SMC

Operation Manual

Product name

Electric actuator controller Gateway (GW) unit (EtherNet IP type)

Model / Series

LEC-GEN1

SMC Corporation

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LEC Series/ Gateway unit
1.　　Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions are categorized into three groups, "Caution", "Warning" and "Danger" depending on the level of hazard and damage, and the degree of emergency. They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC), Japan Industrial Standards (JIS)*1) and other safety regulations*2).

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems
　　ISO 4413: Hydraulic fluid power -- General rules relating to systems
　　IEC 60204-1: Safety of machinery -- Electrical equipment of machines (Part 1: General requirements)
　　ISO 10218-1992: Manipulating industrial robots -- Safety
　　JIS B 8370: Pneumatic fluid power - General rules relating to systems
　　JIS B 8361: Hydraulic fluid power - General rules relating to systems
　　JIS B 9960-1: Safety of machinery - Electrical equipments of machines (Part 1: General requirements)
　　JIS B 8433-1993: Manipulating industrial robots - Safety, etc/
*2) Labor Safety and Sanitation Law, etc.

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

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

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

⚠ Warning

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

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

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

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

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

The product specified here may become unsafe if handled incorrectly.

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

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent dropping of driven objects or run-away of machinery/equipment have been confirmed.

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

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

⚠ **Warning**

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

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

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

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

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

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LEC-G Series/Gateway unit
Safety Instructions

⚠ Caution

The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".
Read and accept them before using the product.

[Limited warranty and Disclaimer]

(1) The warranty period of the product is 1 year in service or within 1.5 years after the product is delivered.
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

(2) For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to SMC product independently, and not to any other damage incurred due to the failure of the product.

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

[Compliance Requirements]

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

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2.   Outlines of Product

2. 1 Features

The gateway unit (GW unit, hereafter) is the unit to connect the electric actuator controller (LEC series) to Ethernet IP. One unit can control up to 12 same type of controllers.

⚠ **Caution**

When setting up the device or when failure occurs, please refer to the operation manual of the controller, the actuator, and the teaching box as well as this operation manual.

* Keep this operation manual accessible so it can be referred to when necessary.

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2. 2 How to Order

How to order is shown below.

L E C - G E N 1 □

Electric equipment

Controller

DIN rail

Nil	Not mountable.
D	Mountable

Applicable

EN1	EtherNetIP

Unit types
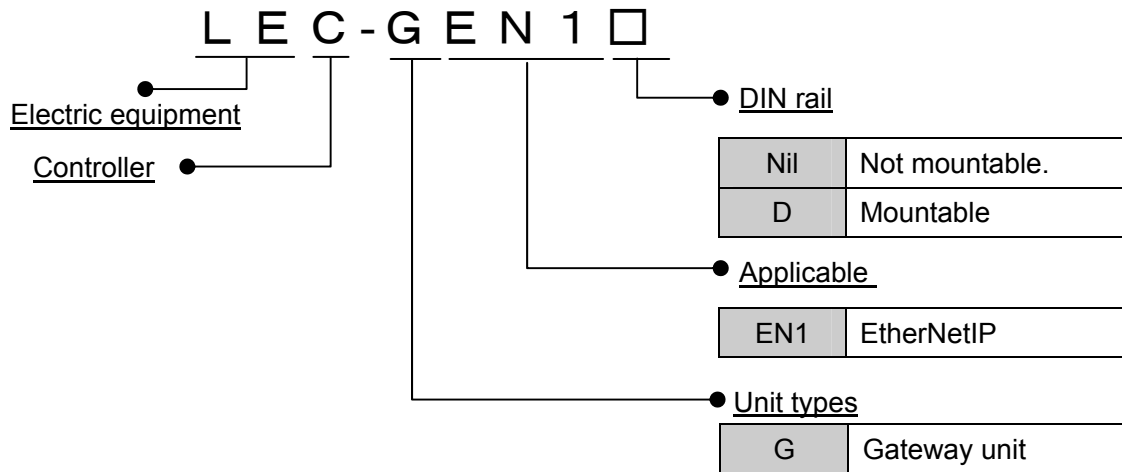
G	Gateway unit

2. 3 Structure of the product

The system applies this unit consists of the unit below.

System structure drawing.

PLC

HUB

EtherNet/IP

Gateway unit
LEC-GEN1□

Teaching box
LEC-T1- 3 □G□

●Controller setting Kit
LEC-W2

LEC serial communication (RS485)

Modbus communication

Termination Resistor

Motor controller
LEC Series

Electric actuator
LE Series
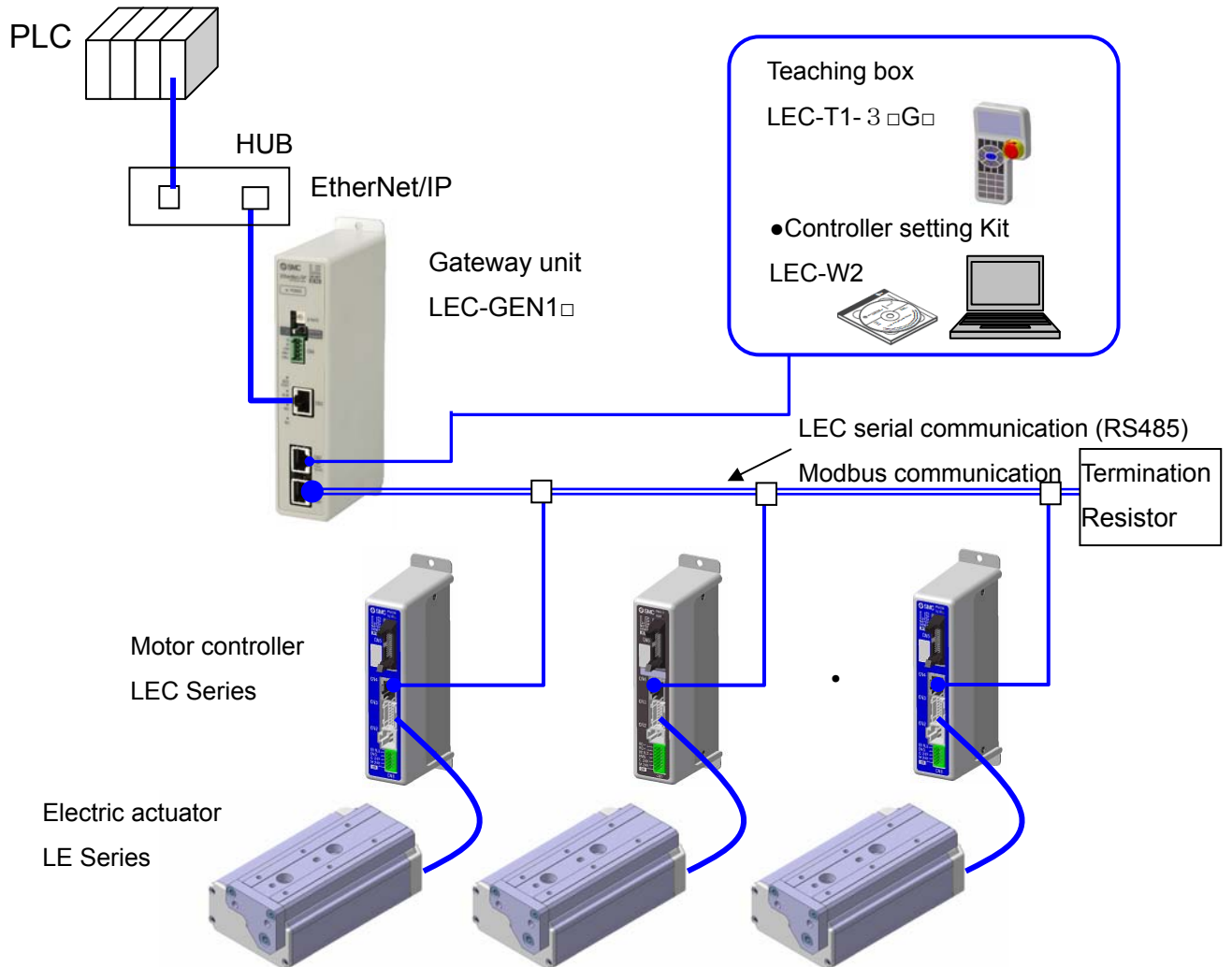
2. 4 Procedure （How to start the actuator)

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

(1) Checking the content of the package

After unpacking, check the description of the label to identify the gateway unit and the quantity of accessories.

Part's name	Quantity
Gateway unit （LEC－GEN1）	1 pc.
Power supply connector	1 pc.

Gateway unit

Power rsupply connector

^(*) These items are included if you ordered by the part number for a set of controller and actuator.

(2) Mounting the unit

Refer to **3.4 How to install** for the mounting of the gateway unit.

(3) Initial setting of the connect controller

The parameters of the controller's, that are is connected to the gateway unit need to be set.
Refer to section **4. 3 Setting of controller (LEC)**

(4) Setting the unit

It is necessary to set the node address and the communication speed by the rotary switch of the gateway unit. Refer to section **4. Initial Setting**

(5) Unit wiring / Connection

Connect cables to the connectors(CN1 to CN3) of the gateway unit.
Refer to section **5. External connection** for the wiring of connectors.

Connector

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(6) Power supply

Supply power 24V DC.

⚠ Caution

Supply power first to the controller (LEC), then to the gateway unit.

If power is supplied to the gateway unit and then to the controller (LEC), reset the data link after

supplying power to the controller (LEC).

(Refer to **11.4 Gateway unit control flag** for the details of data link reset.)

If the condition is normal, LED on the front of the gateway unit turns on as the table below when power

is supplied.

Functions	LED condition	Condition
PWR	Green On	Supply of power
CN2 STAT	Off	CN2（TB/PC terminal） invalid
BUS STAT	Green flashing	Controller IF is communicating
ALM	Green flashing	No alarm
NS	Green On	EtherNetIP status normal
MS	Green On	EtherNetIP status normal

Refer to **10. LED display** for the explanation of LED lamps.

If LED [ALM] on the front panel of the gateway unit shows red, an alarm conditions has occured.

(7) Operation

Refer to section **11. Memory map** for the assignment of the memory.　Read the operation manual of LEC series as well.

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3. Specifications

3. 1 Specifications

Basic specifications of the product.
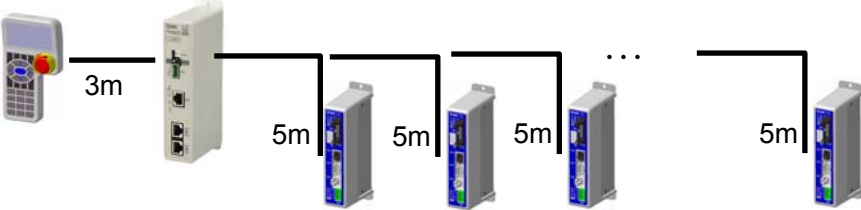
Item	Specifications
Rated voltage	24 VDC±10%
Current consumption	200mA or less (When teaching box is not connected)
	300mA or less (When teaching box is connected)
Applicable controller	Electric actuator controller (LEC series)
Product to be connected	Max. 12pcs.

When conformity to UL is required, the electric actuator and controller should be used with a UL1310 Class 2 power supply.

【EtherNet type】

Item	Specifications
Fieldbus	EtherNet (IEEEE802.3)
Media	100BASE-TX
Communication speed	10/100Mbps (Automatically selected)
Maximum length of cable	100m (328ft)
Fieldbus protocol	EtherNet/IP TM
Occupied area (inputs /outputs)	2048 point（256byte）/2048 point（256byte）
IP address setting	DHCP server.　Arbitrary address
Device information	Vendor ID: 7
	Device type: 0 (Generic device)
	Product code: 154
	Product name: LEC-GEN1

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【Controller IF communication spec.】

Item	Specifications
Serial communication	RS485 (Modbus protocol compliant)
Communication speed	115.2k or 230.4kbps (Select 115.2kbps when the teaching box is connected)
Cable length	The cable for the teaching box (3m) and the electric actuator controller (5m x 12) makes 63m of cable length. This is the maximum cable length.

【Conditions of environment】

Item	Specifications
Applicable ambient temperature	0～40℃(No freezing)
Applicable ambient humidity	90%RH or less (No condensation)
Atmosphere	No corrosive gas, flammable gas, oil mist, or particles.
Storage temperature	-10～60℃(No freezing)
Storage humidity	90%RH or less (No condensation)
Vibration	4.9m/s^2 (0.5G) or less
Enclosure	IP20
Mass	200g (screw mount type) 220g (DIN rail mount type)

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3. 2 Details of parts

Details of parts of the gateway unit
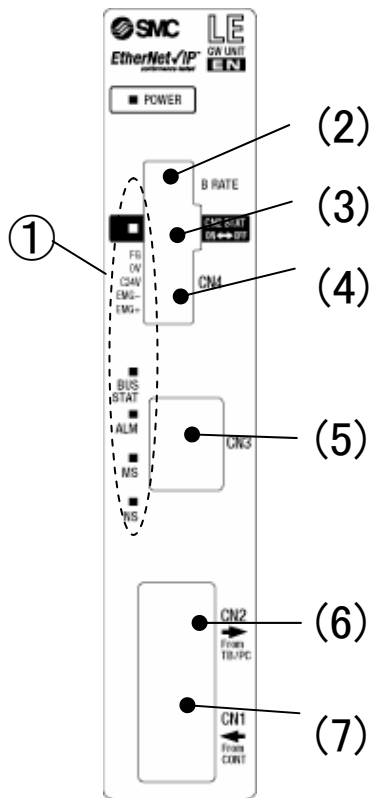
No.	Display	Description	Detail
1	-	LED lamp	LED to indicate the condition of the gateway unit
2	B RATE	Communication speed	The switch to set the communication speed of the controller IF communication line.
3	CN2 SW	Communication switch	Disables the communication with the controller IF communication line, and ables the communication with the equipment which are connected to CN2.
4	CN4	Power supply connector	Connect the power supply and EMG signal.
5	CN3	Bus connector	Connect EtherNet/IP line.
6	CN2	TB/PC connector	The connector which connect LEC teaching box (LEC-T1) or the ACT software Controller for setting (LEC-W2)
7	CN1	CONT connector	The connector for the controller IF communication line. Connect the motor controller (LEC series).

