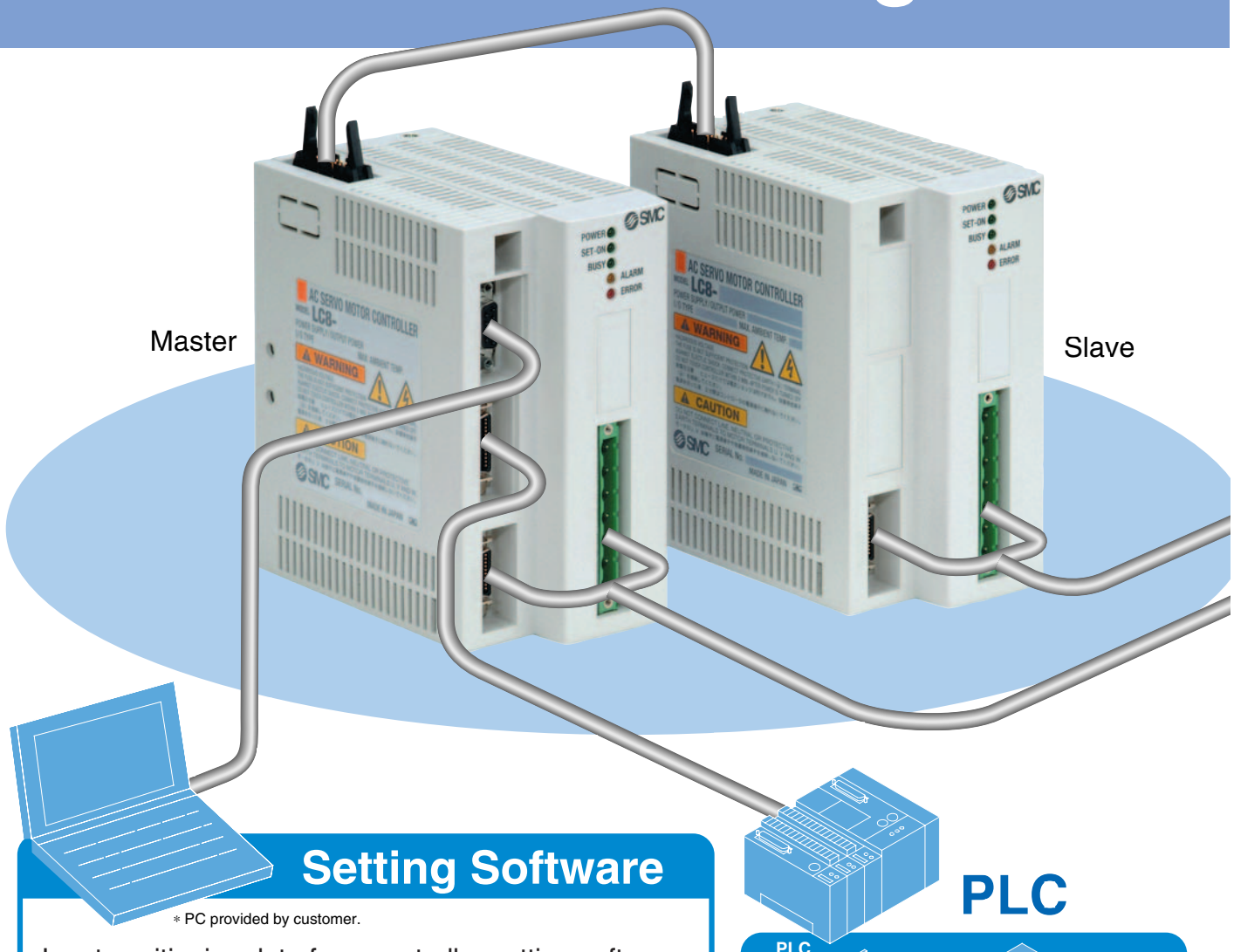
CAT.ES100-53A

Positioning Driver

For AC Servomotor

Compliant with Series LJ1, LG1 and LTF.

Positioning Driver /



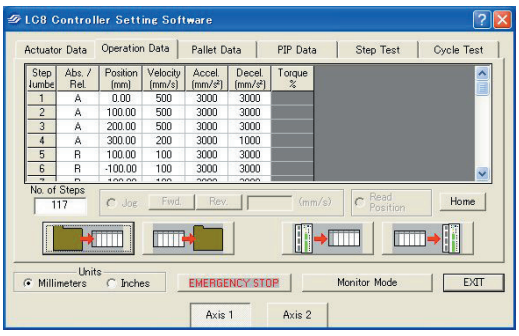
Setting Software

∗ PC provided by customer.

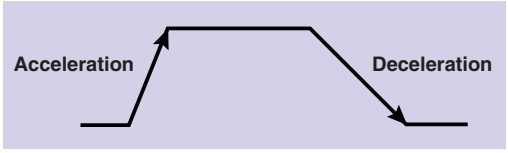
Input positioning data from controller setting software.

Each data is set collectively from master.

Setting data dedicated for each slave is at one time from setting software after connecting the communications cable with master.



The acceleration and the deceleration can be set individually.



PLC

PLC

Manipulation panel

24 VDC voltage

∗ Provided by customer

Stepping Operation

Using I/O of a PLC, able to set the 117 patterns (steps) positioning.

