Doc. no. LEC-OM04505

Operation Manual

PRODUCT NAME

Step Motor Driver (Pulse input type)

MODEL / Series / Product Number

LECPA Series

SMC Corporation

Contents

1. Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage.
These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.”
They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC), 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: General rules for pneumatic equipment.
JIS B 8361: General rules for hydraulic equipment.
JIS B 9960-1: Safety of machinery – Electrical equipment for 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 including our products must be performed by an operator who is appropriately trained and experienced.

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

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

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.

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

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

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

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

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

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

LECPA Series/ Driver
1. Safety Instructions

⚠ Caution

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

Limited warranty and Disclaimer/Compliance Requirements

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

Limited warranty and Disclaimer

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.*3) Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

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

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

***3) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

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).

2. Product Outline

2.1 Product features

The followings are the main functions of this driver:

■ Actuator control

Positioning according to the pulse signal is available by servo control.

■ Separated power supply

Power supply input is separated into the motor power supply and control power supply. Even if the power supply for the motor is turned off, the information of the encoder position is not lost while the control power supply is on, and serial communication is available.

■ Return to origin

Return the actuator to the home position by sending a single signal to a dedicated terminal.

■ Alarm detection function

Automatically detect the abnormal conditions and output the appropriate alarm signal via the serial interface and parallel I/O. The alarm information (up to the last 8 alarms) will be recorded into the memory in the driver.

■ Data input method

It is possible to perform a parameter setup, status monitoring, trial run and alarm reset via the serial communication with a PC installed with the controller setting software or the teaching box.

■ Operation with specified thrust

The holding force and pushing force of the actuator can be controlled.

⚠ Caution

1. The operation with specified thrust is available for driver version 1.60 or more.
   Please refer to the **"3.2 Parts description (page 13)"** for the confirm method of the driver version.
2. Please keep this manual safe for future use. It will be necessary to refer to this manual along with the teaching box and the setting software manuals at installation and faultfinding.

2.2 How to Order

The part number construction for this product is as follows:

L E C P A N □ □ — □

Compatible motor

P	Step motor (Servo / 24VDC)

Controller type

A	Pulse input type

Parallel I/O type

N	NPN type
P	PNPtype

I/O cable length

Nil	None
1	1.5m
3	3m*
5	5m*

*Available only when differential pulse input.
Only 1.5m cable is available for open collector.

DIN rail

Nil	Not mountable.
D	Mountable

Actuator part number

("LE" to "Stroke" of the actuator part number)
Example: If "LEFS16A-300" is the complete actuator part number, "LEFS16A-300" will come here.

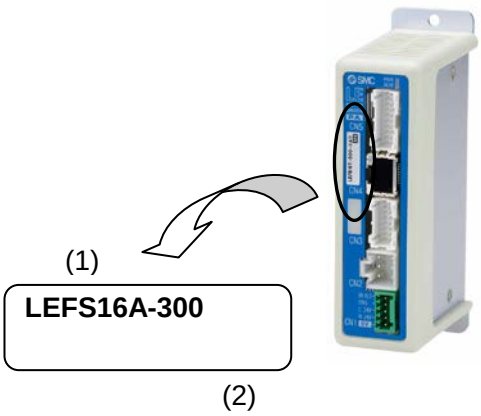
⚠ Caution

The driver and actuator are factory set Confirm the combination of the driver and the actuator is correct.

<Check the following before use>

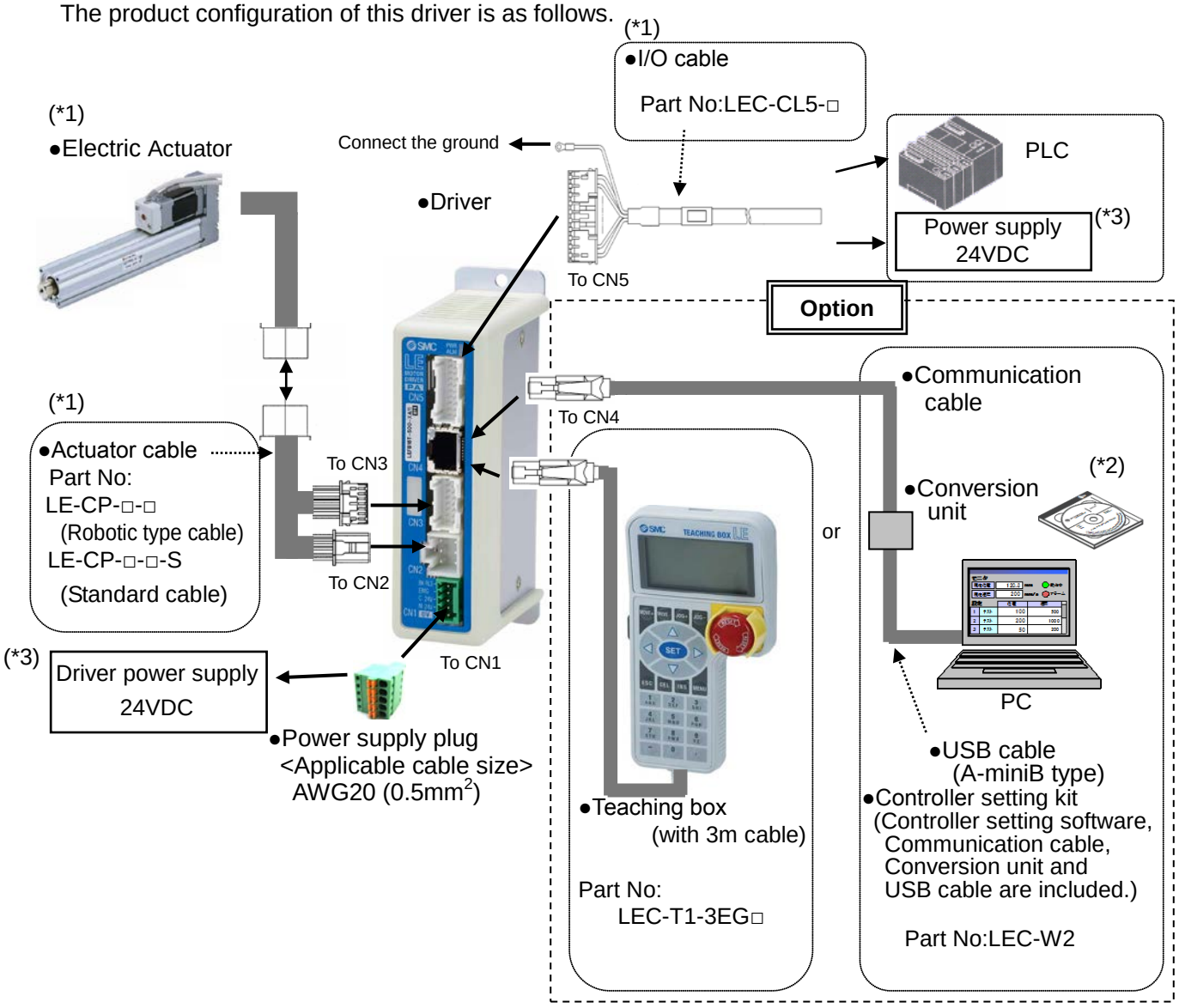
(1) Check the actuator label for model number.
This matches the driver.

(2) Check parallel I/O configuration matches (NPN or PNP).



2.3 Product configuration

The product configuration of this driver is as follows.



(*1) These items are included when it is selected by ordering code.

(*2) When the controller setting software/version is earlier than V1.2, please upgrade the controller setting software. Upgrade software be able to download on SMC website.
http://www.smcworld.com/

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

⚠ Warning

Check all the connections as shown in section 4 and diagrams shown on page 17. Pay special attention to details in section 14 on page 64.
Please connect to the personal computer communication cable with the USB port cable via the conversion unit.

Do not connect the teaching box directly to the personal computer.
Do not use LAN cable to connect to the driver, it will cause damage to the personal computer.

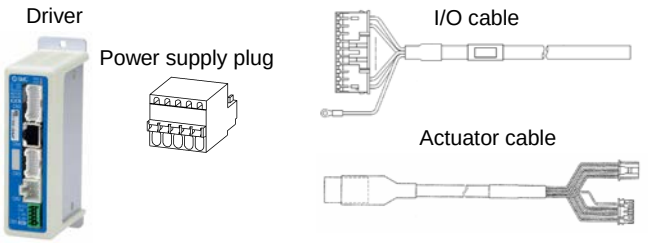
2.4 Start up Procedures

Before using this driver, please connect cables and startup using the following procedures.

(1) Confirmation of the package content

When you open the product package for the first time; please check the package contents to confirm the driver, label indication, quantity of accessories, etc. are correct.

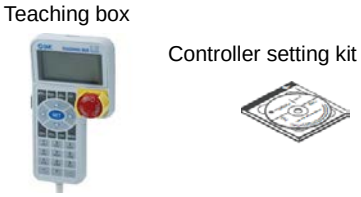
Item	Quantity
Driver (LECPA□□□-□)	1 unit
Power supply plug	1 piece
I/O cable(*) (LEC-CL5-□)	1 piece
Actuator(*)	1 unit
Actuator cable(*) (LE-CP-□-□-□)	1 piece



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

Option

Teaching box (part number: LEC-T1-3□G□)
Controller setting kit (part number: LEC-W2)
[Controller setting software, communication cable, USB cable and conversion unit are included.]



* In case of any shortages or damaged parts, please contact the selling office.

(2) Installation

Please refer to the **"3.4 How to install (page 15)"**.

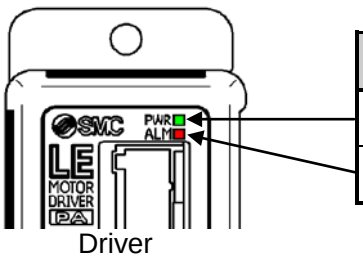
(3) Wiring and connection

Connect cables, etc. to the connector (CN1 to CN5) of the driver.

Please refer to the **"4. External Wiring Diagram (page 17)"** for the wiring of the connectors.

(4) Power ON alarm (error)

Ensure the stop is not activated and then supply 24VDC power.



Driver

LED color	Status	Function
Green	Normal	POWER
Red	Problems	ALARM

If the LED [PWR] lights in green, the driver is in the normal condition.

However, if the LED [ALM] lights in red, the driver is in the alarm (error) condition.

⚠ Caution

In case of alarm (error) condition:

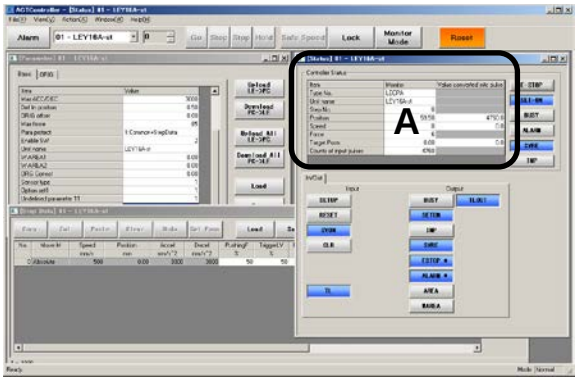
Connect a PC or the teaching box to the CN4 serial I/O connector and check the details of the alarm. Then, remove the cause of the error referring to the **"13. Alarm Detection (page 58)"**.

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

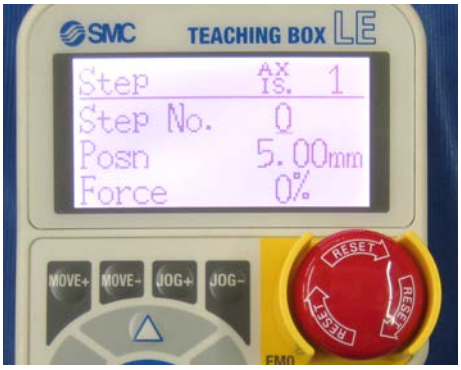
(5) Operation pattern setting

Setup the operation pattern (step data, basic parameter and return to origin parameters) by using a PC (with the controller setting software) or the teaching box. **Specifically, be sure to configure the parameter"option set 1" from the basic parameters section.** Refer to **"7. Setting Data Entry (page 31)"** for details.

■ PC (Normal mode)

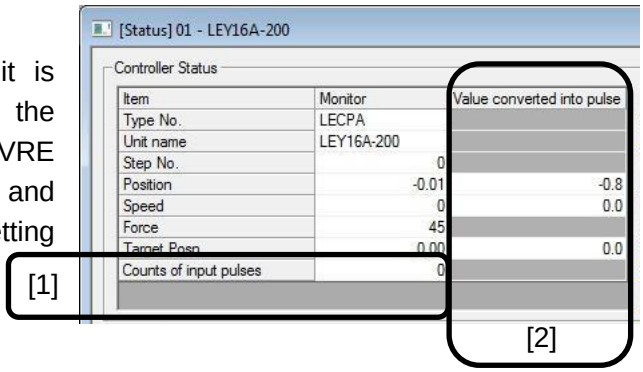


■ Teaching box



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

A: Status window



[1] Counts of input pulses

The pulse number input from the positioning unit is displayed. However, please take care that under the situation that the driver doesn't count the pulse (The SVRE power output: turning off, the return to origin inside, and CLR input: turn on, Test in operation by controller setting software/teaching box), this value is changed.

[2] Value converted into pulse

The values about the speed and the target position, current position converted into the pulse number are displayed. Conversion formula is shown in below.

Position [Pulse]

= Position [mm] / Actuator lead [mm/rotation] x 800 [Pulse/rotation] x electronic gear (denominator) / electronic gear (numerator)

Speed [Pulse/sec]

= Speed [mm/s] / Actuator lead [mm/rotation] x 800 [Pulse/rotation] x electronic gear (denominator) / electronic gear (numerator)

* Please refer to **"7.2 Basic parameter (page 33)"** for electronic gear (denominator, numerator).

(6) Trial run (actuator adjustment)

After confirming that an unexpected operation can be stopped externally, check the operation by inputting the pulse signal from the positioning unit.

3. Product Specifications

3.1 Basic specifications

The basic specifications of this driver are as follows:

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Compatible motor</td><td>Step Motor (Servo / 24VDC)</td></tr>
<tr><td>Compatible encoder</td><td>Incremental A/B phase(800 pluse/rotation)</td></tr>
<tr><td>Power supply (*1) (*3)</td><td>Power voltage:24VDC +/-10%
Max.current consumption: 3A(Peak 5A) (*2)
(for both of motor drive power,control power,stop,lock brake release)</td></tr>
<tr><td>Parallel input</td><td>5 inputs (photo-coupler isolation)
Except pulse signal input terminal and COM terminal</td></tr>
<tr><td>Parallel output</td><td>Output 9 points (Photo coupler insulation)</td></tr>
<tr><td>Pulse signal input</td><td>
<table>
<tr><th></th><th>Open collector input</th><th>Differential input</th></tr>
<tr><td>Maximum frequency</td><td>60kpps</td><td>200kpps</td></tr>
<tr><td>Input type</td><td>1 pulse mode
(Direction and pulse input)
2 pulse mode
(Pulse for each direction)</td><td>1 pulse mode
(Direction and pulse input)
2 pulse mode
(Pulse for each direction)</td></tr>
</table>
</td></tr>
<tr><td>Serial communication</td><td>Conforming to RS485</td></tr>
<tr><td>Memory</td><td>EEPROM</td></tr>
<tr><td>LED indicator</td><td>2 of LED’s (green and red)</td></tr>
<tr><td>Lock control</td><td>Forced-lock release terminal</td></tr>
<tr><td>Cable length</td><td>I/O cable:1.5m or less (Open collector input)
5m or less (Differential input)
Actuator cable: 20m or less</td></tr>
<tr><td>Cooling system</td><td>Natural air cooling</td></tr>
<tr><td>Operating temperature range</td><td>0– 40^{o}C(No freezing)</td></tr>
<tr><td>Operating humidity range</td><td>90%RH or less (No condensation)</td></tr>
<tr><td>Storage temperature range</td><td>-10 – 60^{o}C (No freezing)</td></tr>
<tr><td>Storage humidity range</td><td>90%RH or less (No condensation)</td></tr>
<tr><td>Insulation resistance</td><td>Between external terminal and case
50MΩ (500VDC)</td></tr>
<tr><td>Mass</td><td>120g(screw mount type)
140g(DIN rail mount type)</td></tr>
</table>

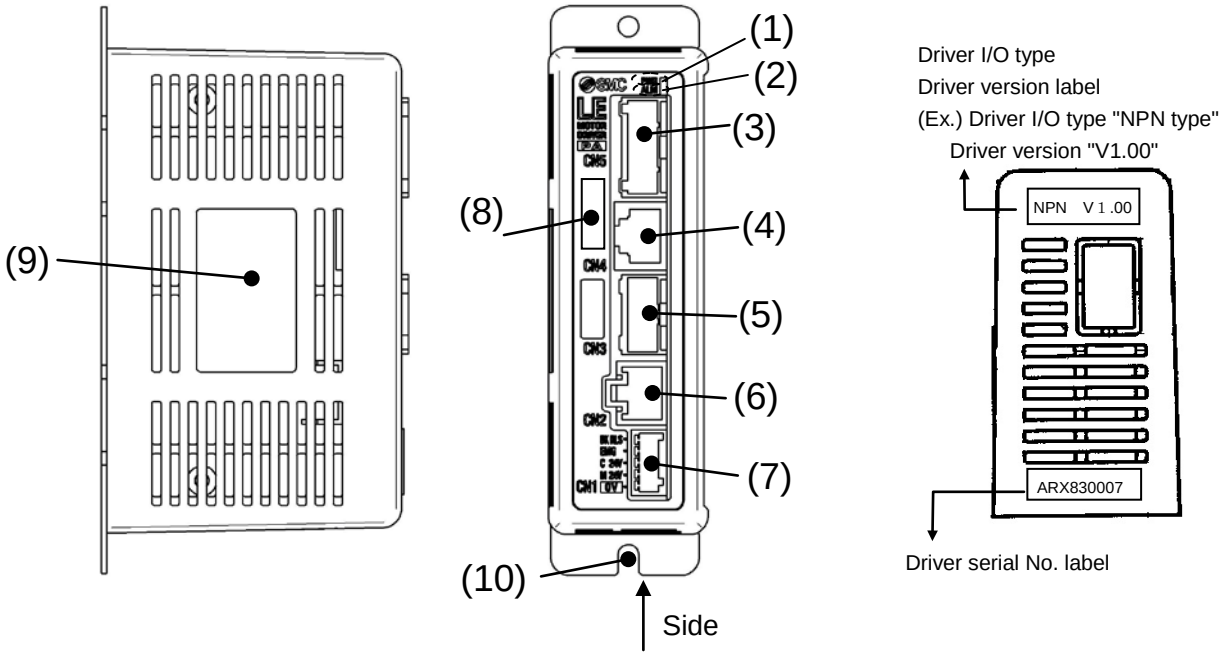
(*1) The driver power supply do not use the power supply of “rush-current restraining type”.

(*2) The power consumption changes depending on the actuator model.
Please refer to the specifications of actuator for more details.

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

3.2 Parts description

The detailed descriptions of each part are as follows.

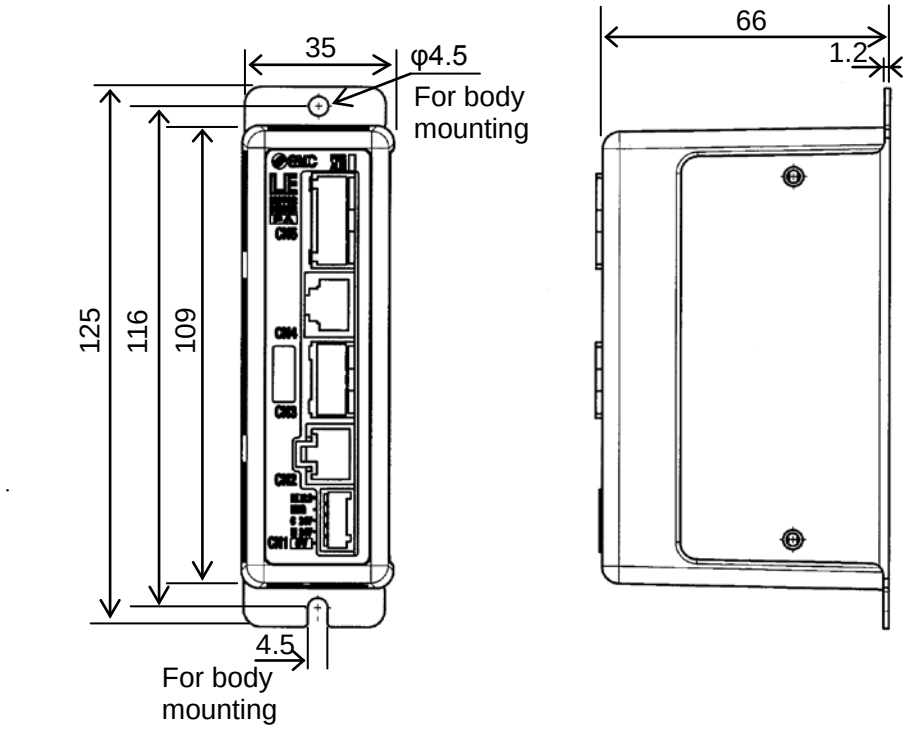


No.	Label	Name	Description
1	PWR	Power LED (green)	Power ON/No alarm: Green light Data (step data, parameter) writing /green light flashing **⚠ caution** Do not turn off the driver input power or remove the cable while data is being written (green light flashing). *Data (step data, parameter) may not be written correctly.
2	ALM	Power LED (red)	Power ON/Alarm: Red light
3	CN5	Parallel I/O Connector (20pins)	Used to connect PLC, etc. with the I/O cable.
4	CN4	Serial I/O Connector (8 pins)	Used to connect the teaching box, PC, etc.
5	CN3	Encoder connector (16 pins)	Used to connect the actuator cable.
6	CN2	Motor power connector (6 pins)	
7	CN1	Power connector (5 pins)	Used to connect the driver power supply (24VDC) with the power supply plug. Common power(-),Motor power (+),Control power(+),Stop signal(+),Lock release(+)
8	-	Compatible actuator label	The label indicating the applicable actuator model. It also indicates the type of the parallel I/O (PNP/NPN).
9	-	Driver label	The label indicating the part number of the driver.
10	-	FG	Functional ground (When the driver is mounted, tighten screws and connect the grounding cable.)

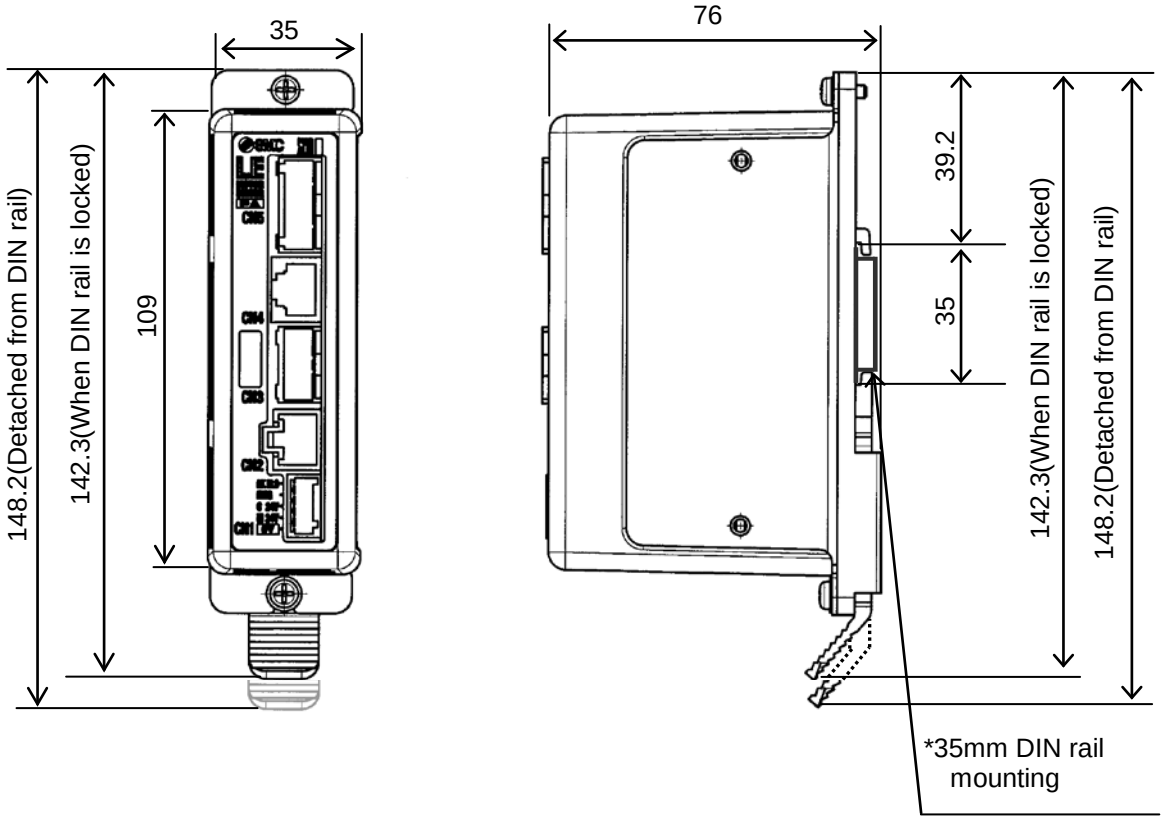
3.3 Outside dimension diagram

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

(1) Screw mount type (LECPA□□-□)



(2) DIN rail mount type (LECPA□□D-□)



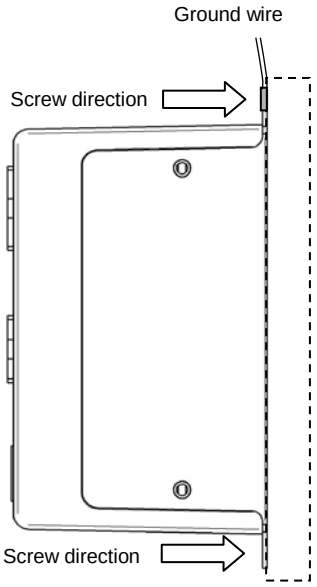
3.4 How to install

(1) How to install

The followings are the descriptions on how to install each driver.

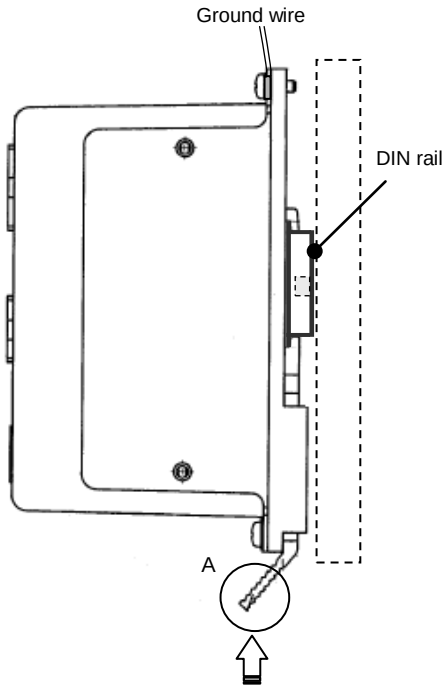
[1] Screw mount type (LECPA□□-□)

(Installation with two M4 screws)



[2] DIN rail mount type (LECPA□□D-□)

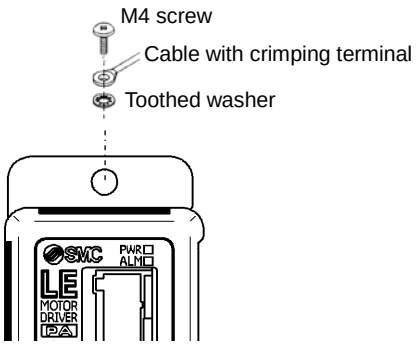
(Installation with the DIN rail)



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

(2) Ground wire connection

Put the cable with crimped terminal between the M4 thread and toothed washer and tighten the thread as shown below.



Driver

⚠ Caution

The M4 screw, cable with crimping terminal, and toothed washer should be obtained separately.

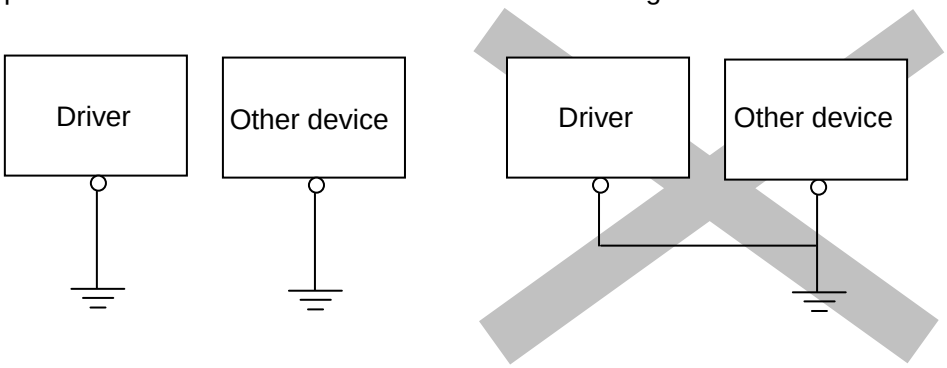
Ground the driver to shield it from electric noise.

⚠ Caution

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

(2) The cross section of the grounding wire should be greater than 2mm^2.

The ground point should be near this driver to make the wire length shorter.