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3.3 Outside dimension diagram

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

(1) Screw mount type (LEC－GEN1)

(2) DIN rail mount type (LEC－GEN1D)

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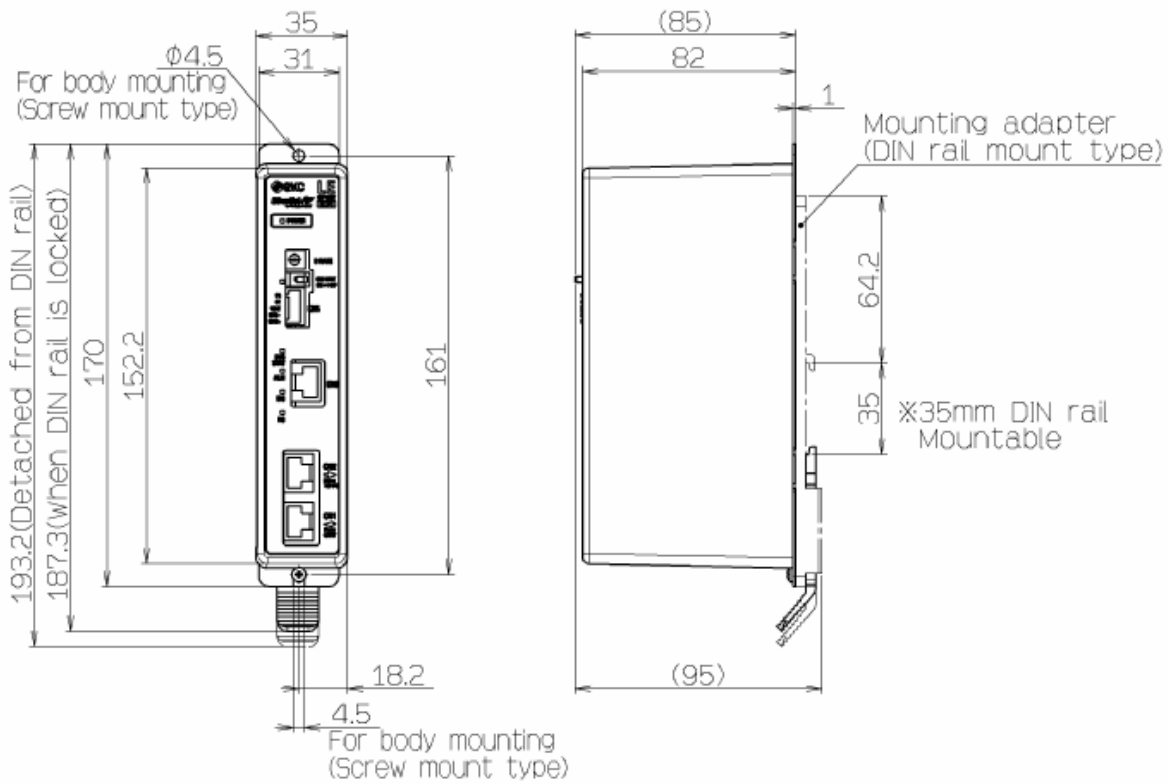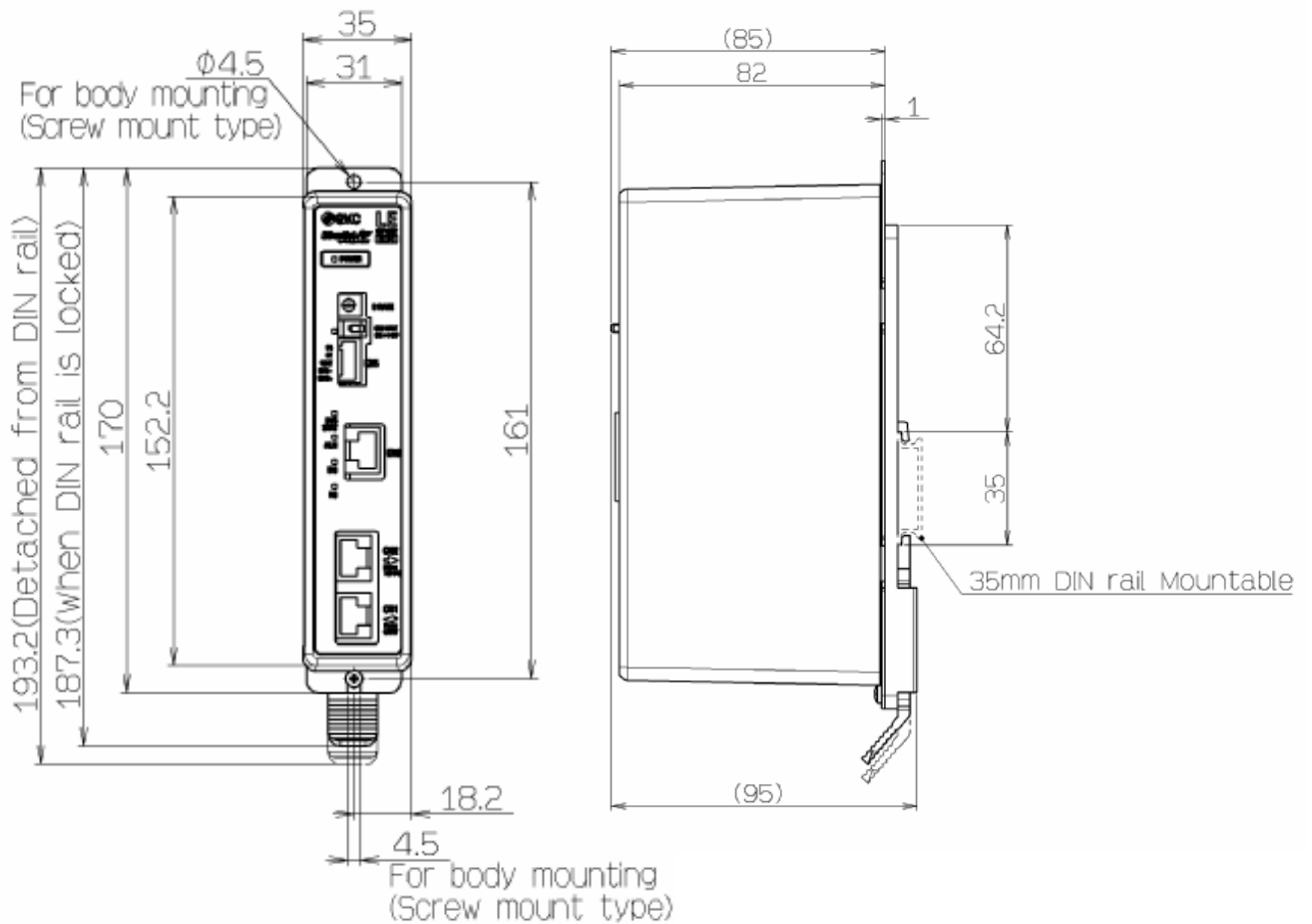
3.4 How to install

(1) How to install

There are two types of controllers; screw mount type and DIN rail mount type.

The followings are the descriptions on how to install each type:

[1] Screw mount type (LEC-GEN1)

(Installation with two M4 screws)

Screw direction
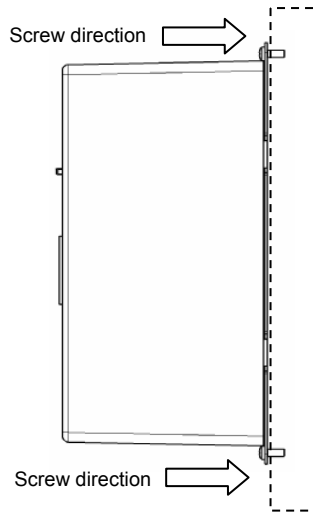
Screw direction

[2] DIN rail mount type (LEC-GEN1D)

(Installation with the DIN rail)

DIN rail is locked.

DIN rail

A
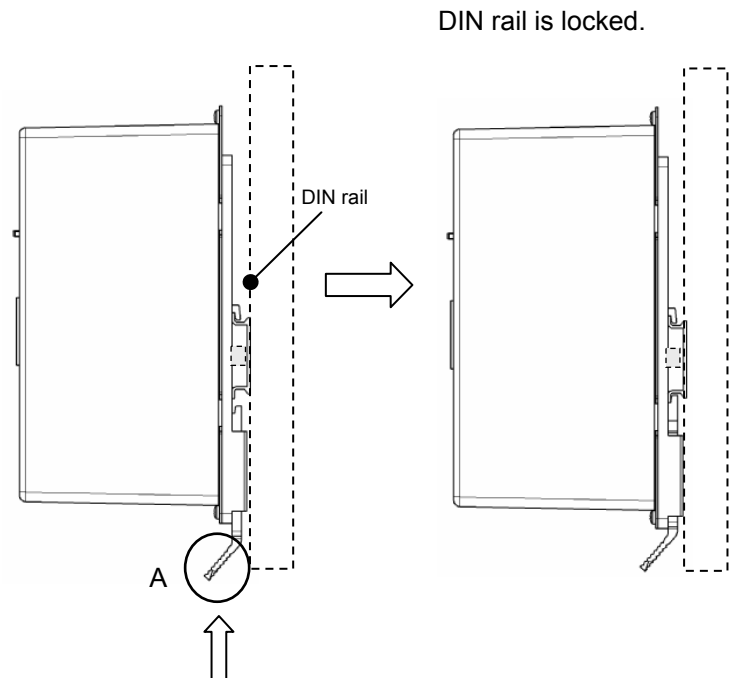
Hook the controller on the DIN rail and press the lever of section A in the arrow direction to lockit.

(2) Installation location

Please install this gateway unit at an appropriate place where the surrounding temperature will not exceed 40°C.

⚠ **Caution**
Install the gateway unit on a flat surface. Excessive pressure applied to the housing will damage the gateway unit.

4. Initial Setting

4. 1 Gateway unit   Communication speed switch (B RATE)

The transmission rate of motor controller LEC are set. Table below shows the setting of switches.

The treble is shown about the transmission rate of controller IF
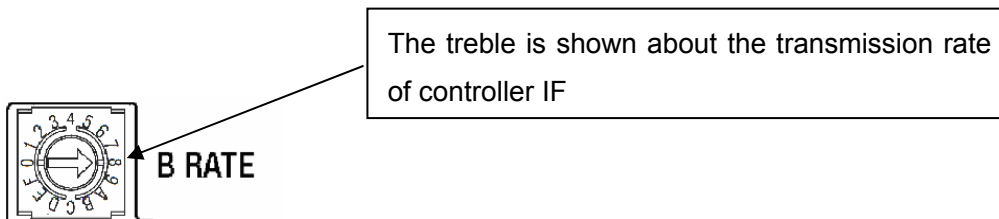
B RATE	Communication speed of controller IF
F : 9	Not used
8	230.4 kbps
7 : 1	Not used
0	115.2 kbps

※   Do not set B RATE to the value of "Unused"

Caution1: Set the controller IF communication speed at 115.2kbps to use the teaching box (LEC-T1-□).

Caution2: Turn off the power supply in order to change the switch setting

4. 2 Setting the switch to change the communication   （CN2SW）

Turn ON the **communication switch (CN2SW)** during EtherNet/IP control.   If the communication switch (CN2SW) is turned off   during EtherNet/IP control, communication error (data link error) is generated in the gateway unit.   Turn OFF communication switch (CN2SW) when changing the setting of controller (LEC) by connecting the teaching box (LEC-T1-□) of setting software (LEC-W2) to PC/TB connector (CN2). In this case, the communication from EtherNet/IP to the controller (LEC) is cut.

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4. 3 Setting of controller (LEC)

   Initial parameter setting is necessary for the controller (LEC) which is connected to the gateway unit. Set the following by directly connecting the teaching box (LEC-T1-□) or the setting software to the controller (LEC) before connecting the gateway unit.

   Check the operation manual of the controller (LEC) and the teaching box (LEC-T1-□) when setting the controller (LEC).

4. 3. 1 ID setting

ID setting is necessary when connecting two or more controllers (LEC) to the gateway unit.