For AC Servomotor *Series LC8*

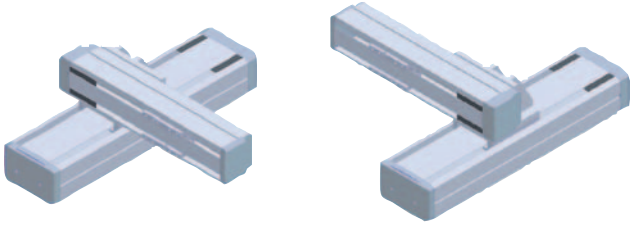
Electric Actuator

Caution

In case of using 3-axis or more,
be sure to contact us for operating
usage and its condition.

Standardized X-Y bracket

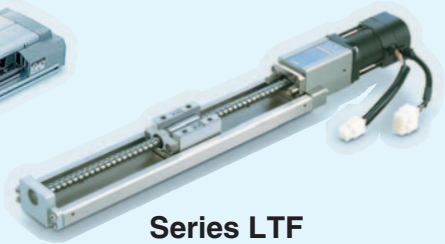
Two types are available depending on Y-axis installation direction



Compliant Actuators

Series LJ1

Series LG1



Series LTF

Variations

Motor capacity		Series LJ1	Series LG1	Series LTF
50 W	Payload	10 kg	—	—
	Max. speed	600 mm/s		
100 W	Payload	30 kg	30 kg	30 kg
	Max. speed	1000 mm/s	1000 mm/s	500 mm/s
200 W	Payload	60 kg	—	50 kg
	Max. speed	1000 mm/s		1000 mm/s

∗ For detailed information, please refer to each series.

SMC's Proposals for Assembly Equipment

Factors supplied for simplified cell assembly

Presents the system totally optimum for the small-sized cell production method.

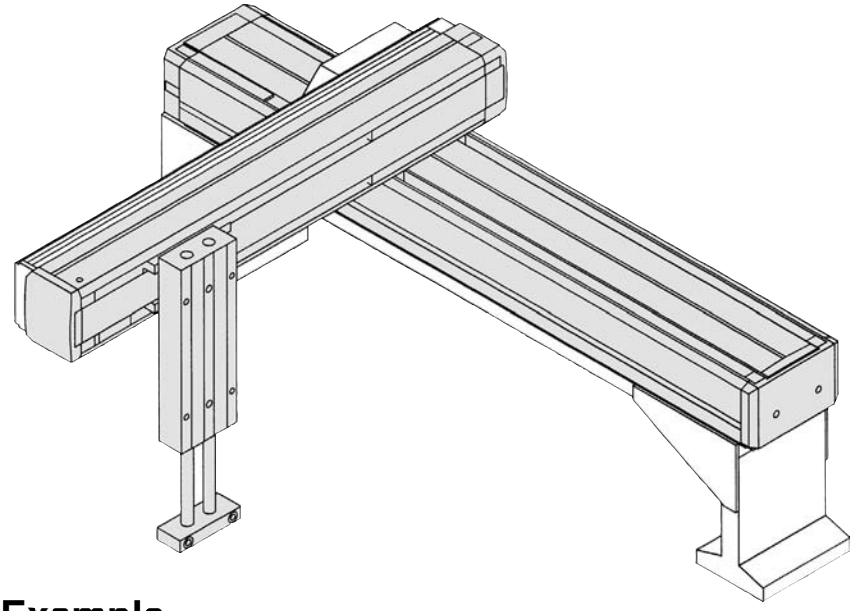
1 **Positioning conducts the horizontal (X-Y) positioning.**

2 **Lifting workpieces up and down, revolving and gripping those are done by actuator in each type (Cylinder, Gripper, Rotary Actuator) or vacuum adsorption.**

3 **Securing the position of workpieces and clamping those is done by pneumatic cylinder or electric actuator.**

Controlling everything with the conventional multi-axis robot controller was complicated. However, simplified cell assembly system makes it possible to design, control and administrate by every group and lead to shorten the start-up period of equipment and simplify.
We, SMC have numerous solutions to cover these each factor. Also, customer can select both the pneumatics and the electrics freely, so customer can build the cell production system at the lowered cost.

Hardware/Control devices that can be controlled by the ON/OFF function of a PLC.



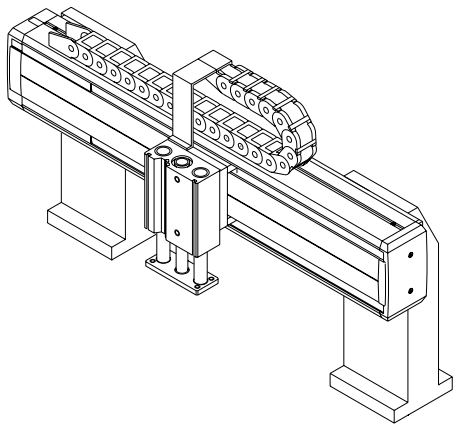
Application Example

	Hardware	Control device	Interface
(X-Y)	 **LJ1 LG1 LTF**	**LC8**	ON/OFF command by I/O of PLC
Z-axis	 **LX□ LTF MX□ CX□**	**Solenoid valve LC6C**	
θ-axis	 **CR□ MS□**	**Solenoid valve**	
End effector (Gripping)	 **MH□ Z□**	**Solenoid valve**	
Positioning work (Securing, Clamping)	 **MX□ CQ□ LX□**	**Solenoid valve LC6C**	