Recommended Functional grounding

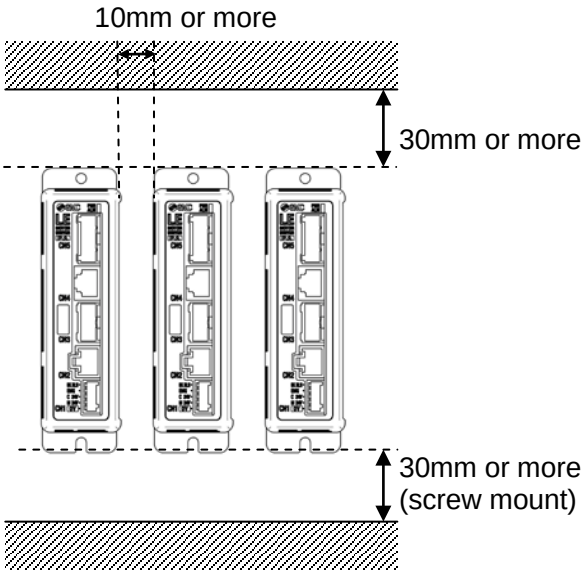
Not Recommended grounding

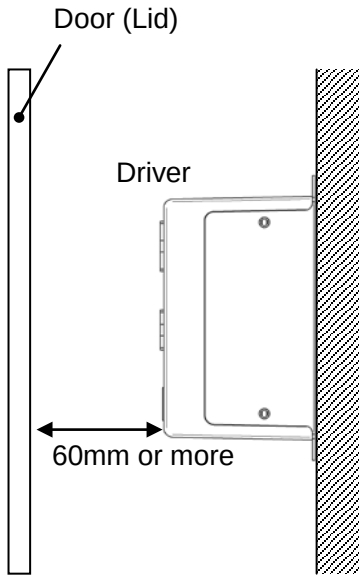
(3) Installation location

Please install this driver at an appropriate place where the surrounding temperature will not exceed 40^{o}C.

As shown in the diagrams below, the driver should be installed on a vertical wall with 30 / 50mm or larger spaces above and below it. In addition, there should be 60mm or larger space between the driver and the facing cover (the housing) so that it is possible to connect/disconnect the driver. The drivers should be positioned appropriately with enough spaces to keep it within the above mentioned operating temperature range.

Place supplys of vibration like a large-size electromagnetic contactor, no-fuse current chopper, etc. to be mounted on a different panel or away from the driver.





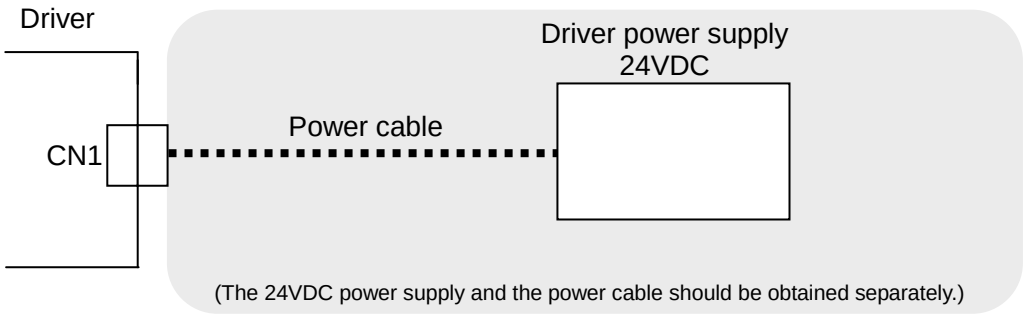
⚠ Caution

Install the driver on a flat surface. Excessive pressure applied to the housing will damage the driver.

4. External Wiring Diagram

The typical connections for each connector of this driver (CN1 to CN5) are as shown below.

4.1 CN1: Power connector



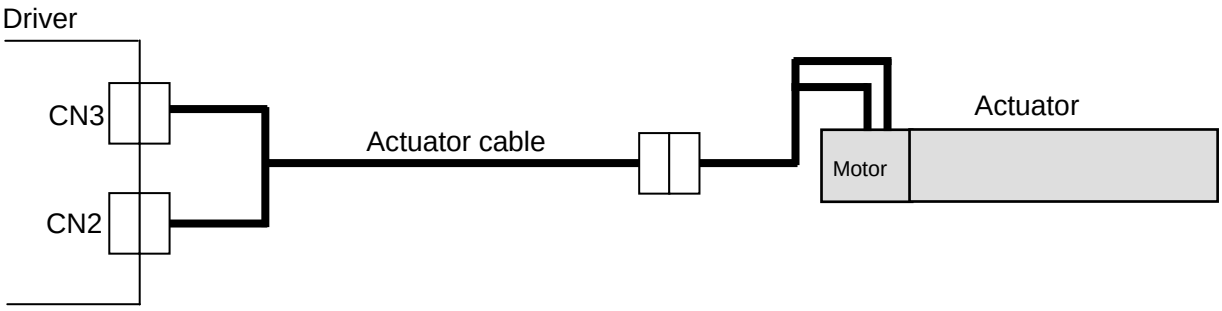
* Please refer to **"5. CN1: Power supply plug (page 19)"** for how to wire the CN1 connector.

⚠Caution

The driver power supply (24VDC) do not use the power supply of "rush-current restraining type".

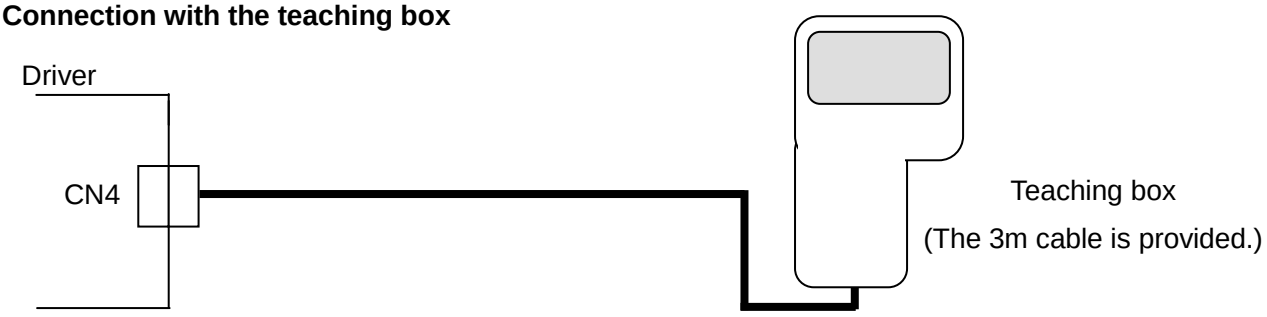
4.2 CN2: Motor power connector and CN3: Encoder connector

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



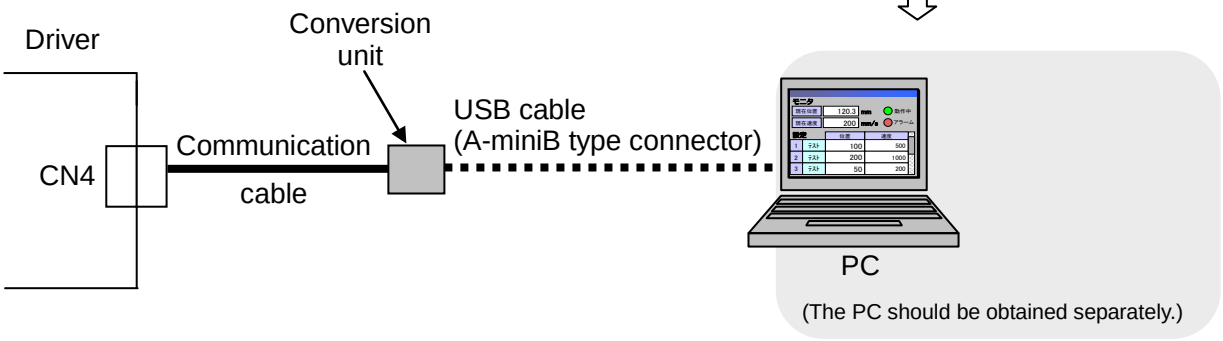
4.3 CN4: Serial I/O connector

(1) Connection with the teaching box

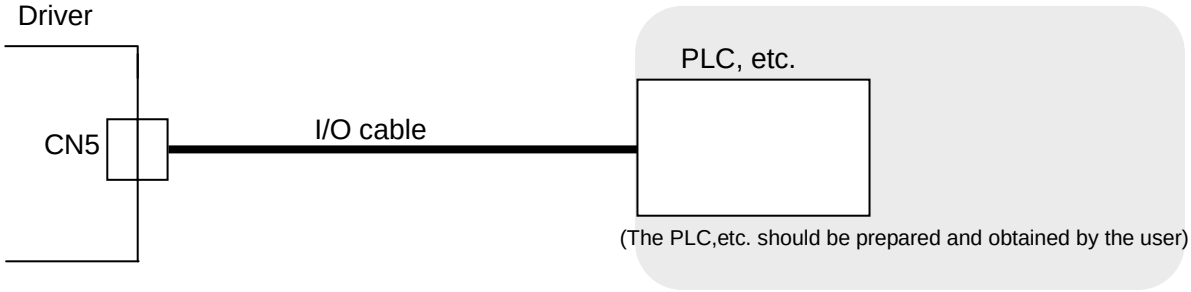


(2) Connection with a PC

*Controller setting kit
(Controller setting software, communication cable, USB cable and the conversion unit are provided.)



4.4 CN5: Parallel I/O connector



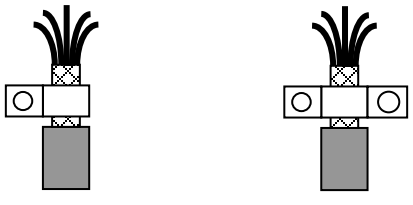
* Please refer to **"<u>6.4 Parallel I/O connector wiring (Example) (page 29)</u>"** for how to wire the CN5 driver.

* Please refer to **"<u>6.3 The parallel I/O signal is detailed (page 26)</u>"** for details of each signal of parallel I/O.

⚠Caution

(1)Ground the both I/O cable ends for the protection from the noise.

(2)Ground the cable end at the positioning unit side with metal cable clamp so that the entire circumference of I/O cable shield contacts the clamp. Keep the stripped part of shield as short as possible.



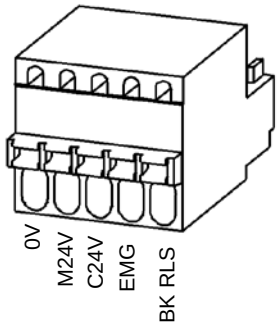
P clip U clip

5. CN1: Power supply plug

5.1 Power supply plug specifications

The specifications of the provided power supply plug are as follows.

Power supply plug(*)

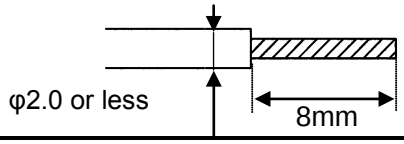


Terminal	Function	Descriptions
0V	Common power (-)	The negative common power for M24V, C24V, EMG and BK RLS.
M24V	Motor power (+)	The positive power for the actuator motor to be supplied via the driver.
C24V	Control power (+)	The positive control power.
EMG	Stop signal(+)	The positive power for Stop signal. Actuator is stopped when 24V is removed.
BK RLS	Lock release (+)	The positive power for lock release.

(*)Made by Phoenix Contact (Part no: FK-MC0.5/5-ST-2.5)

5.2 Electric wire specifications

Prepare electric wire according to the following specification.

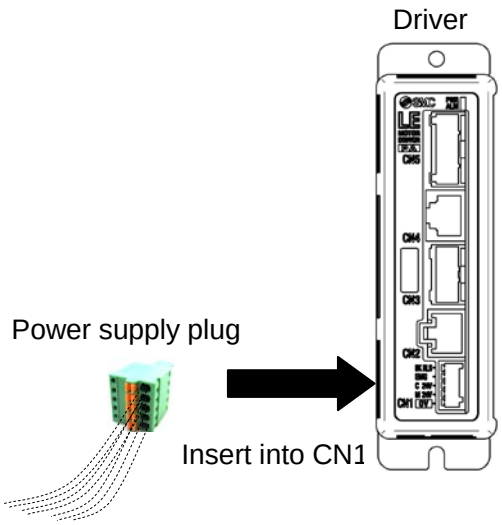
Item	Specifications
Applicable wire size	AWG20 (0.5mm^2): Single line, No insulation sleeve, Twisted wire with bar terminal * The rated temperature for the insulation coating: 60^{o}C or more. Outer sheath should be φ2.0mm or less.
Stripped section length	

* Please insert only the peel line part when insert the electric wire in the power plug.

⚠Caution
Multiple electric wires should not be connected to one terminal. Arrange wiring so that conductors of each terminal do not contact other lines.

After the wiring of the power supply plug is completed, connect it to the CN1 connector of the driver.

Please refer to **"<u>5.3 Wiring of power supply plug (page 20)</u>"** for how to wire the power supply plug.

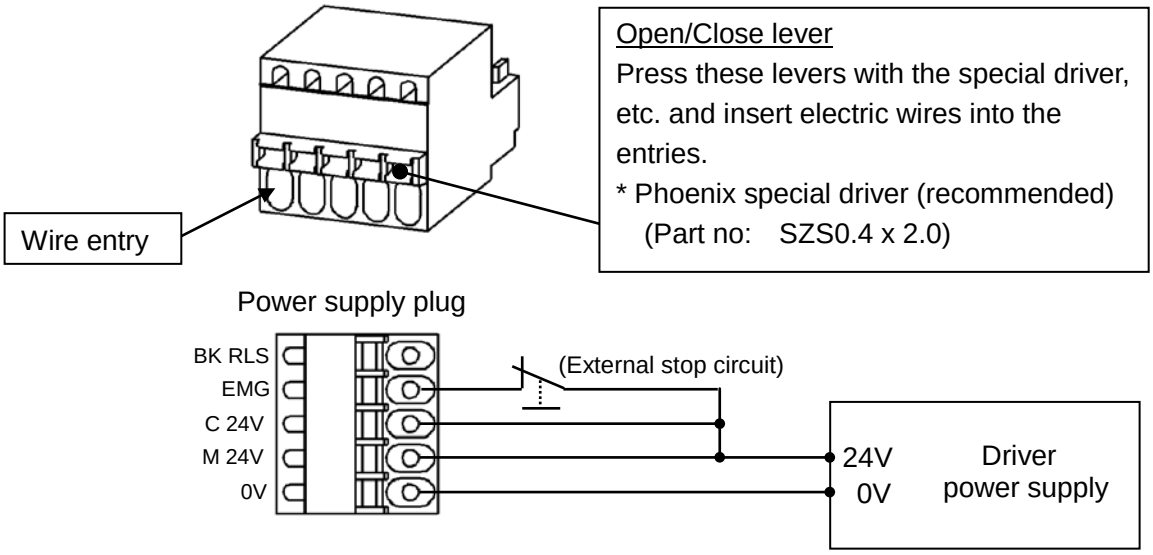


5.3 Wiring of power supply plug

Connect the power supply plug to the 24VDC driver power supply according to instructions (1) (2) and (3) and then, insert it into the CN1 connector of the driver.

(1) Wiring of the power supply

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



⚠Caution

For driver input power supply (24VDC) use a power supply with a capadty not less than the “momentary maximum power” of the actuator spedfications. Do not use “inrush-current restraining type”power supply.

(2) Wiring of the stop switch

When applying 24V to EMG terminal, the product starts operating. When 24V is shut off, Servo OFF activates and the product stops operating. Stop switch must be installed by the user to stop the actuator in abnormal situations.

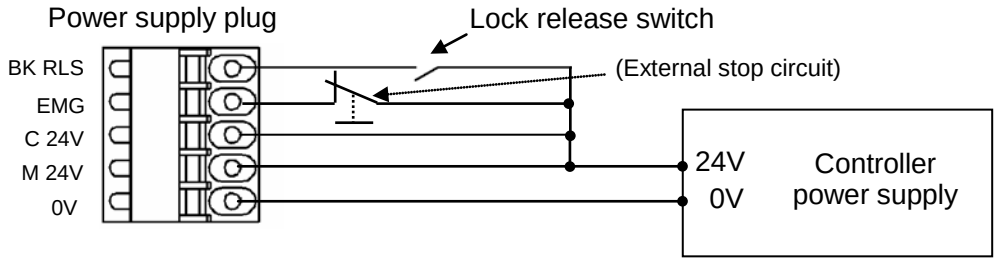
Please refer to **“<u>5.4 Stop circuits (page 21)</u>”** for examples of how to wire stop switches.

(3) Wiring of the lock release

Actuators with lock will need a lock release switch fitted.

* The switch (24VDC, Contact capacity: 0.5A or more) should be obtained separately.

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



⚠Caution

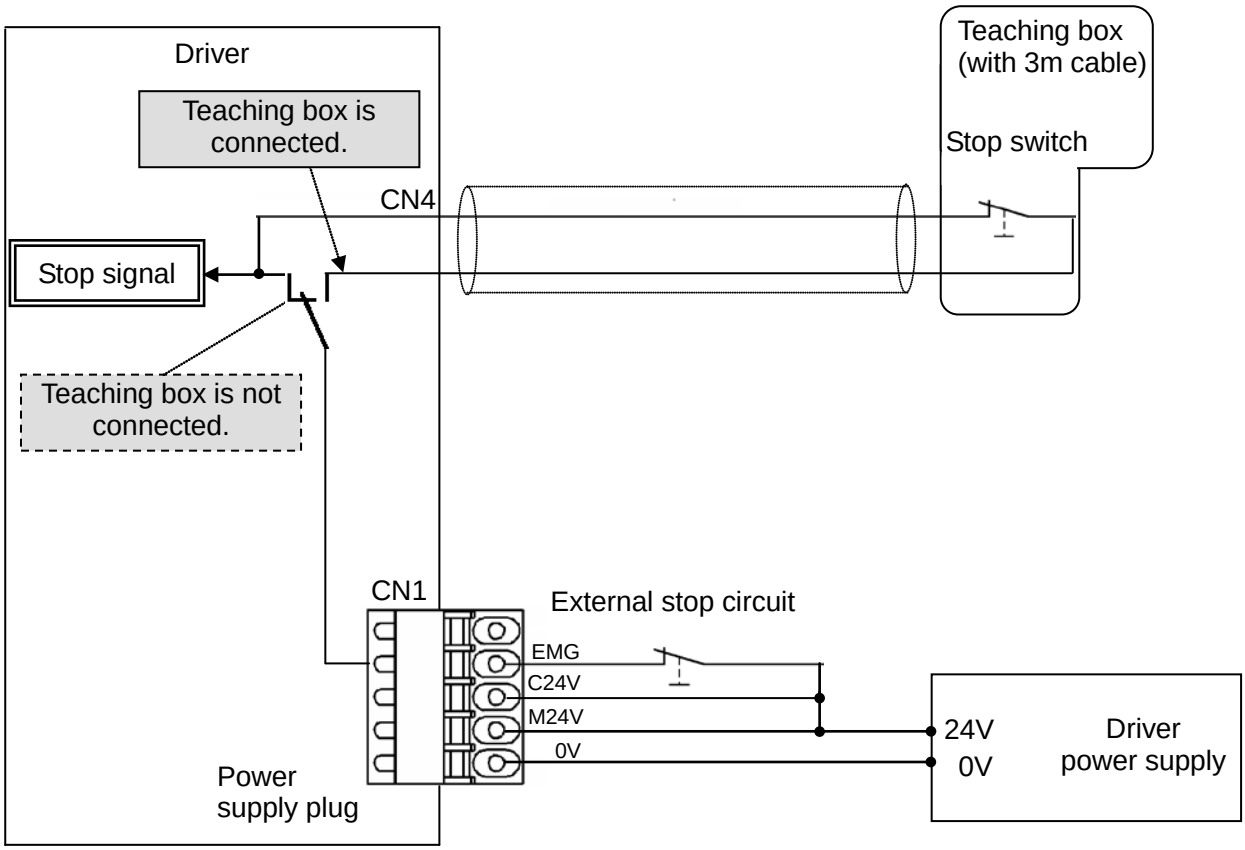
1. If the actuator is a non lock type, it is not necessary to wire the BK RLS terminal.
2. The terminal BK RLS must not energize while using only for the adjustment and the return treatment in the emergency and usually operating.

5.4 Stop circuits

- The driver can provide a ‘controlled stop’when the +24 VDC is removed from the ‘EMG’ pin. In a controlled stop condition the driver decelerates the actuator with maximum deceleration value for the actuator.
- The stop switch on the teaching box causes a controlled stop if activated.
- For an Emergency stop the 24 VDC power supply should be disconnected from the motor (M24V).

(1) Example circuit 1- Single driver with teaching Box

When the teaching box is connected to the driver, the teaching box’s stop switch will become effective.



⚠Warning

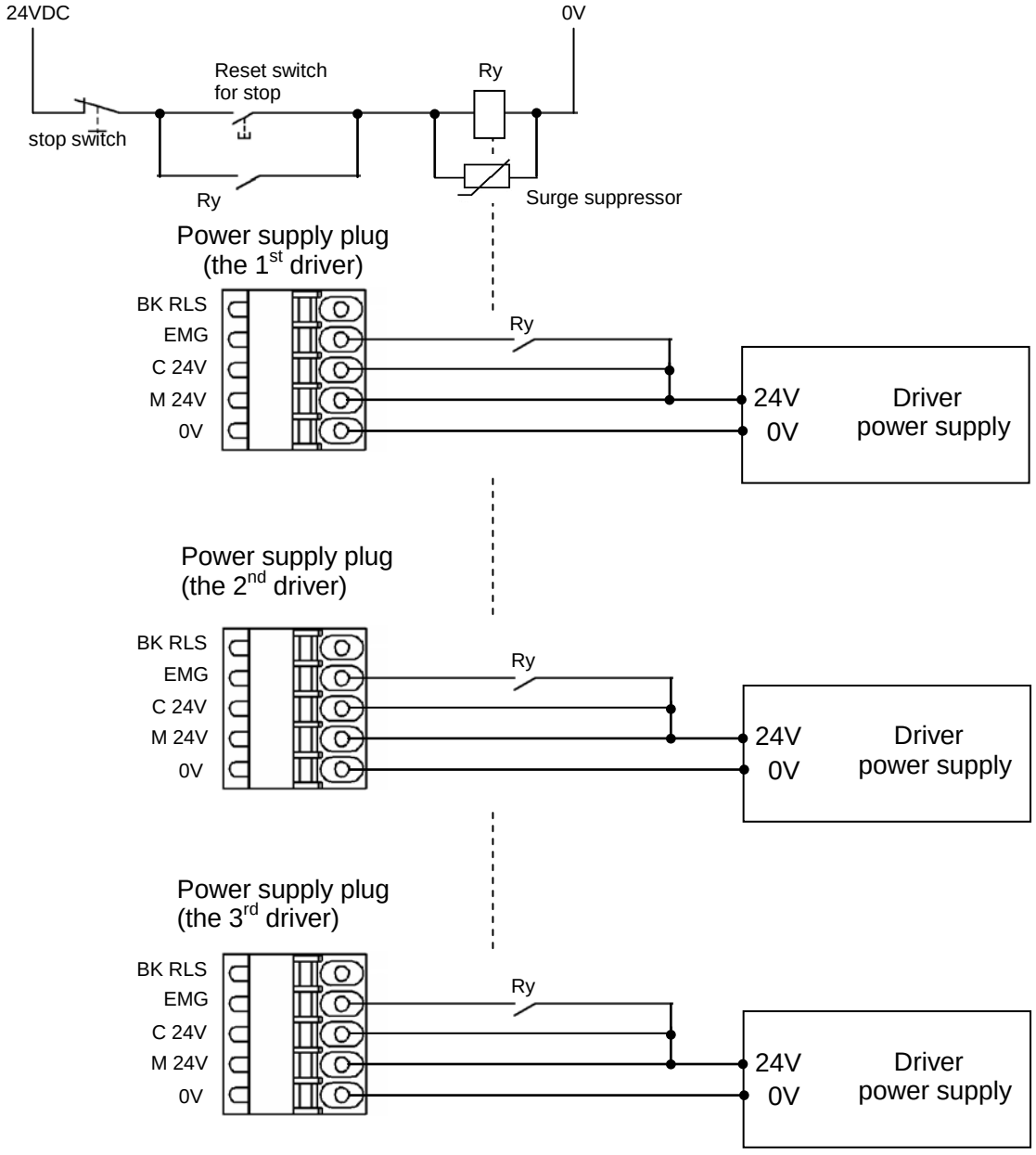
The teaching box’s stop switch is effective only to the driver that is connected with it.

When shutdown is input, the driver stops with maximum deceleration speed, then the motor is turned off.

(2) Example circuit 2 - multiple drivers (Stop relay contact (1))

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

(Circuit example) *The figure below shows the stopped state.



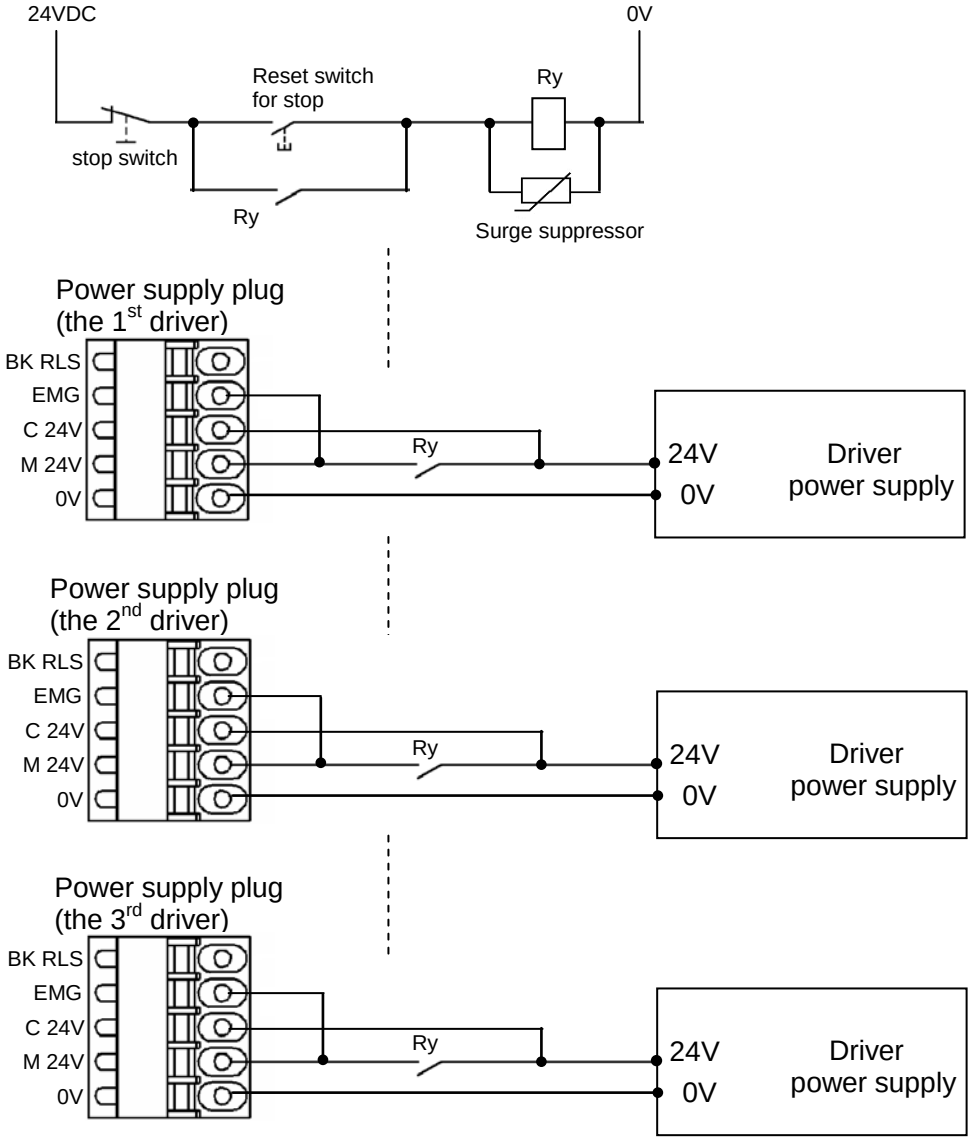
The relay must be a safety relay or monitored by a safety relay.

⚠ Caution
When shutdown is input, the driver stops with maximum deceleration speed, then the motor is turned off.

(3) Example circuit 3 - Motor power shutdown (Stop relay contact (2))

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

(Circuit example) *The figure below shows the stopped state.



The relay must be a safety relay or monitored by a safety relay.

⚠Warning

1. Relay contacts should be made between the 24VDC driver power supply and the M24V and EMG terminal of the power supply plug. The actuator may make unexpected movement.
2. If the motor power supply and EMC are shut-off simultaneously during operation, the power will be shut-off before the product is stopped, so it may takeadditional time and therefore a longer distance until the product coasts to a stop due to inertia of workpieces.
3. Do not perform return to origin (SETUP input ON) when motor drive power (M24V) is disconnected. The driver cannot recognize the correct origin point if a return to origin instruction is made with the motor drive power (M24V) disconnected.
4. The brake release is prohibited when the M24 is OFF, BK RLS terminal is connected to M24V in the controller, so the actuator may operate unexpectedly. When BK RLS terminal is energized while the motor power supply is OFF, be sure to turn off the EMG terminal.