Assign ID to each controller (LEC) in serial number so that the numbers do not overlap. The setting range of ID is between 1 to 12.

[Example of ID change procedure using the ACT Controller Setting software (LEC-W2)]

Start the setting software in Normal mode.

Open the parameter window.

(1) Set the controller ID.
(Letters are changed to blue)

(2) Select Download.
　(Changed ID is sent to the controller. ID set value turns to black)

Item	Value
Controller ID	9
IO pattern	8
ACC/DEC pattern	Trapezoid-motion
S-motion rate	0
Stroke(+)	1000.00
Stroke(-)	-1000.00
Max speed	100
Max ACC/DEC	2000
Def In position	0.10
ORIG offset	0.00
Max force	100
Para protect	1 : Common+StepData
Enable SW	Disable
Unit name	

-21474836.47 ... 21474836.47

4. 3. 2 Setting of the communication speed

   It is necessary to match the gateway unit controller IF communication speed with the controller (LEC) communication speed.　Set the controller IF communication speed at 115,2kbps to use the teaching box (LEC-T1-□)

[Communication speed change procedure Setting software (LEC-W2)]

Start the setting software with Normal mode.

(1)Select [HELP] - [Password] from the menu. Password input screen below appears. Enter "password".

Input Password

OK　　Cancel

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(2) Set the controller so that the communication speed can be changed.

Change "Parameter protect" setting so that "Communication speed" parameter can be changed.

View the parameters of the controller.
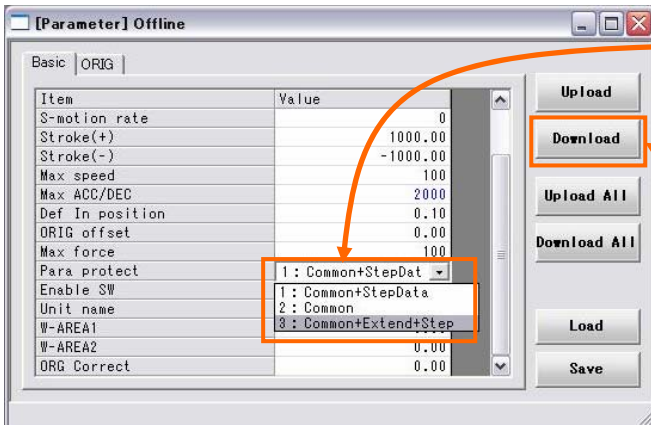
(2)-1 Change parameter protect to [3: Common + Extend + Step].

(2)-2 Select Download.

Select "Basic" Tab - Item "Parameter protect" to "3: Common + Extend + Step"

The changed data is sent by clicking the download button, and the parameter protect set value text changes from blue to black.

(3) Select the "Motor" Tab of the parameter window to change item "Comm speed" to "115200" for when using Teaching box or "230400" for when using ACT Controller software.
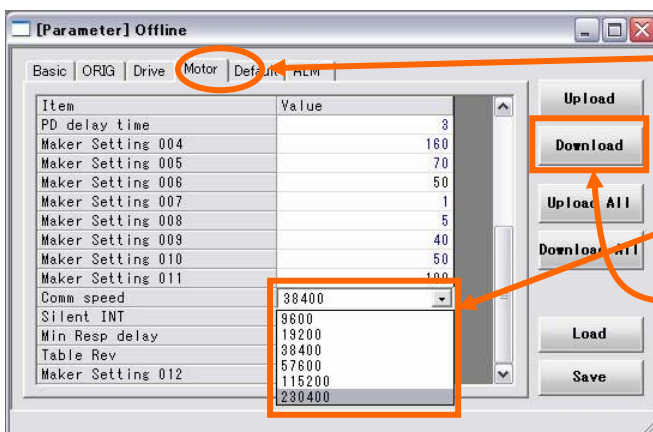
(3)-1 Select the tag "Motor".

(3)-2 Change the communication speed to 「115200」 (5)　or　「230400」 (6)

(3)-3 Select Download.

The changed data is sent by clicking the download button, and "Communication speed" set value is changed from blue to black.

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(4) Change item "Parameter protect" using "Basic" tab of the display of (2) to "1: Common + Step data" and click download.

(5) Close the ACT Controller software (LEC-W2) and turn OFF the controller (LEC) power supply. The changed communication speed will be valid from the next time the controller (LEC) is turned on.

⚠Caution

The communication speed of the gateway unit and the controller (LEC) must match.
    If the communication speed does not match, the gateway unit and the controller (LEC) cannot communicate.
Set the controller IF communication speed to 115,2kbps when using the teaching box (LEC-T1-)
The defaults setting of communication speed in the setting software (LEC-W2) is 38.6kbps.
    After changing the communication speed, set the ACT Controller software (LEC-W2)
    communication speed to 115.2kbps for Teaching box or 230.4kbps for the ACT controller software.
Do not change any parameters other than "ID setting"/"Communication speed setting".
    Otherwise, malfunction can result.
Change "ID setting" / "Communication speed setting" to use the controller (LEC) stand-alone.

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4. 4 Setting of EtherNet/IP using RSLogix5000TM

It is necessary to enter the value of Assembly instance Input, Output, and Configuration to set by using RSLogix5000TM. Set with values below.

・Comm Format: Data-SINT

・Connection Parameters

	Instance	Size
Input	100	256
Output	150	256
Configuration	1	0

＊It is not necessary to set Connection and ModuleInfo.

＊RSLogix5000TM is a registered trademark of Rockwell Automation.

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5. External connection

5. 1 CN4: Power supply connector

Connect the power supply. The gateway unit and the controller (LEC) should have the common 0V line.

Gateway

Unit

CN 4

Power supply line

Power supply
（24 VDC）

（Cables, PLC and power supply are prepared by customer）
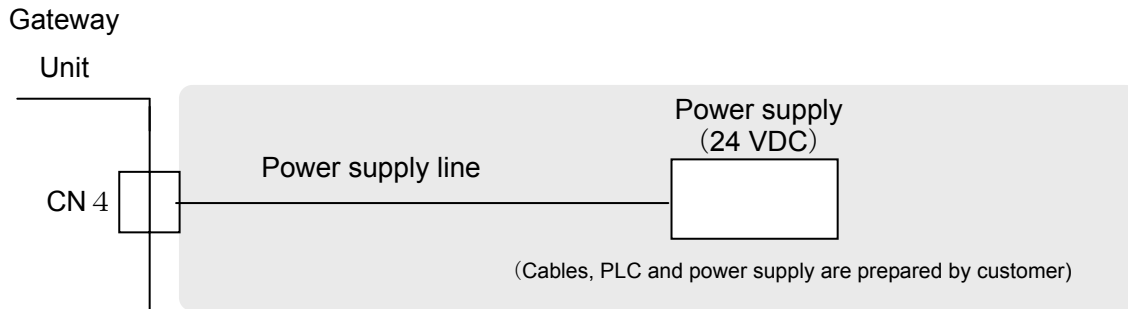
* Refer to **6. CN4: Power supply connector**

5. 2 CN3: Bus connector

Connect the EtherNet line and the controller (LEC) with the communication cable (LEC-CG□-□)

Gateway

Unit

CN 3

EtherNet line.

HUB

PLC

（Cables, PLC and power supply are prepared by
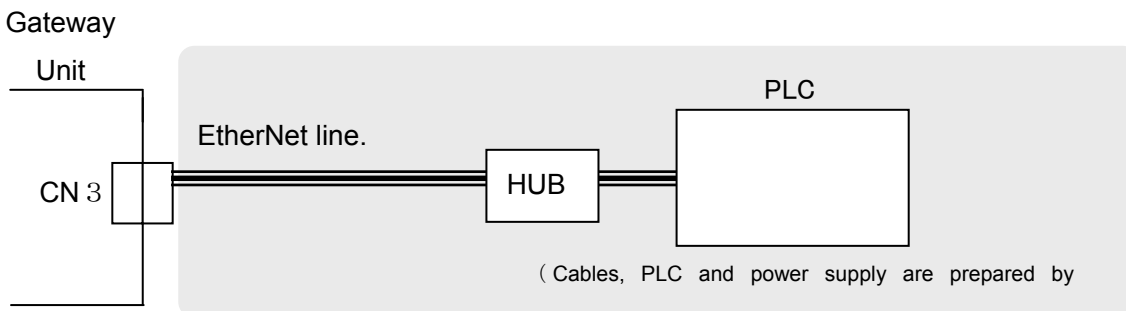
5. 3 CN1: CONT connector

Connect the gateway unit and the controller (LEC) to communication cable (LEC-CG□-□).

Gateway

unit

CN 1

Controller input power supply
24 VDC

Terminating Resistor

(120Ω 1/4W)

CN4

CN4

CN4

Controller (LEC)   Controller (LEC)   Controller (LEC)

SMC
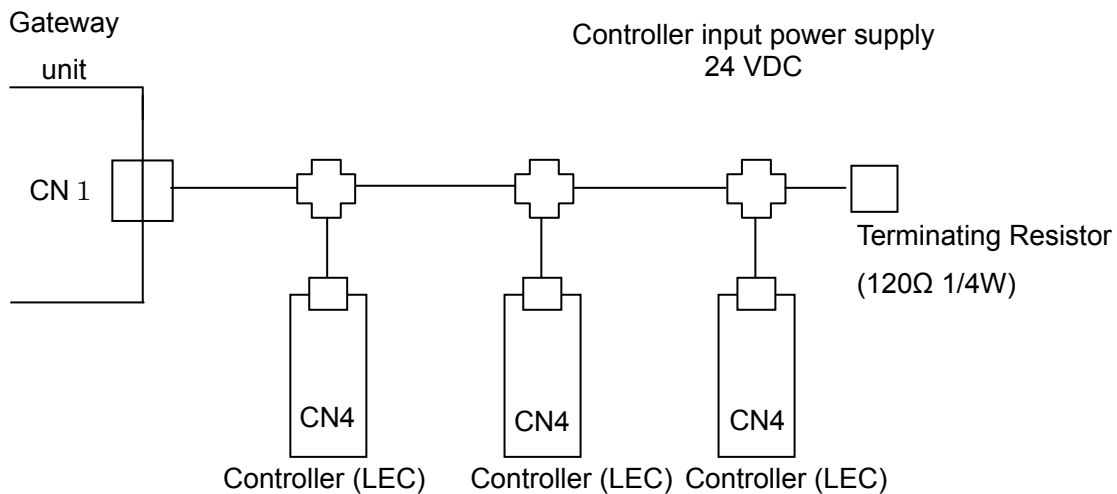
> ## ⚠Caution
> **Do not pull out the cable between the gateway unit and the cable, or cut off the power supply to the controller (LEC).   Communication is interrupted.**

5. 4 CN2: PC/TB connector

The connector which connects the tools teaching box (LEC-T1-3*G*) or PC (LEC-W2) for setting the controller (LEC.

The data link of the gateway unit and the controller (LEC) data is cut by turning off CN2SW or stopping data link, and communication with the tool teaching box (LEC-T1-3*G*) for setting the controller or PC (LEC-W2) becomes possible.

(1) Connecting the teaching box

Gateway unit

CN2

Teaching box
（with 3m of cable）
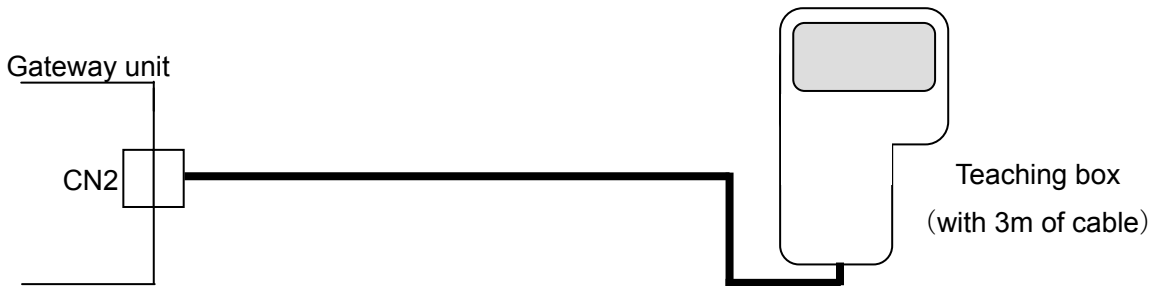
(2) Connecting PC

●Controller setting software
（Communication cable, USB cable, conversion unit）

Gateway unit

Conversion unit

USB cable
（A-miniB type）

CN2CN 2

Communication cable

PC

（PC is prepared by customer）
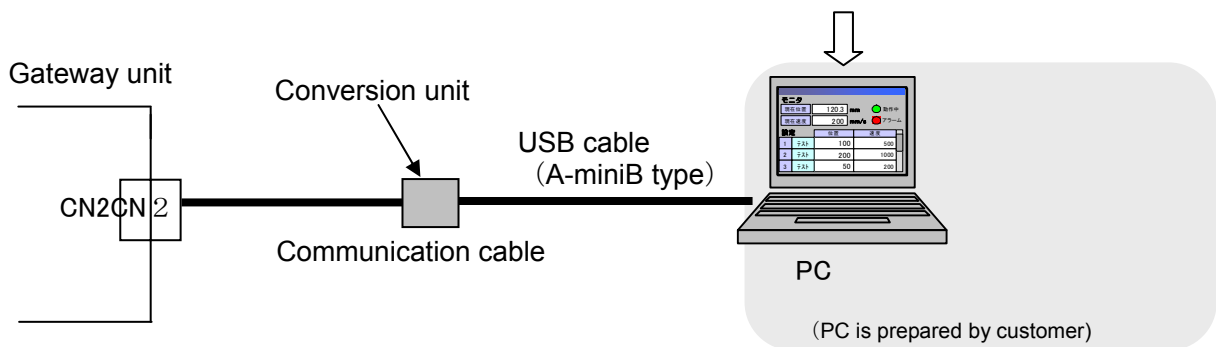
※Refer to **8.   CN2：TB/PC Power supply connector** for usage.