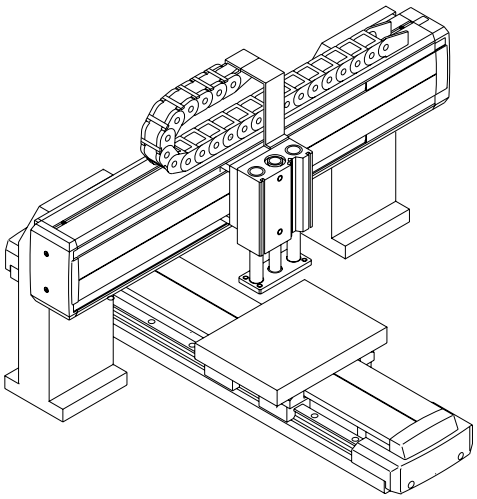
Application Example Using LC8

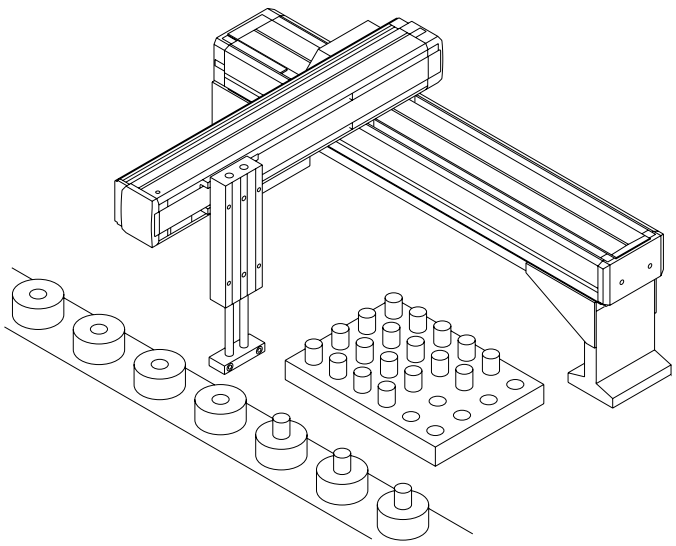
Pick & Place

For multi-point positioning, it can be operated in accordance with the commands from a PLC, etc. by simply programming the operation data into the LC8.



Palletizing motion

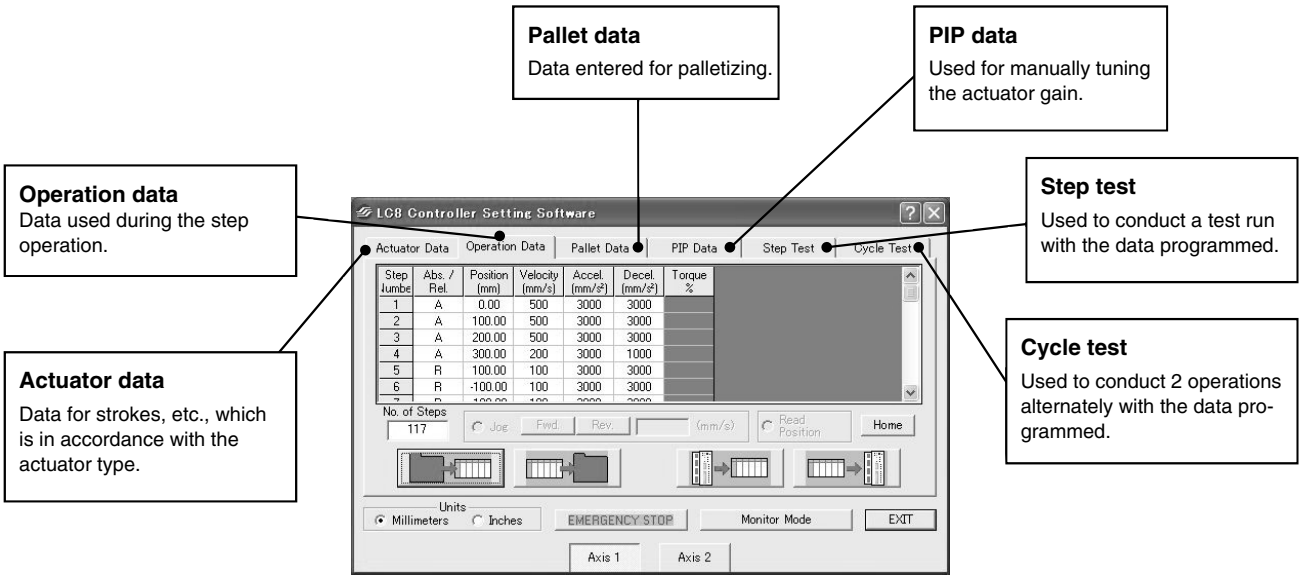




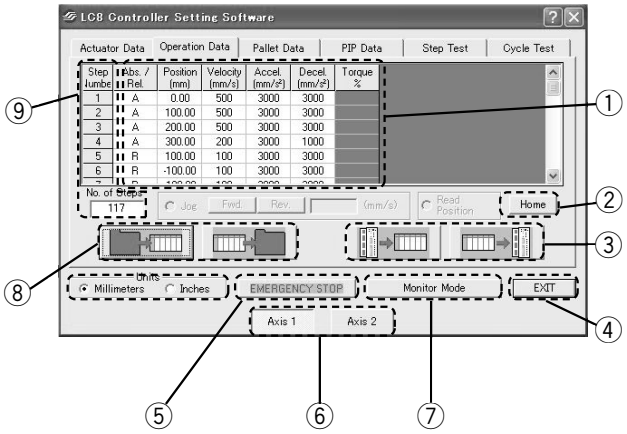
By combining to form 2-axis, a motion such as palletizing is possible.
If programming the positioning motion into LC8, it will operate in accordance with the command by PLC, etc. (Makeup motion cannot be done)