6. CN5: Parallel I/O Connector

6.1 Parallel I/O specifications

*** Input specifications**
(NPN and PNP common, pulse signal input terminal is excluded.)

No.	Item	Specifications
1	Input circuit	Internal circuit and photo coupler isolation
2	Number of inputs	5 inputs
3	Voltage	24VDC +/- 10%
4	Input current when ON	2.4mA+/-20% (at 24VDC)
5	Input current when OFF	0.1 mA or less

*** Output specifications**
(NPN and PNP common)

No.	Item	Specifications
1	Output circuit	Internal circuit and photo coupler isolation
2	Number of outputs	9 outputs
3	Max. voltage between terminal	30VDC
4	Max. output current	10mA supply/sink
5	Saturation voltage	4.0V (Max.)

6.2 Parallel I/O type (NPN/PNP type)

There are two types of parallel I/O for this driver: NPN type (LECPAN**-*) and PNP type (LECPAP**-*).

(1) Parallel I/O input circuit (same for both NPN and PNP type)

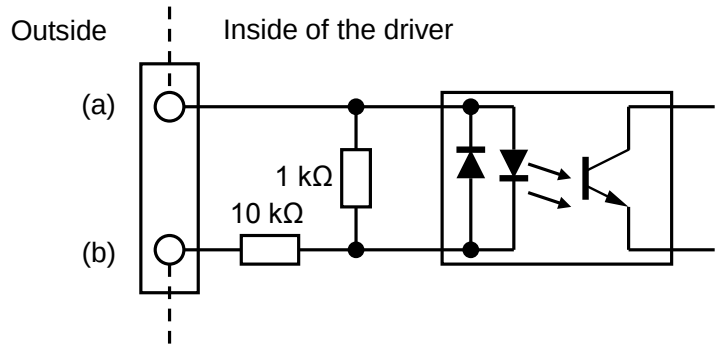
*** NPN and PNP common, pulse signal input terminal is excluded.**

NPN type

(a)	「COM+」<1>
(b)	SETUP<7> - TL<11>

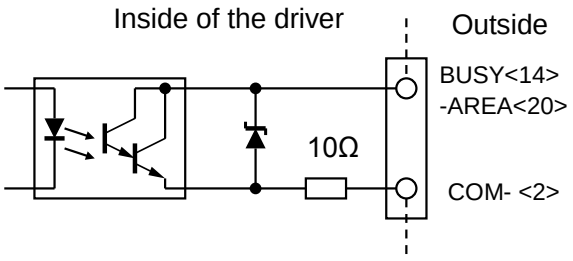
PNP type

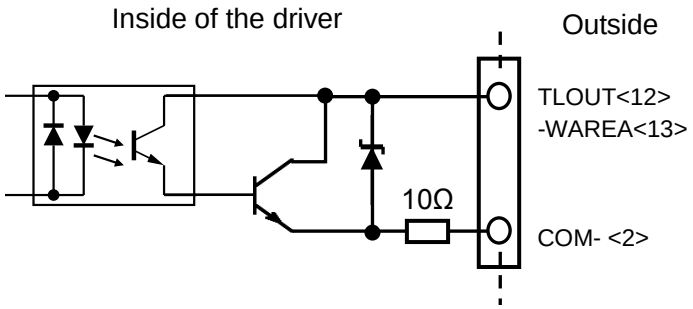
(a)	「COM-」<2>
(b)	SETUP<7> - TL<11>



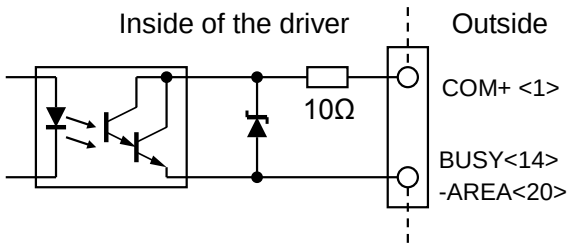
(2) Parallel I/O output circuit

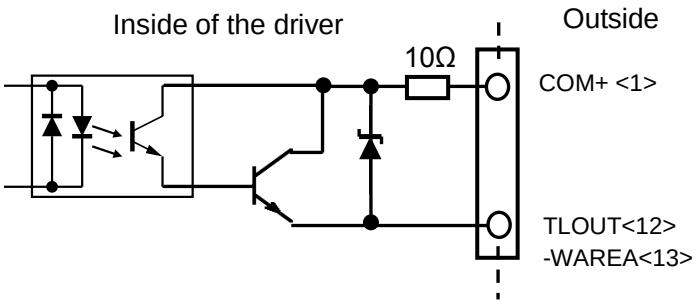
NPN type





PNP type

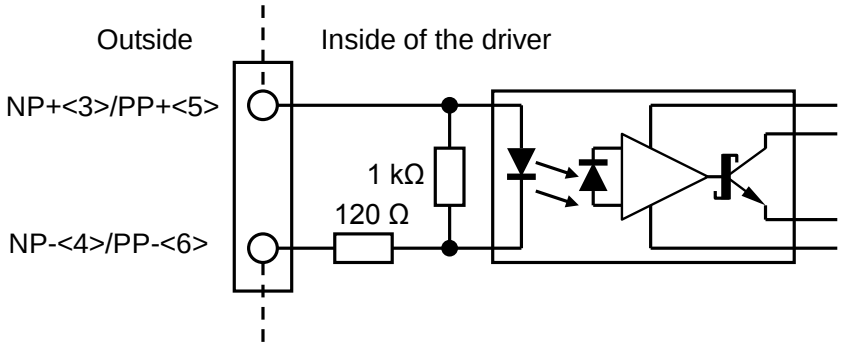




(3) Pulse signal input circuit

■Differential input

Connect the differential output terminal of the positioning unit to NP+/NP- terminal and PP+/PP- terminal directly.



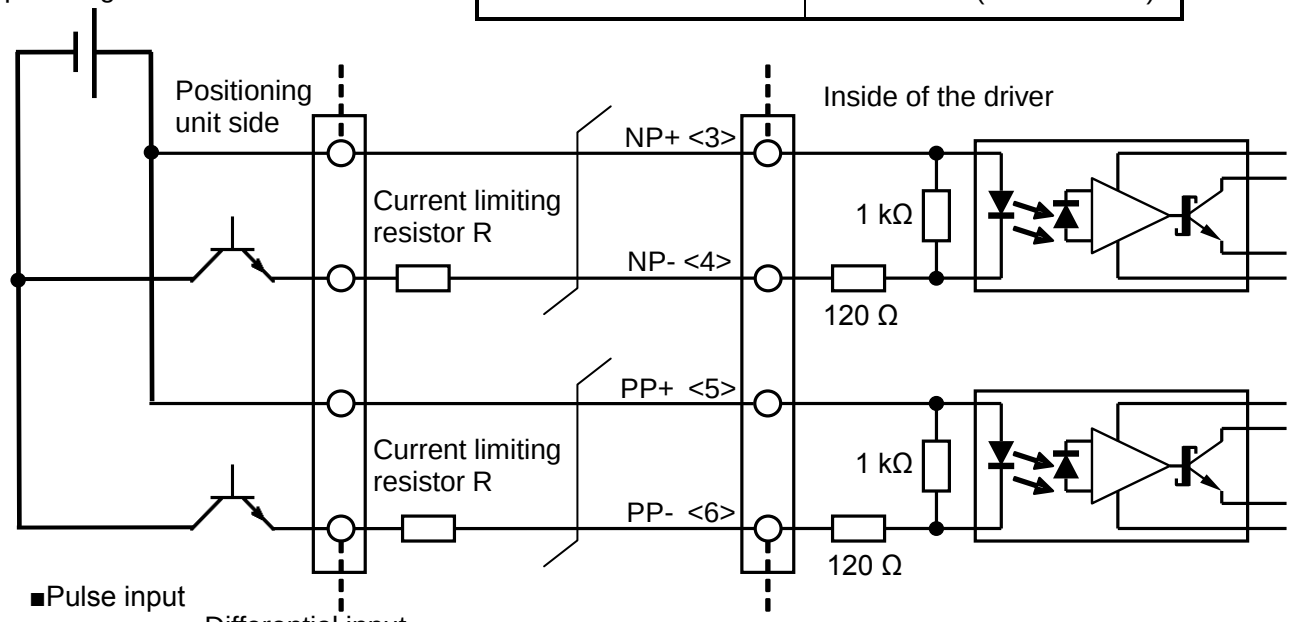
⚠Caution

For differential input, connect the positioning unit using the line driver which is equivalent to DS26C31T.

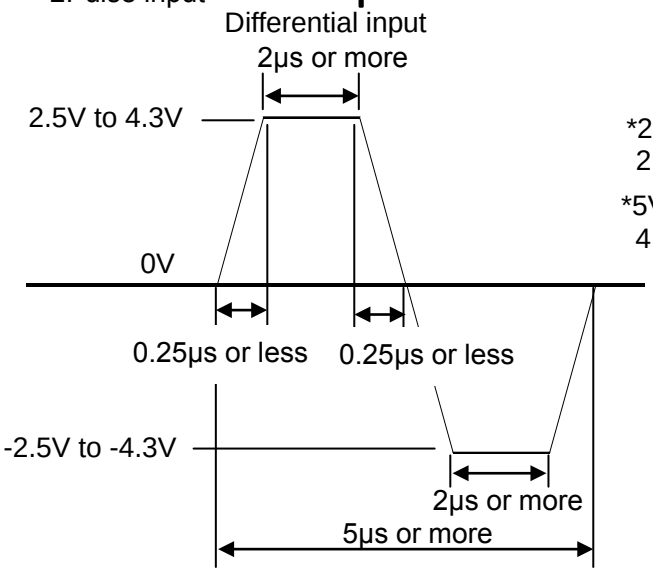
■Open collector input

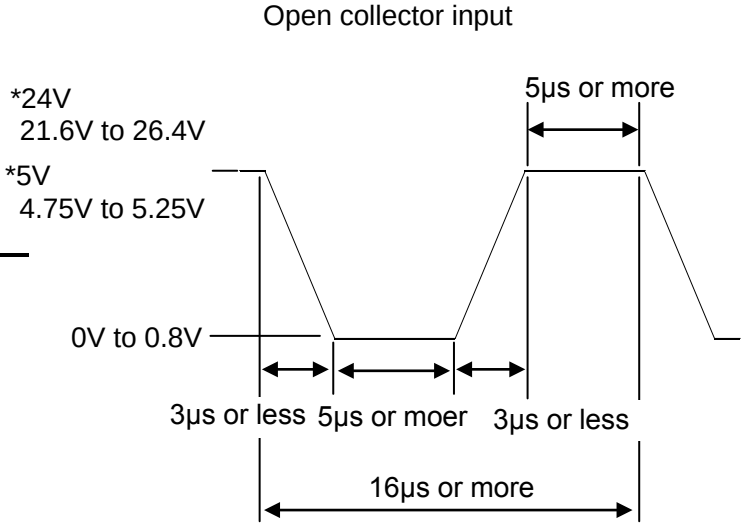
Connect the current limiting resistor R which is corresponding the pulse signal voltage in series.

Power supply voltage for pulse signal	Current limiting resistor R type
24VDC+/-10%	3.3kΩ+/-5% (0.5W or more)
5VDC+/-5%	390Ω+/-5% (0.1W or more)

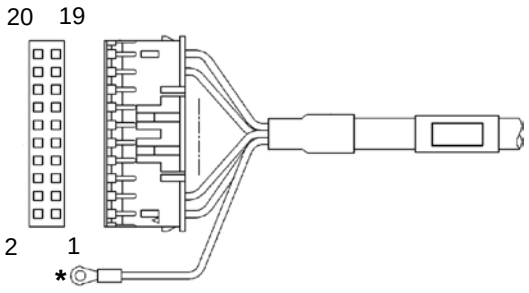


■Pulse input





6.3 The parallel I/O signal is detailed



*Connected to the cable shield
Be sure to provide grounding.

Pin No.	Color of insulation	Dot mark	Dot color	Category	Terminal
1	Light brown	■	Black	24V	COM+
2	Light brown	■	Red	0V	COM-
3	Yellow	■	Black	Pulse signal	NP+
4	Yellow	■	Red	Pulse signal	NP-
5	Light green	■	Black	Pulse signal	PP+
6	Light green	■	Red	Pulse signal	PP-
7	Grey	■	Black	Input	SETUP
8	Grey	■	Red	Input	RESET
9	White	■	Black	Input	SVON
10	White	■	Red	Input	CLR
11	Light brown	■■	Black	Input	TL
12	Light brown	■■	Red	Output	TLOUT
13	Yellow	■■	Black	Output	WAREA
14	Yellow	■■	Red	Output	BUSY
15	Light green	■■	Black	Output	SETON
16	Light green	■■	Red	Output	INP
17	Grey	■■	Black	Output	SVRE
18	Grey	■■	Red	Output	*ESTOP
19	White	■■	Black	Output	*ALARM
20	White	■■	Red	Output	AREA

-Input side-

Terminal number	Function	Description
1	COM+	The terminal for the 24V of the 24VDC I/O signal power.
2	COM-	Connect the 0V side of the power supply (24VDC) for input / output signal.
3	NP+	Assignment of the function depends on the parameter which determines the method for inputting the pulse signal (Basic parameter "Option1") Refer to **"7.2 Basic parameter (page 33)"**for details. Function / 2 pulse mode / 1 pulse mode PP+/PP- / Normal (CW) or reversed (CCW) pulse. / Pulse NP+/NP- / Reverse (CCW) or normal (CW) pulse. / Direction *For 2 pulse type, PP is for normal rotation (CW), and NP is for reversed rotation (CCW) as initial setting.
4	NP-	
5	PP+	
6	PP-	
7	SETUP	Command to Return to origin. Returning to home position starts when turned on while the servo is ON.
8	RESET	Resets alarm. Alarm output is OFF when RESET is ON while alarm is generated.
9	SVON	Specify the servo ON.When SVON is ON, the servo motor will be turned ON. When this is OFF, the servo motor will be turned OFF. (*1)
10	CLR	Deviation reset signal.Signal to reset the difference between the movement commanded by the pulse signal and the actual movement. ⚠ Cation 1. Clear the deviation counter when CLR is turned ON from OFF. (Recognized by the edge) 2. Actuator does not operate when the pulse is input while CLR is ON.
11	TL	Signal to switch to pushing operation. When TL is ON, it becomes pushing operation.

*1 It maybe takes about ten seconds from turning on SVON to SVRE turned on when after the power supply.

Valid condition of parallel I/O (ON: Only ON is recognized, OFF: Only OFF is recognized, ON/OFF: Recognized regardless of ON or OFF)

Conditions / Signal	SETON output	SVRE output	BUSY output	Returning to home position	CLR input	RESET input
Pulse signal (PP, NP)	ON/OFF	ON	ON/OFF	Other than during operation	OFF	ON/OFF
SETUP	ON/OFF	ON	ON/OFF	Other than during operation	ON/OFF	OFF
TL	ON/OFF	ON	ON/OFF	Other than during operation	ON/OFF	ON/OFF

-Output side-

Terminal number	Function	Description
12	TLOUT	Turns ON during pushing operation. However, the TLOUT output is turned OFF in the following condition. 1. Alarm generated 2. Return to origin instruction 3. Servo is OFF (SVRE output is OFF)
13	WAREA	When the actuator is within the output range between "W-AREA1 and W-AREA2" of basic parameter, this terminal will be turned ON. Note that when the SETON output is OFF, the WAREA signal will also be OFF.
14	BUSY	This terminal is ON during positioning and the actuator operation.
15	SETON	When the actuator position information is established after returning to home position, this terminal is turned ON. However, the SETON output is turned OFF in the following condition. 1. Alarm generated 2. Return to origin instruction from pushing operation (TLOUT output is ON) (After the return to origin is completed, the SETON output is turned ON again). 3. Servo is OFF (SVRE output is OFF) 4 .CLR input is ON 5. When test operation by controller setting software/teaching box is finished
16	INP	Because of actuator action, if INP signal is ON, the actuator condition can vary. 1.Return to origin The output signal INP turns ON when the actuator operation stops (BUSY output is OFF) and the position is within the range of the origin position ±basic parameter “initial positioning range”. 2.During positioning operation If pulse signal is not input for 10ms or longer, INP signal is ON when the difference becomes smaller than the step data No.0 "positioning width". 3. During pushing operation Turns on when the pushing force exceeds the value set in the step data No.0. **⚠Caution** If "positioning width" of the step data No.0 is too large during slow movement of the actuator, INP signal may be ON even if the positioning of the actuator is not completed.
17	SVRE	When the servo motor is ON, SVRE is ON. When the servo motor is OFF, SVRE is OFF. (*1)
18	*ESTOP (*2)	ESTOP is ON during normal operation. During activation of Teaching Box stop switch or by the stop command, this terminal is OFF.
19	*ALARM (*2)	When there are no alarms, this terminal is ON. When there are alarms, this is OFF.
20	AREA	When the actuator is within the output range between Area1 and Area2 in the step data No.0, this terminal will be turned ON. Note that when the SETON output is OFF, the AREA signal will also be OFF.

*1 It maybe takes about ten seconds from turning on SVON to SVRE turned on when after the power supply.

*2 The “ALARM” and “ESTOP” become the negative-true logic output.

The change of output signal under the condition of the driver.

Status \ Output	BUSY	INP	SVRE	Lock	SETON
Servo OFF status at stop after power supply	OFF	OFF	OFF	Lock	OFF
Servo ON status at stop after power supply	OFF	ON	ON	How to release	OFF
During returning to origin	ON	OFF	ON	How to release	OFF(*2)
The actuator is at the origin. On completion of [SETUP]	OFF	ON(*1)	ON	How to release	ON
During movement by positioning after returning to home position.	ON	OFF	ON	How to release	ON
Stopping for pushing after returning to origin. (Holding)	OFF	ON	ON	How to release	ON
Stopped due to no detection of work-load during pushing operation after returning to origin.	OFF	OFF	ON	How to release	ON
Positioning after returning to home position is completed (within positioning range).	OFF	ON	ON	How to release	ON
Servo is OFF after returning to home position.	OFF	OFF	OFF	Lock	OFF
Stopped due to EMG signal after returning to home position.	OFF	OFF	OFF	Lock	OFF

*1: The output turns on when the actuator is within the range defined in the basic parameter setup.

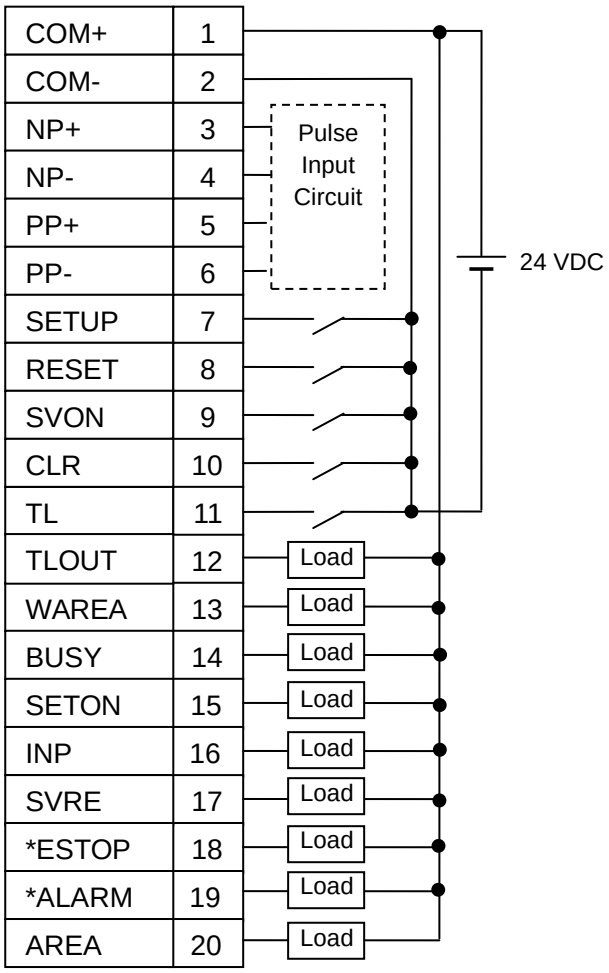
*2: When return to origin is performed while the SETON is turned ON, the SETON signal will remain ON.

6.4 Parallel I/O connector wiring (Example)

When you connect a PLC, etc. to the CN5 parallel I/O connector, please use the I/O cable.

Wiring depends on the driver parallel input/output (NPN, PNP) and input pulse mode.

***NPN type (LECPAN**-*)**

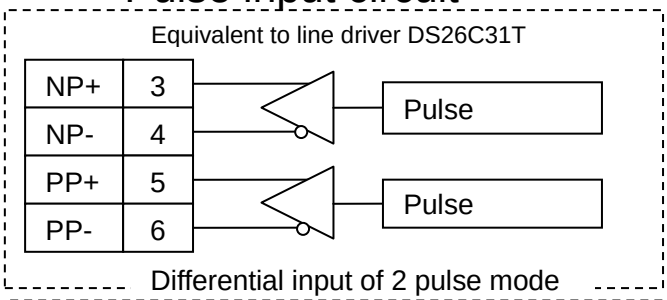


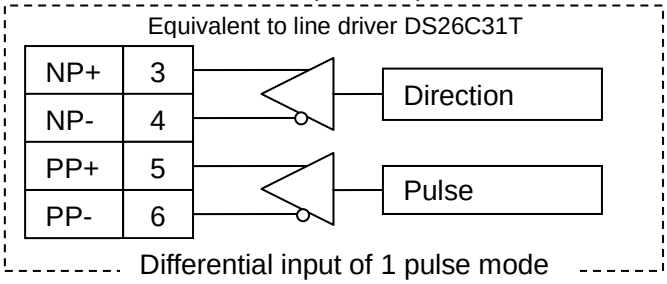
R: Current limiting resistor

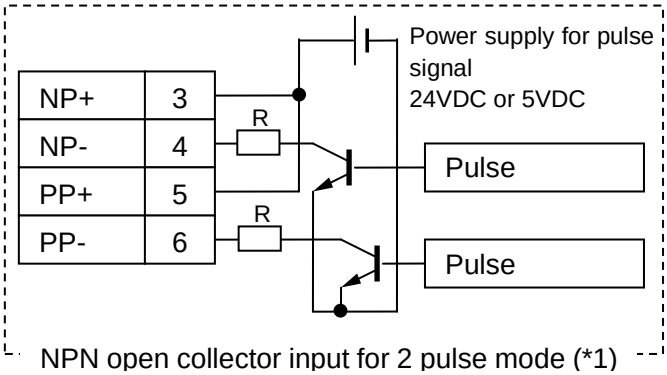
Power supply voltage for pulse signal	Current limiting resistor R type
24VDC +/- 10%	3.3kΩ+/-5% (0.5W or more)
5VDC+/-5%	390Ω+/-5% (0.1W or more)

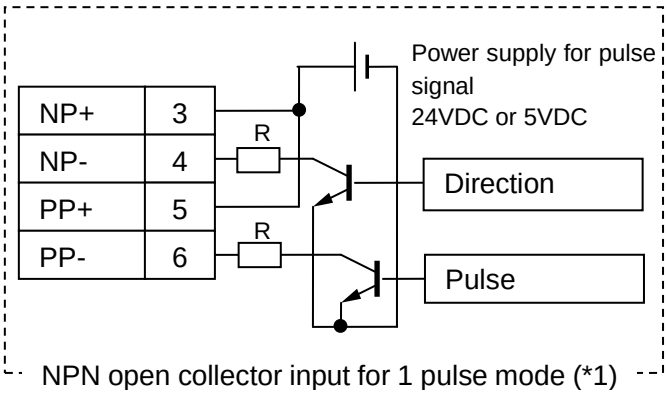
(*1) The pulse input circuit of NPN type and PNP type is the same. Refer to the pulse input circuit of PNP type (LECPAP**-*) for the connection of PNP open collector.

Pulse input circuit





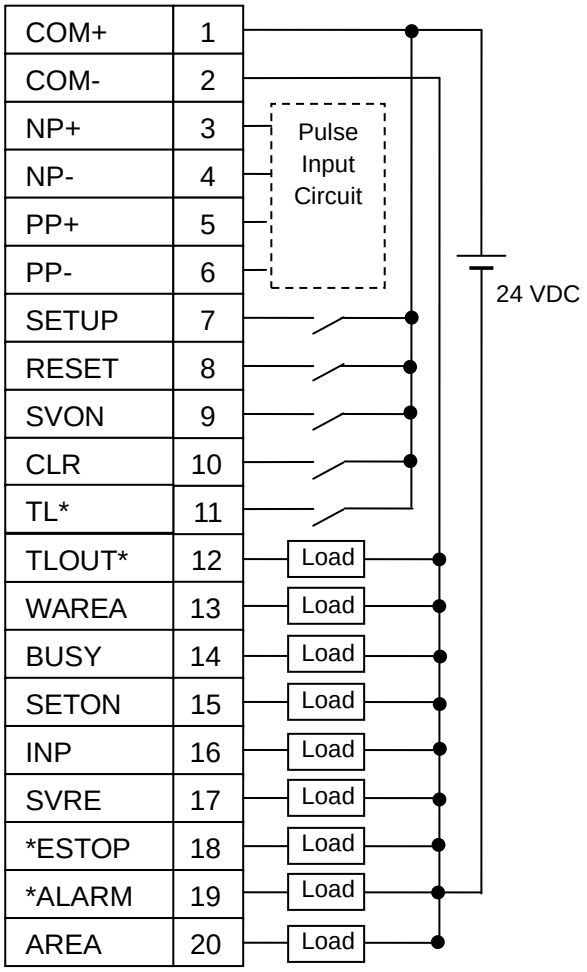




⚠ Caution

1. For open collector input, connect a current limiting resistor.
   Refer to **"(3) Pulse signal input circuit (page 25)"**.
2. The current limiting resistance should be prepared by a customer.
3. TL and TLOUT are available for driver's which version is V1.60 or more.
   Do not use these terminals, if the driver version is earlier than V1.60.

***PNP type (LECPAP**-*)**

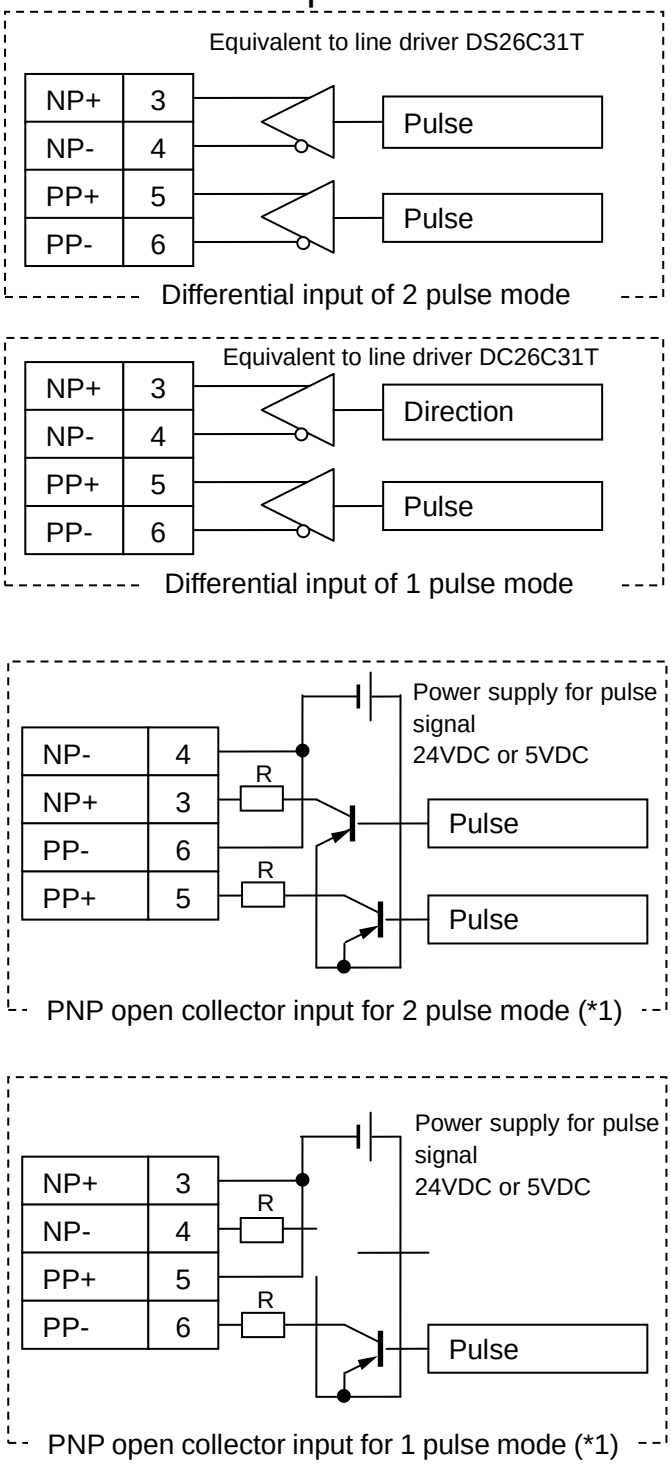


R: Current limit resistor

Power supply voltage for pulse signal	Current limiting resistor R type
24VDC +/- 10%	3.3kΩ+/-5% (0.5W or more)
5VDC+/-5%	390Ω+/-5% (0.1W or more)

(*1) The pulse input circuit of NPN type and PNP type is the same. Refer to the pulse input circuit of NPN type (LECPAN**-*) for the connection of NPN open collector.