> ## ⚠ Caution
> Do not start the setting software during data link.
> Otherwise, communication error (data link error) is generated with the gateway unit.

6. CN4: Power supply connector

6.1 Power supply connector

Specifications of the communication connector in accessory

5 4 3 2 1
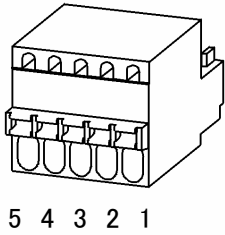
	terminal	Function	Functional explanation
1	EMG +	EMG signal output ＋	Output terminal of the emergency stop switch of the teaching box.
2	EMG -	EMG signal output -	
3	C 24V	Power supply + terminal	Power supply terminal of the Gateway unit (Power to the teaching box is supplied from this terminal)
4	0V	Power supply - Terminal	
5	FG	FG Terminal	Grounding terminal
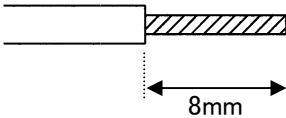
⚠ Caution

(1) 0V line of the gateway unit and the motor controller (LEC) have to be common.

(2) When conformity to UL is required, the electric actuator and controller should be used with a UL1310 Class 2 power supply.

6.2 Power line

（Power lines are prepared by customer. Specifications below need to be satisfied）

Item		Specifications
Applicable wire Size	Power terminal (24V，0V)	AWG20: Single line,No insulation sleeve, Twisted wire with bar terminal. *The rated temperature for the insulation coating: 60 degrees C or more.
	EMG signal output （EMG+,EMG-）	AWG20: Single line,No insulation sleeve, Twisted wire with bar terminal. *Rated temperature of the insulation cover is 60 degrees C or higher
Peeled wire length		8mm

⚠ Caution

Do not connect multiple wires to one terminal.

⚠ **Caution**

(1) The earthling should be the dedicated grounding point. It should be a functional ground with less than 100 Ω resistance.

(2) The ground point should be near this gateway unit to make the wire length shorter.

Recommended Functional grounding   Not Recommended grounding
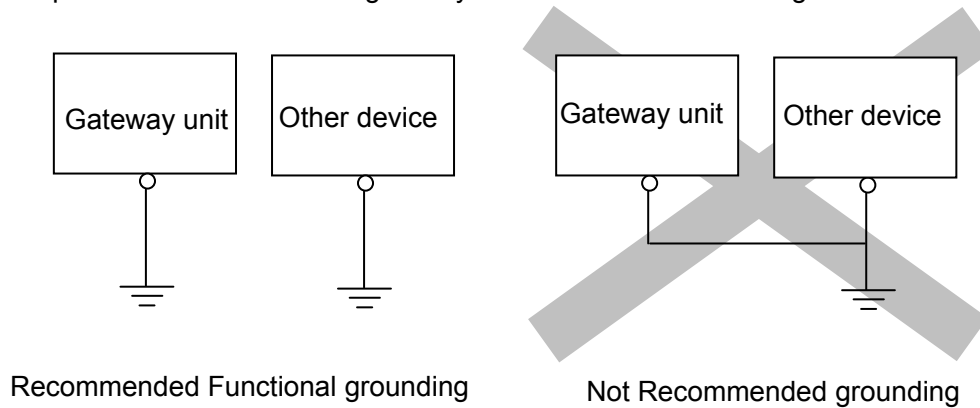
6. 3 Wiring of the shutdown circuit

The gateway unit has terminals (EMG+, EMG-) which route the stop switch signal's from the teaching box when the communication switch (CN2SW) is turned on. Set the terminal to EMG terminal of the controller (LEC) when using the teaching box.

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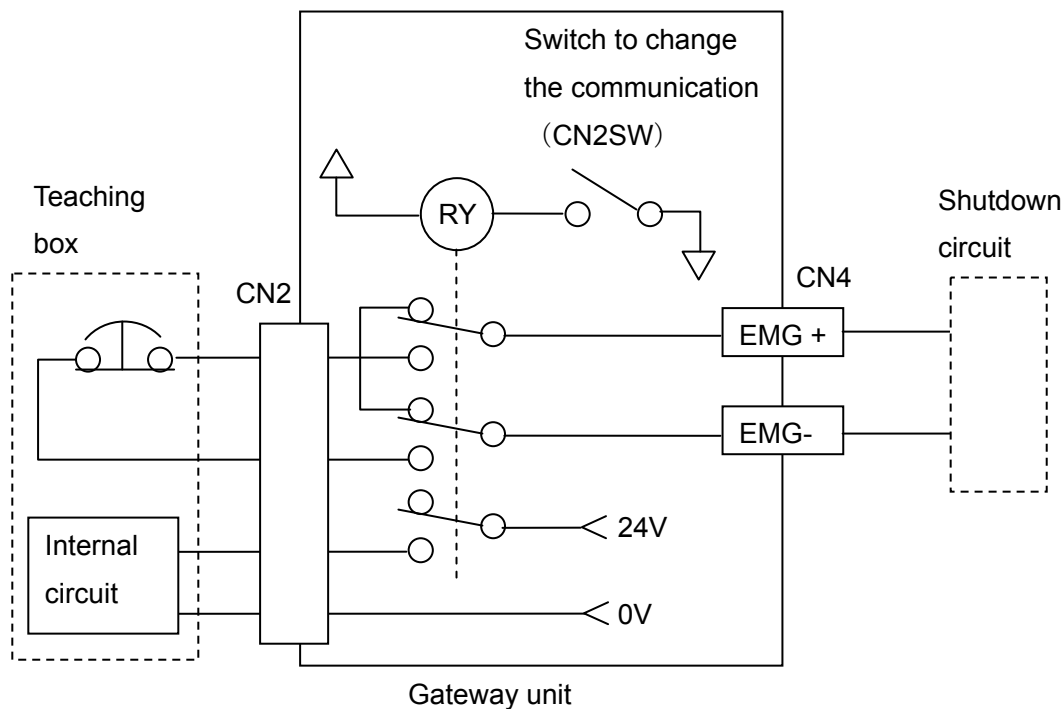
⚠ Caution
Turn on the communication switch (CN2SW) before install / removal of the teaching box to / from the gateway unit. If EMG+ and EMG- terminals are connected to the controller (LEC) or a shutdown circuit and the communication switch is turned off when the teaching box is not connected, connected controller (LEC) or the shutdown circuit receives stop signal (Open between EMG+ and EMG-) and operation stops

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【**Shutdown circuit Example**】

Shutdown circuit with gateway Check the circuit referring the controller (LEC) operation manual.

【Example of the circuit】 ex. LEC6
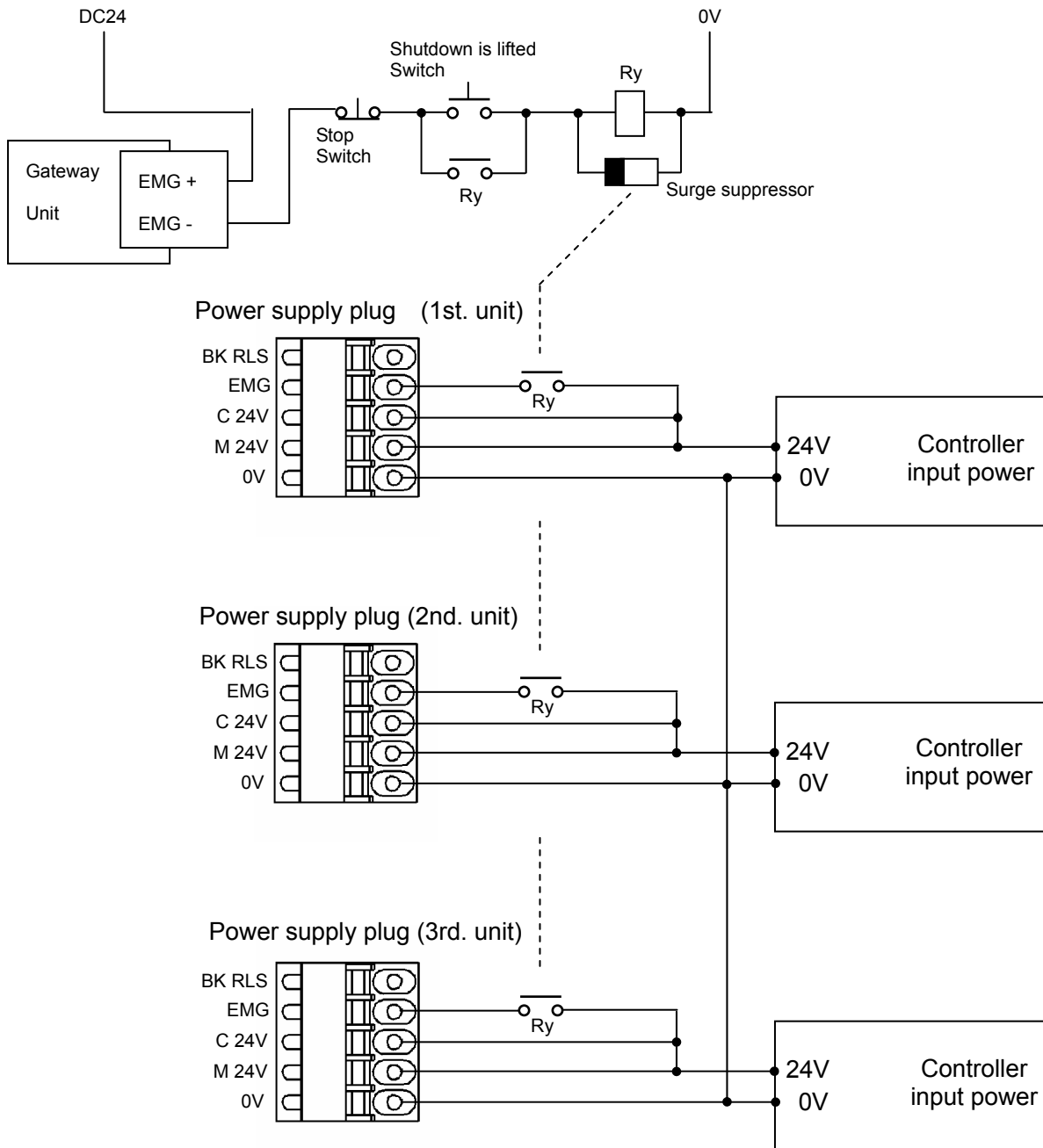
⚠️ Caution

When the stop signal is input, the controller (LEC) is stopped with max deceleration speed, and servo motor is turned off.

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7. CN1: Controller IF communication connector (CONT)

7. 1 Connection

One unit can control up to 12 pcs. of controllers (LEC).

The example of link connection which consists of telecommunication cable LEC-CG 1-1 and cable LEC-CG 2-1 between branches is shown below.
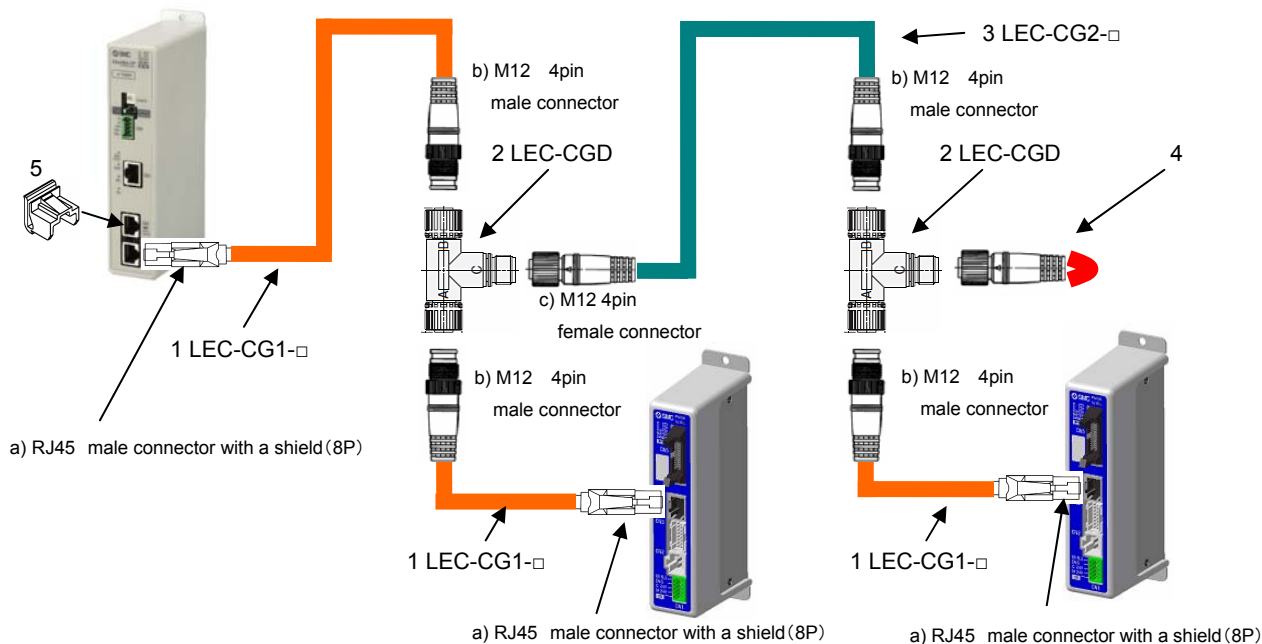
No	Description	Part number	Content
1	Communication cable cable	LEC-CG1-□ K 0.3m L 0.5m 1 1m	Cable to connect the gateway unit CN1 and the branch connector, or controller (LEC) CN4 and the branch connector.
2	Branch connector	LEC-CGD	The junction cable to connect the gateway and the controller.
3	Cable between branches	LEC-CG2-□ K 0.3m L 0.5m 1 1m	Cable to connect the branch connector.
4	Terminating Resistor	-	Termination on RS-485 Bus (120 Ohms) Recommended connector :XS2C-D4** [OMRON Corporation] 120Ω 1/4W
5	RJ-45 connector dust cover	LEC-CAP-X22	Dust adhere when the RJ-45 connector is not connected with the CN1 or CN2 or CN3 connector. Please attach a cover when you prevent the adhesion such as dust.