LC8 Controller Setting Software

Principal Functions



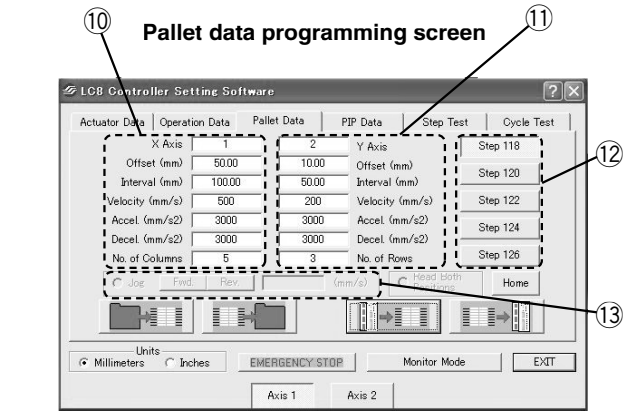
Operation data programming screen



Explanation for operation data programming screen

No.	Description	Function
①	Inputting data	Program the transfer mode, position, speed, acceleration, deceleration, torque (in torque mode).
②	Returning to home position	Conduct motion to return to home position from software.
③	Transmitting/ Receiving the data	Transmit/Receive the data to and from LC8.
④	Exit	Close the program.
⑤	Emergency stop	Emergency stop function, as well as displaying the status of emergency stop.
⑥	Axis programming	Select the axis number.
⑦	Monitor mode	Switch to the monitor mode.
⑧	Reading file/Save	Write/Read the data in/out of the file.
⑨	Selecting step number	Display the step number for operation data.

Pallet data programming screen



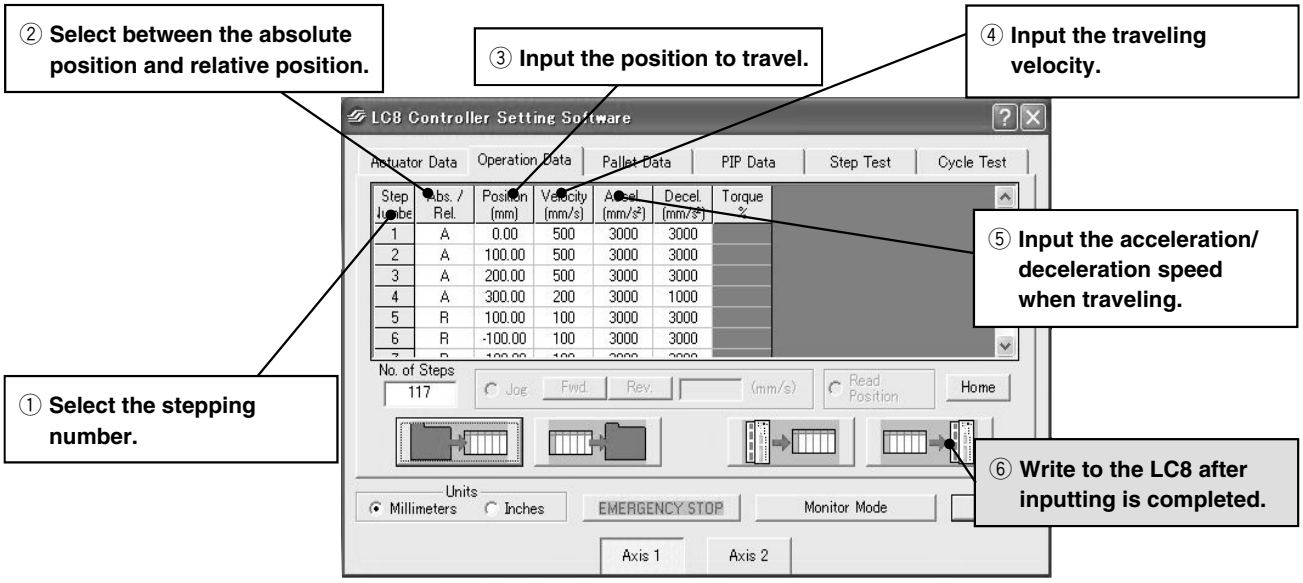
Explanation of pallet data programming screen

No.	Description	Function
⑩	Programming the X-axis	Program the data for the actuator in the X-axis.
⑪	Programming the Y-axis	Program the data for the actuator in the Y-axis.
⑫	Step number	Switches the display between 5 different pallet data.
⑬	Jog	Program the position by jog operation.

Programming the Stepping Data and Executing It (For details, please refer to the “Instruction Manual”.)

How to Input the Stepping Data

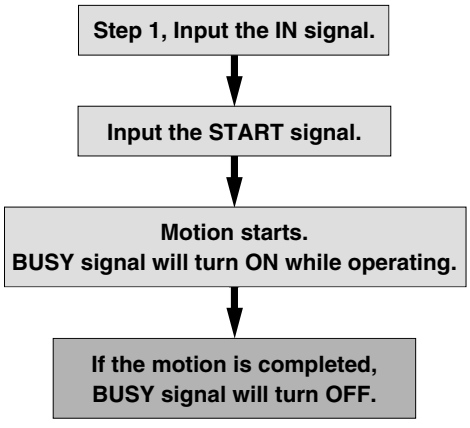
Able to input the stepping data by using controller setting software.



