1 Causes and countermeasures of individual alarms

The alarm codes will be read out in gateway status signal 0 ALMC1 ~ 128 (b0 ~ b7).
For details, refer to "5.2 Address Configuration (page 5.2)".
(Note) Alarm codes displayed on the gateway parameter configuration 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 (850) | Field network communication error (ERR-C) | Cause: Field network link error. If a latch is set with the gateway parameter configuration 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, communication speed, etc.), wiring, etc. |
| 61 (861) | Dependent axis internal communication error (transmission) | Cause: RCON internal communication error. Communication failure with driver unit connecting actuator axes.<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |
| 62 (862) | Dependent axis internal communication error (reception) | Cause: RCON internal communication error. Communication failure with driver unit connecting actuator axes.<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |
| 80 (880) | GW parameter error | Cause: Gateway parameters are abnormal.<br>Countermeasure: Check connected axes, operation mode, etc. with gateway parameter configuration tool. |
| 81 (881) | Parameter check sum error | Cause: RCON internal memory data may be damaged.<br>Countermeasure: Reset with the gateway parameter configuration tool, or if backup is available, write in the backup data. |
| 9B (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 (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 (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 24 VDC = 28.8 V).<br>1) 24 VDC power supply voltage is high<br>2) Malfunction of parts inside the 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 24 VDC = 16.8 V).<br>1) 24 VDC power supply voltage is low<br>2) Malfunction of parts inside the 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: Gateway unit control power supply voltage has dropped to or below 16.8 V (70% of 24 VDC).<br>1) Control power supply voltage drop<br>2) Malfunction of parts inside the gateway unit<br>Countermeasure: 1) Confirm that voltage of 24 VDC ±10% is being applied to the gateway unit control power connector. If the voltage is low, the 24 VDC 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. |

| Alarm code | Alarm name | Causes/countermeasures |
|---|---|---|
| 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. |
| DC<br>(8DC) | RCON-EC Unit Communication Error | 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<br>(8DD) | Unit connection check signal error | Cause: Units may not be correctly connected.<br>1) Connector or SCON cable connector is not correctly connected.<br>2) Interior signal line or SCON connection cable is disconnected.<br>3) Terminal unit or terminal connector (for SCON) has not been mounted.<br>Countermeasure: 1) 2) Confirm that units are firmly connected together. Disconnect the units and then connect them again. Contact IAI if this reoccurs even after turning ON the power again.<br>3) Mount the terminal unit or terminal connector. |
| FA<br>(8FA) | CPU error | Cause: Abnormal reset detected in gateway board interior CPU.<br>Countermeasure: Reboot the power. If it occurs again, contact IAI. |
| FFF | Power ON log | 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 by 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 or controller. |
| 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 abnormality 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 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.

| 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 | Red/green 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 window.<br>● Maintenance Warning 3 (Overload warning) is cleared by resetting the alarm. |

* 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, 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 | The peak power capacity of the 24V power supply is less than 4.2A. | Use a power supply with peak current of 4.2 A or higher (per axis). |
| 6 | 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. |
| 7 | 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. |
| 8 | 24V power 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 abnormality alarm]**

Motor abnormality 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. For some models, the motor cannot be replaced by the customer. In that case, please contact IAI. |

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

ELECYLINDER control unit abnormality 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 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 abnormality alarm]**

An abnormality 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-type motor and battery-less absolute spec ELECYLINDER control unit have been combined by mistake | Cut 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. The motor cannot be replaced by the customer. In that case, please contact IAI.<br>→ For the replacement method, refer to the instruction manual for each ELECYLINDER. |

**[Alarm group E: Supply voltage/power capacity abnormality alarm]**

An abnormality 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 21.6V to 26.4V. | [Countermeasure 1]<br>Inspect with a tester to see whether the power supply voltage is in the range of 21.6 V to 26.4 V. If it is out of range, the 24VDC 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. |

**[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.<br>[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 alarms.

**[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.<br>[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 alarms.

**[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, 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 alarms.

## Revision history

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Quality and Innovation


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