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Recommended connector

No	Description	Part number	
a)	RJ45　male connector with a shield（8P）	TM21P-88P	［HIROSE ELECTRIC CO., LTD.］
b)	M12　4pinmale connector	HR24-8DJ4PE550A(73)	［HIROSE ELECTRIC CO., LTD.］
		XS2G-D4**	［OMRON Corporation］
c)	M12　4pin female connector	HR24-8DP4S300(73)	［HIROSE ELECTRIC CO., LTD.］
		XS2C-D4**	［OMRON Corporation］

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7. 2 Wiring diagram

For you reference, the example of wiring of the gateway unit CN1 is shown below.

The communication line from the gateway unit CN1 branches to each controller (LEC) by the branch connector. It is recommended to connect the terminating resistor (120Ω 1/4W) to the branch connector at the terminal.

When connecting the cable, the shield of the cable becomes same potential as 0V of the controller power supply.

When using it, do not contact it to conductive parts of switchboard, other instruments, wiring, etc.

← Gateway unit CN1

Description	Pin No.
N.C.	1
N.C.	2
SD+	3
SD-	4
N.C.	5
N.C.	6
N.C.	7
N.C.	8
Shield	

Branch   Branch

←Controller CN4

Description	Pin No.
EMG+	1
EMG-	2
SD+	3
SD-	4
EN_SW+	5
ON	6
DC24V	7
GND	8
Shield	

←Controller CN4

Description	Pin No.
EMG+	1
EMG-	2
SD+	3
SD-	4
EN_SW+	5
ON	6
DC24V	7
GND	8
Shield	

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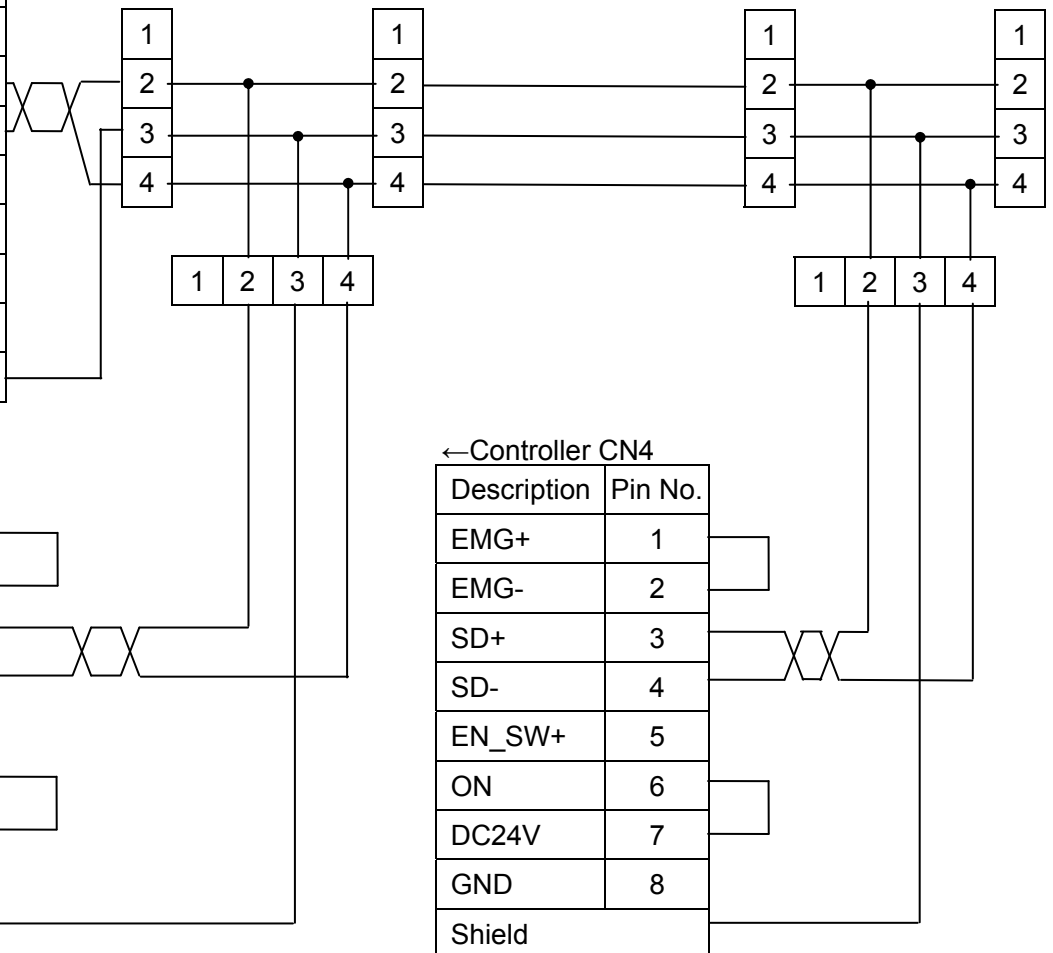
8. CN2: TB/PC connector

8. 1 How to use

This connector is for setting the controller (LEC) which is connected to the gateway unit by the teaching box or the set software.

When the communication switch (CN2SW) is turned off, the communication from EtherNet/IP to the controller is disconnected, and the signal line of CN2 and CN1 is connected. From now on, the setting of each controller is possible.

The following is the setting procedure of the controller (LEC) when the teaching box or PC setting software us connected to the gateway unit.

【Procedure to start setting】

(1) Connect the teaching box or PC to CN2 of gateway unit.

(2) Turn off the communication switch (CN2SW).

(3) Reset signal is sent to all controllers (LEC) which are connected to the gateway unit, and the communication from Ethernet to the controller (LEC) is disconnected. Reset signal stops all actuators.

(4) Communication from the teaching box or PC becomes available.

【Procedure to finish setting】

(1) Exit the Act Controller software.

(2) Turn on the communication switch (CN2SW).

(In case of the teaching box, power supply is turned off at this point)

(3) Communication starts after the reset signal is sent from the gateway unit to the controller (LEC).

Reset signal stops all the actuators immediately after communication starts.

(4) Remove the teaching box or PC from the CN2 of gateway unit.

⚠ **Caution**
Do not start the setting software during data link (CN2SW turn on).   Otherwise, communication error (data link error) is generated with the gateway unit.   **Use the teaching box and the setting software after finishing startup process of the gateway unit (After ALM lamp green blinks). (CN2SW turn off etc.)**   The gateway unit communicates with controller (LEC) as startup processing immediately   after turning on of the power supply.   At this time, if the teaching box or the setting software communicate to controller (LEC),   communication error is generated.

9. LED display

9. 1 LED display
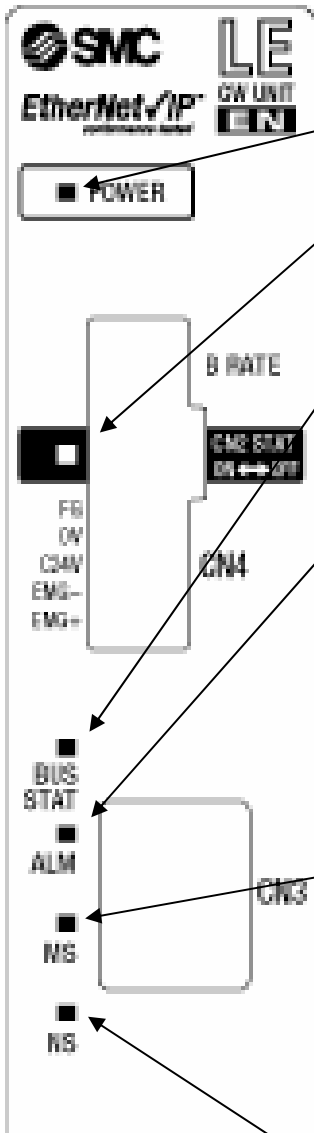
LED name	Content			
PWR	Power supply status	OFF	Power is not supplied	
		Green ON	Power is supplied	
CN2STAT	ON, OFF status of SN2SW	OFF	When switch ON	
		Green ON	When switch OFF	
BUS STAT	Controller IF status	Green flashing	Communicating	
		OFF	Communication disconnected	
ALM	Alarm status.	Green flashing	Normal status	
		Orange flashing	Warning generated	
		Red ON	When alarm is generated or communication data link is disconnected.	
MS	Module Status (Ethernet IP)	OFF	No power	
		Green ON	Controlled by a Scanner in Run state	
		Green flashing	Not configured,or Scanner in Idle state	
		Red ON	Major fault	
		Red,flashing	Recoverable fault	
NS	Network Status (Ethernet IP)	OFF	No power or no IP address	
		Green ON	On-line,connections established	
		Green,flashing	On-line,no connections established	
		Red ON	Duplicate IP address	
		Red,flashing	Connections timed out	

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9. 2 Controller IF communication status and LED display

Gateway unit status		PWR	BUS STAT	ALM	CN2 STAT
Supply of power		Green On	Off	Off	Off
Controller (LEC) and normal communication		Green On	Green flashing	Green flashing	Off
Command to interrupt data link is being given		Green On	Off	Green flashing	Off
CN2SW OFF Command to interrupt data link is being given		Green On	Off	Green flashing	Green On
Controller IF	Communication error with some controllers (LEC) is detected.	Green On	Green flashing	Orange flashes	Off
	Communication error is detected for all controllers (LEC), or IF communication speed of the controller is incorrect.	Green On	Green flashing	Red On	Off

10. Mode

10. 1 Outline

This unit has 3 types of operation mode. These modes can be switched by mode change[OUT: 250.0, 250.1] Current mode can be checked by mode return[IN: 250.0, 250.1]

Refer to "11.4(1) Return of the mode" for "Return of the Mode".

● Step data input mode [250.0=0, 250.1=0]

Operating actuator by using the memory of the gateway unit which corresponds to parallel IO of controller (LEC).

● Numerical data input mode [250.0=1, 250.1=0]

Operating actuator by using the memory of the gateway unit which corresponds to parallel IO of controller (LEC), and operating actuator by directly sending the parameters which like a position, a speed etc., are available.

● Step data writing mode [250.0=0, 250.1=1]

Operating actuator by using the memory of the gateway unit which corresponds to parallel IO of controller (LEC), and editing step data of the LEC controllers through the gateway unit, are available.

Please confirm the setting method of "Mode change" and "Mode return" by "Gateway control flag" and "Gateway unit state flag".

10. 2 Step data input mode

This is the mode that Operating actuator by using the memory of the gateway unit which corresponds to parallel IO of controller (LEC).

In case that "ID" setting of the controller(LEC) is "1", the memory which corresponds to the parallel IO of controller can be operated by [OUT: 0][OUT: 1] and [IN: 0][IN: 1]

Refer to the manual of controller (LEC) for detail of the function and the operation of parallel IO.

10. 3 Numerical data input mode

This is the mode that operating actuator by sending to controller (LEC) the data which is a position, a speed etc.

The actuator moves with the position, the speed etc which is specified by sent data.

In this mode, the command by using parallel I/O is available.

Before operating the actuator by directly sending the data which like a position, a speed etc, SVON and return to origin should be finished.

Please make same operation as performing SVON and return to origin with parallel IO by using the corresponding memory.

And operating the actuator is availavle by using the memory which corresponds to parallel IO of LEC controller.

Refer to the manual of controller (LEC) for detail of the function and the operation of parallel IO.

The data such as the current position can be read by "Setting numerical data".

Refer to "11.4(5) Setting numerical data" for "Setting numerical data".

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●Operation commanded by numerical data input mode (ID=1)

(1) Write "0" in [OUT: 2].