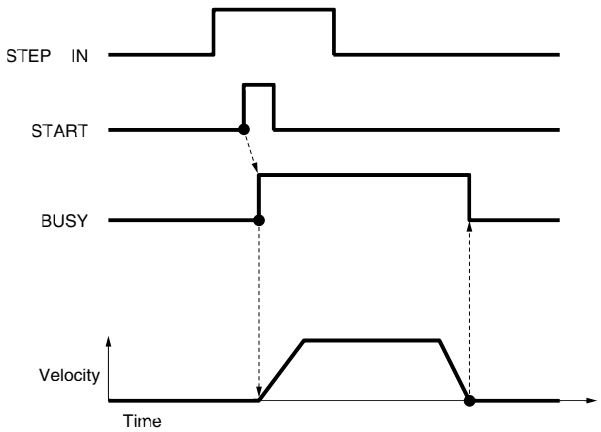
How to Operate the Stepping Data

Operate the stepping data input communicated with the signal of a PLC.

Example) In case of operating the motion of step 1.



Timing Chart



2-Axis Step Operation

Example: In case of operating the motion of step 2.

Step 2, Input the IN signal.

↓

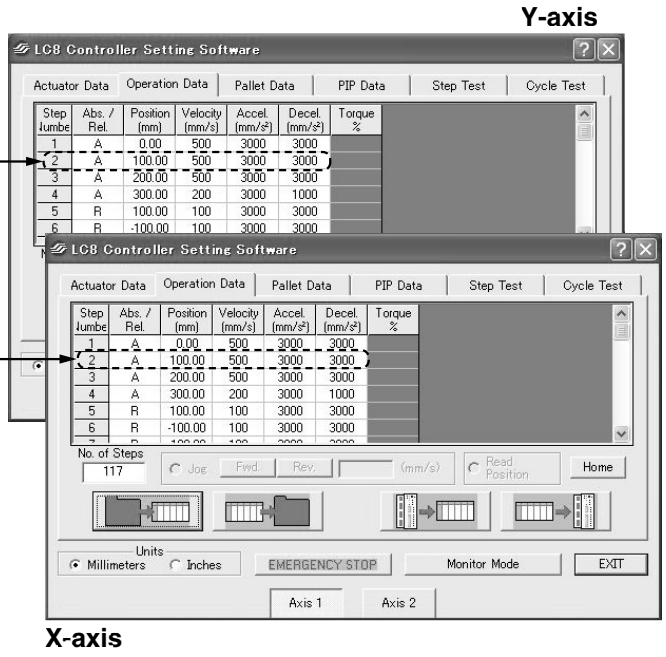
Input the START signal.

↓

X- and Y-axis will start actuating respectively. BUSY signal will turn ON while operating.

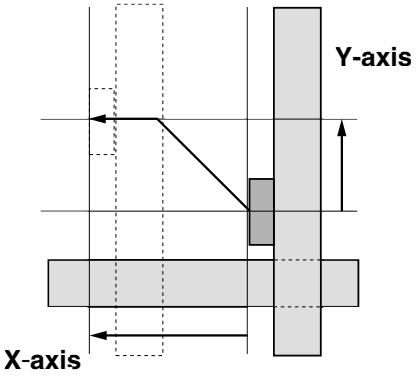
↓

The BUSY signal will turn off when the motion of the X- and Y-axis are both completed.



In case of using by 2-axis, if the step number is indicated, and START signal is input, motion of transfer will get started in line with the step data for X- and Y-axis respectively.

Although Y-axis motion is first completed, BUSY won't turn OFF until X-axis will complete its motion. Only when X- and Y-axis will be completed, BUSY signal will turn OFF.



Precautions on Connecting 2-Axis

⚠ Caution

1 **Motion for returning to home position starts 2-axis simultaneously. When returning to home position, please design the equipment so that the components inside the equipment should not interfere with each other**

2. **In the case of entering step data for "Motion for 1 axis only" enter step data by means of setting the "Relative coordinates to the 0 mm position" for the step data of the stopped axis.**

How to Input the Pallet Data (For details, refer to “Instruction Manual”.)

How to Input the Pallet Data

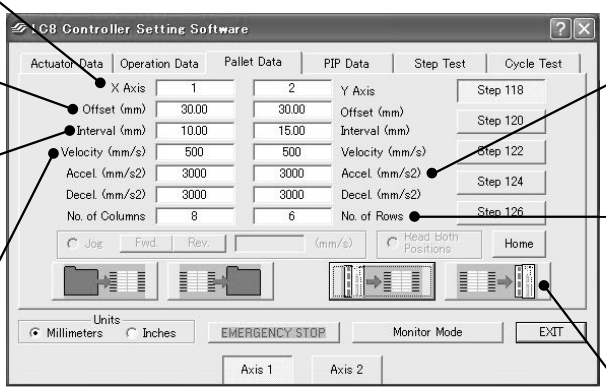
Able to input the pallet data by attached programming software for controller