Pulse input circuit



⚠ Caution

1. For open collector input, connect current limiting resistor.
   Refer to **"(3) Pulse signal input circuit (page 25)"**.
2. The current limiting resistance should be prepared by a customer.
3. TL and TLOUT are available for driver's which version is V1.60 or more.
   Do not use these terminals, if the driver version is earlier than V1.60.

7. Setting Data Entry

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

You can select the appropriate one depending on the operation.

*Easy mode

Step data can be set easily by the controller setting software or the teaching box.

* The combination of settings you need to setup will change depending on the type of actuators (combination of data can be selected.)

* Normal mode

In Normal mode, you can make a further detailed setup (conditions for actuator and driver, etc.) than the Easy mode.

You can change three kinds of setting data, “Step data,” “Basic parameter” and “Return to origin parameter” in this mode.

7.1 Step data

Step data means the data which is not determined by pulse signal input such as positioning width. Speed, position, acceleration and deceleration are determined by the pulse signal input. Step data will become effective as soon as it is recorded into the driver.

Each data is set by step data No.0. Pushing force(*1), Trigger LV(*1), Pushing speed(*1), Mvoving force, Area 1, Area 2 and, In position can be set. Do not change the set value of other items.

(Example) Step data on the PC (controller setting software) screen [Normal mode]

No.	Move	Speed Speed mm/s	Position (mm)	Accel mm/s^2	Decel mm/s^2	PushingF %	TriggerLV %	PushingSp Speed mm/s	Moving F %	Area1 (mm)	Area2 (mm)	In pos (mm)
0	Fixed value	Fixed value	Fixed value	Fixed value	Fixed value	60	50	30	100	18.00	22.50	0.5
1	-	-	-	-	-	-	-	-	-	-	-	-
:	:	:	:	:	:	:	:	:	:	:	:	:
63	-	-	-	-	-	-	-	-	-	-	-	-

*1: Available only for driver's version V1.60 or more. Do not change the default value of these parameters, if the driver version is less than V1.60. Refer to **“<u>Appendix 1. Default setting value per actuator (page 80)</u>”**.

Details of step data

Refer to **"Appendix 1. Default setting value per actuator (page 80)"**

Setting name	Range	Description
No.	0 to 63	Only step No.0 is used.
MovementMOD	3 options (Blank, Absolute, Relative)	Not used in this product. (Select Absolute or Relative. An alarm will be generated if this is blank.)
Speed	Minimum value(*1) to "Max speed" of the basic parameter	Not used in this product. * It should not be changed.
Position	"Stroke (-)" to "Stroke (+)" of the basic parameter	Not used in this product. * It should not be changed.
Accelerate	1 to "Max ACC/DEC" of the basic parameter	Not used in this product. * It should not be changed.
Decelerate	1 to "Max ACC/DEC" of the basic parameter	Not used in this product. * It should not be changed.
Push force	Minimum value(*1) to "Max force" of the basic parameter	The maximum force for the pushing operation. * Please refer to the actuator manual for the appropriate range of the speed. * When pushing force=0, "abnormal operating data" alarm (1-048) will occur.
Trigger LV	Minimum value(*1) to "Max force" of the basic parameter"	A condition where INP output signal during pushing operation is on. When the actuator generates a force over this value during pushing operation, INP will be turned ON. * Please refer to the actuator manual for the appropriate range of the speed.
Push speed	*1	The pushing speed for the pushing operation. * Please refer to the actuator manual for the appropriate range of the speed.
Move force	*1	The setting to define the maximum torque during the positioning operation. (Unit: %) Enter a value within the range appropriate for the actuator. * Please refer to the actuator manual for the appropriate range of the speed.
Area1	"Stroke(-)"to "Stroke (+)" of the basic parameter	The setting to define the conditions where the AREA output will be turned ON (Unit: mm). If the current position is within the range between the Area1 and Area2, the AREA output will be turned ON. * If Area1 >Area2, the alarm "Step Data ALM1" will be activated. (However, no alarm is generated if "Area1"= "Area2"= 0, the AREA output will be turned OFF)
Area2	"Stroke(-)"to "Stroke (+)" of the basic parameter	
In position	*1	This is the setting to define the conditions where the INP will be turned ON. INP output is ON when the deviation to the pulse signal from PLC is within the positioning range while pulse signal is not input. If the set value is too small, INP signal is ON during operation. *2

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

*2: The set point here usually pierces the case of 0.5mm or less. A few overshoots will be done before an actuator completely stops then it converges and it stops at the set position finally. At this time, there is a possibility that the INP signal is turned on before it stops completely because it will pass over the range of A several times when the setting of A is too small, and the INP signal is turned on several times along with it.

7.2 Basic parameter

The “Basic parameter” is the data to define the operating conditions of the driver, conditions of the actuator, etc.

Details of basic parameter

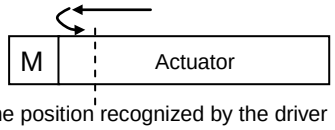
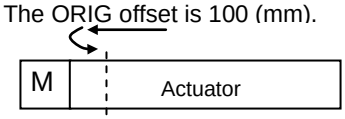
Activation: “XX” = Become effective just after recorded into the driver
“X” = Become effective after restarting the driver
“-“ = The parameter cannot be changed (fixed value)

Refer to **“Appendix 1. Default setting value per actuator (page 80)”**

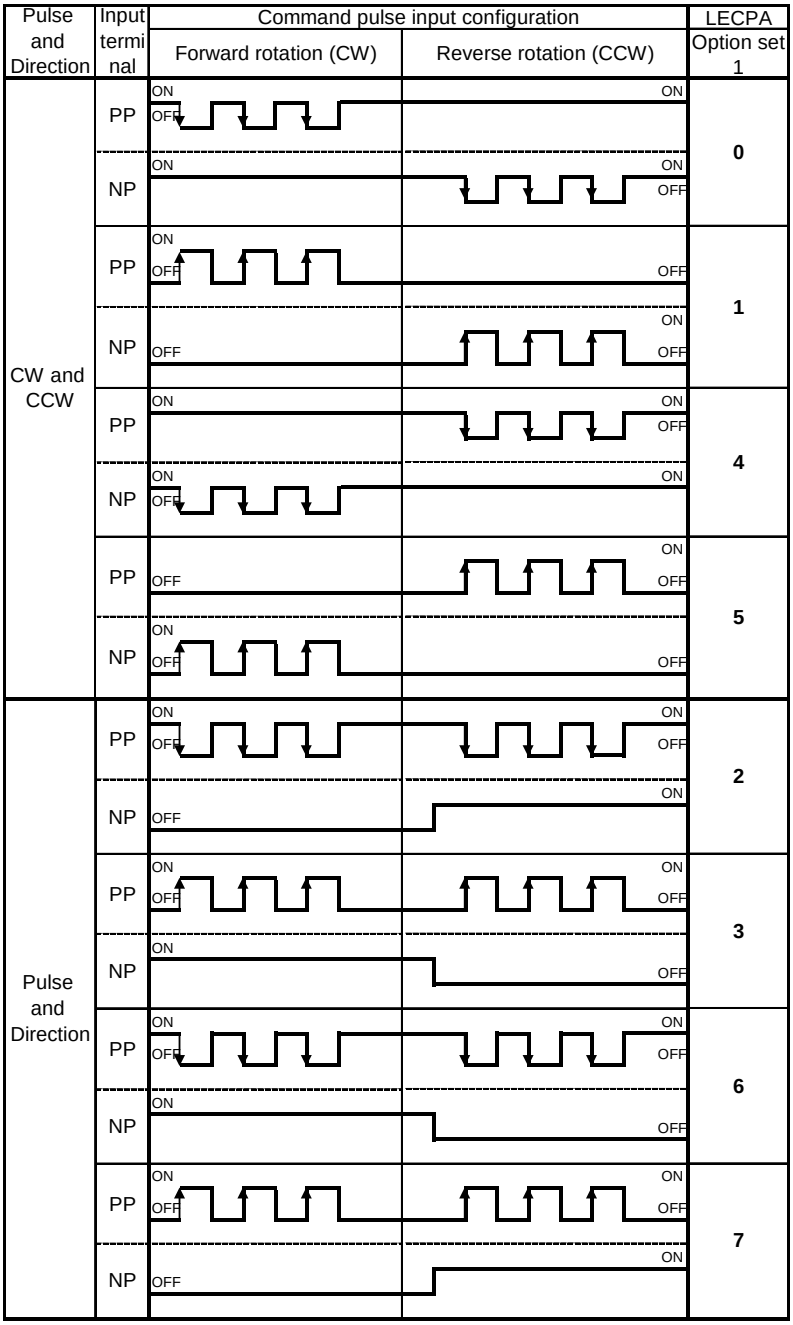
Parameter name	Range	Description	Acti-vation
Controller ID	1 to 32	Identification number (axis) parameters of serial communications are set.	X
IO pattern	Fixed value	Value is fixed for this product. * It should not be changed.	-
ACC/DEC pattern	Fixed value	Value is fixed for this product. * It should not be changed.	-
S-motion rate	Fixed value	Value is fixed for this product. * It should not be changed.	-
Stroke (+)	*1	This defines the positive (+) side limit of the position. (Unit: mm)	XX
Stroke (-)	*1	This defines the negative (-) side limit of the position. (Unit: mm)	XX
Max speed	*1	This defines the maximum limit of the speed (Unit: mm/s). * It should not be changed.	-
Max ACC/DEC	*1	This defines the maximum limit of the ACC/DEC (Unit: mm/s^2). * It should not be changed.	-
Def In position	*1	This defines the range to activate the INP output when the actuator is within it after the return to origin operation. (Unit: mm)	XX

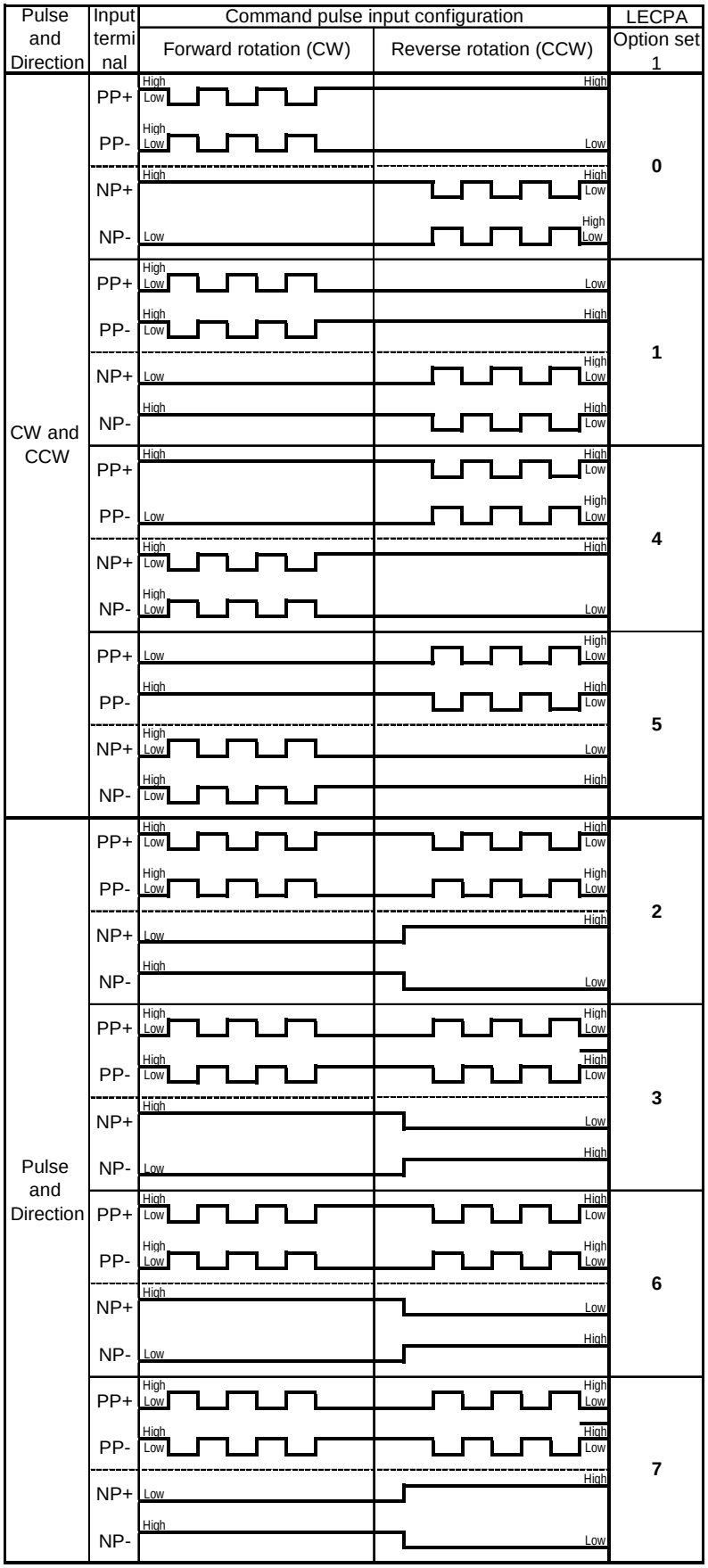
*1: The range varies depending on the actuator. Please refer to the manual of the actuator for more details.

<table>
<tr><td>ORIG offset</td><td>*1</td><td>This defines the position of the actuator after the return to origin operation. (Unit: mm)

* The ORIG offset is 0 (mm).
 
The position recognized by the driver after the return to the origin operation (0mm).
* The ORIG offset is 100 (mm).
 
The position is identified by the driver after the return to the origin operation (100mm).
Between the left examples, the actuator positions are not different but the reference point that the driver recognizes will be changed after the return to origin operation.
⚠ Caution
If the value for the “ORIG offset” is changed, the “Stroke (+)” and “Stroke (-)” of the basic parameter should be checked.</td><td>XX</td></tr>
<tr><td>Max force</td><td>*1</td><td>The maximum force for the pushing operation.</td><td>XX</td></tr>
<tr><td>Para protect</td><td>1 to 2</td><td>Sets the range in which parameter and step data can be changed.
1. Basic parameter + Step data (Basic parameter + Return to origin parameter + Step data)
2. Basic parameter(Basic parameter + Return to origin parameter)</td><td>XX</td></tr>
<tr><td>Enable SW</td><td>1 to 2</td><td>This defines the status of the Enable switch of the teaching box.
1. Enable
2. Disable</td><td>XX</td></tr>
<tr><td>Unit name</td><td>Fixed value</td><td>Indication of actuator type compatible to the driver.
* It should not be changed.</td><td>-</td></tr>
<tr><td>W-AREA1</td><td>“Stroke(-)”to “Stroke (+)” of the basic parameter</td><td rowspan="2">The setting to define the conditions where the WAREA output will be turned ON (Unit: mm).
If the current position is within the range between the W-AREA1 and W-AREA2, the WAREA output will be turned ON.
* If W-AREA1 >W-AREA2, the alarm “Parameter ALM” will be activated.(However,no alarm is generated if “W-AREA1”= W-“AREA2”= 0, the WAREA output will be turned OFF)</td><td>XX</td></tr>
<tr><td>W-AREA2</td><td>“Stroke(-)”to “Stroke (+)” of the basic parameter</td><td>XX</td></tr>
<tr><td>Link Offset</td><td>Fixed value</td><td>Value is fixed for this product. (For initial values, refer to "Basis Parameter" of the operation manual of each actuator.)
* It should not be changed.</td><td>-</td></tr>
<tr><td>Sensor type</td><td>Fixed value</td><td>Value is fixed for this product. (Default: 1)
* it should not be changed.</td><td>-</td></tr>
</table>

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

Option set1	0 to 7	Pulse input mode should be set in accordance with the table below so that it is compatible with the pulse output setting of the master (positioning unit etc.). If set to higher than "7", the set value becomes 0. Open collector input connection.  ON/OFF in the table above indicates ON/OFF of the photo coupler of the pulse input circuit of this driver. Please refer to **6.2 (3) Pulse signal input circuit (page 25)** for details of pulse input circuit. In the open collector input, two of the pulse input terminals (PP+, PP-, NP+, NP-) are connected to Pulse and other two terminals are connected to Common. Which pulse input terminals (+ or -) should be connected to Pulse or Common depends on the master device. Therefore, + / - of input terminal is not indicated in the table above.	X

Option set1	0 to 7	Differential input connection  * The pulse input circuit of this driver is not a differential receiver. The photo coupler turns ON when the terminal on the + side turns High and the terminal on the - side turns Low. Please refer to **6.2 (3) Pulse signal input circuit (page 25)** for details of pulse input circuit.	X

Undefined No.11	1 to 4096	Define the ratio of electronic gear of pulse signal input. * Undefined parameter 11: "Electronic gear (numerator)"(Default: 1) * Undefined parameter 12: "Electronic gear (denominator)"(Default: 1) This product controls LE series motor (800 pulse per rotation). Please refer to the actuator manual for the appropriate range of the movement due to the rotation of the motor. <Example> (1) "Electronic gear (numerator): 1", "Electronic gear (denominator): 1" → Motor makes one turn when 800 pulses are input. (2) "Electronic gear (numerator): 2", "Electronic gear (denominator): 2" → Motor makes one turn when 1600 pulses are input. (3) "Electronic gear (numerator): 2", "Electronic gear (denominator): 1" → Motor makes one turn when 400 pulses are input. * "Electronic gear (numerator): 1", "Electronic gear (denominator): 1" is recommended. If other values are selected, the vibration or noise of the actuator can result. * If set “0”, the set value is recognized as “1”. * If set more than “4097”, the set value is recognized as “4096”.	X
Undefined No.12	1 to 4096		X

7.3 Return to origin parameter

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

Details of Return to origin parameter

Activation: “XX” = Become effective just after recorded into the driver,

“X” = Become effective after restarting the driver,

“-“ = The parameter cannot be changed (fixed value).

Refer to **“Appendix 1. Default setting value per actuator (page 80)”**

Name	Range	Description	Acti-vation
ORIG direction	1 to 2	Sets the direction of return to origin operation. 1. CW 2. CCW	X
ORIG mode	1 to 2	The setting for the return to origin operation 1. pushing origin operation [Stop] 2. limit switch origin [Sensor]	XX
ORIG limit	*1	A pushing force level at which to set the origin.	XX
ORIG time	Fixed value	This is the fixed value for this driver. * It should not be changed.	-
ORIG speed	*1	The allowable speed to move to origin.	XX
ORIG ACC/DEC	*1	The acceleration and deceleration during find origin.	XX
Creep speed	Fixed value	This is the fixed value for this driver. * It should not be changed.	-
ORIG sensor	0 to 2	The setting for ORIG sensor 0. The origin sensor is not effective. [Disable] 1. The origin sensor is N.O type. [N.O]. 2. The origin sensor is N.C type. [N.C.]	XX
ORIG SW DIR	Fixed value	Value is fixed for this product. * It should not be changed.	-
Undefined No.21	Fixed value	Value is fixed for this product. * It should not be changed.	-

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

8. Operations explanation

8.1 Return to origin

After entering the setting data, it is necessary to perform a return to origin operation before starting the positioning or pushing operation. (To ensure the position of origin) There are two return to origin methods. One is to use the SETUP signal of LECPA and the other is to use the return to origin function of the master.

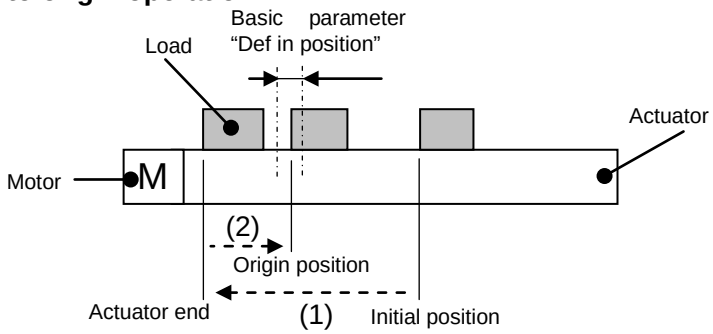
■ Return to origin mode using LACPA SETUP signal

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

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

Return to origin signal → Move in the return to origin direction → Stop the movement → Move in the opposite direction → Origin position

(Example) Return to origin operation



⚠Caution

This direction is dependent on the actuator.

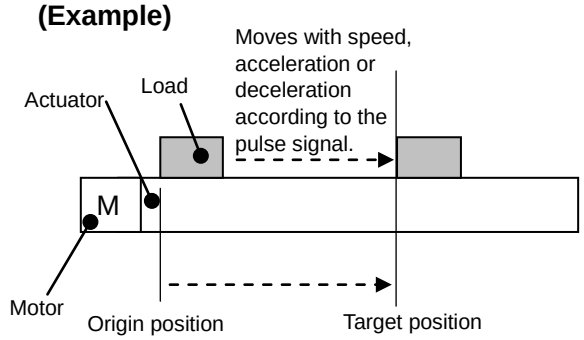
■ Return to origin function of the master

Refer to the operation manual of the master device. When using the return to origin function of the master, the SETON signal of LECPA is turned OFF constantly.

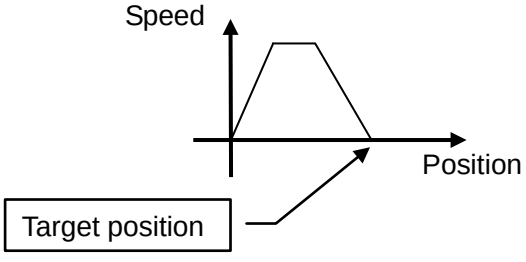
8.2 Positioning operation

Positioning according to the input pulse signal.

*** Positioning operation (Example)**



*** Positioning operation [Speed/Position] (Example)**



⚠Caution

The travel distance from the positioning unit, the speed and the command of acceleration/ deceleration shall not exceed the specifications of the actuator. Operation exceeding the specification leads to the generation of the alarm and malfunction.

8.3 Pushing operation

1. During operation at "Pushing speed" of Step Data No.0 or less, or the actuator is stopping.
2. TL input turns on

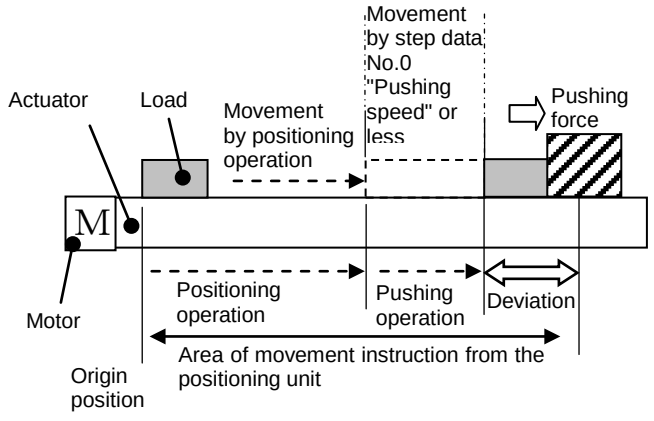
When above two conditions are satisfied, operation is switched to pushing operation (pushing force). The actuator pushes the load with the force no more than the maximum pushing force set in the “Pushing force” of the step data No.0. TLOUT is turned ON during pushing operation.

* After switching to the pushing operation (TLOUT output is ON), the actuator operates at "Pushing speed" set in Step Data No.1 even if the pulse signals more than "Pushing speed" of Step Data No.0 is input.

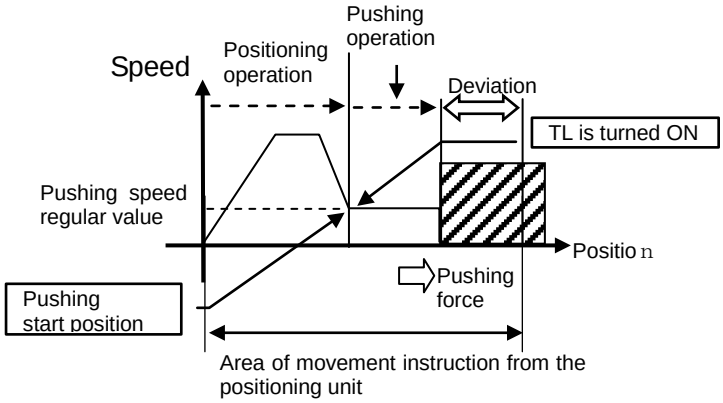
(1) Successful pushing operation

During the pushing operation, if the pushing force is kept higher than the value specified by “Trigger LV” of the step data No.0 for a certain time, the INP output will be turned ON. Set thrust continues to be generated even after the pushing is completed.

●Pushing operation (e.x.)

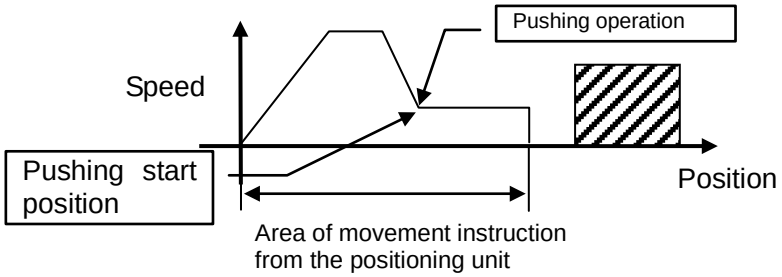


●Pushing operation (E.X.)【Speed/Position】(e.x.)



(2) Unsuccessful pushing operation (Pushing the air)

When the actuator does not complete the pushing even when it moves from the start position of the pushing to the operation range commanded by the pulse signals coming from the positioning unit, the operation is stopped. In such case, the INP output and BUSY output will be turned OFF.

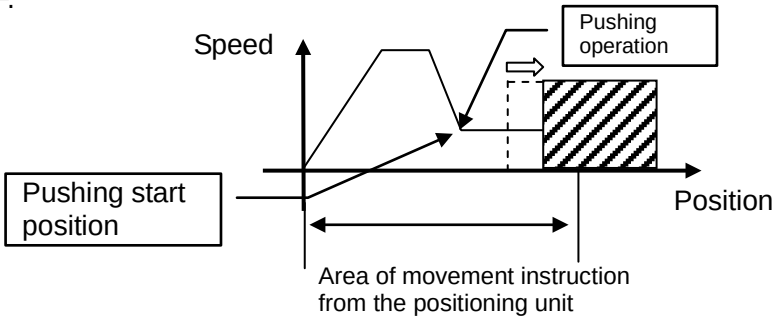


(3) Workpiece moves when pushing operation is completed

(i) The workpiece moves in the pushing direction.

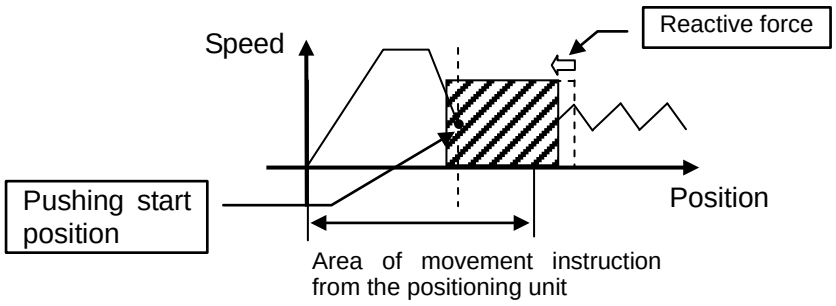
After completion of the pushing operation, if the reaction force from the workpiece becomes smaller, the actuator may move with a force smaller than that specified in the “Trigger LV” of the step data. In such case, the BUSY output will be turned ON and the INP output will be turned OFF and the actuator moves within the positioning range according to the balance of the force.

During the pushing operation, if the pushing force is kept higher than the value specified by “Trigger LV” of the step data No.0 for a certain time again, the INP output will be turned ON and BUSY output will be turned OFF.



(ii)When the actuator moves in the opposite direction of pushing direction

When the actuator is pushed back after the pushing move is completed, the actuator is pushed until the reaction force and pushing force are balanced, the BUSY output stays ON and INP output stays ON.



8.4 Response time for the driver input signal

Response delay due to the input signal other than pulse signal contains the following factors.

(1) Driver input signal scan delay
(2) Delay due to input signal analysis
(3) Delay of command analysis

Leave an interval of 15 ms (30 ms if possible) or more between input signals and maintain the state of the signal for 30ms or more, as PLC processing delays and driver scaning delays can occur.

8.5 Methods of interrupting operation

It is possible to stop the actuator by interrupting the movement of a positioning operation or pushing operation.

[Stopping by EMG signal]

If the EMG signal is turned OFF during operation, after the actuator decelerates and stops, the servo will turn OFF so the stopped position is not held. (For an actuator with lock, it is held by the lock function.)
Pulse signal input is ignored while EMG signal is OFF because the servo is OFF.

9. Operation (example)

9.1 Positioning operation

Calculation example of the travel amount (pulse) and travel speed (pulse frequency) when the electronic gear ratio is 1/1 (Recommended value) which are set with basic parameter "Undefined No. 11" "Undefined No.12".