(2) Write the motion profile (position, speed…) in [OUT: 3～19]

Refer to "7.1 Step data" of the operation manual of the controller(LEC).

(3) Write "1" in [OUT: 2]. Then, the command of the driving is sent to the controller (LEC).

(4) When the sending to the controller(LEC) is completed, "Sending completed" [IN: 19.0] changes

from "0" to "1" and the actuator starts driving.

(5) And, when the actuator completes driving, INP [IN: 1.3] is changed from "0" to "1".

Refer to "6.3 Parallel IO input" of the operation manual of the controller(LEC) for detail of INP

signal.

(6) Write "0" in [OUT: 2].

Then, "Sending completed" [IN: 19.0] is changed from "1" to "0".

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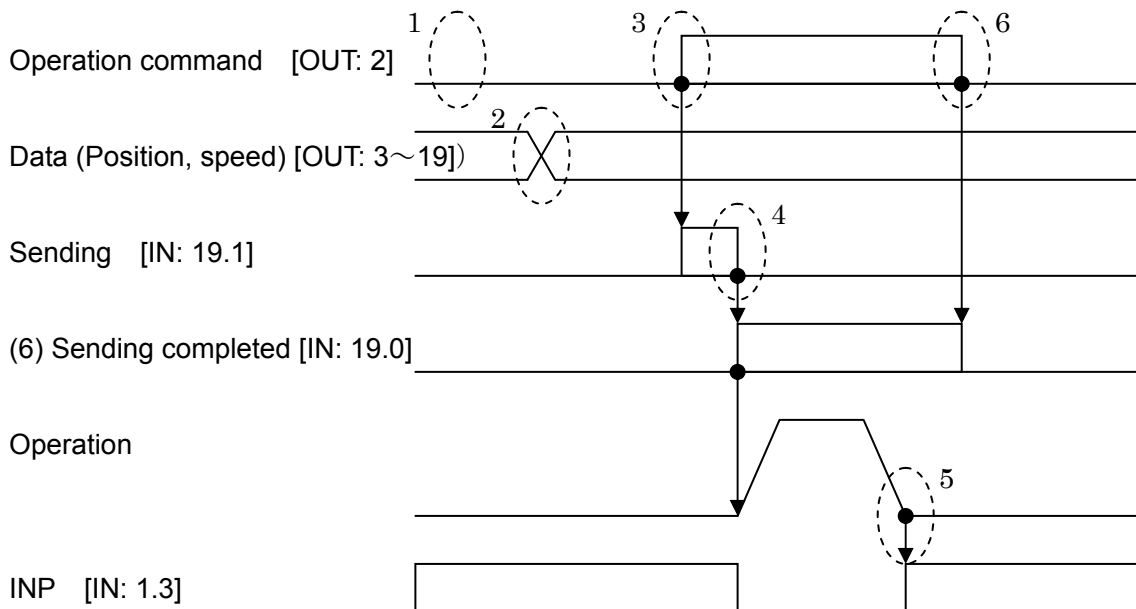
10. 4 Data writing mode

This is the mode that the step data of the controller(LEC) can be changed through the gateway unit. After changing it, the changed step data is reflected by commanding to drive the changed step data.

And the same functions as step data input mode are available in this mode.

The driving and the return to origin etc. are commanded by using the memory which corresponds to parallel IO of LEC   controller.

Refer to the manual of controller (LEC) for detail of the function and the operation of parallel IO.

●Writing step data method

(1)Write "0" in [OUT: 3].

(2)Write the motion profile (position, speed…) in [OUT: 4-19]

Refer to "7.1 Step data" of the operation manual of the controller(LEC).

(3)Write the step data number which is changed in [OUT: 2]. (range 0-63 of input)

(4)Write "1" in [OUT: 3]. Then, the data which is written in avobe (2) are sent to the controller(LEC).

(5)When the sending to the controller(LEC∗6) is completed, "Sending completed" [IN: 19.0] is changed from "0" to "1".

(6)Write "0" in [OUT: 3].

Then, "Sending completed " [IN: 19.0]changes from "1" to "0".

11. Memory map

11.1 Memory assignment

● Gateway unit --> Higher level device　[IN]

Corresponding ID	Address	Bit/Byte No.	Data name	Model/ Size	Value range	Unit	Corresponding mode
ID1	0	0	OUT0	bit	0,1	-	All modes
		1	OUT1	bit	0,1	-	
		2	OUT2	bit	0,1	-	
		3	OUT3	bit	0,1	-	
		4	OUT4	bit	0,1	-	
		5	OUT5	bit	0,1	-	
		6	-	bit	0	-	
		7	-	bit	0	-	
	1	0	BUSY	bit	0,1	-	
		1	SVRE	bit	0,1	-	
		2	SETON	bit	0,1	-	
		3	INP	bit	0,1	-	
		4	AREA	bit	0,1	-	
		5	WAREA	bit	0,1	-	
		6	ESTOP	bit	0,1	-	
		7	ALARM	bit	0,1	-	
	2	3	Current position	4	+/-2147483647	0.01mm	Numerical data input
	3	2					
	4	1					
	5	0					
	6	H	Current speed	2	0 to 65500	mm/s	
	7	L					
	8	H	Current Force	2	0 to 300	%	
	9	L					
	10	3	Target position	4	+/-2147483647	0.01mm	
	11	2					
	12	1					
	13	0					

・Please refer the operation manual of the step motor controller (LECP6) and the servo motor controller (LECA6) to check the detail of each signal.

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Corresponding ID	Address	Bit/Byte No.	Data name	Model/ Size	Value range	Unit	Corresponding mode
ID1	14	-	Alarm	4	0 to 255	-	Numerical data input
	15	-	Alarm		0 to 255	-	
	16	-	Alarm		0 to 255	-	
	17	-	Alarm		0 to 255	-	
	18	Controller IF status flag(ID=1)					All modes
	19						
ID2	20 to 39	Same as ID1					
ID3	40 to 59	Same as ID1					
ID4	60 to 79	Same as ID1					
ID5	80 to 99	Same as ID1					
ID6	100 to 119	Same as ID1					
ID7	120 to 139	Same as ID1					
ID8	140 to 159	Same as ID1					
ID9	160 to 179	Same as ID1					
ID10	180 to 199	Same as ID1					
ID11	200 to 219	Same as ID1					
ID12	220 to 239	Same as ID1					
-	240 to 249	Unused					
-	250 to 253	Gateway unit status flag					All modes
-	254,255	Unused					

● Higher level device --> Gateway unit [OUT]

Corresponding ID	Address	Bit/Byte No.	Data name	Model/ Size	Value range	Unit	Corresponding mode
ID1	0	0	IN0	bit	0,1	-	All mode
		1	IN1	bit	0,1	-	
		2	IN2	bit	0,1	-	
		3	IN3	bit	0,1	-	
		4	IN4	bit	0,1	-	
		5	IN5	bit	0,1	-	
		6	-	bit	0	-	
		7	-	bit	0	-	
	1	0	HOLD	bit	0,1	-	
		1	SVON	bit	0,1	-	
		2	DRIVE	bit	0,1	-	
		3	RESET	bit	0,1	-	
		4	SETUP	bit	0,1	-	
		5	-	bit	0	-	
		6	-	bit	0	-	
		7	-	bit	0	-	
	2	-	Start flag	1	0: no send 1: send	-	Numerical data input
			Step data No		0 to 63		Data writing
	3	-	Operation	1	1: Absolute 2: Relative 0: (Only data writing mode)	-	Numerical data input
	4	H	Speed	2	0 to 65500	mm/s	Data writing
	5	L					
	6	3	Position	4	+/-2147483647	0.01mm	
	7	2					
	8	1					
	9	0					
	10	H	Acceleration	2	0 to 65500	mm/s^2	
	11	L					
	12	H	Deceleration	2	0 to 65500	mm/s^2	
	13	L					

・Please refer the operation manual of the step motor controller (LECP6) and the servo motor controller (LECA6) to check the detail of each signal.

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Corresponding ID	Address	Bit/Byte No.	Data name	Model/ Size	Value range	Unit	Corresponding mode
ID1	14	-	Pushing force	1	0 to 30	10%	Numerical data input Data writing
	15	-	Trigger LV	1	0 to 30	10%	
	16	-	Pushing speed	1	0 to 255	mm/s	
	17	-	Positioning thrust	1	0 to 30	10%	
	18	H	In pos	2	0 to 65500	0.01mm	
	19	L					
ID2	20 to 39	Same as ID1					
ID3	40 to 59	Same as ID1					
ID4	60 to 79	Same as ID1					
ID5	80 to 99	Same as ID1					
ID6	100 to 119	Same as ID1					
ID7	120 to 139	Same as ID1					
ID8	140 to 159	Same as ID1					
ID9	160 to 179	Same as ID1					
ID10	180 to 199	Same as ID1					
ID11	200 to 219	Same as ID1					
ID12	220 to 239	Same as ID1					
-	240 to 249	Unused					
-	250 to 253	Gateway unit control flag					Step data input mode Numerical data input
-	254,255	Unused					

11.2 Controller IF flag（IN Data）

Controller IF flag is sent back to each ID ID=1 is shown below as an example

[ID=1]

bit I_Address	7	6	5	4	3	2	1	0
18	—	—	—	—	—	—	Abnormal station	Connect station
19	—	—	—	—	—	—	Sending	Sending completed

(1) Connect station [IN18.0]
　1(ON) appears when it is confirmed that the motor controller (LEC) is connected. 0 (OFF) appears when the connection is not confirmed.

(2) Abnormal station [IN18.1]
　0 (OFF) appears when the communication with the motor controller is normal at the connect station. 1 (ON) appears when the communication is not normal.

(3) Sending [IN: 19.0]
　1 (ON) appears while the operation command from the motor controller (LEC) is given and the sending of the operation data for the motor controller is completed at numerical data input mode. 0 (OFF) appears when the sending is completed.

(4) Sending completed [IN: 19.1]
　1 (ON) appears when the sending of the operation command data to the motor controller (LEC) is completed at the numerical data input mode. 1 (ON) appears while the sending of the operation command data to the motor controller when the operation command is (ID=1). 0 (OFF) appears when the sending is completed.

Start flag

Sending

Sending completed

Sending command
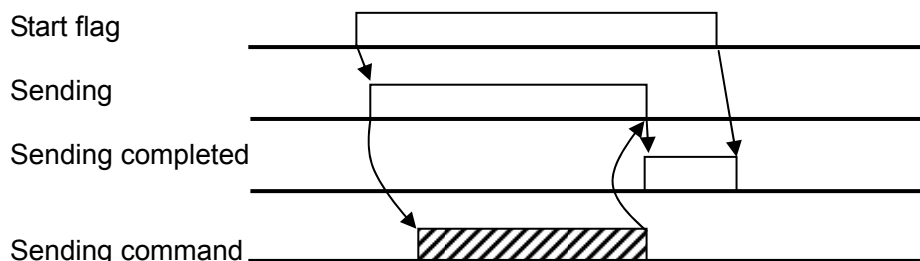
11.3 Gateway unit status flag（IN Data）
The flag to indicate the gateway communication status.

bit I_Address	7	6	5	4	3	2	1	0
250	Communicating	Initial	ALARM	READY	—	—	Return of the mode	
251	Return of the read numerical data							
252								
253						Return of the final station number		

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(1) Return of the mode
  Current mode is displayed

Address250		Mode name
bit1	Bit0	
0	0	Step data input mode
0	1	Numerical data input mode
1	0	Data writing mode

(2) READY
  1 (ON) appears when the gateway is activated.

(3) ALARM
  1 (ON) appears when one or more abnormal station are present, and the alarm is generated. 0 (OFF) appears when alarm is not generated.

(4) Initial
  0 (OFF) appears during processing the initial for check the connect station. 1 (ON) appears when the processing of the initial is completed.

(5) During communication
  1 (ON) appears when communication is made for one or more station. 0 (OFF) appears when not communicated.
  In one of following cases, communication is not made.
  CN2SW is ON.
  Stop［OUT：250.7］ is ON.
  All the connect stations become abnormal and the communication is stopped.

(6) Return of the read numerical data (Valid only in numerical data input mode)
  ON (1) appears in ID bit if numerical data can be read. OFF (0) appears when the data can not be read.
  The command to read numerical data is given by [OUT: 251.]{OUT: 252.}.

bit I_Address	7	6	5	4	3	2	1	0
251	ID8	ID7	ID6	ID5	ID4	ID3	ID2	ID1
252	-	-	-	-	ID12	ID11	ID10	ID9

(7) Return of the final station number
  Return the range of the ID of the controller to communication when the initial is processed. ID number is returned in binary digit.

bit ID	3	2	1	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
:			:	
11	1	0	1	1
12	1	1	0	0

11.4 Gateway unit control flag（OUT Data）

The flag to control the gateway communication status.

Address \ bit	7	6	5	4	3	2	1	0
250	Stop	-	Restart	Reset	-	-	Mode command	
251	ID8	ID7	ID6	ID5	ID4	ID3	ID2	ID1
252	-	-	-	-	ID12	ID11	ID10	ID9
253	-	-	-	-	Setting the final station number			

(1) Mode command
  Command the mode. Mode return[IN: 250.0.1.] is updated when the set mode becomes valid.