① **Program the axis number to be used.**

② **Input the off-set distance of the home position**

③ **Input the distance (pitch) of the pallet**

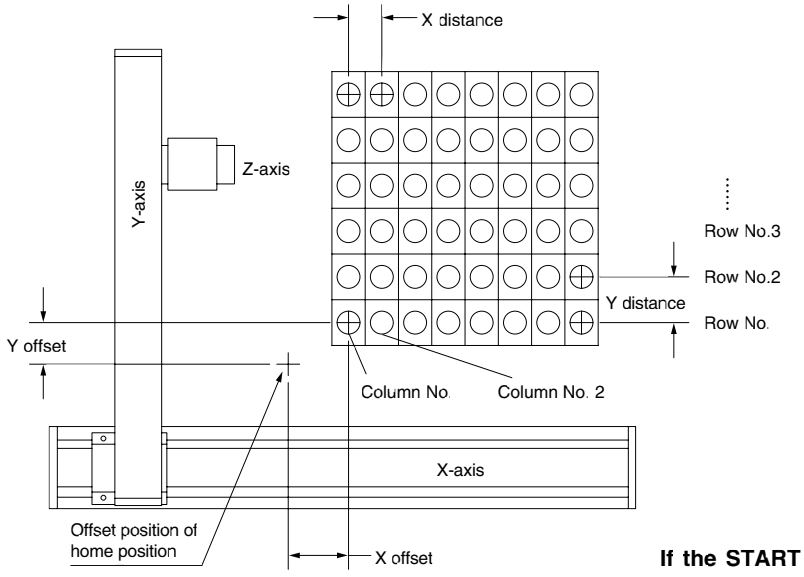
④ **Input the traveling velocity**



⑤ **Input the acceleration and deceleration when traveling**

⑥ **Input the number of line and row for X-axis and Y-axis.**

⑦ **Write to the LC8 after input is completed.**



If the START signal is inputted after the step number of the palletizing data has been inputted, it will move to the 1st row/1st column of the pallet.

On every input of the START signal by using the same step number it will move to the 2nd row/1st column, 3rd row/1st column…1st row/2nd column on the pallet. Each respective move is completed when BUSY signal is turned OFF.

Positioning Driver/For AC Servomotor

Series LC8

Compliant actuators/Series LJ1, Series LG1, Series LTF

How to Order

Master **LC8** **B** **1** **H** **1** **N** **M** **F**

Motor capacity

1	50 W
2	100 W
3	200 W

Power voltage

1	100 VAC/115 VAC
2	200 VAC/230 VAC

Command I/O

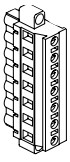
N	NPN
P	PNP

Mounting bracket

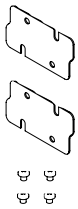
Nil	None
F	Mounting bracket

Accessory

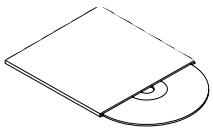
①	**LC8-1-MP**	Motor/Power connector
②	**LC8-1-B**	Kit for mounting bracket (Designated only with mounting bracket)
③	**LC8-1-W1**	LC8 controller installation software



①



②



③

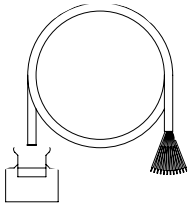
Option Note) Purchase separately.

①	**LC8-1-CN**	Command I/O connector
②	**LC8-1-1050**	Connector with command I/O cable (0.5 m)
③	**LC8-1-1050P**	With connector stick terminals with command I/O cable (0.5 m)
④	**LC8-1-R03C**	RS-232C communications cable (3 m)

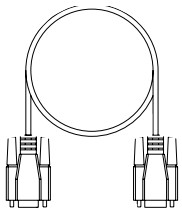
① **Made by Sumitomo 3M** **Connector: 10126-3000VE**
Shell: 10326-52-A0-008 (or equivalent)
② **Cable terminal: Individual wires**
③ **Cable terminal: Stick terminals (compliant with PC wiring system)** Note 2)

Note 1) Either ① or ② or ③ will be required.
Note 2) As for PC wiring system, please confirm by Electric Products (CAT. 150) catalog.

①



②, ③



④

Precautions on Using Master

⚠ Caution

1 In case of using in 1-axis, use a master (Slave alone cannot be used.)

2. Regarding the use of 3-axis or more, be sure to contact us for how-to-use and operating conditions.

How to Order

Slave **LC8** **B** **1** **H** **1** **V** **F**

Motor capacity

1	50 W
2	100 W
3	200 W

Power voltage

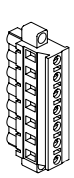
1	100 VAC/115 VAC
2	200 VAC/230 VAC

Mounting bracket

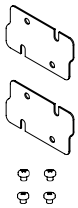
Nil	None
F	Mounting bracket

Accessory

①	**LC8-1-MP**	Motor/Power connector
②	**LC8-1-B**	Kit for mounting bracket (Designated only with mounting bracket)



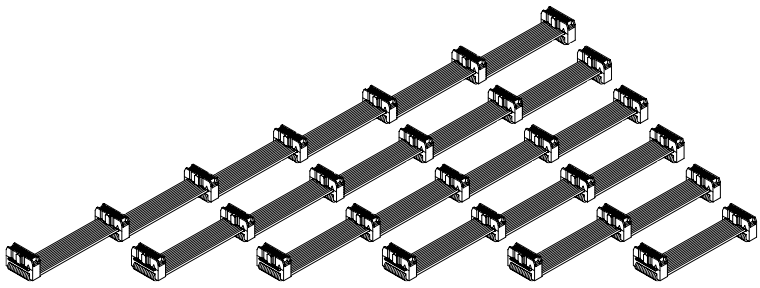
①



②

Option Note) Purchase separately

①	**LC8-1-C2**	2-axis communications cable
	LC8-1-C3	3-axis communications cable
	LC8-1-C4	4-axis communications cable
	LC8-1-C5	5-axis communications cable
	LC8-1-C6	6-axis communications cable
	LC8-1-C7	7-axis communications cable



①

Precautions on Connecting Slave

⚠ Caution

1 Motion for returning to the home position starts simultaneously for master and slave. Design the equipment so that it will not interfere with components in equipment when returning to the home position.