■ Setting example of pulse signal

Actuator lead: 10[mm/rotation], electronic gear (denominator): 1, electronic gear (numerator): 1
2 pulse mode (Pulse input for each direction)

Target position1: Travel amount 100mm Travel speed 30mm/s
Acceleration 3000mm/s^2 Deceleration 3000mm/s^2
Target position2: Travel amount 60mm Travel speed 100mm/s
Acceleration 2000mm/s^2 Deceleration 2000mm/s^2

■ Calculation example

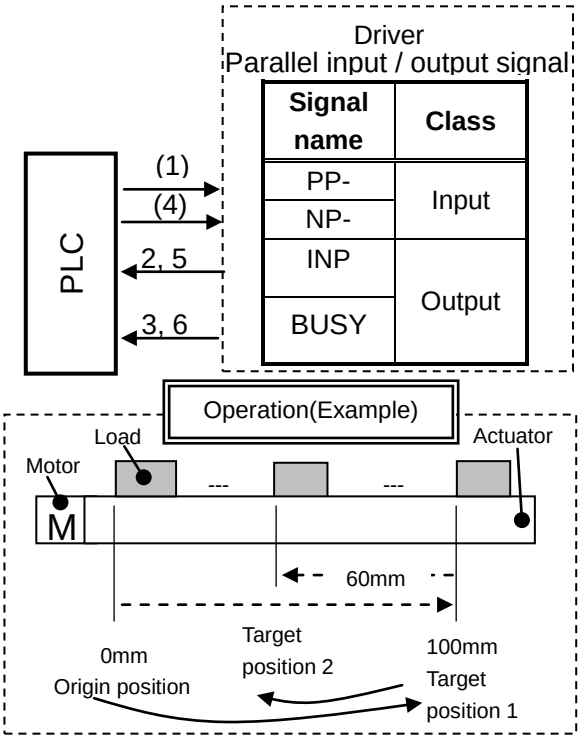
Travel amount (Pulse amount[Pulse])
= Encoder resolution [Pulse/ rotation] x electronic gear [1/1] / Actuator lead[mm/ rotation] x travel amount [mm]

Travel speed (pulse frequency [pulse/sec])
= (Encoder resolution [Pulse/ rotation] x electronic gear [1/1] / Actuator lead[mm/ rotation]) x travel speed [mm/s]

Acceleration / deceleration time [s]
= Travel speed[mm/s] / Deceleration or acceleration speed [mm/s ^{2}]

<Calculation example of target position 1>
Travel amount: 800 x 1 / 10 x 100 = 8000[pulse]
Travel speed: 800 x 1 / 10) x 30 = 2400 [pulse/sec])
Acceleration / deceleration time: 30 / 3000 = 0.01 [s]

<Calculation example of target position 2>
Travel amount: 800 x 1 / 10 x 60 = 4800[pulse]
Travel speed: 800 x 1 / 10 x 100 = 8000 [pulse/sec])
Acceleration / deceleration time: 100 / 2000 = 0.05 [s]



(1)Target position 1 is commanded.
Pulse; 8000, Pulse frequency: 2400 [pulse/sec])
Acceleration time 0.01[s], deceleration time 0.01[s]
This pulse is input to “PP-”

↓

Travels to target position 1

↓

(2) When the travel is completed, "INP" output is ON.

↓

(3) BUSY output is OFF

↓

Travel to target position 1 is completed

↓

(4) Target position 2 is commanded.
Pulse; 4800, Pulse frequency: 8000 [pulse/sec])
Acceleration time 0.05[s], deceleration time 0.05[s]
This pulse is input to “NP-”

↓

Travels to target position 2

↓

(5) When the travel is completed, "INP" output is ON.

↓

(6) "BUSY" output is OFF
Travel to target position 2 is completed.

9.2 Pushing operation

Calculation example of the travel amount (pulse) and travel speed (pulse frequency) when the electronic gear ratio is 1/1 (Recommended value) which are set with basic parameter "Undefined No. 11" "Undefined No.12".

Ex) Perform pushing from the home position to the start position for pushing 100mm away at 100mm/sec.

From the point of 100mm, pushing starts at 30mm/s for 30mm with 50% of pushing force.

■ Setting example of pulse signal

Actuator lead: 10[mm/rotation], electronic gear (denominator): 1, electronic gear (numerator): 1

2 pulse mode (Pulse input for each direction)

Positioning operation: Travel amount 100mm Travel speed 100mm/s
Acceleration 3000mm/s^2 Deceleration 3000mm/s^2

Pushing operation: Travel amount 30mm Travel speed 30mm/s
Acceleration 3000mm/s^2 Deceleration 3000mm/s^2

■ Calculation example

Travel amount (Pulse amount [Pulse]) = Encoder resolution [Pulse/Rotation] x Electronic gear[1/1] / Actuator lead [mm/rotation] x Travel distance [mm]

Travel amount (Pulse frequency [Pulse/sec]) = Encoder resolution [Pulse/Rotation] x Electronic gear[1/1] / Actuator lead [mm/rotation] x Travel distance [mm/s]

Acceleration / deceleration time [s] =Travel speed[mm/s] / Deceleration or acceleration speed [mm/s ^{2}]

<Calculation example of positioning operation>

Travel amount: 800 x 1 / 10 x 100 = 8000[pulse]

Travel speed: 800 x 1 / 10 x 100 = 8000 [pulse/sec])

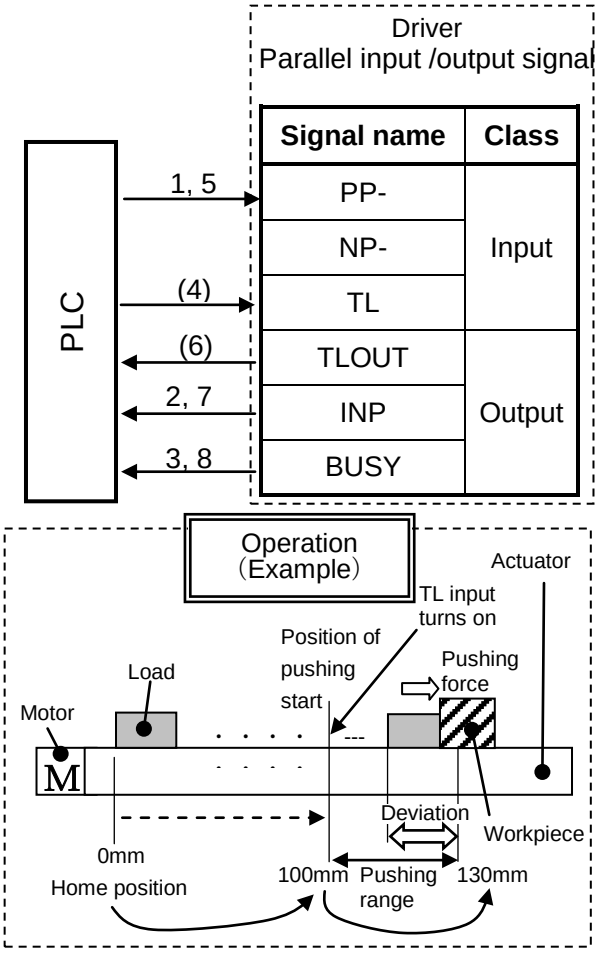
Acceleration / deceleration time: 100 / 3000 = 0.1 [s]

<Calculation example of pushing operation>

Travel amount: 800 x 1 / 10 x 30 = 2400[pulse]

Travel speed: 800 x 1 / 10 x 30 = 2400 [pulse/sec])

Acceleration / deceleration time: 30 / 3000 = 0.01 [s]



(1)Positioning operation starts until the start position for the pushing operation.Input pulse amount 8000[pulse], pulse frequency 8000[pulse/sec], acceleration 0.1[s], deceleration 0.1[s] to "PP-"

↓

Travels to the start position of pushing.

↓

(2) When the travel is completed, "INP" output is ON.

↓

(3) BUSY output is OFF

↓

Complete the movement to the start position of pushing.

↓

(4) TL input is turned ON.

↓

(5) Starts pushing
Input pulse amount 2400[pulse], pulse frequency 2400[pulse/sec], acceleration 0.01[s], deceleration 0.01[s] to "PP-"

↓

Starts pushing

↓

(6) TLOUT is turned ON when pushing starts

↓

Push the workpiece with the specified pushing force.

↓

(7) INP turns ON when pushing force stays larger than Trigger LV for specific period of time or longer.

↓

(8) “BUSY” output turns off

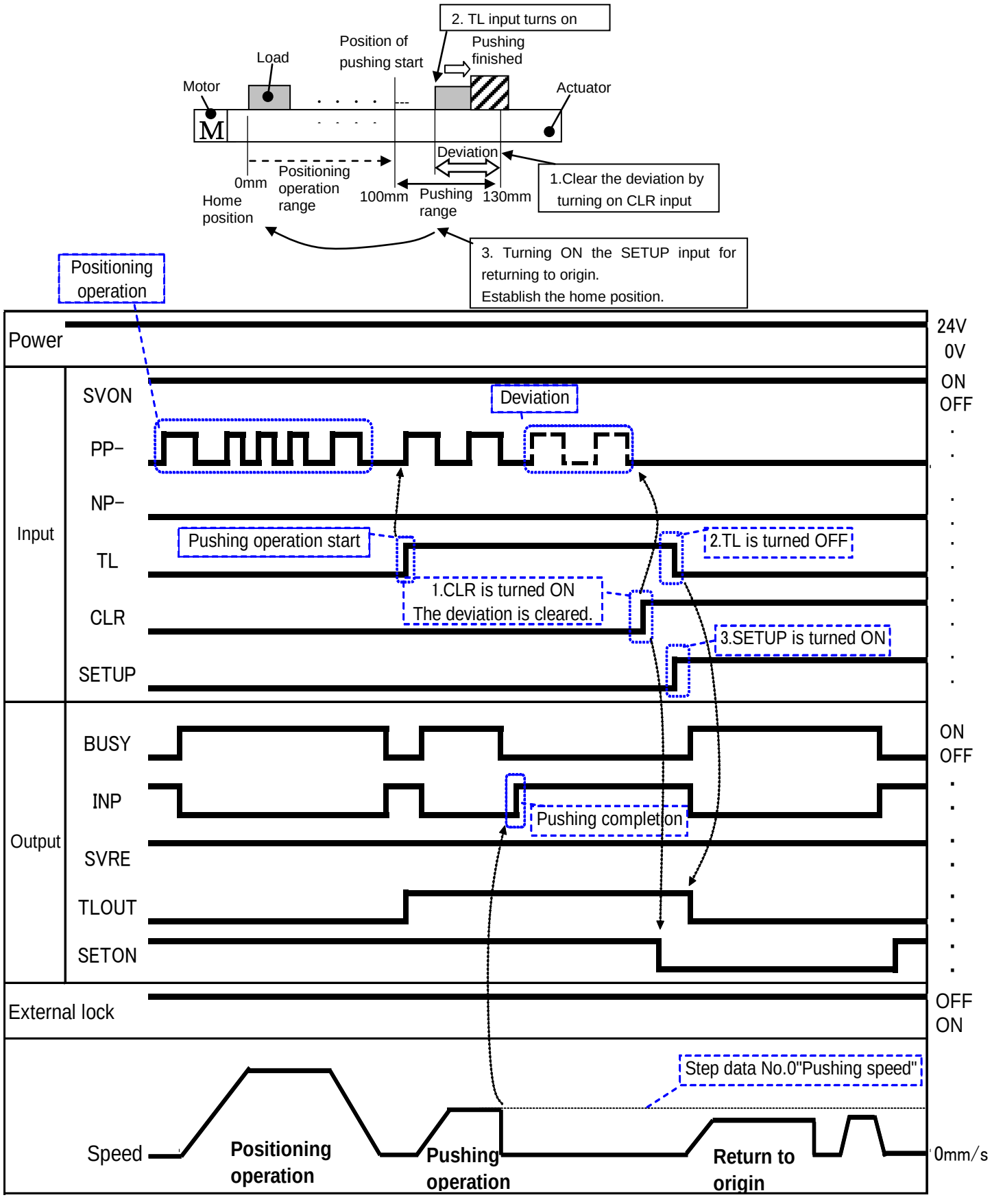
↓

Pushing completes

9.3 Pushing operation

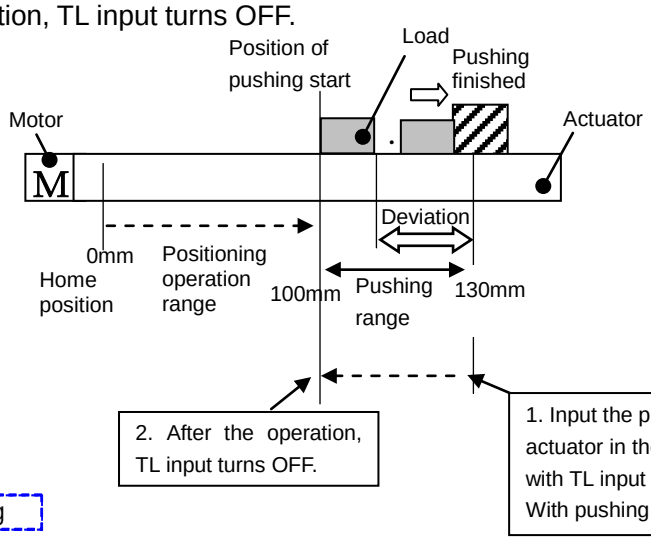
(Ex.1) Clear the deviation. Return to origin from the finish position of pushing.

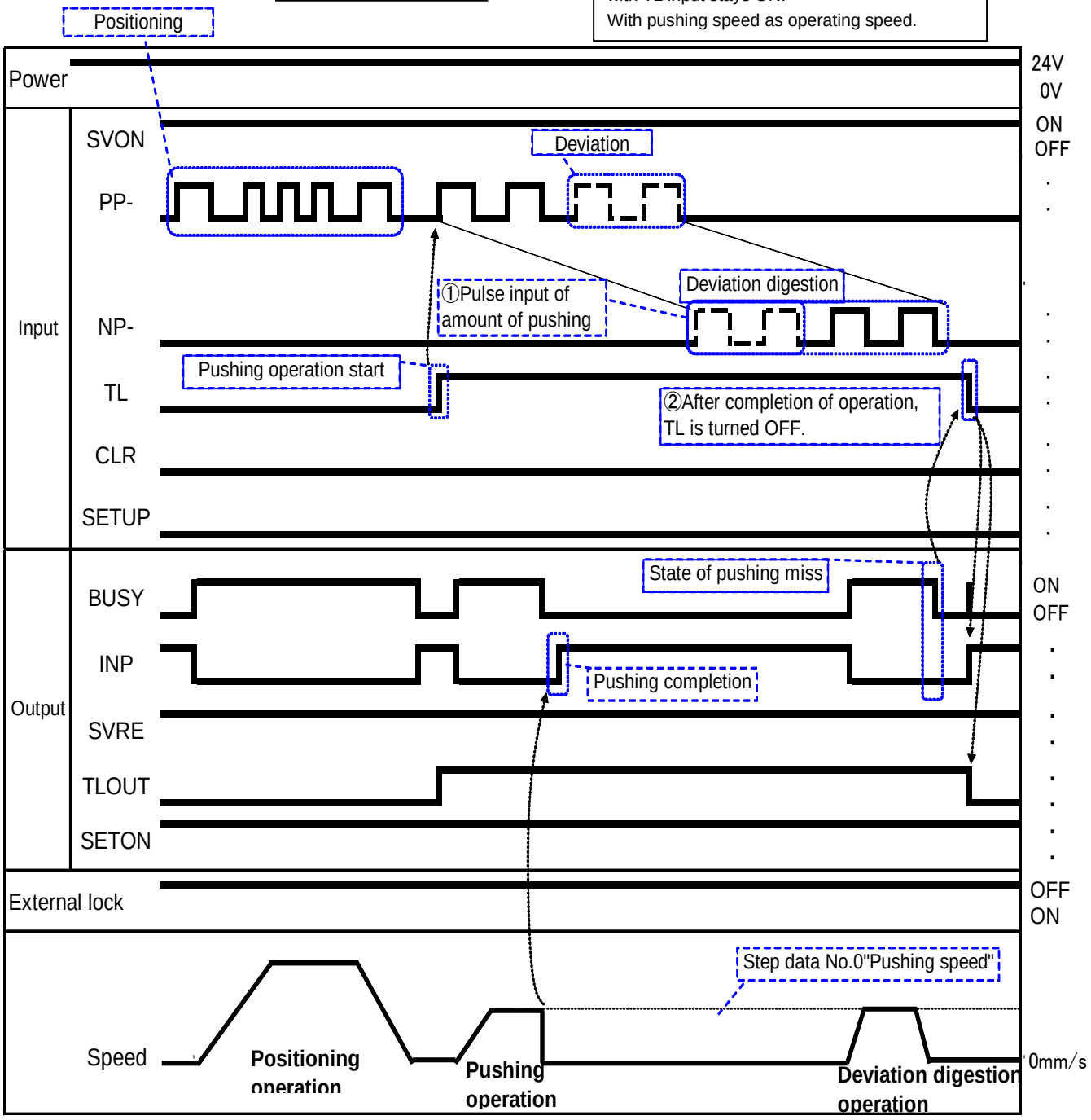
1. After pushing finishes, CLR turns on and the deviation is cleared.
2. TL input turns OFF.
3. Perform returning to origin by turning ON the SETUP input to establish the home position.



(Ex.2) Not clear the deviation. Input the pulse for the distance of pushed actuator but in the opposite direction with TL input ON.

1. After finishing the pushing, input the pulse for the distance of the pushed actuator in the opposite direction of the pushing. With pushing speed as operating speed.
2. After the operation, TL input turns OFF.





10. Operation instruction

10.1 Outline of the operation instruction

The operation of the driver can be achieved by input / output signals and pulse signals.

10.2 Procedures with the Parallel I/O

Please refer to the following “Procedures” and “Timing chart” for each operation.

[1] Power on → Return to origin

- Procedures-

(1) Apply the power.

↓

(2) ALARM is turned ON.
ESTOP is turned ON.

↓

(3) SVON is turned ON.

↓

(4) SVRE is turned ON.
(lock release)
* The time [SVRE] output turns ON is dependant on the type of actuator and the customer usage.
* It maybe takes about ten seconds from turning on SVON to SVRE turned on when after the power supply.
* The actuator with lock is unlocked.

↓

(5) SETUP is turned ON.

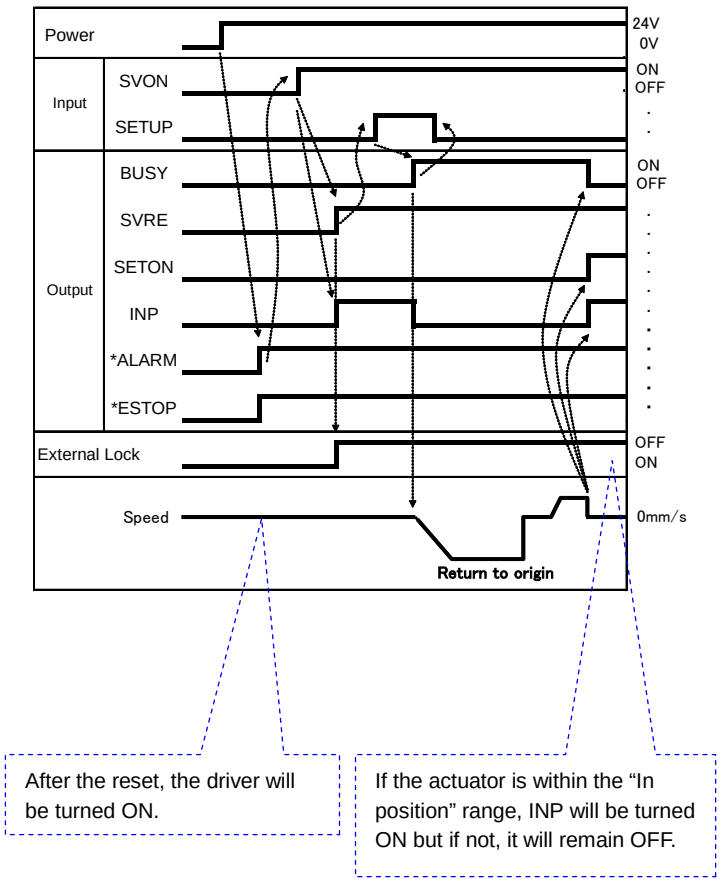
↓

(6) BUSY is turned ON.
(The actuator moves.)

↓

(7) SETON and INP are turned ON.
When the BUSY output is turned OFF, the return to origin operation has been completed.

- Timing chart-



* The “ALARM” and “ESTOP” are expressed as negative-logic circuit.

[2] Positioning operation

- Procedures-

(1) Input pulse signal

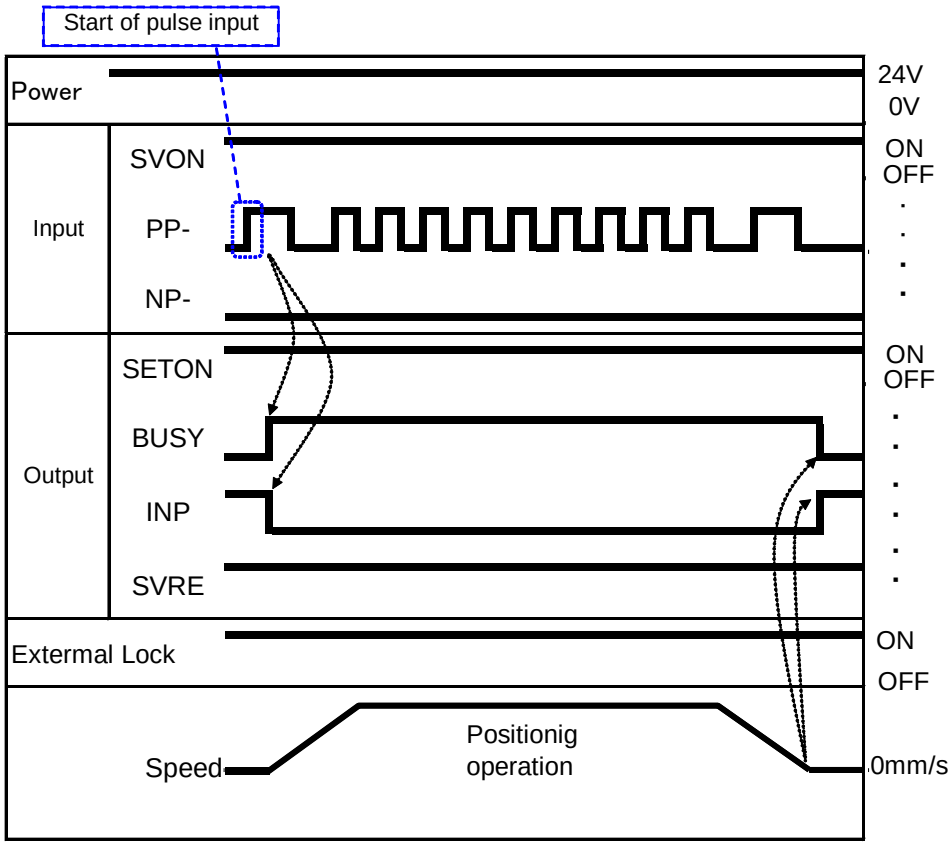
↓

(2) BUSY output turns ON
INP output is OFF
(Positioning starts)

↓

(3) If pulse signal is not input for 10ms or longer, INP signal is ON when the difference becomes smaller than "positioning width" BUSY signal is OFF when the actuator completes its operation.

-Timing chart-



⚠ Caution

1. Do not input normal (CW) and reversed (CCW) pulse signal simultaneously.
2. Keep 10ms or more interval to input reversed pulse signal when changing the actuator direction (motor direction). Minimum interval depends on the operating speed and load.

* It should not be shortened more than necessary.

[3] Pushing operation

- Procedure -

(1) Input pulse signal

↓

(2) TL input is turned ON.

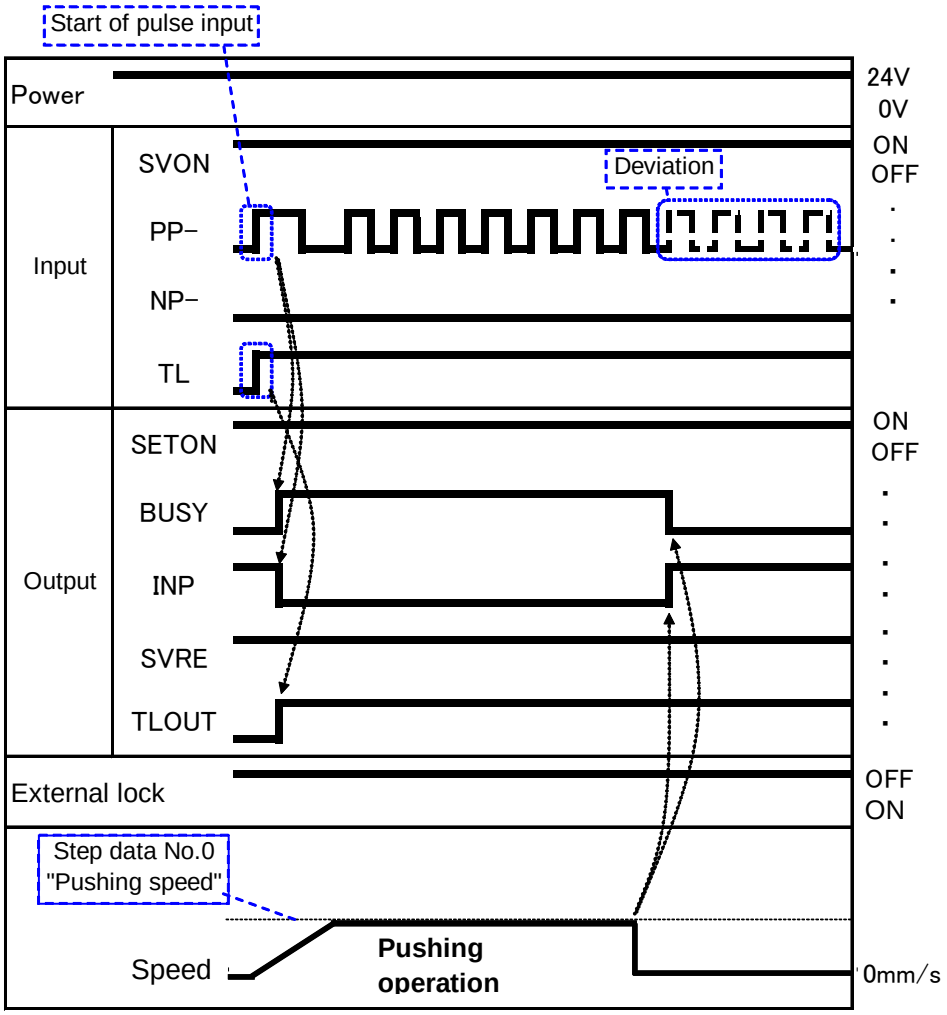
↓

(3) BUSY output turns ON
INP output is OFF
TLOUT output is turned on.
(Starts pushing)

↓

(4) Pushing is completed when INP output is ON and BUSY output is OFF.
(Thrust more than step data No.0 "Trigger LV" is generated)

-Timing chart-



[4] Alarm reset

-Procedures-

(1) Alarm generated
(SETON output and SVRE output are OFF when alarm is generated)

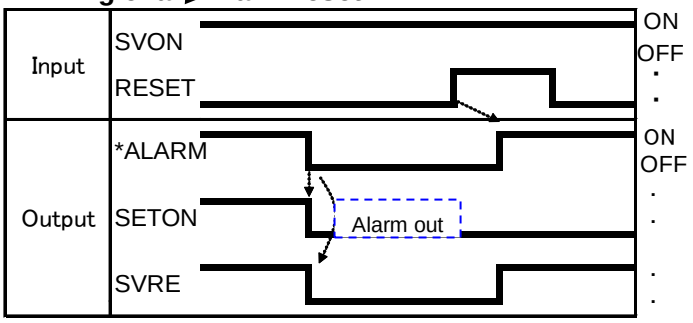
↓

(2) RESET is turned ON.

↓

(3) ALARM is turned ON and the output SVRE turned ON (the alarm is deactivated).

-Timing chart- Alarm reset



* The “ALARM” is expressed as negative-logic circuit.
* It is necessary to reenter the controlled source for reset of the alarm when alarm group E is generated.

[5] Deviation reset

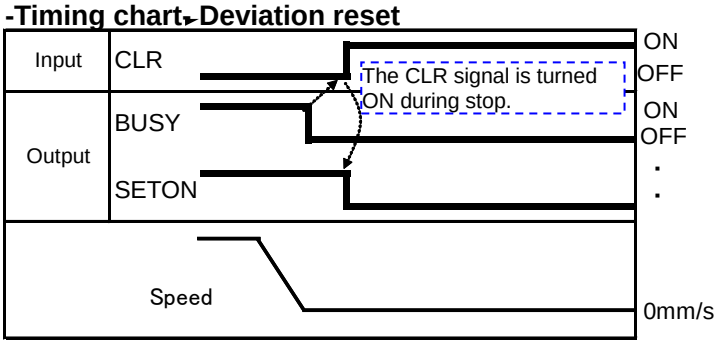
-Procedures-

(1) The CLR input is turned ON during the stop (when BUSY is OFF).

↓

(2) The deviation is cleared.
SETON is turned OFF.

-Timing chart- Deviation reset



[6] Stop (EMG)

-Procedures-

(1) The stop [EMG] input is turned OFF during the operation (when BUSY is ON).
[stop command]
Turn off the pulse signal input at the same time.

↓

(2) ESTOP is turned OFF.
SETON is turned ON.

↓

(3) BUSY is turned OFF
(the actuator stops).
SVRE is turned OFF
(if the actuator has a lock).