Address250		Mode name
bit1	Bit0	
0	0	Step data input mode
0	1	Numerical data input mode
1	0	Data writing mode

(2) Reset
  Communication to the abnormal station restart when 0 (OFF) is changed to 1 (ON). But, it is invalid when Stop[OUT: 250.7.] is 1 (ON) or CN2SW is ON.

(3) Restart
  Initial processing is executed again when 0 OFF) is changed to 1 (ON).   But, it is invalid when Stop [OUT: 250.7.] is 1 (ON) or CN2SW is ON.

(4) Stop
  All communications to the connected motor controller (LEC) are stopped when 0 (OFF) is changed to 1 (ON).   Communication restart by chancing to 0 (OFF) from 1 (ON).

(5) Setting numerical data (Valid only in direct setting mode)
  ON (1) appears in ID bit if numerical data can be read. OFF (0) appears when the data can not be read.

Address \ bit	7	6	5	4	3	2	1	0
251	ID8	ID7	ID6	ID5	ID4	ID3	ID2	ID1
252	-	-	-	-	ID12	ID11	ID10	ID9

(6) Return of the final station number
  Indicates the range of the ID of the controller(LEC) to communication when the initial is processed. ID number is set in binary digit.
  Input range is from 1 to 12. If the set value is lower than 0 or larger than 12, 12 is set.

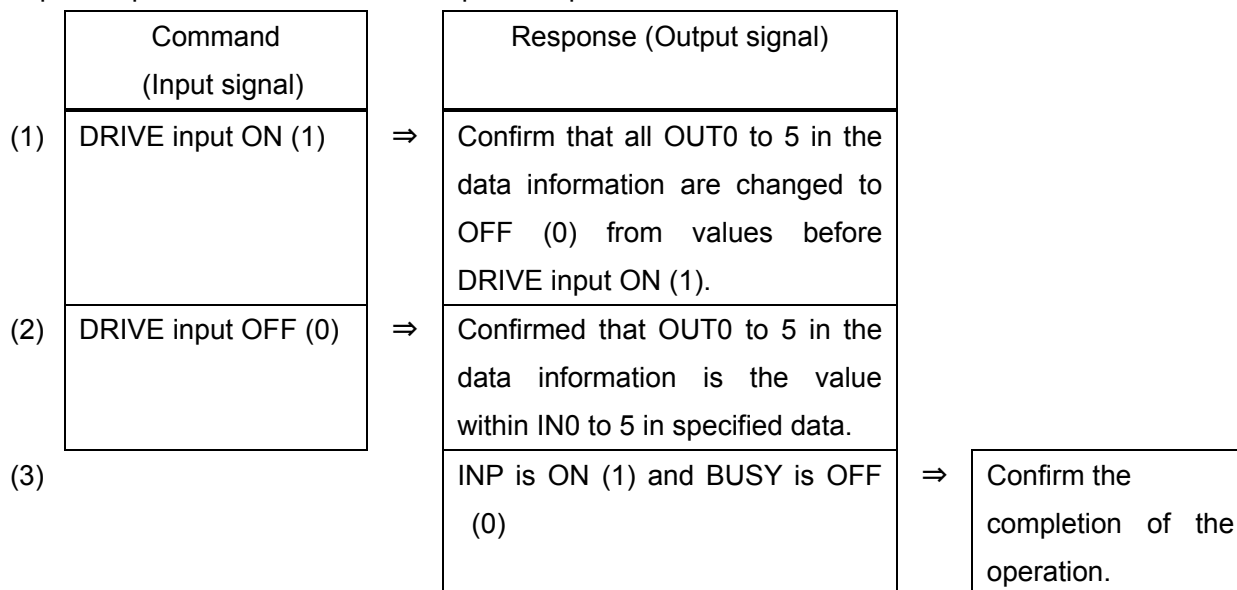| ID \ bit	3	2	1	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
:		:		
11	1	0	1	1
12	1	1	0	0

12. Precautions for controlling the controller (LEC)

12. 1 Communication delay between the gateway unit unit and the controller(LEC)

There is communication delay between the gateway unit and the controller (LEC). Please refer to the procedure below for the control procedure taking the delay into consideration

For details of each signal, please refer to the operation manual of each motor controller (LEC) to be connected.

●Example of operation indication with step data input mode

	Command (Input signal)		Response (Output signal)		
(1)	DRIVE input ON (1)	⇒	Confirm that all OUT0 to 5 in the data information are changed to OFF (0) from values before DRIVE input ON (1).		
(2)	DRIVE input OFF (0)	⇒	Confirmed that OUT0 to 5 in the data information is the value within IN0 to 5 in specified data.		
(3)			INP is ON (1) and BUSY is OFF (0)	⇒	Confirm the completion of the operation.

Cautions for the above example

When the operation is ordered right after the operation shown below, the response of DRIVE above are not recognized because OUT0 to 5 in the data information are all OFF (0) before turning ON (1) the DRIVE input. In this case, take measures against the communication delay by using the timer.

【Condition in which OUT0 to 5 in the data information is all OFF】
  - Supply of power
  - During and the right after the returning to origin position.
  - RESET input ON
  - After DRIVE input OFF(0) after commanding to start step data No.0

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12. 2. Guideline of the Response delay between the Gateway and the Motor Control Unit

The gateway unit communicates with the motor controller (LEC) to read the controller status and commands the controller. The time for the communication causes delay in the response.
Please take this into consideration when selecting the PLC program.

Communication   between   the
gateway unit and the controller

PLC		Gateway Unit		Motor controller （LEC）
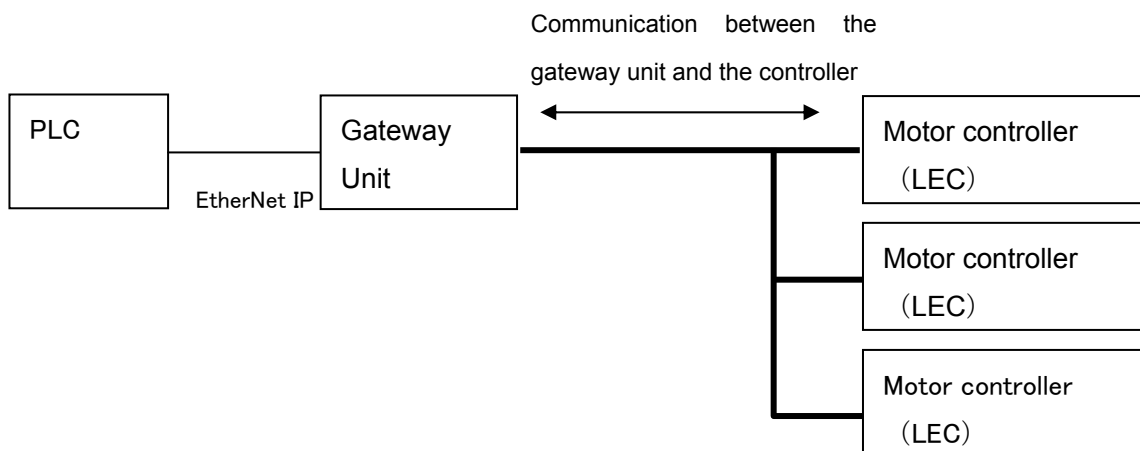
Communication to read the motor controller status

The gateway unit communicates one by one in order. The communication time is approximately 30ms per unit. When reading of numerical data is validated during Numerical data input mode or data rewrite mode, it takes another 30ms for communicating with valid controller (LEC).

Communication for commanding the motor controller

When rewrite of the remote I/O and the register is commanded by Ethernet IP master, it takes 30ms for communicating with the target controller (LEC).

Response delay depends on the number of the connected motor controllers (LEC) and rewrite frequency.

Ex. 1) Response time guideline when four controllers are connected in step data input mode.
   4 pcs. × approx. 30ms ＝ Approx. 120ms ＋ α
   [α：Communication time to rewrite the remote I/O and the register]

Ex. 2) Response time guideline when twelve controllers are connected in step data input mode.
   12 pcs. × approx. 30ms ＝ Approx. 360ms ＋ α
   [α：Communication time to rewrite the remote I/O and the register]

Ex. 3) Response time guideline when 12 controllers are connected in numerical data input mode (6 controllers are valid for reading numerical data).
   12 pcs. × approx. 30ms + 6pcs. x approx. 30ms ＝ Approx. 540ms ＋ α
   [α：Communication time to rewrite the remote I/O and the register]

※This response time does not include the response time of Ethernet IP and motor controller (LEC), and processing time of PLC.

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13. Wiring of cables/Common precautions

⚠**Warning**

1. **Adjusting, mounting or wiring change should never be done before shutting off the power supply to the product.**

   Electrical shock, malfunction and damaged can result.

2. **Never disassemble the cable. Use only specified cables.**

3. **Never connect or disconnect the cable or connector with power on.**

⚠**Caution**

1. **Wire the connector securely. Do not apply any voltage to the terminals other than those specified in the product Manual.**

2. **Wire the connector securely.**

   Check for correct connector wiring and polarity.

3. **Take appropriate measures against noise.**

   Noise in a signal line may cause malfunction. As a countermeasure, separate high voltage and low voltage cables, and shorten wiring lengths, etc.

4. **Do not route wires and cables together with power or high voltage cables.**

   The product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line. Route the wires of the product separately from power or high voltage cables.

5. **Take care that actuator movement does not catch cables.**

6. **Operate with cables secured. Avoid bending cables at sharp angles where they enter the product.**

7. **Avoid twisting, folding, rotating or applying an external force to the cable.**

   Risk of electric shock, wire break, contact failure and lost of control for the product can happen.

8. **Fix the motor cable protruding from the product in place before using.**

   The motor and lock cables are not robotic type cables and can be damaged when moved.Therefore do not place it in a flexible moving tube.

9. **The cable connecting the actuator and controller (LEC) is superior in bending resistance, but should not be placed into a flexible moving tube with a radius smaller than the specified value.**

   (Min. 50 mm)
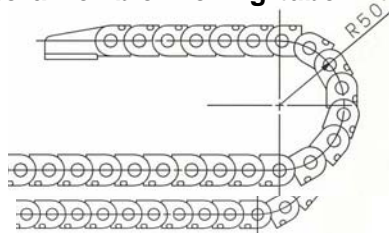
10. **Confirm proper wiring of the product.**

    Poor insulation (interference with other circuits, poor insulation between terminals and etc.) can apply excessive voltage or current to the product causing damage.

11. **The Speed / pushing force may vary, depending on the cable length, load and mounting conditions etc..**

    If the cable length exceeds 5m, the speed / pushing force will be reduced by a maximum of 10% per 5m. (If cable length is 15m: Maximum 20% reduction.)

[Transportation]

⚠**Caution**

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

14. Electric actuators/Common precautions

14.1 Design and selection

⚠️**Warning**

1. **Be sure to read the Operation Manual.**

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

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

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

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

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

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

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

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

5. **Consider a possible loss of power source.**

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

6. **Consider behavior of emergency stop of whole system.**

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

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

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

8. **Disassembly and modification prohibited**

   Do not modify or reconstruct (including additional machining) the product. An injury or failure can result.

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

   The stop signal, "EMG" of controller and the stop switch on the teaching box are for decelerating and stopping the actuator.

   Design the system with an emergency stop circuit which is applied relevant safety standard separately.

10. **When using it for vertical application, it is necessary to build in a safety device.**

    The rod may fall due to the weight of work. The safety device should not interfere with normal operation of the machine.

⚠️**Caution**

1. **Operate within the limits of the maximum usable stroke.**

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

2. **When the product repeatedly cycles with partial strokes, operate it at a full stroke at least once a day or every 1000 strokes.**

   Otherwise, lubrication can run out.

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

   The product can be damaged. Each component that includes motor is made with accurate tolerance. So even slightly deformed or miss-alignment of component may lead operation failure of the product.

4. **Refer to a common auto switch /matter (Best Pneumatics No 2) when an auto switch is built in and used.**

5. **Return to origin cannot return while operating.**

   It cannot be done during positioning operation, pushing operation and pushing.

6. **When conformity to UL is required, the electric actuator and controller should be used with a UL1310 Class 2 power supply.**

14.2 Mounting

⚠**Warning**

1. **Install and operate the product only after reading the Operation Manual carefully and understanding its contents. Keep the manual in a safe place future reference.**

2. **Observe the tightening torque for screws.**

   Tighten the screws to the recommended torque for mounting the product.

3. **Do not make any alterations to this product.**

   Alterations made to this product may lead to a loss of durability and damage to the product, which can lead to human injury and damage to other equipment and machinery.

4. **When using external guide, the guide axis should be parallel to the actuator axis.**

   There will be damage/excessive wear on the lead screw if the external guide is not parallel.

5. **When an external guide is used, connect the moving parts of the product and the load in such a way that there is no interference at any point within the stroke.**

   Do not scratch or dent the sliding parts of the product tube or piston rod etc., by striking or grasping them with other objects. Components are manufactured to precise tolerances, so that even a slight deformation may cause faulty operation.

6. **Prevent the seizure of rotating parts.**

   Prevent the seizure of rotating parts (pins, etc.) by applying grease.