2. If the START signal is input, the designated operation data for all the axes will start to the designated step number For the operation data of the axis which should not operate, enter "Relative coordinates to the 0 mm position"

3. In case of using with single axis, use a master. (Slave alone cannot be used.)

4. Regarding the use of 3-axis or more, be sure to contact us for how-to-use and operating conditions.

Specifications

Model	LC8-B□□1□-□□	LC8-B□□2□-□□
Power supply	100 to 115 V ± 10% 50/60 Hz	200 to 230 V ± 10% 50/60 Hz
Dimensions	141 mm x 75 mm x 130 mm	
Weight	0.85 kg	

Electrical Specifications

Model	LC8-B1□1 □-□□	LC8-B2□1 □-□□	LC8-B3□1 □-□□	LC8-B1□2 □-□□	LC8-B2□2 □-□□	LC8-B3□2 □-□□
Motor capacity	50 W	100 W	200 W	50 W	100 W	200 W
Operating ambient temperature	0 to 50°C		0 to 40°C	0 to 50°C		0 to 40°C
Operating ambient humidity	35 to 85% (No condensation)					
Rated power consumption	80 VA	150 VA	320 VA	80 VA	160 VA	300 VA
Max. power consumption	230 VA	450 VA	960 VA	240 VA	460 VA	900 VA
Position detecting method	Incremental encoder					
Withstand voltage	1000 VAC (1 minute between terminal and case)					
Insulation resistance	2 MΩ (500 VDC) (Between terminal and time)					
Anti-noise	1000 Vp-p 1 μs, Start-up time 1 ns					

Data Input

Item	Performance/Specifications
Number of steps	117 steps at the maximum
Palletizing pattern	5 patterns (when using master, slave)

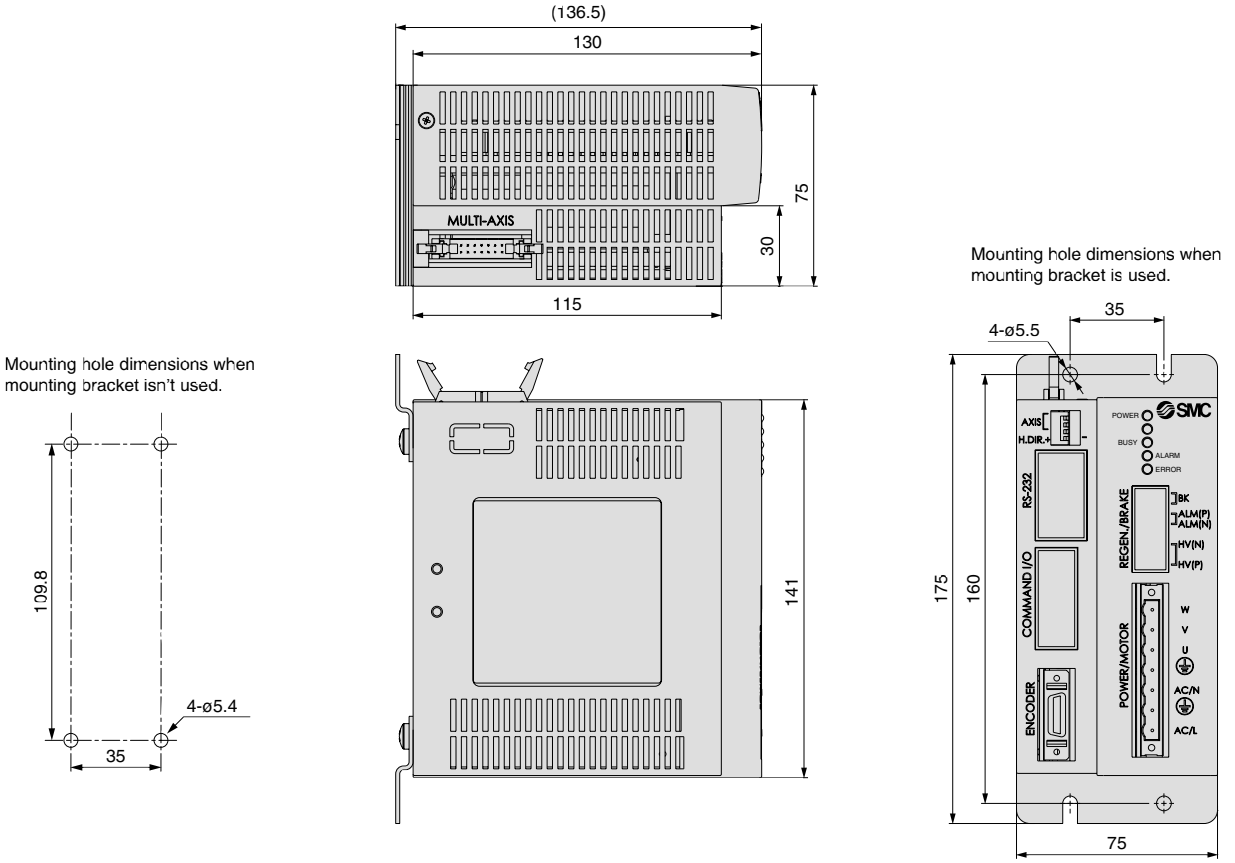
Command I/O Specifications

Model	LC8-B□□□N-□□	LC8-B□□□P-□□
Command I/O input	+24 V common, 24 VDC ± 10%, Minimum 6 mA	PLC GND common, 24 VDC ± 10%, Minimum 6 mA
Command I/O output	NPN open collector (sink type), 24 VDC ± 10%, Maximum 80 mA	PNP open collector (source type), 24 VDC ± 10%, Maximum 80 mA
Minimum input pulse width	10 ms (E. Stop is 100 ms or more.)	
Leakage current	10 μA or less	
Internal voltage drop	0.8 V or less	