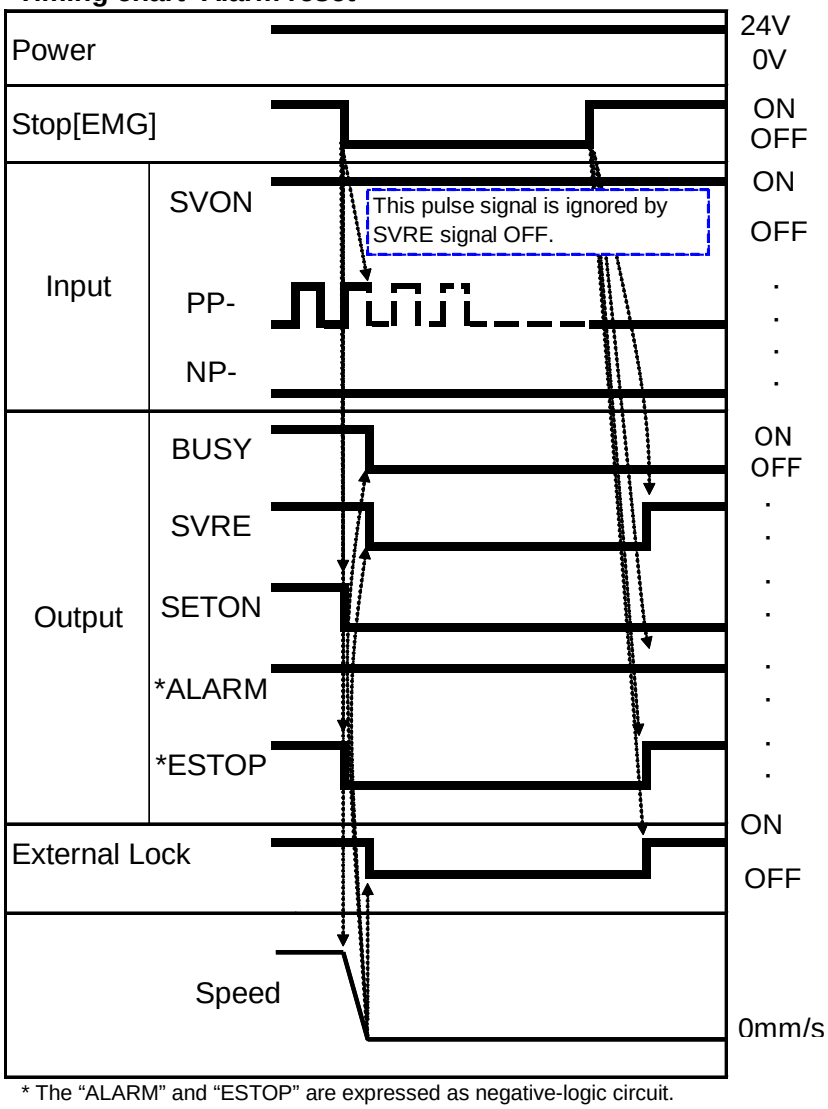
↓

(4) The stop [EMG] input is turned ON.
[The stop release command]

↓

(5) STOP is turned ON.
* SVRE is turned ON.
(*lock release)

-Timing chart- Alarm reset



* The “ALARM” and “ESTOP” are expressed as negative-logic circuit.
* When "Stop" is OFF, the stop is activated.

[7] Area output

-Procedures-

***Operation 1**

(1) Input pulse signal

↓

(2) BUSY output turns ON
INP output is OFF

↓

(3) AREA output turns ON
(at 50mm)

↓

(4)AREA output is OFF.
(at 80mm)

↓

(5) BUSY output is turned OFF
INP output turns ON

↓

***Operation 2**

(6) Input pulse signal

↓

(7) BUSY output turns ON
INP output is OFF

↓

(8) WAREA output turns ON
(at 130mm)

↓

(9) WAREA output is turned OFF
(at 160mm)

↓

(10) BUSY output is OFF
INP output turns ON

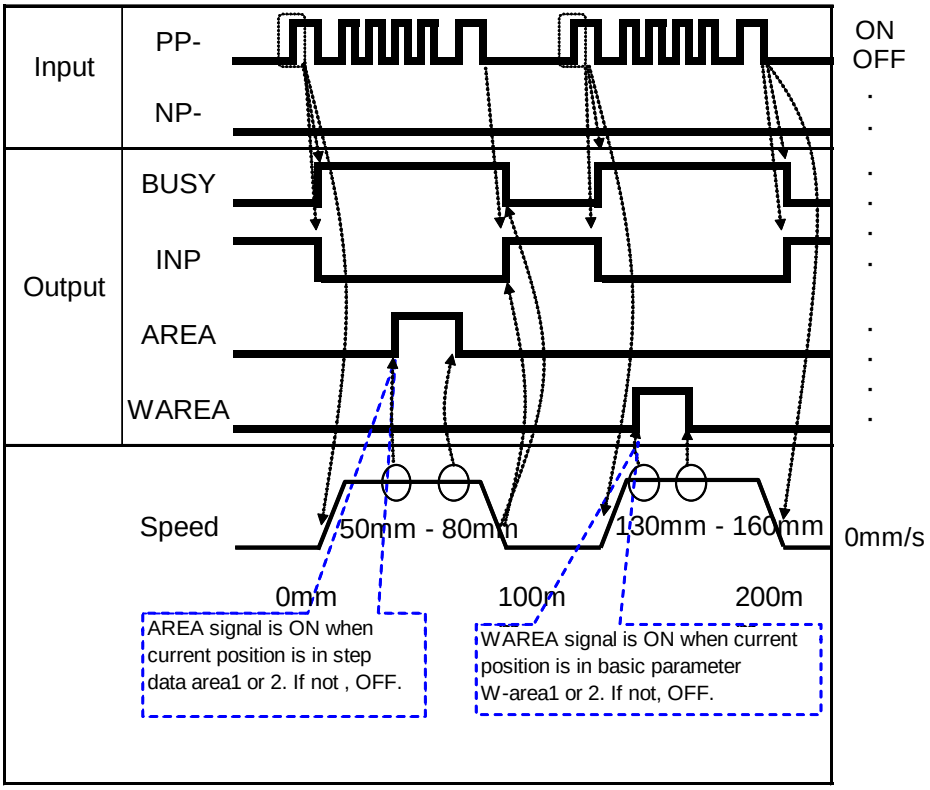
-Timing chart-

Example:

The initial position: 0mm

Operation 1: Position: 100mm, Area1 – Area2: 50-80mm

Operation 2: Position: 200mm, W-AREA1 – W-AREA2: 130-160mm



11. Automatic pulse reference detection

11.1 The meaning of automatic pulse reference detection

"Automatic pulse reference detection" is a function which checks the reference pulse (signal reference for "no pulse input") when the first SVON input is ON. The reference of "No pulse input" detected by this function precedes H/L reference which is determined by parameters which set up the pulse signal input method (option set 1).

(This detection is "H/L reference " only. "Pulse Input Method" cannot be detected.)

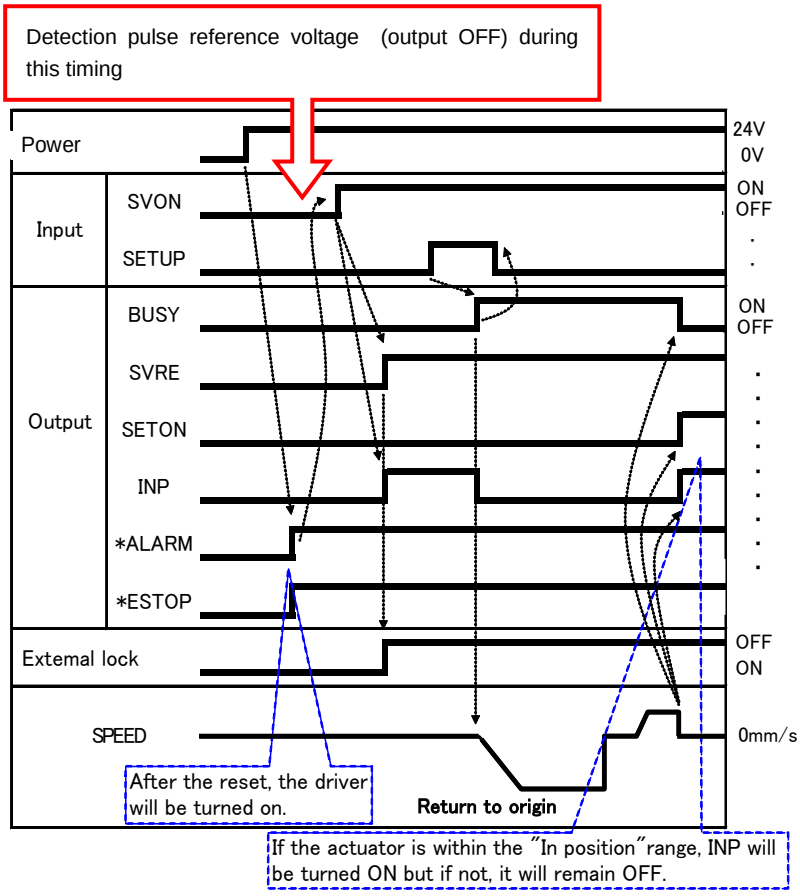
When the first SVON input is ON during the pulse inputting, the H/L reference cannot be detected.

If the H/L reference cannot be detected correctly, please refer to "11.3 Automatic pulse reference detection OFF"

11. 2 Operation procedure using automatic detection function

Refer to the operation procedure for parallel IO and timing chart below.

- Timing chart -



* The "ALARM" and "ESTOP" are expressed as negative-logic circuit.

-Procedures-

(1) Apply the power (Driver and PLC).

↓

(2) ALARM is turned ON.
*ESTOP is turned ON.
Pulse train from the PLC must be turned off.

↓

(3) SVON is turned ON.
Detect the pulse reference.

↓

(4) SVRE is turned ON.
* The time [SVRE] output turns ON is dependent on the type of actuator and the customer usage.
* It maybe takes about ten seconds from turning on SVON to SVRE turned on when after the power supply.
* The actuator with lock is unlocked.

↓

(5) SETUP is turned ON.

↓

(6) BUSY is turned ON.
(The actuator moves.)

↓

(7) SETON and INP are turned ON.
When the BUSY output is turned OFF, the return to origin has been completed.

11.3 Automatic pulse reference detection OFF

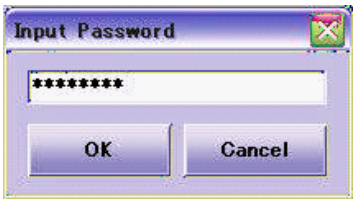
The procedure below demonstrates how to turn off "Automatic pulse reference detection" using the setup software (LEC-W2).

- Setting procedure -

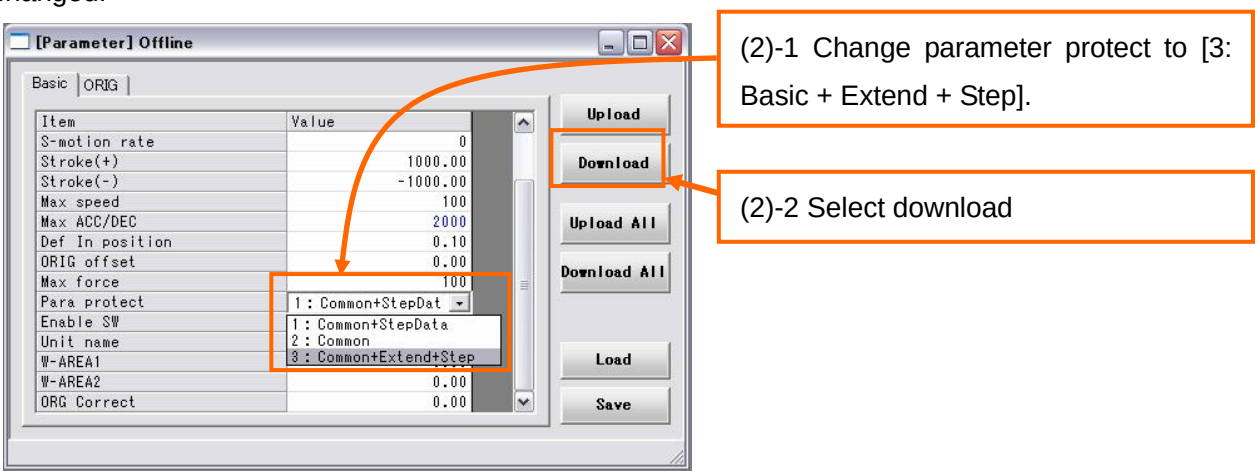
(1) Launch the setup software in Normal Mode while the power supply for the driver is ON to allow the setup software to communicate with the controller (Online status).

* During Offline status, "Offline" is displayed in the upper left corner of the setup software screen.

(2) After starting the setup software in Normal Mode, select "HELP", then select "Password" from the pulldown menu. Enter "password" into the password field as shown below.



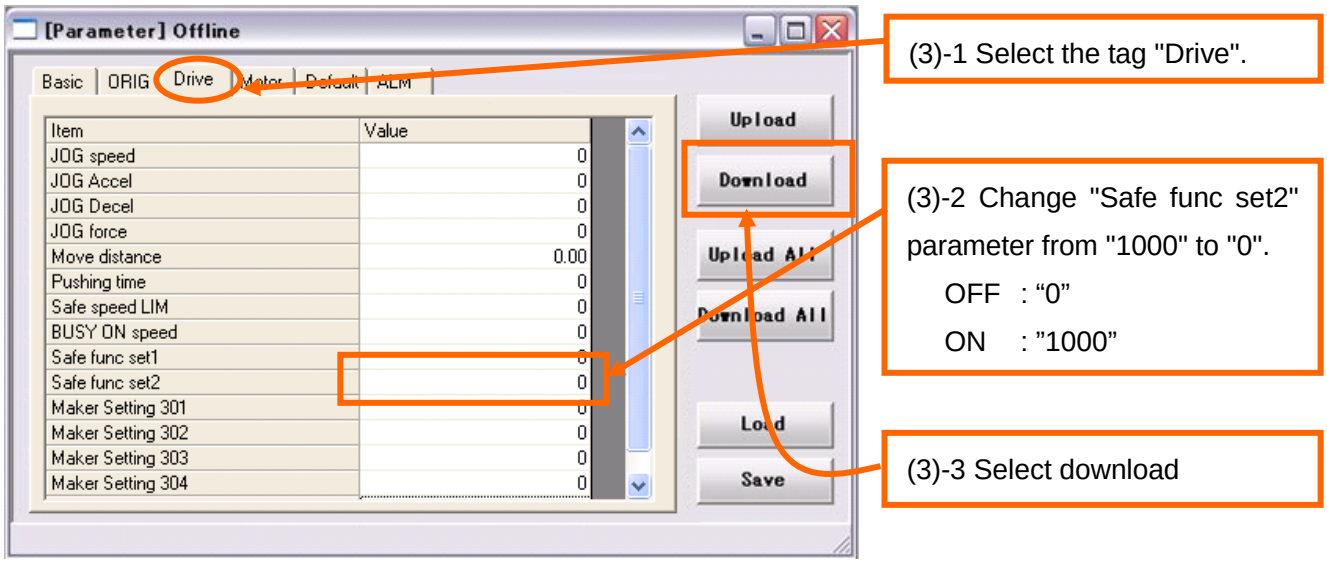
(3) Change the "Parameter protect" setting to allow the "Safety function setting 2" parameter to be changed.



Change the parameter window "Basic"-"Parameter protect" to "3: Basic + Extension + Step"

Select “Download” button. The modified data is transmitted to the controller. Once downloaded, the parameter set value which was displayed in blue will now be displayed in black.

(4) Select "Drive" on the Parameter window. Change "Safe func set2" from "1000" to "0".



Select "Download" button. The modified data is transmitted to the controller. Once downloaded, the parameter set value for "Safe func set2" which was displayed in blue will now be displayed in black.

(5) After selecting "1: Basic + Step data" in "Para protect" shown in the display above, select "Download".

(6) Exit the setup software (LEC-W2). Turn off the power supply for the controller (LEC). Automatic pulse reference detection will be" OFF "the next time the controller (LEC) power supply is turned on.

⚠ Caution

(1) Do not set any values to "Safe func set2"other than those specified above.
Otherwise, malfunction can result.

(2) Do not modify any parameters other than "Drive parameter (Safe func set2)", "Basic parameter", and "ORIG".
Otherwise, malfunction can result.

12. Option

12.1 Actuator cable (5m or less)

LE - CP - □ - □

Cable length (L)

1	1.5m
3	3m
5	5m

Actuator cable type

Nil	Robot cable
S	Standard cable

<1>

Signal	Tarminal no.
A	B-1
$\overline{A}$	A-1
B	B-2
$\overline{B}$	A-2
COM-A/COM	B-3
COM-B/ -	A-3
Vcc	B-4
GND	A-4
$\overline{A}$	B-5
A	A-5
$\overline{B}$	B-6
B	A-6

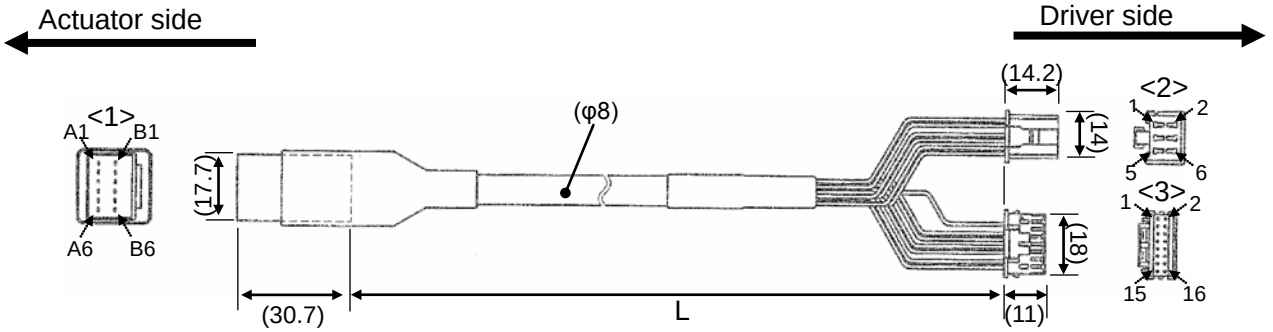
<2>

Cable color	Tarminal no.
Brown	2
Red	1
Orange	6
Yellow	5
Green	3
Blue	4

<3>

Cable color	Tarminal no.
Brown	12
Black	13
Red	7
Black	6
Orange	9
Black	8
-	3

Shield



12.2 Actuator cable (8-20m)

LE - CP - □

Cable length (L)

8	8m*
A	10m*
B	15m*
C	20m*

* Poduced upon receipt of order

* Only "Robotic type cable" can be selected.

<1>

Signal	Tarminal no.
A	B-1
$\overline{A}$	A-1
B	B-2
$\overline{B}$	A-2
COM-A/COM	B-3
COM-B/ -	A-3
Vcc	B-4
GND	A-4
$\overline{A}$	B-5
A	A-5
$\overline{B}$	B-6
B	A-6

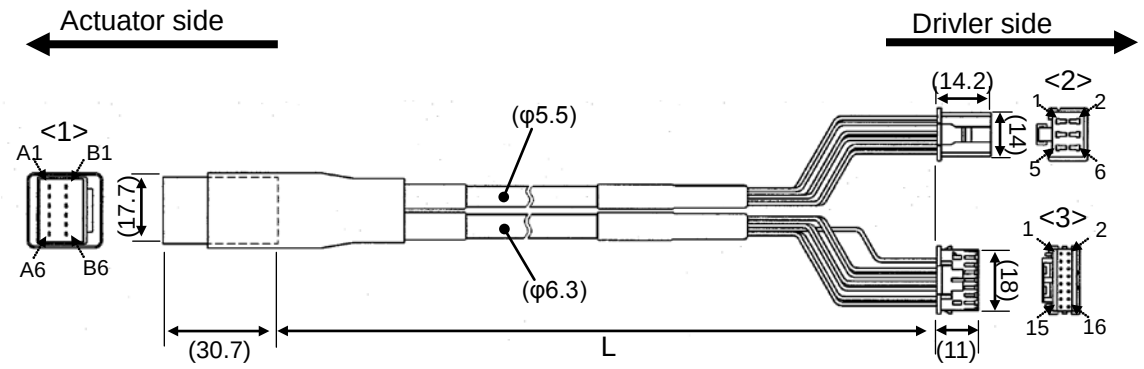
<2>

Cable color	Tarminal no.
Brown	2
Red	1
Orange	6
Yellow	5
Green	3
Blue	4

<3>

Cable color	Tarminal no.
Brown	12
Black	13
Red	7
Black	6
Orange	9
Black	8
-	3

Shield



SMC

12.3 Actuator cable for with lock (5m or less)

LE - CP - □ - B - □

Cable length (L)

1	1.5m
3	3m
5	5m

Actuator cable type

Nil	Robot cable
S	Standard cable

<1>

Signal	Tarminal no.
A	B-1
$\overline{A}$	A-1
B	B-2
$\overline{B}$	A-2
COM-A/COM	B-3
COM-B/ -	A-3

<2>

Cable color	Tarminal no.
Brown	2
Red	1
Orange	6
Yellow	5
Green	3
Blue	4

<3> Shield

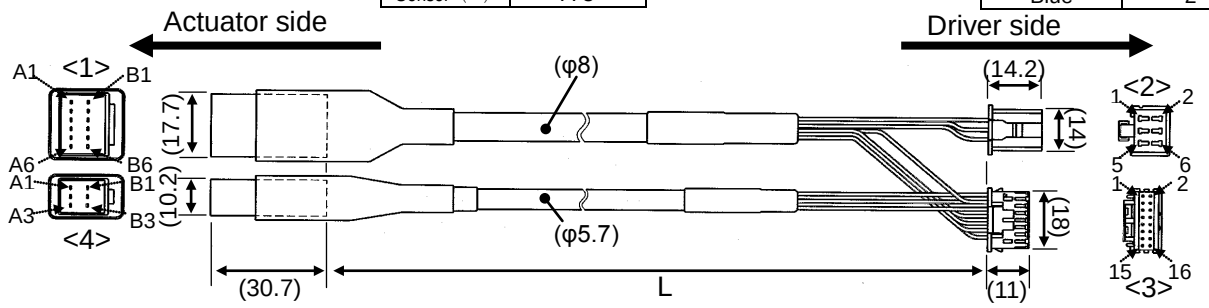
Vcc	B-4
GND	A-4
$\overline{A}$	B-5
A	A-5
$\overline{B}$	B-6
B	A-6

Cable color	Tarminal no.
Brown	12
Black	13
Red	7
Black	6
Orange	9
Black	8
-	3

<4>

Signal	Tarminal no.
Lock (+)	B-1
Lock (−)	A-1
Sensor (+)	B-3
Sensor (−)	A-3

Cable color	Tarminal no.
Red	4
Black	5
Brown	1
Blue	2



12.4 Actuator cable for with lock (8-20m)

LE - CP - □ - B

Cable length (L)

8	8m*
A	10m*
B	15m*
C	20m*

* Produced upon receipt of order

* Only "Robotic type cable" can be selected.

<1>

Signal	Tarminal no.
A	B-1
$\overline{A}$	A-1
B	B-2
$\overline{B}$	A-2
COM-A/COM	B-3
COM-B/ -	A-3

<2>

Cable color	Tarminal no.
Brown	2
Red	1
Orange	6
Yellow	5
Green	3
Blue	4

<3> Shield

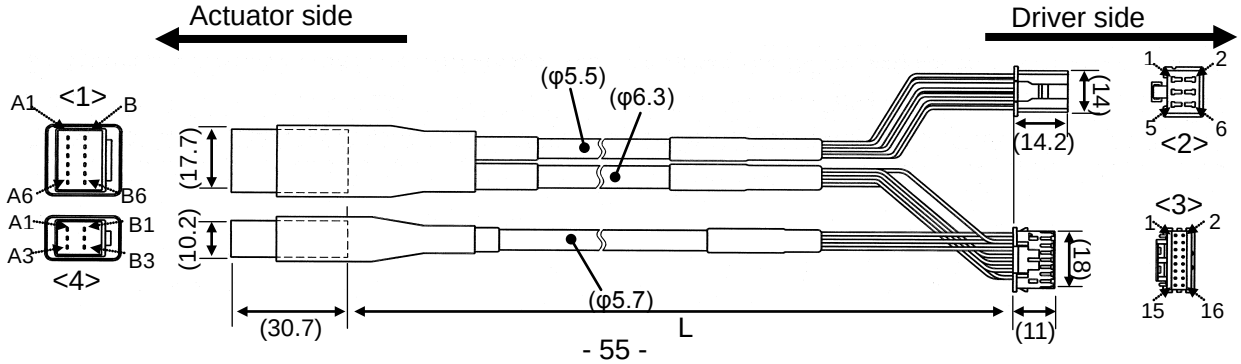
Vcc	B-4
GND	A-4
A	B-5
$\overline{A}$	A-5
B	B-6
$\overline{B}$	A-6

Cable color	Tarminal no.
Brown	12
Black	13
Red	7
Black	6
Orange	9
Black	8
-	3

<4>

Signal	Tarminal no.
Lock (+)	B-1
Lock (−)	A-1
Sensor (+)	B-3
Sensor (−)	A-3

Cable color	Tarminal no.
Red	4
Black	5
Brown	1
Blue	2



SMC

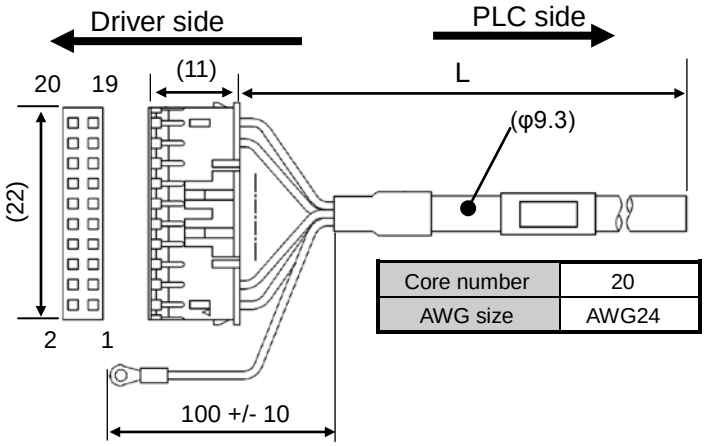
12.5 I/O Cable

LEC – CL5 – □

Cable length(L)

1	1.5m
3	3m*
5	5m*

* Available only when differential pulse input. Only 1.5m cable is available for open collector.



Pin No.	Color of insulation	Dot mark	Dot color
1	Light brown	■	Black
2	Light brown	■	Red
3	Yellow	■	Black
4	Yellow	■	Red
5	Light green	■	Black
6	Light green	■	Red
7	Grey	■	Black
8	Grey	■	Red
9	White	■	Black
10	White	■	Red
11	Light brown	■■	Black
12	Light brown	■■	Red
13	Yellow	■■	Black
14	Yellow	■■	Red
15	Light green	■■	Black
16	Light green	■■	Red
17	Grey	■■	Black
18	Grey	■■	Red
19	White	■■	Black
20	White	■■	Red

12.6 Controller setting kit

LEC – W2

Controller setting kit

Contents

(1) Controller setting software (CD-ROM)
(2) Communication cable
(3) Conversion unit
(4) USB cable

Hardware requirements

PC/AT compatible machine installed with Windows XP®, Windows 7® and Windows 8.1® and equipped with USB1.1 or USB2.0 ports.

*Windows®, Windows XP®, Windows 7® and Windows 8.1® are registered trade marks of Microsoft Conporation.

⚠ Caution

When the controller setting software/version is earlier than V1.2, please upgrade the controller setting software. Upgrade software be able to download on SMC website.
http://www.smcworld.com/

12.7 Teaching box

LEC - T1 - 3 E G □

Teaching box

Cable length

3	3m

Initial language

E	English
J	Japanese

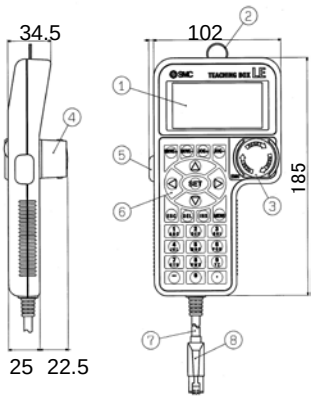
Enable switch

Nil	No enable switch
S	Equipped with enable

Stop switch

G	Equipped with stop switch

Dimensions



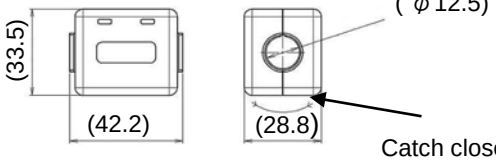
No	Name	Function
(1)	LCD	Liquid crystal display (with backlight)
(2)	Ring	The ring to hang the teaching box.
(3)	Stop switch	Pressing down to lock this, controlled stop will be activated.Turn clockwise to release the lock.
(4)	Stop guard	Protector for the stop switch
(5)	Enable switch (Option)	Switch to prevent unintentional operation of Jog test function. * Does not apply to other functions e.g. data change
(6)	Key switch	Entry switches
(7)	Cable	3m length
(8)	Connector	The connector to be connected to the CN4 of the driver.

12.8 Noise filter set

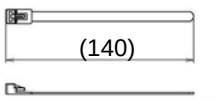
LEC - NFA

Noise filter set

Noise filter (2pcs.)