7. **Do not use the product until you verify that the equipment can be operated properly.**

   After mounting or repair, connect the power supply to the product and perform appropriate functional inspections to check it is mounted properly.

8. **At the overhang mounted impeller fixation**

   There is a possibility that the power at the bending moment damages the actuator when moving it at high speed.

   The support metal fittings that suppress the vibration of the main body of the actuator are installed.

   Lower and use speed for the state that the actuator doesn't vibrate.

9. **When attaching work piece, do not apply strong impact or large moment.**

   If an external force over the allowable moment is applied, it may cause looseness in the guide unit, an increase in sliding resistance or other problems.

10. **Maintenance space.**

    Allow sufficient space for maintenance and inspection.

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14.3 Handling

⚠Warning

1. **Do not touch the motor while in operation.**
   The surface temperature of the motor can increase to approx. 90oC to 100oC due to operating conditions. Energizing alone may also cause this temperature increase. As it may cause burns, do not touch the motor when in operation.

2. **If abnormal heating, smoking or fire, etc., occurs in the product, immediately shut off the power supply.**

3. **Immediately stop operation if abnormal operation noise or vibration occurs.**
   If abnormal operation noise or vibration occurs, the product may have been mounted incorrectly. Unless operation of the product is stopped for inspection, the product can be seriously damaged.

4. **Never touch the rotating part of the motor or moving part of the actuator while in operation.**

5. **When installing, adjusting, inspecting or performing maintenance on the product, controller and related equipment, be sure to shut off the power supply to each of them. Then, lock it so that no one other than the person working can turn the power on, or implement measures such as a safety plug.**

6. **In the case of the actuator that has a servo motor (24VDC), the "motor phase detection step" is done by inputting the servo on signal just after the controller power is turned on. The "motor phase detection step" operates the table/rod to the maximum distance of the lead screw. (The motor rotates in the reverse direction if the table hits an obstacle such as the end stop damper.) Take the "motor phase detection step" into consideration for the installation and operation of this actuator.**

⚠Caution

1. **Keep the controller and product combined as delivered for use.**
   The product is set in parameters for shipment. If it is combined with a different parameter, failure can result.

2. **Check the product for the following points before operation.**
   a) Damage to electric driving line and signal lines
   b) Looseness of the connector to each power line and signal line
   c) Looseness of the actuator/cylinder and controller/driver mounting
   d) Abnormal operation
   e) Emergency stop of the total system

3. **When more than one person is performing work, decide on the procedures, signals, measures and resolution for abnormal conditions before beginning the work. Also, designate a person to supervise work other than those performing work.**

4. **Actual speed of the product will be changed by the workload.**
   Before selecting a product, check the catalog for the instructions regarding selection and specifications.

5. **Do not apply a load, impact or resistance in addition to a transferred load during return to origin.**
   In the case of the return to origin by pushing force, additional force will cause displacement of the origin position since it is based on detected motor torque.

6. **Do not remove the name plate.**

7. **Operation test should be done by low speed. Start operation by predefined speed after confirming there is no trouble.**

[Earth]

⚠Warning

1. **Please give the earth of the actuator.**

2. **Please make it to the earth of the exclusive use. The earth construction is D seed.**
   (Below earth resistance 100Ω)

3. **Please shorten the distance until the actuator and earth.**

[Unpackaging]

⚠️**Caution**

1. **Check the received product is as ordered.**

   If a different product is installed from the one ordered, injury or damage can result.

14.4. Operating environment

⚠️**Warning**

1. **Avoid use in the following environments.**

   a. Locations where a large amount of dusts and cutting chips are airborne.

   b. Locations where the ambient temperature is outside the range of the temperature specification (refer to specifications).

   c. Locations where the ambient humidity is outside the range of the humidity specification (refer to specifications).

   d. Locations where corrosive gas, flammable gas, sea water, water and steam are present.

   e. Locations where strong magnetic or electric fields are generated.

   f. Locations where direct vibration or impact is applied to the product.

   g. Areas that are dusty, or are exposed to splashes of water and oil drops.

   h. Areas exposed to direct sunlight (ultraviolet ray).

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

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

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

   Play or increased sliding resistance can result.

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

5. **Shield the valve from radiated heat generated by nearby heat sources.**

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

6. **Grease oil can be decreased due to external environment and operating conditions, and it deteriorates lubrication performance to shorten the life of the product.**

[Storage]

⚠️**Warning**

1. **Do not store the product in a place in direct contact with rain or water drops or is exposed to harmful gas or liquid.**

2. **Store in an area that is shaded from direct sunlight and has a temperature and humidity within the specified range (-10oC to 60oC and 35 to 85% No condensation or freezing.**

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

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14.5 Maintenance

⚠️**Warning**

1. **Do not disassemble or repair the product.**
   Fire or electric shock can result.

2. **Before modifying or checking the wiring, the voltage should be checked with a tester 5 minutes after the power supply is turned off.**
   Electrical shock can result.

⚠️**Caution**

1. **Maintenance should be performed according to the procedure indicated in the Operating Manual.**
   Incorrect handling can cause injury, damage or malfunction of equipment and machinery.

2. **Removal of product.**
   When equipment is serviced, first confirm that measures are in place to prevent dropping of work pieces and run-away of equipment, etc, and then cut the power supply to the system. When machinery is restarted, check that operation is normal with actuators in the proper positions.

[Lubrication]

⚠️**Caution**

1. **The product has been lubricated for life at manufacturer, and does not require lubrication in service.**
   Contact SMC if lubrication will be applied.

14.6 Precautions for actuator with lock

1. **Do not use the lock as a safety lock or a control that requires a locking force.**
   The lock used for the product with a lock is designed to prevent dropping of work piece.

2. **For vertical mounting, use the product with a lock.**
   If the product is not equipped with a lock, the product will move and drop the work piece when the power is removed.

3. **"Measures against drops" means preventing a work piece from dropping due to its weight when the product operation is stopped and the power supply is turned off.**

4. **Do not apply an impact load or strong vibration while the lock is activated.**
   If an external impact load or strong vibration is applied to the product, the lock will lose it's holding force and damage to the sliding part of the lock or reduced lifetime can result. The same situations will happen when the lock slips due to a force over the thurst of the product, as this accelerates the wear to the lock.

5. **Do not apply liquid or oil and grease to the lock or its surrounding.**
   When liquid or oil and grease is applied to the sliding part of the lock, its holding force will reduce significantly.

6. **Take measures against drops and check that safety is assured before mounting, adjustment and inspection of the product.**
   If the lock is released with the product mounted vertically, a work piece can drop due to its weight.

15. Gateway unit and its peripheral devices /Specific product precautions

15.1 Design and selection

⚠**Warning**

1. **Be sure to apply the specified voltage.**

    Otherwise, a malfunction and breakage of the gateway unit may be caused.
    If the applied voltage is lower than the specified, it is possible that the load cannot be moved due to an internal voltage drop. Please check the operating voltage before use.

2. **Do not operate beyond the specifications.**

    It may cause a fire, malfunction or actuator damage can result. Please check the specifications before use.

3. **Install an emergency stop circuit.**

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

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

5. **If a fire or danger against the personnel is expected due to an abnormal heat generation, ignition, smoking of the product, etc., cut off the power supply for this product and the system immediately.**

6. **Use UL1310 compliant Class 2 power supply unit for direct current.**

15.2 Handling

⚠**Warning**

1. **The inside of the gateway unit and its connector should not be touched.**
    It may cause an electric shock or damage to the controller.

2. **Do not perform the operation or setting of this equipment with wet hands.**
    It may cause an electric shock.

3. **Product with damage or the one lacking of any components should not be used.**
    It may cause an electric shock, fire, or injury.

4. **Use only the specified combination between the controller and electric actuator.**
    It may cause damage to the controller or the actuator.

5. **Be careful not to be caught or hit by the workpiece while the actuator is moving.**
    It may cause an injury.

6. **Do not connect the power supply or power on the product before confirming the area where the work moves is safe.**
    The movement of the work may cause accident.

7. **Do not touch the product when it is energized and for some time after power has been disconnected, as it is very hot.**
    It may lead to a burn due to the high temperature.

8. **Check the voltage using a tester for more than 5 minute after power-off in case of installation, wiring and maintenance.**
    There is a possibility of getting electric shock, fire and injury.

9. **Do not use in an area where dust, powder dust, water or oil is in the air.**
   It will cause failure or malfunction.
10. **Do not use in an area where a magnetic field is generated.**
    It will cause failure or malfunction.
11. **Do not install in the environment of flammable gas, corrosive gas and explosive gas.**
    It could lead to fire, explosion and corrosion.
12. **Radiant heat from strong heat supplys such as a furnace, direct sunlight, etc. should not be applied to the product.**
    It will cause failure of the gateway unit or its peripheral devices.
13. **Do not use the product in an environment subject to a temperature cycle.**
    It will cause failure of the gateway unit or its peripheral devices.
14. **Do not use in a place where surges are generated.**
    When there are units that generate a large amount of surge around the product (e.g., solenoid type lifters, high frequency induction furnaces, motors, etc.), this may cause deterioration or damage to the product's' internal circuit. Avoid supplys of surge generation and crossed lines.
15. **The product is not immune to lightening strikes. Take measures against lightening strikes in the system.**
16. **Do not install this product in an environment under the effect of vibrations and impacts.**
    It will cause failure or malfunction.
17. **If this product is used with a relay or solenoid valve, they should be the surge absorbing element built-in type.**

15.3 Mounting

⚠**Warning**

1. **The** gateway unit **and its peripheral devices should be installed on a fire-proof material.**
   A direct installation on or near a flammable material may cause fire.
2. **Do not install this product in a place subject to vibrations and impacts.**
   It may cause an electric shock, fire, or injury.
3. **Take measure so that the operating temperature of this** gateway unit **and its peripheral devices are within the range of the specifications.   Also, this controller should be installed with 50mm or larger spaces between each side of it and the other structures or components.**
   It may cause a malfunction of the controller and its peripheral devices and a fire.
4. **Do not mount this** gateway unit **and its peripheral devices together with a large-sized electromagnetic contactor or no-fuse breaker, which generates vibration, on the same panel. Mount them on different panels, or keep the controller and its peripheral devices away from such a vibration supply.**
5. **This** gateway unit **and its peripheral devices should be installed on a flat surface.**
   If the mounting surface is distorted or not flat, an unacceptable force may be added to the housing, etc. to cause troubles.

15.4 Electrical wiring

1. **Do not apply any excessive force to cables by repeated bending, tensioning or placing a heavy object on the cables.**
   It may cause an electric shock, fire, or breaking of wire.
2. **Connect wires and cables correctly.**
   Incorrect wiring could break he gateway unit or its peripheral devices depending on the seriousness.
3. **Do not connect wires while the power is supplied.**
   It can break the gateway unit or its peripheral devices could be damaged to cause a malfunction.
4. **Do not carry this product by holding its cables.**
   It may cause an injury or damage to the product.
5. **Do not connect power cable or high-voltage cable in the same wiring route as the unit.**
   Te wires to the gateway unit or its peripheral devices can be interrupted with noise or induced surge voltage from power lines or high-voltage lines and malfunction could be caused.
   Separate the wiring of the gateway unit and its peripheral device from that of power line and high voltage line.
6. **Verify the insulation of wiring.**
   Insulation failure (interference with other circuit, poor insulation between terminals and etc.) could introduce excessive voltage or current to the gateway unit or its peripheral devices and damage them.

15.5 Power supply
⚠**Caution**
1. **Use a power supply that has low noise between lines and between power and ground.**
   In cases where noise is high, an isolation transformer should be used.
2. **To prevent surges from lightning, an appropriate measure should be taken. Ground the surge absorber for lightning separately from the grounding of the** gateway unit **and its peripheral devices.**

15.6. Grounding

1. **Be sure to carry out grounding in order to ensure the noise tolerance of the** gateway unit**.**
   It may cause an electric shock or fire.
2. **Dedicated grounding should be used.**
   Grounding should be to a D-class ground (Ground resistance of 100 Ω or less.)
3. **Grounding should be performed near the unit as much as possible to shorten the grounding distance.**
4. **In the unlikely event that malfunction is caused by the ground, it may be disconnected.**

15.7 Maintenace

1. **Perform a maintenance check periodically**

    Confirm wiring and screws are not loose.

    Loose screws or wires may cause unintentional malfunction.

2. **Conduct an appropriate functional inspection after completing the maintenance.**

    In case of any abnormities (in the case that the actuator does no move, etc.), stop the operation of the system. Otherwise, an unexpected malfunction may occur and it will become impossible to secure the safety.

3. **Do not disassemble, modify or repair this** gateway unit **and the peripheral equipment.**

4. **Do not put anything conductive or flammable inside of this** gateway unit**.**

    It may cause a fire and explosion.

5. **Do not conduct an insulation resistance test and withstand voltage test on this product.**

6. **Ensure sufficient space for maintenance activities. Provide space required for maintenance.**

    Design the system that allows required space for maintenance.

7. **Do not used solvents such as benzene, thinner etc. to clean the gateway unit.**

    They could damage the surface of the body and erase the markings on the body.

    Use a soft cloth to remove stains.

    For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.