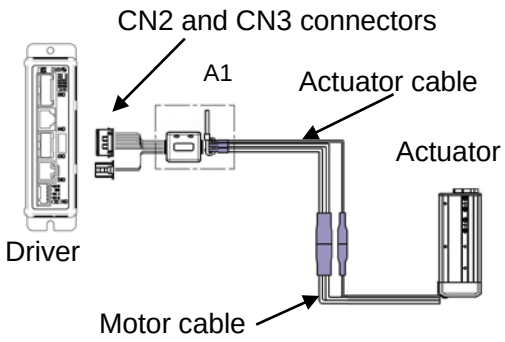


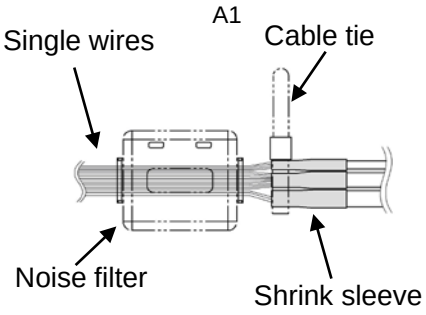
Cable tie (3pcs.)



Assembly procedure:

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





⚠ Caution

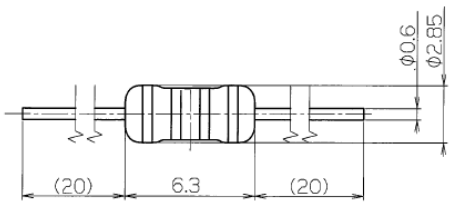
1) When mounting a noise filter on the actuator cable, fit all of the single wires into the noise filter. (CN2 connector 6 wires and CN3 connector 7 wires [17 wires for the lock specification]). Be careful not to crush the wires when mounting the noise filter.
2) Also, ensure that the shrink sleeve does not get inside the noise filter (refer to A1).
3) When unplugging the actuator cable connectors CN2 and CN3 from the driver, remove the cable tie and move the noise filter towards the shrink sleeve. After re-mounting, return the noise filter to its original position and re-fasten the cable tie.

12.9 Current limiting resistor

The following resistor (LEC-PA-R-□) is used when the pulse input signal uses the open collector configuration.

LEC-PA-R-□

Current limiting resistor



Symbol	Resistance	Power supply voltage for pulse input signal
332	3.3kΩ+/-5%	24VDC+/-10%
391	390Ω+/-5%	5VDC+/5%

* Select the current limiting resistor R which corresponds to the pulse signal voltage.
* LEC-PA-R-□ is provided with 2 pcs in one set.

13. Alarm Detection

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

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

Please refer to section **"13.2 Alarm details (page 59)"** of this manual on how to, deactivate the alarm. There are two types of alarms: the ones that can be deactivated by the RESET input via the parallel communication and the other that can be deactivated by cycling the driver power supply (C24V).

13.1 Parallel output for the alarm group

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

Alarm group	Parallel output		Procedure of restart
	SVRE	SETON	
Alarm group A	OFF	OFF	RESET input
Alarm group B			RESET input
Alarm group C			RESET input
Alarm group D			RESET input
Alarm group E			Power off →Turn on the power again

13.2 Alarm details

Alarm (code)	Group	How to deactivate	Alarm contents/Countermeasure
Step data ALM1 (1-048)	B	RESET SVON input	**<Contents>**The step data is in-correct for the following conditions:(Assignable value range) (1) Area1 < Area2 (If both Area1 and Area2 is 0, the alarm will not be activated.) (2) Trigger LV ≤ Pushing force (3) Minimum speed of actuator ≤ Pushing speed ≤ Speed (4) Pushing speed ≤ Maximum pushing speed of actuator (5) Pushing force ≥ Minimum pushing force of actuator (6) Basic parameters "Max force" ≥ Minimum pushing force of actuator (7) Basic parameters "Max force" ≥ Trigger LV (8) Pushing force ≠ 0 **<Countermeasure>** Modify the step data and "basic parameters" setting. **⚠ Caution** Please confirm this pushing force and minimum speeds of Data maximum speed and 0 or more of the actuator with the actuator manual or the catalog.
Parameter ALM (1-049)	B	RESET SVON input	**<Contents>** The basic parameter is not correct for the following condition:(Assignable value range) (1) Stroke (-) < Stroke (+) (2) W-Area 1 < W-Area2(If both W-Area1 and W-Area2 is 0, the alarm will not be activated.) (3) Maximum pushing force < Maximum pushing force of actuator **<Countermeasure>** Modify the basic parameter setting. **⚠ Caution** Please refer to the manual or the catalogue of the actuator for the max/min pushing force/speed for the actuator.
Step data ALM2 (1-051)	B	RESET SVON input	**<Contents>** Generated when test operation is performed by the teaching box or PC setting software. **<Countermeasure>** (1) Check if "Operation" of the step data is "Blank (Invalid data)". (2)This product cannot perform test operation by the teaching box or PC setting software. Refer to **"7.1 Step data (page 31)"**

<table>
<tr><td>Stroke limit
(1-052)</td><td>B</td><td>RESET
SVON
input</td><td><Contents> The actuator goes out the stroke limit specified by the basic parameters, “Stroke (+)” and “Stroke (-)” if it performs the requested operation. (Including JOG operation after return to origin)
<Countermeasure> Make sure that the basic parameter, “Stroke (+)” and “Stroke (-)” are consistent with the distance of actuator movement specified in the step data.
* Generated only in case of SETON
⚠ Caution
If the “Movement MOD” of the step data is relative, pay attention to the starting point and distance of the actuator movement.</td></tr>
<tr><td>ORIG ALM
(1-097)</td><td>C</td><td>RESET
SVON
input</td><td><Contents> 1.Return to origin is not completed within the set time.
2. Return to origin parameter has the conditions shown below.
<table><tr><th colspan="2">Parameter setting content</th></tr><tr><th>ORIG mode</th><th>ORIG sensor</th></tr><tr><td>limit switch origin [Sensor]</td><td>2. N.C</td></tr></table>* Alarm is generated with condition above when the sensor is not mounted to the actuator.
<Countermeasure> 1.Check whether the movement of the actuator is obstructed.
2. Please check the Return to origin parameter and motor and sensor type.</td></tr>
<tr><td>Servo off ALM
(1-098)</td><td>C</td><td>RESET
SVON
input</td><td><Contents> While the servo motor is off (when EMG terminal is not energized), the return to origin operation, JOG operation or MOVE operation is requested.
<Countermeasure> Modify the setting so that those operations will be requested while the servo motor is ON (the SVON input is ON). Apply 24 VDC to the EMG terminal.</td></tr>
<tr><td>ORIG Sens ALM
(1-103)</td><td>C</td><td>RESET
SVON
input</td><td><Contents> Return to origin parameter has the conditions shown below.
<table><tr><th rowspan="2"></th><th colspan="2">Parameter setting content</th></tr><tr><th>ORIG mode</th><th>ORIG sensor</th></tr><tr><td>1</td><td>Pushing origin operation [Stop]</td><td>1. N.O</td></tr><tr><td>2</td><td>Limit switch origin [Sensor]</td><td>0. Disable
or
1. N.O</td></tr></table>* Alarm is generated with condition above when the sensor is not mounted to the actuator.
<Countermeasure> Sensor installation and return to origin parameter and motor and sensor type is setting to have confirmed.</td></tr>
<tr><td>AbEnc Comm ALM
(1-106)</td><td>C</td><td>RESET
SVON
input</td><td><Contents> The alarm is generated when the communication between the driver ciruit and the absolute ciruit is not normal. (This driver has not absolute function.)
<Countermeasure> Make sure that the sensor type of the basic parameter is 1. After the parameter is changed, it is necessary to reapply the power.</td></tr>
</table>

<table>
<tr><td>Overflow ALM
[6C]
(1-108)</td><td>C</td><td>RESET
SVON
input</td><td><Contents>Position deviation counter in the driver has overflowed during the operation by pulse signals.
<Countermeasure> Make sure there are no obstructions that interfere with the actuator movement. Also, make sure that the load, speed, acceleration and deceleration are within the range of the actuators.</td></tr>
<tr><td>Over speed
(1-144)</td><td>D</td><td>RESET
SVON
Input</td><td><Contents> The motor speed exceeds a specific level due to an external force, etc.
<Countermeasure> Make improvements such that the motor speed will not exceed the maximum speed of the actuator.
⚠ Caution
Please refer to the manual or the catalogue of the actuator for the maximum speed of the actuator.</td></tr>
<tr><td>Over motor Vol
(1-145)</td><td>D</td><td>RESET
SVON
Input</td><td><Contents>The motor power supply voltage is out of range.During [SVON] .
<Countermeasure> Make sure that the voltage supplied to the motor power (M24V) of the driver is within specification.
⚠ Caution
If the power supply is “rush-current restraining type”, a voltage drop may cause an alarm during the acceleration/deceleration.
<Contents> Also, a regenerative electric power may cause an alarm due to the method of operation of the actuator.
<Countermeasure> Make sure that the operating conditions are within the specifications.
⚠ Caution
Please refer to the manual or the catalogue of the actuator for the method of operation of the actuator.</td></tr>
<tr><td>Over Temp.
(1-146)</td><td>D</td><td>RESET
SVON
Input</td><td><Contents> The temperature around the power element of the driver is too high.
<Countermeasure> Make improvements so that the temperature around the driver is kept appropriate.</td></tr>
<tr><td>Over Crtl Vol
(1-147)</td><td>D</td><td>RESET
SVON
Input</td><td><Contents> The control power supply voltage within the driver is out of a range.
<Countermeasure> Make sure that the voltage supplied to the control power (C24V) of the driver is appropriate.
⚠ Caution
If one power supply is commonly used for the control power and the motor power, or the power supply is ”rush-current restraining type”, a power voltage drop may be caused due to a voltage drop during the acceleration/deceleration.
<Contents> Also, a regenerative electric power may be generated to cause an alarm due to the method of operation of the actuator.</td></tr>
</table>

			<Countermeasure> Make sure that the operating conditions are within the specifications. **⚠ Caution** Please refer to the manual or the catalogue of the actuator for the method of operation of the actuator.
Over load (1-148)	D	RESET SVON Input	**<Contents>** The output current accumulated value exceeds the specified value. **<Countermeasure>** Check whether the movement of the actuator is obstructed.Also confirm whether the actuator load, speed, acceleration and deceleration are within the specification range of the actuator.
Posn failed (1-149)	D	RESET SVON Input	**<Contents>** Failed to reach to the set position within the set time limit during origin operation, Move operation or JOG operation. This alarm is not generated by operation triggered by pulse signal. **<Countermeasure>** Eliminate any obstructions that interfere with the actuator movement. Also, make sure that the load, speed, acceleration and deceleration are within the range of the actuators.
Ctrl Comm ALM (1-150)	D	RESET SVON Input	**<Contents>** The connection with the higher-level devices (such as the PC and teaching box) is disconnected. **<Countermeasure>** Make sure that the higher-level devices will not be disconnected during the actuator operation.
Encoder ALM (1-192)	E	Power off	**<Contents>** Abnormality in communication with the encoder. **<Countermeasure>** Check the connection of the actuator cable.
Phase Det ALM (1-193)	E	Power off	**<Contents>** Unable to find the motor phase within the set time. (When the servo motor is turned on (SVON is turned on) first time after the power is applied, the actuator needs to move a little to find the motor phase. However, if this actuator movement is prevented, this alarm will be activated.) **<Countermeasure>** Make sure there are no obstructions that interfere with the actuator movement and then, turn on the servo motor (SVON is turned on).
Over current (1-194)	E	Power off	**<Contents>** The output current of the power circuit is extraordinarily high. **<Countermeasure>** Make sure that there are no short circuits of actuator cables, connectors, etc. In addition, make sure that the actuator conforms to the driver.
I sens ALM (1-195)	E	Power off	**<Contents>** An abnormality is detected by the current sensor that is checked when the driver is reset. **<Countermeasure>** Make sure that the actuator conforms to the driver. Even after this measure, if the alarm regenerates when the power is reapplied, please contact SMC.

Err overflow (1-196)	E	Power off	**<Contents>** Position deviation counter in the driver has overflowed during JOG or MOVE operation. **<Countermeasure>** Check if the travel of the actuator is interrupted. Check if the load of the actuator is within the specification range.
Memory ALM (1-197)	E	Power off	**<Contents>** An error of the EEPROM is occurred. **<Countermeasure>** Please contact SMC.
CPU ALM (1-198)	E	Power off	**<Contents>** The CPU is not operating normally. (It is possible that the CPU or surrounding circuits is failed or a malfunction of the CPU is occurred due to an electric noise). **<Countermeasure>** If the alarm cannot be deactivated even after the power is reapplied, please contact SMC.

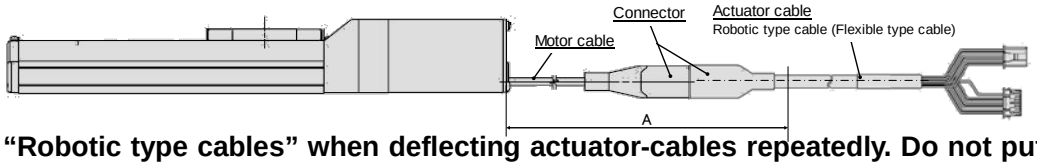
14. Wiring of cables/Common precautions

⚠Warning

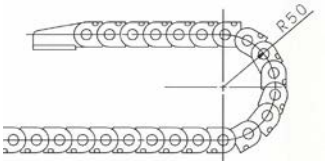
1. **Adjusting, mounting or wiring change should never be done before shutting off the power supply to the product.**
   Electrical shock, malfunction and damaged can result.
2. **Never disassemble the cable. Use only specified cables.**
3. **Never connect or disconnect the cable or connector with power 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, high voltage and low voltage cables should be separated, and keep wiring lengths short, etc.
4. **Do not route wires and cables together with power or high voltage cables.**
   The product can malfunction due to interference and surge voltage cables. Route the wires to the product separately from power or high voltage cables.
5. **Take care that actuator movement does not damage cables.**
6. **Operate with cables secured. Avoid bending cables at sharp angles where they enter the product.**
7. **Avoid twisting, folding, rotating or applying an external force to the cable.**
   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 A part below it in a flexible moving tube.



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



10. **Confirm correct 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 the cable length is 15m: Maximum 20% reduction.)

[Transportation]

⚠Caution

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

15. Electric actuators/ Common precautions

15.1 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 product failure.
   Any damage attributed to use beyond the specifications is not guaranteed.
2. **There is a possibility of dangerous sudden action by the product if sliding parts of machinery are twisted due to external forces, etc.**
   In such cases, human injury may occur, such as 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 supply failure.
6. **Consider the behavior of an emergency stop of the whole system.**
   Design the system so that human injury and/or damage to machinery and equipment will not be caused, when it is stopped by a safety device for abnormal conditions such as a power outage or a manual emergency stop of the whole system.
7. **Consider the action when operation is restarted after an emergency stop or abnormal stop of the whole system.**
   Design the system so that human injury or equipment damage will not occur upon restart of operation of the whole system.
8. **Disassembly and modification 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 driver and stop switch on the teaching box as the emergency stop of system.**
   The stop signal, "EMG" of driver and the stop switch on the teaching box are for decelerating and stopping the actuator.
   Design the system with an emergency stop circuit which is applied to the relevant safety standard separately.
10. **When using it for vertical application, it is necessary to build in a safety device.**
    The rod may fall due to the weight of the work. The safety device should not interfere with normal operation of the machine.

⚠Caution

1. **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 be lost.

3. **Do not use the product in applications where excessive external force or impact force is applied.**
   The product can be damaged. Each component that includes motor is made with accurate tolerances. Even slightly deformed or misaligned of components may lead to product failure.
4. **Refer to a common auto switch (Best Pneumatics No 2), when an auto switch is built and used within the system.**
5. **When conformity to UL is required, the electric actuator and driver should be used with a UL1310 Class 2 power supply.**

15.2 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 them with other objects. Components are manufactured to precise tolerances, so the slightest deformation may cause faulty operation.
6. **Prevent the seizure of rotating parts.**
   Prevent the seizure of rotating parts (pins, etc.) by applying lubricating 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 will damage the actuator when moving at high speed.
   The metal support fittings which suppress the vibration of the main body of the actuator are installed.
   Reduce the speed to the condition where the actuator does not vibrate.
9. **When mounting the actuator or attaching to the work piece, do not apply strong impact or large moment.**
   If an external force above 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.

15.3 Handling

⚠Warning

1. **Do not touch the motor while in operation.**
   The surface temperature of the motor can increase to approx. 90°C to 100°C due to operating conditions. Energizing alone may also cause this temperature increase. 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, driver 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 driver 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 driver and product combined as delivered for use.**
   The product parameters are set before shipment. If the controller is combined with a different actuator, failure can result.
2. **Check the product for the following points before operation.**
   a) Damage to 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 driver/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 the "Return to Origin" operation.**
   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. **An operation test should be carried out using a low speed. Start operation using the predefined speed after confirming there is no problems.**

[Ground]

⚠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.

15.4 Operating environment

⚠Warning

1. **Avoid use in the following environments.**
   a. Locations where a large amount of dust or 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 or oil drops.
   h. Areas exposed to direct sunlight (ultraviolet light).
   i. Environment at an altitude of 1000 meters or higher
      Heat dissapation and withstand voltage will decrease. Contact your SMC representative for details.

2. **Do not use in an environment where the product is directly exposed to liquid, such as cutting oils.**
   If cutting oils, coolant or oil mist contaminates the product, failure or increased sliding resistance can result.
3. **Install a protective cover when the product is used in an environment directly exposed to foreign matters such as dust, cutting chips and spatter.**
   Play or increased sliding resistance can result.
4. **Provide a protective cover if the product is used in direct sunlight.**
5. **Protect the product 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.
6. **Grease oil can be reduced due to the external environment and operating conditions. The lubrication performance may deteriorate and shorten the life of the product.**

[Storage]

⚠Warning

1. **Do not store the product in direct contact with rain or water drops, or exposed to harmful gas or liquids.**
2. **Store in an area that is shaded from direct sunlight and has a temperature and humidity within the specified range (-10°C to 60°C and 90% or less No condensation or freezing.**
3. **Do not apply vibration and impact to the product during storage.**

15.5 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.**
   Electric shock can result.

⚠Caution

1. **Maintenance should be performed according to the procedure indicated in the Operating Manual.**
   Incorrect handling can cause injury, damage or malfunction of equipment and machinery.
2. **Removal of product.**
   When equipment is serviced, first confirm that measures are in place to prevent dropping of work pieces and run-away of equipment, etc, then cut the power supply to the system. When machinery is restarted, check that operation is normal with actuators in the proper positions.

3. **When moving the actuator slider manually by hand, please disconnect the actuator cable.**
   The actuator cannot be moved smoothly by the induced voltage of the motor goes to the controller when actuator slider is moved with the actuator connected with the controller. Moreover, the controller might break down by the induced voltage when moving the actuator slider at high frequency.

[Lubrication]

⚠Caution

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

15.6 Precautions for actuator with lock

⚠Warning

1. **Do not use the lock as a safety lock or a control that requires a locking force.**
   The lock used for the product with a lock is designed to prevent dropping of work 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 drop and check that safety is assured before mounting, adjustment and inspection of the product.**
   If the lock is released with the product mounted vertically, a work piece can drop due to its weight.
7. **When the actuator is operated manually (when SVRE output signal is off), supply 24DCV to the [BK RLS] terminal of the power supply connector.**
   If the product is operated without releasing the lock, wear of the lock sliding surface will be

accelerated, causing a reduction in the holding force and the life of the locking mechanism.

8. Do not supply 24VDC continuously to the [BK RLS(Lock release)] terminal.

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

/Refer to the operation manual of the LEC (controller) for details of wiring.

16. Driver and its peripheral devices /Specific product precautions

16.1 Design and Selection

⚠Warning

1. **Be sure to apply the specified voltage.**
   Otherwise, a malfunction and breakage of the driver 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. **Moving element of the actuator might pulsate when stopping without deviation of pulse in the pushing in operation.**

16.2 Handling

⚠Warning

1. **The inside of the driver and its connector should not be touched.**
   It may cause an electric shock or damage to the driver.
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 driver and electric actuator.**
   It may cause damage to the driver 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 driver or its peripheral devices.

13. Do not use the product in an environment subject to a temperature cycle.
It will cause failure of the driver 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. Do not install this product in an environment under the effect of vibrations and impacts.
It will cause failure or malfunction.

16. If this product is used with a relay or solenoid valve, they should be the surge absorbing element built-in type.

16.3 Installation

⚠Warning

1. **The driver 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 driver and its peripheral devices are within the range of the specifications. Also, this driver 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 driver and its peripheral devices and a fire.
4. **Do not mount this driver 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 driver and its peripheral devices away from such a vibration supply.**
5. **This driver 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.

16.4 Wiring of cables

⚠Warning

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 driver or its peripheral devices depending on the seriousness.
3. **Do not connect wires while the power is supplied.**
   It can break the driver 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 driver 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 driver 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 driver or its peripheral devices and damage them.

16.5 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. **The power supplys should be separated between the driver power and the I/O signal power and both of them do not use the power supply of "rush-current restraining type".**
   If the power supply is "rush-current restraining type", a voltage drop may be caused during the acceleration of the actuator.
3. **To prevent surges from lightning, an appropriate measure should be taken. Ground the surge absorber for lightning separately from the grounding of the driver and its peripheral devices.**

16.6 Grounding

⚠Warning

1. **Be sure to carry out grounding in order to ensure the noise tolerance of the driver.**
   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.**

16.7 Maintenance

⚠Warning

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 driver and the peripheral equipment.**
4. **Do not put anything conductive or flammable inside of this driver.**
   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.

17. Troubleshooting

In case of any troubles, please consult thefollowing table.

Consider replacing driver, if not of the causes on this table are applicable. It is possible that this product is damaged due to the operating conditions (applications), please contact SMC to discuss appropriate measures.

17.1 Operation trouble

Problem	Possible cause	How to diagnose the trouble	Solutions
The actuator does not move at all.	Power fault	Check if the LED (green) of the driver is lit.	The power supply, voltage or current should be modified to an appropriate one. → 4. External Wiring Diagram (page 17) → 5. CN1: Power supply plug (page 19)
	Stop command	Check if a voltage of 24 VDC is applied to the EMG terminal. If it is not energized, the servo will be OFF and does not operate.	Apply 24 VDC to the EMG terminal.
	External device fault	Check if the PLC connected to the driver is working well. Test operation of the driver stand-alone.	Take appropriate measures according to this manual. → 6.3 The parallel I/O signal is detailed (page 26)
	Wiring fault	Check if the driver is wired correctly according to this manual without any breakings and short circuits.	Correct the wiring so that the input/output of each signal is performed appropriately. Separate the power supply for the CN1driver power supply and the CN5 I/O signal power supply. → 4. External Wiring Diagram (page 17) → 6.4 Parallel I/O connector wiring (Example) (page 29)
	Alarm condition	Check if the driver is in the alarm condition. If it is, check the type of alarm referring to this manual.	Take appropriate measures according to this manual. → 13. Alarm Detection (page 58)
	Lock release error	Check if you can hear the sound of lock release when the manual lock switch is turned on and off.	If there is no sound of lock release, the lock brake is possibly broken. → If the trouble continues, please contact SMC.
	Inappropriate specifications	Check if the driver's specifications are appropriate, the power supply is suitable and the actuator is compatible to the driver.	Check the actuator part number to replace with one of the appropriate ones compatible to the driver. → 3. Product Specifications (page 12)
	Input of the incorrect signal	Causes of product not operating even when the pulse signal is input 1. Servo is OFF 2. CLR input is ON 3. The return to origin inside 4. Test in operation by controller setting software/teaching box	1. Turn on the servo 2. Turn off the CLR input. 3. Please do not input the pulse signal in the return to origin. 4. Please do not input the pulse signal to the test in operation by controller setting software/teaching box.
	Wrong parameters	Please check if the setting of the input mode of the pulse signal correct.	Please confirm whether the setting of the input mode of the pulse signal is correct. → 7.2 Basic parameter (page 33)

Move occasionally.	Alarm condition	Check if the driver is in the alarm condition. If it is, check the type of alarm referring to this manual.	Take appropriate measures according to this manual. → 13. Alarm Detection (page 58)
	Wiring fault	Check if the driver is wired correctly according to this manual without any break and short circuits.	Correct the wiring so that the input/output of each signal is performed appropriately. Separate the power supply for the CN1driver power supply and the CN5 I/O signal power supply. → 4. External Wiring Diagram (page 17) → 6.4 Parallel I/O connector wiring (Example) (page 29)
Move occasionally.	Electric noise	Check if the grounding for the driver is appropriate. Also, check if the cables are not bundled.	Take appropriate measures according to this manual. → 3.4 How to install (page 15)
	Inappropriate parameter	Check if the parameters are appropriate. Check if the driver is compatible to the actuator.	Modify the parameters accordingly and check the operation. → 7. Setting Data Entry (page 31)
	Voltage drop	Check if there are any temporary voltage drops for the power supply. (In case of a voltage drop, the EMG terminal of CN1 power driver will be turned off to put the actuator in an stop condition. However, this stop will be released when the voltage recovers.)	Replace the power supply. But do not use the power supply of “rush-current restraining type”.that has a sufficient capacity. → 3. Product Specifications (page 12)
	Inappropriate specifications	Check if the driver’s specifications are appropriate, the power supply is suitable and the driver is compatible to the actuator.	Check the actuator part number to replace with one of the appropriate ones compatible to the driver. → 3. Product Specifications (page 12)
	Signal timing	Check the timing of the signal from the PLC to the driver.	PLC processing delay and driver scan delay are generated. Please ensure an interval of 15ms(30 ms if possible)or more between input signals, and maintain the signal state. → 8.3 Response time for the driver input signal Driver input signal response time (page 40)
	Signal timing	Make sure that TLOUT output is ON during pushing operation. TLOUT signal is OFF in following conditions. 1. Alarm generated 2. Return to origin 3. Servo is OFF (SVRE output is OFF)	Followings are precautions during pushing operation 1. If an alarm is generated during pushing operation, turn off TL input once, then turn it on again. (TL signal is recognized by the starting edge) 2. Do not turn on TL input during returning to origin. If returning to origin is commanded during pushing operation, turn off TL input, then turn it on again. 3. Do not turn on TL input during servo OFF (SVRE output is OFF). Signal is not recognized.

Communication fault.(LEC-W2)	USB driver is not installed	Please confirm if the USB driver of the communication unit is installed.	Please install the USB driver of the communication unit. The USB driver's installation starts when the communication unit is connected with PC.The detail of the installation procedure is shown in "Installation procedure of the LEC-W2 setting software".
	Incorrect COM port setting	Please confirm if the correct COM port is set to the ACTController	The COM port allocated to the communication unit is different according to customer’s PC. Please confirm the COM port number with the PC communication unit connected.The COM port number can be checked by checking device manager in PC. Please confirm.The detail of the COM port checking method and setting method is shown in " Installation procedure of the LEC-W2 setting software " .
Communication fault.(LEC-W2)	Inappropriate connection	Please confirm the connection status.	Please confirm motor driver (LEC) = communications cable = communication unit = USB cable = PC is connected. As example, can not make the communication if the connector have been damaged. Please confirm the power supply of motor driver (LEC) has been turned on. The communication is not made if the Power supply is off. If the equipments (PLC and measurement hardware) except motor driver (LEC) is connected with PC. (There is a possibility that the communication with other equipment interferes in PC.)interferes in PC.)
Incorrect display	The screen is not displayed properly by the controller setup software	Old version of the controller setting software.	Upgrade the controller setting software. To upgrade the software, refer to the operation manual on the SMC website. http://www.smcworld.com/

17.2 Position/Speed trouble

Problem	Possible causes	How to diagnose the trouble	Solutions
The products occasionally fail to move to the correct position.	Incorrect origin position	If it is a pushing operation, repeat return to origin operations several times to check if the actuator returns to the origin correctly.	Take measure to make the actuator operates normally (remove foreign matters that interferes with the actuator movement, etc.)
	Inappropriate basic parameters	Check if the values for the parameter are appropriate and the program is correct. Review the maximum speed, the maximum acceleration and the maximum deceleration of the actuator.	Modify the parameters to appropriate ones and test the operation. Specifically, confirm that the option set 1 is correct. → 7. Setting Data Entry (page 31)
	Signal Timing	Check that operation direction switching and pulse input are performed simultaneously for pulse and direction control mode.	Input the pulse after 15ms or more (30ms is recommended) has passed after the direction is switched.
	Incorrect pulse input	Confirm that the number of input pulses received by the LECPA corresponds with the number of output pulses from the master → 2.4 (5)1. The number of input pulses (page 11)	<When the number of pulses match> Correct the calculation method for the number of pulses. <When the number of pulses do not match> Correct the pulse counting, frequency and output modes of the pulses which are output from the master to make them correspond with parameter settings and specifications of LECPA.
	Incorrect pulse detection	Check for equipment which may generate strong noise around the product. Reduce the noise generated from the surrounding equipment and check the product operation again.	Reduce the amount of noise generated from the surrounding equipment. Route the LECPA I/O cable separately from the noise source (surrounding equipment and their cables).
The products does not move to the correct position.	Wiring fault	Check if the driver is wired correctly according to this manual without any breaks and short circuits.	Correct the wiring so that the input/output of each signal is performed appropriately. Separate the power supply for the CN1 driver power supply and the CN5 I/O signal power supply. → 4. External Wiring Diagram (page 17) → 6.4 Parallel I/O connector wiring (Example) (page 29)
	Inappropriate specifications	Check if the driver's specifications are appropriate, the power supply is suitable and the driver is compatible to the actuator.	Take appropriate measures according to this manual. → 3. Product Specifications (page 12)
	Signal timing	Check the timing of the signal from the PLC to the driver.	PLC processing delay and driver scan delay are generated. Please ensure an interval of 15ms(30 ms if possible) or more between input signals, and maintain the signal state. → 8.4 Response time for the driver input signal (page 41)
	Data writing failure	Check whether data (step data, parameter) is written correctly. Do not turn off the driver input power or remove the cable while data is being written (green light flashing).	Input correct data (step data, parameter) again and confirm operation. → 3.2 Parts description (page 13) → 7. Setting Data Entry (page 31)
	Inappropriate basic parameters	Check that the correct parameters have been configured. Review the lead, maximum speed, maximum acceleration and maximum deceleration of the actuator.	Modify the parameters to appropriate ones and test the operation. Specifically, confirm that the option set1 is correct. → 7. Setting Data Entry (page 31)

	Incorrect pulse input	Confirm that the number of input pulses received by the LECPA corresponds with the number of output pulsesfrom the master → 2.4 (5)1. The number of input pulses (page 11)	<When the number of pulses match> Correct the calculation method for the number of pulses and electric gear setting. <When the number of pulses do not match> Correct the pulse counting, frequency and output modes of the pulses which are output from the master to make them correspond with parameter settings and specifications of LECPA.
Insufficient speed	Inappropriate basic parameters	Check if the values for the parameter are appropriate and the program is correct. Review the maximum speed and the maximum acceleration of the actuator.	Modify the values of the parameters to appropriate ones and test the operation. → 7. Setting Data Entry (page 31)
	Inappropriate step data	Check if a trapisodial acceleration / deceleration is programmed for the actuator operation. In case of such operation, the actuator may start slowing down before it reaches the maximum speed.	Modify the setting to make the moving distance longer or the acceleration larger. → 7. Setting Data Entry (page 31)
Insufficient speed	Inappropriate specifications	Check if the driver's specifications are appropriate, the power supply is suitable and the driver is compatible to the actuator.	Take appropriate measures according to this manual. → 3. Product Specifications (page 12)
	Voltage drop	Check if there has been any temporary voltage drop in the power supply. (If there is a temporary voltage drop in the power supply, the EMG terminal of CN1 power connector will turn OFF so the actuator will stop. However, this stop will be released when the voltage recovers.)	There is a possibility of a momentary voltage drop because the capacity of the power supply is insufficient, or the power supply has inrush current restraining specification. → 3. Product Specifications (page 12)
	Incorrect pulse input	Check if the input pulse is correct.	Modify the pulse and test the operation. → 9. Operation (example) (page 42)

Appendix 1. Default setting value per actuator

Appendix 1.1 LEY/LEYG series setting value

LEY/LEYG Step data default

Model		LEY16/LEYG16			LEY25/LEYG25			LEY32/LEYG32			LEY40/LEYG40		
Lead[mm]		10	5	2.5	12	6	3	16	8	4	16	8	4
Step data default	No.	0			0			0			0		
	Movement MOD	Absolute			Absolute			Absolute			Absolute		
	Speed	500	250	125	500	250	125	500	250	125	300	150	75
	Position	0.00			0.00			0.00			0.00		
	Acceleration	3000			3000			3000			3000		
	Deceleration	3000			3000			3000			3000		
	Pushing force	85			65			85			65		
	Trigger LV	85			65			85			65		
	Pushing speed	50			35			30			30		
	Moving force	100			100			100			100		
	Area1	0.00			0.00			0.00			0.00		
	Area2	0.00			0.00			0.00			0.00		
	In position	0.50			0.50			0.50			0.50		

LEY/LEYG Basic parameter default

Model		LEY16/LEYG16			LEY25/LEYG25			LEY32/LEYG32			LEY40/LEYG40		
Lead[mm]		10	5	2.5	12	6	3	16	8	4	16	8	4
Basic parameter default	Controller ID	1			1			1			1		
	IO pattern	1			1			1			1		
	Acceleration/ Deceleration pattern	1			1			1			1		
	S-motion ratio	0			0			0			0		
	Storoke(+)	1000.00			1000.00			1000.00			1000.00		
	Storoke(-)	-1000.00			-1000.00			-1000.00			-1000.00		
	Maximum speed	500	250	125	500	250	125	500	250	125	300	150	75
	Maximum acceleration/ deceleration	3000			3000			3000			3000		
	Default In position	0.50			0.50			0.50			0.50		
	ORIG offset	0.00			0.00			0.00			0.00		
	Max force	85			65			85			65		
	Para protect	1			1			1			1		
	Enable SW	2			2			2			2		
	Unit name	Part no. of each product											
	W-AREA1	0.00			0.00			0.00			0.00		
	W-AREA2	0.00			0.00			0.00			0.00		
	ORG Correct	0.00			0.00			0.00			0.00		
	Sensor type	1			1			1			1		
	Option set1	1			1			1			1		
	Undefined parameter11	1			1			1			1		
	Undefined parameter12	1			1			1			1		

LEY/LEYG Return to origin parameter default

Model		LEY16/LEYG16	LEY25/LEYG25	LEY32/LEYG32	LEY40/LEYG40
Return to origin parameter default	ORIG direction	2	2	2	2
	ORIG mode	1	1	1	1
	ORIG limit	100	100	100	100
	ORIG time	100	100	100	100
	ORIG speed	20	20	20	20
	ORIG ACC/DEC	1000	1000	1000	1000
	Creep speed	10	10	10	10
	ORIG sensor	0	0	0	0
	ORIG SW Dir	0	0	0	0
	Undefined parameter21	0	0	0	0

Appendix 1.2 LEF series setting value

LEFS Step data default

Model		LEFS16		LEFS25		LEFS32		LEFS40	
Lead[mm]		10	5	12	6	16	8	20	10
Step data default	No.	0		0		0		0	
	Movement MOD	Absolute		Absolute		Absolute		Absolute	
	Speed	500	250	500	250	500	250	500	250
	Position	0.00		0.00		0.00		0.00	
	Acceleration	3000		3000		3000		3000	
	Deceleration	3000		3000		3000		3000	
	Pushing force	100		100		100		100	
	Trigger LV	100		100		100		100	
	Pushing speed	30		30		30		30	
	Moving force	100		100		100		100	
	Area1	0.00		0.00		0.00		0.00	
	Area2	0.00		0.00		0.00		0.00	
	In position	0.50		0.50		0.50		0.50	

LEFS Basic parameter default

Model		LEFS16		LEFS25		LEFS32		LEFS40	
Lead[mm]		10	5	12	6	16	8	20	10
Basic parameter default	Controller ID	1		1		1		1	
	IO pattern	1		1		1		1	
	Acceleration/ Deceleration pattern	1		1		1		1	
	S-motion ratio	0		0		0		0	
	Storoke(+)	Storoke +2		Storoke +2		Storoke +2		Storoke +2	
	Storoke(-)	-2		-2		-2		-2	
	Maximum speed	500	250	500	250	500	250	500	250
	Maximum acceleration/ deceleration	3000		3000		3000		3000	
	Default In position	0.50		0.50		0.50		0.50	
	ORIG offset	0.00		0.00		0.00		0.00	
	Max force	100		100		100		100	
	Para protect	1		1		1		1	
	Enable SW	2		2		2		2	
	Unit name	Part no. of each product							
	W-AREA1	0.00		0.00		0.00		0.00	
	W-AREA2	0.00		0.00		0.00		0.00	
	ORG Correct	0.00		0.00		0.00		0.00	
	Sensor type	1		1		1		1	
	Option set1	1		1		1		1	
	Undefined parameter11	1		1		1		1	
	Undefined parameter12	1		1		1		1	

LEFS Return to origin parameter default

Model		LEFS16	LEFS25	LEFS32	LEFS40
Return to origin parameter default	ORIG direction	2	2	2	2
	ORIG mode	1	1	1	1
	ORIG limit	100	100	100	100
	ORIG time	100	100	100	100
	ORIG speed	30	30	30	30
	ORIG ACC/DEC	1000	1000	1000	1000
	Creep speed	10	10	10	10
	ORIG sensor	0	0	0	0
	ORIG SW Dir	0	0	0	0
	Undefined parameter21	0	0	0	0

LEFB Step data default

Model		LEFB16	LEFB25	LEFB32
Lead[mm]		48	48	48
Step data default	No.	0	0	0
	Movement MOD	Absolute	Absolute	Absolute
	Speed	1100	1400	1500
	Position	0.00	0.00	0.00
	Acceleration	3000	3000	3000
	Deceleration	3000	3000	3000
	Pushing force	100	100	100
	Trigger LV	100	100	100
	Pushing speed	60	60	60
	Moving force	100	100	100
	Area1	0.00	0.00	0.00
	Area2	0.00	0.00	0.00
	In position	1.00	1.00	1.00

LEFB Basic parameter default

Model		LEFB16	LEFB25	LEFB32
Lead[mm]		48	48	48
Basic parameter default	Controller ID	1	1	1
	IO pattern	1	1	1
	Acceleration/ Deceleration pattern	1	1	1
	S-motion ratio	0	0	0
	Storoke(+)	Storoke +2	Storoke +2	Storoke +2
	Storoke(-)	-2	-2	-2
	Maximum speed	1100	1400	1500
	Maximum acceleration/ deceleration	3000	3000	3000
	Default In position	1.00	1.00	1.00
	ORIG offset	0.00	0.00	0.00
	Max force	100	100	100
	Para protect	1	1	1
	Enable SW	2	2	2
	Unit name	Part no. of each product		
	W-AREA1	0.00	0.00	0.00
	W-AREA2	0.00	0.00	0.00
	ORG Correct	0.00	0.00	0.00
	Sensor type	1	1	1
	Option set1	1	1	1
	Undefined parameter11	1	1	1
	Undefined parameter12	1	1	1

LEFB Return to origin parameter default

Model		LEFB16	LEFB25	LEFB32
Return to origin parameter default	ORIG direction	2	2	2
	ORIG mode	1	1	1
	ORIG limit	100	100	100
	ORIG time	200	200	200
	ORIG speed	60	60	60
	ORIG ACC/DEC	1000	1000	1000
	Creep speed	10	10	10
	ORIG sensor	0	0	0
	ORIG SW Dir	0	0	0
	Undefined parameter21	0	0	0

Appendix 1.3 LES series setting value

LES Step data default

Model		LES8		LES16		LES25	
Lead[mm]		4	8	5	10	8	16
Step data default	No.	0		0		0	
	Movement MOD	Absolute		Absolute		Absolute	
	Speed	200	400	200	400	200	400
	Position	0.00		0.00		0.00	
	Acceleration	5000		5000		5000	
	Deceleration	5000		5000		5000	
	Pushing force	70		70		70	
	Trigger LV	70		70		70	
	Pushing speed	20		20		20	
	Moving force	100		100		100	
	Area1	0.00		0.00		0.00	
	Area2	0.00		0.00		0.00	
	In position	0.50		0.50		0.50	

LES Basic parameter default

Model		LES8		LES16		LES25	
Lead[mm]		4	8	5	10	8	16
Basic parameter default	Controller ID	1		1		1	
	IO pattern	1		1		1	
	Acceleration/ Deceleration pattern	1		1		1	
	S-motion ratio	0		0		0	
	Storoke(+)	Storoke +1		Storoke +1		Storoke +1	
	Storoke(-)	-1.00		-1.00		-1.00	
	Maximum speed	200	400	200	400	200	400
	Maximum acceleration/ deceleration	5000		5000		5000	
	Default In position	0.50		0.50		0.50	
	ORIG offset	0.00		0.00		0.00	
	Max force	70		70		70	
	Para protect	1		1		1	
	Enable SW	2		2		2	
	Unit name	Part no. of each product					
	W-AREA1	0.00		0.00		0.00	
	W-AREA2	0.00		0.00		0.00	
	ORG Correct	0.00		0.00		0.00	
	Sensor type	1		1		1	
	Option set1	1		1		1	
	Undefined parameter11	1		1		1	
	Undefined parameter12	1		1		1	

LES Return to origin parameter default

Model		LES8	LES16	LES25
Return to origin parameter default	ORIG direction	2	2	2
	ORIG mode	1	1	1
	ORIG limit	100	100	100
	ORIG time	100	100	100
	ORIG speed	20	20	20
	ORIG ACC/DEC	100	100	100
	Creep speed	10	10	10
	ORIG sensor	0	0	0
	ORIG SW Dir	0	0	0
	Undefined parameter21	0	0	0

LESH Step data default

Model		LESH8		LESH16		LESH25	
Lead[mm]		4	8	5	10	8	16
Step data default	No.	0		0		0	
	Movement MOD	Absolute		Absolute		Absolute	
	Speed	200	400	200	400	150	400
	Position	0.00		0.00		0.00	
	Acceleration	5000		5000		5000	
	Deceleration	5000		5000		5000	
	Pushing force	70		70		70	
	Trigger LV	70		70		70	
	Pushing speed	20		20		20	
	Moving force	100		100		100	
	Area1	0.00		0.00		0.00	
	Area2	0.00		0.00		0.00	
	In position	0.50		0.50		0.50	

LESH Basic parameter default

Model		LESH8		LESH16		LESH25	
Lead[mm]		4	8	5	10	8	16
Basic parameter default	Controller ID	1		1		1	
	IO pattern	1		1		1	
	Acceleration/ Deceleration pattern	1		1		1	
	S-motion ratio	0		0		0	
	Storoke(+)	Storoke +1		Storoke +1		Storoke +1	
	Storoke(-)	-1.00		-1.00		-1.00	
	Maximum speed	200	400	200	400	150	400
	Maximum acceleration/ deceleration	5000		5000		5000	
	Default In position	0.50		0.50		0.50	
	ORIG offset	0.00		0.00		0.00	
	Max force	70		70		70	
	Para protect	1		1		1	
	Enable SW	2		2		2	
	Unit name	Part no. of each product					
	W-AREA1	0.00		0.00		0.00	
	W-AREA2	0.00		0.00		0.00	
	ORG Correct	0.00		0.00		0.00	
	Sensor type	1		1		1	
	Option set1	1		1		1	
	Undefined parameter11	1		1		1	
	Undefined parameter12	1		1		1	

LESH Return to origin parameter default

Model		LESH8	LESH16	LESH25
Return to origin parameter default	ORIG direction	2	2	2
	ORIG mode	1	1	1
	ORIG limit	100	100	100
	ORIG time	100	100	100
	ORIG speed	20	20	20
	ORIG ACC/DEC	100	100	100
	Creep speed	10	10	10
	ORIG sensor	0	0	0
	ORIG SW Dir	0	0	0
	Undefined parameter21	0	0	0

Appendix 1.4 LEHZ series setting value

LEHZ Step data default

Model		LEHZ10	LEHZ16	LEHZ20	LEHZ25	LEHZ32	LEHZ40
Lead[mm]		251/73	249/77	246/53	243/48	242/39	254/43
Step data default	No.	0		0		0	
	Movement MOD	Absolute		Absolute		Absolute	
	Speed	80		100		120	
	Position	0.00		0.00		0.00	
	Acceleration	2000		2000		2000	
	Deceleration	2000		2000		2000	
	Pushing force	100		100		100	
	Trigger LV	100		100		100	
	Pushing speed	50		50		50	
	Moving force	150		150		150	
	Area1	0.00		0.00		0.00	
	Area2	0.00		0.00		0.00	
	In position	0.50		0.50		0.50	

LEHZ Basic parameter default

Model		LEHZ10	LEHZ16	LEHZ20	LEHZ25	LEHZ32	LEHZ40
Lead[mm]		251/73	249/77	246/53	243/48	242/39	254/43
Basic parameter default	Controller ID	1		1		1	
	IO pattern	1		1		1	
	Acceleration/ Deceleration pattern	1		1		1	
	S-motion ratio	0		0		0	
	Storoke(+)	1000.00		1000.00		1000.00	
	Storoke(-)	-1000.00		-1000.00		-1000.00	
	Maximum speed	80		100		120	
	Maximum acceleration/ deceleration	2000		2000		2000	
	Default In position	0.50		0.50		0.50	
	ORIG offset	1.00		1.00		1.00	
	Max force	100		100		100	
	Para protect	1		1		1	
	Enable SW	2		2		2	
	Unit name	Part no. of each product					
	W-AREA1	0.00		0.00		0.00	
	W-AREA2	0.00		0.00		0.00	
	ORG Correct	0.00		0.00		0.00	
	Sensor type	1		1		1	
	Option set1	1		1		1	
	Undefined parameter11	1		1		1	
	Undefined parameter12	1		1		1	

LEHZ Return to origin parameter default

Model		LEHZ10	LEHZ16	LEHZ20	LEHZ25	LEHZ32	LEHZ40
Return to origin parameter default	ORIG direction	2		2		2	
	ORIG mode	1		1		1	
	ORIG limit	100		100		100	
	ORIG time	100		100		100	
	ORIG speed	10		10		10	
	ORIG ACC/DEC	1000		1000		1000	
	Creep speed	10		10		10	
	ORIG sensor	0		0		0	
	ORIG SW Dir	0		0		0	
	Undefined parameter21	0		0		0	

LEHF Step data default

Model		LEHF10	LEHF20	LEHF32	LEHF40
Lead[mm]		40/15	50/15	70/16	70/16
Step data default	No.	0	0	0	0
	Movement MOD	Absolute	Absolute	Absolute	Absolute
	Speed	80	100	100	100
	Position	0.00	0.00	0.00	0.00
	Acceleration	2000	2000	2000	2000
	Deceleration	2000	2000	2000	2000
	Pushing force	100	100	100	100
	Trigger LV	100	100	100	100
	Pushing speed	20	30	30	30
	Moving force	150	150	150	150
	Area1	0.00	0.00	0.00	0.00
	Area2	0.00	0.00	0.00	0.00
	In position	0.50	0.50	0.50	0.50

LEHF Basic parameter default

Model		LEHF10	LEHF20	LEHF32	LEHF40
Lead[mm]		40/15	50/15	70/16	70/16
Basic parameter default	Controller ID	1	1	1	1
	IO pattern	1	1	1	1
	Acceleration/ Deceleration pattern	1	1	1	1
	S-motion ratio	0	0	0	0
	Storoke(+)	1000.00	1000.00	1000.00	1000.00
	Storoke(-)	-1000.00	-1000.00	-1000.00	-1000.00
	Maximum speed	80	100	100	100
	Maximum acceleration/ deceleration	2000	2000	2000	2000
	Default In position	0.50	0.50	0.50	0.50
	ORIG offset	1.00	1.00	1.00	1.00
	Max force	100	100	100	100
	Para protect	1	1	1	1
	Enable SW	2	2	2	2
	Unit name	Part no. of each product			
	W-AREA1	0.00	0.00	0.00	0.00
	W-AREA2	0.00	0.00	0.00	0.00
	ORG Correct	0.00	0.00	0.00	0.00
	Sensor type	1	1	1	1
	Option set1	1	1	1	1
	Undefined parameter11	1	1	1	1
	Undefined parameter12	1	1	1	1

LEHF Return to origin parameter default

Model		LEHF10	LEHF20	LEHF32	LEHF40
Return to origin parameter default	ORIG direction	2	2	2	2
	ORIG mode	1	1	1	1
	ORIG limit	100	100	100	100
	ORIG time	100	100	100	100
	ORIG speed	10	10	10	10
	ORIG ACC/DEC	1000	1000	1000	1000
	Creep speed	10	10	10	10
	ORIG sensor	0	0	0	0
	ORIG SW Dir	0	0	0	0
	Undefined parameter21	0	0	0	0

LEHS Step data default

Model		LEHS10	LEHS20	LEHS32	LEHS40
Lead[mm]		255/76	235/56	235/40	235/40
Step data default	No.	0	0	0	0
	Movement MOD	Absolute	Absolute	Absolute	Absolute
	Speed	70	80	100	120
	Position	0.00	0.00	0.00	0.00
	Acceleration	2000	2000	2000	2000
	Deceleration	2000	2000	2000	2000
	Pushing force	100	100	100	100
	Trigger LV	100	100	100	100
	Pushing speed	50	50	50	50
	Moving force	100	100	100	100
	Area1	0.00	0.00	0.00	0.00
	Area2	0.00	0.00	0.00	0.00
	In position	0.50	0.50	0.50	0.50

LEHS Basic parameter default

Model		LEHS10	LEHS20	LEHS32	LEHS40
Lead[mm]		255/76	235/56	235/40	235/40
Basic parameter default	Controller ID	1	1	1	1
	IO pattern	1	1	1	1
	Acceleration/ Deceleration pattern	1	1	1	1
	S-motion ratio	0	0	0	0
	Storoke(+)	1000.00	1000.00	1000.00	1000.00
	Storoke(-)	-1000.00	-1000.00	-1000.00	-1000.00
	Maximum speed	70	80	100	120
	Maximum acceleration/ deceleration	2000	2000	2000	2000
	Default In position	0.50	0.50	0.50	0.50
	ORIG offset	1.00	1.00	1.00	1.00
	Max force	100	100	100	100
	Para protect	1	1	1	1
	Enable SW	2	2	2	2
	Unit name	Part no. of each product			
	W-AREA1	0.00	0.00	0.00	0.00
	W-AREA2	0.00	0.00	0.00	0.00
	ORG Correct	0.00	0.00	0.00	0.00
	Sensor type	1	1	1	1
	Option set1	1	1	1	1
	Undefined parameter11	1	1	1	1
	Undefined parameter12	1	1	1	1

LEHS Return to origin parameter default

Model		LEHS10	LEHS20	LEHS32	LEHS40
Return to origin parameter default	ORIG direction	2	2	2	2
	ORIG mode	1	1	1	1
	ORIG limit	100	100	100	100
	ORIG time	100	100	100	100
	ORIG speed	10	10	10	10
	ORIG ACC/DEC	1000	1000	1000	1000
	Creep speed	10	10	10	10
	ORIG sensor	0	0	0	0
	ORIG SW Dir	0	0	0	0
	Undefined parameter21	0	0	0	0

Appendix 1.5 LER series setting value

LER Step data default

Model		LER10K	LER10J	LER30K	LER30J	LER50K	LER50J
Gear Ratio[°]		8	12	8	12	7.5	12
Step data default	No.	0	0	0	0	0	0
	Movement MOD	Absolute	Absolute	Absolute	Absolute	Absolute	Absolute
	Speed	280	420	280	420	280	420
	Position	0.00	0.00	0.00	0.00	0.00	0.00
	Acceleration	3000	3000	3000	3000	3000	3000
	Deceleration	3000	3000	3000	3000	3000	3000
	Pushing force	50	50	50	50	50	50
	Trigger LV	50	50	50	50	50	50
	Pushing speed	20	30	20	30	20	30
	Moving force	100	100	100	100	100	100
	Area1	0.00	0.00	0.00	0.00	0.00	0.00
	Area2	0.00	0.00	0.00	0.00	0.00	0.00
	In position	0.50	0.50	0.50	0.50	0.50	0.50

LER Basic parameter default

Model		LER10K	LER10J	LER30K	LER30J	LER50K	LER50J
Gear Ratio[°]		8	12	8	12	7.5	12
Basic parameter default	Controller ID	1		1		1	
	IO pattern	1		1		1	
	Acceleration/ Deceleration pattern	1		1		1	
	S-motion ratio	0		0		0	
	Storoke(+)	1000.00		1000.00		1000.00	
	Storoke(-)	-1000.00		-1000.00		-1000.00	
	Maximum speed	280	420	280	420	280	420
	Maximum acceleration/ deceleration	3000		3000		3000	
	Default In position	0.50		0.50		0.50	
	ORIG offset	0.00/Basic 5.00/External stopper(-2、3)					
	Max force	50		50		50	
	Para protect	1		1		1	
	Enable SW	2		2		2	
	Unit name	Part no. of each product					
	W-AREA1	0.00		0.00		0.00	
	W-AREA2	0.00		0.00		0.00	
	ORG Correct	0.00		0.00		0.00	
	Sensor type	1		1		1	
	Option set1	1		1		1	
	Undefined parameter11	1		1		1	
	Undefined parameter12	1		1		1	

LER Return to origin parameter default

Model		LER10K	LER10J	LER30K	LER30J	LER50K	LER50J
Return to origin parameter default	ORIG direction	2		2		2	
	ORIG mode	1		1		1	
	ORIG limit	50		50		50	
	ORIG time	100		100		100	
	ORIG speed	20	30	20	30	20	30
	ORIG ACC/DEC	1000		1000		1000	
	Creep speed	20	30	20	30	20	30
	ORIG sensor	0		0		0	
	ORIG SW Dir	0		0		0	
	Undefined parameter21	0		0		0	

Appendix 1.6 LEP series setting value

LEPY Step data default

Model		LEPY6		LEPY10	
Lead[mm]		4	8	5	10
Step data default	No.	0		0	
	Movement MOD	Absolute		Absolute	
	Speed	150	300*	200	350*
	Position	0.00		0.00	
	Acceleration	3000		3000	
	Deceleration	3000		3000	
	Pushing force	100	100	100	100
	Trigger LV	100	100	100	100
	Pushing speed	10	20	10	20
	Moving force	150		150	
	Area1	0.00		0.00	
	Area2	0.00		0.00	
	In position	0.50		0.50	

* When the stroke is 25mm, the initial value becomes “250”.

LEPY Basic parameter default

Model		LEPY6		LEPY10	
Lead[mm]		4	8	5	10
Basic parameter default	Controller ID	1		1	
	IO pattern	1		1	
	Acceleration/ Deceleration pattern	1		1	
	S-motion ratio	0		0	
	Storoke(+)	1000.00		1000.00	
	Storoke(-)	-1000.00		-1000.00	
	Maximum speed	150	300	200	350
	Maximum acceleration/ deceleration	3000		3000	
	Default In position	0.50		0.50	
	ORIG offset	0.00		0.00	
	Max force	100		100	
	Para protect	1		1	
	Enable SW	2		2	
	Unit name	Part no. of each product			
	W-AREA1	0.00		0.00	
	W-AREA2	0.00		0.00	
	ORG Correct	0.00		0.00	
	Sensor type	1		1	
	Option set1	1		1	
	Undefined parameter11	1		1	
	Undefined parameter12	1		1	

LEPY Return to origin parameter default

Model		LEPY6	LEPY10
Return to origin parameter default	ORIG direction	2	2
	ORIG mode	1	1
	ORIG limit	150	150
	ORIG time	100	100
	ORIG speed	LEP**J:20 LEP**K:10	LEP**J:20 LEP**K:10
	ORIG ACC/DEC	3000	3000
	Creep speed	20	20
	ORIG sensor	0	0
	ORIG SW Dir	0	0
	Undefined parameter21	0	0

LEPS Step data default

Model		LEPS6		LEPS10	
Lead[mm]		4	8	5	10
Step data default	No.	0		0	
	Movement MOD	Absolute		Absolute	
	Speed	150	300*	200	350*
	Position	0.00		0.00	
	Acceleration	3000		3000	
	Deceleration	3000		3000	
	Pushing force	100	100	100	100
	Trigger LV	100	100	100	100
	Pushing speed	10	20	10	20
	Moving force	150		150	
	Area1	0.00		0.00	
	Area2	0.00		0.00	
	In position	0.50		0.50	

* When the stroke is 25mm, the initial value becomes “250”.

LEPS Basic parameter default

Model		LEPS6		LEPS10	
Lead[mm]		4	8	5	10
Basic parameter default	Controller ID	1		1	
	IO pattern	1		1	
	Acceleration/ Deceleration pattern	1		1	
	S-motion ratio	0		0	
	Storoke(+)	1000.00		1000.00	
	Storoke(-)	-1000.00		-1000.00	
	Maximum speed	150	300	200	350
	Maximum acceleration/ deceleration	3000		3000	
	Default In position	0.50		0.50	
	ORIG offset	0.00		0.00	
	Max force	100		100	
	Para protect	1		1	
	Enable SW	2		2	
	Unit name	Part no. of each product			
	W-AREA1	0.00		0.00	
	W-AREA2	0.00		0.00	
	ORG Correct	0.00		0.00	
	Sensor type	1		1	
	Option set1	1		1	
	Undefined parameter11	1		1	
	Undefined parameter12	1		1	

LEPS Return to origin parameter default

Model		LEPS6	LEPS10
Return to origin parameter default	ORIG direction	2	2
	ORIG mode	1	1
	ORIG limit	150	150
	ORIG time	100	100
	ORIG speed	LEP**J:20 LEP**K:10	LEP**J:20 LEP**K:10
	ORIG ACC/DEC	3000	3000
	Creep speed	20	20
	ORIG sensor	0	0
	ORIG SW Dir	0	0

Revision history
No.LEC-OM04501 Jan/2012 1st printing No.LEC-OM04502 March/2012 Revision - Pushing operation addition - Addition to notes about UL recognition No.LEC-OM04503 April/2014 Revision - Addition to notes about Automatic pulse reference detection No.LEC-OM04504 March /2015 Revision - Corrected and explanation added to Basic parameter "Option set1", EMG terminal, electrical wiring specifications, return to origin, parallel I/O signal, operating environment, troubleshooting and parameter default. - Corrected erroneous descriptions. No.LEC-OM04505 August/2015 Revision - Addition to Pulse input / PNP open collector input circuit -Addition to LES setting value

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