Safety Items

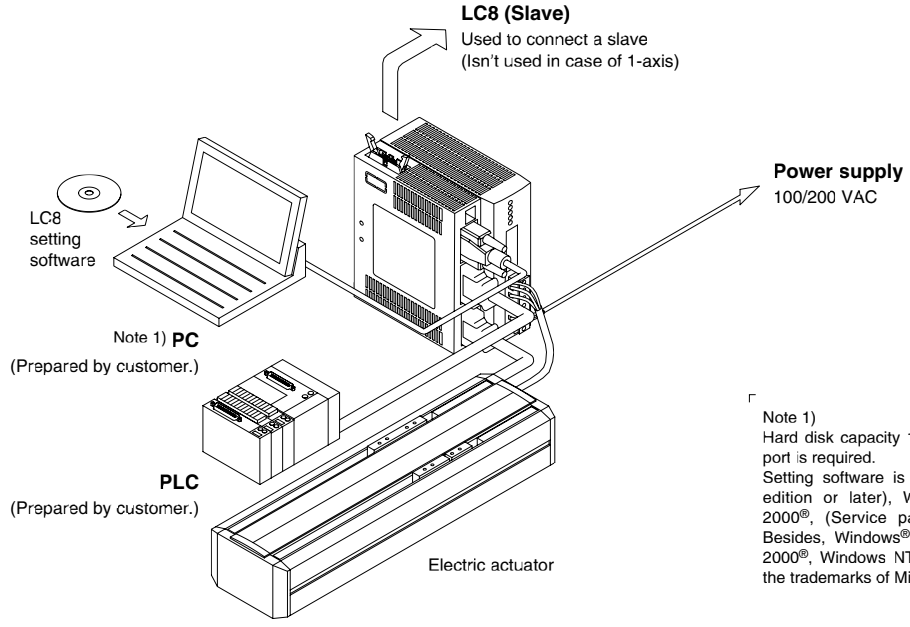
Item	Performance/Specifications
Alarming function	Over voltage/Low voltage, FWD/RVS limit switch, Overload, Motor drive circuit, Encoder connection, Forward soft stroke limit, Absolute home position stroke limit, Regenerative absorption unit, Communications, Non-returning to home position, Over current, Current limit, Initialization of palletizing data, RS-232 communications
Error function	Emergency stop, Step number

External Dimensions



System Composition

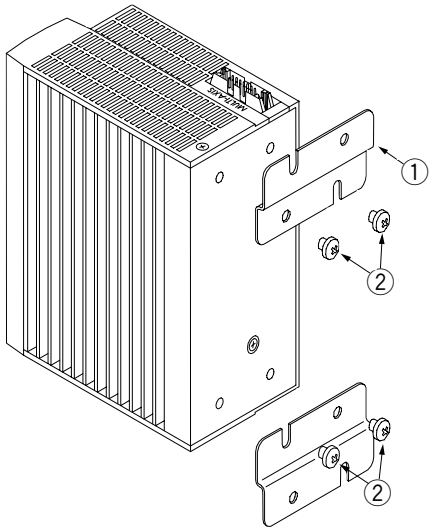
Example of using with 1-axis step operation (In case of using with X-Y a master and a slave is required.)



Note 1)
Hard disk capacity 12 Mb, RAM 4 Mb or more, and RS232C port is required.
Setting software is compliant to Microsoft Windows 95® (B edition or later), Windows 98®, Windows NT®, Windows 2000®, (Service pack 6), Windows Me®, Windows XP® Besides, Windows®, Wndows 95®, Windows 98®, Windows 2000®, Windows NT®, Windows Me® and Windows XP® are the trademarks of Microsoft Corporation

Mounting Method

LC8-B□□□□-□F (In the case of a bracket option.)



Perform by mounting the attached bracket. For mounting dimensions please refer to the external dimension on the prior page. For wall mounting, please prepare the required M5 screws (4 pcs.).

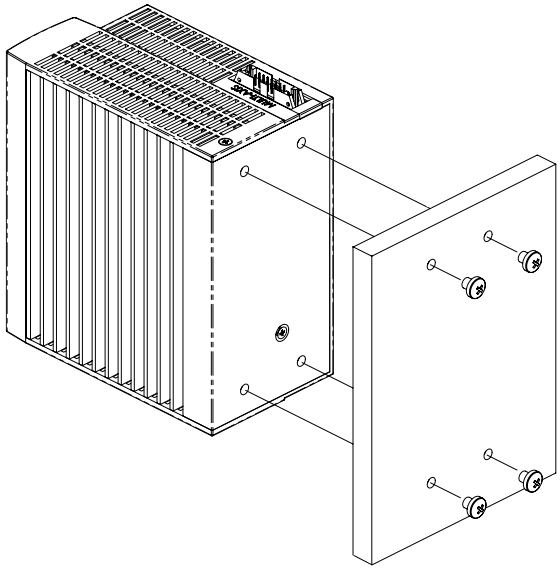
Accessory Contents

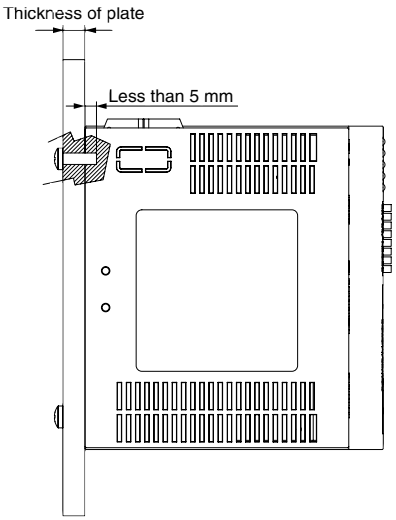
①	Mounting bracket	2 pcs.
②	Mounting screw	4 pcs.

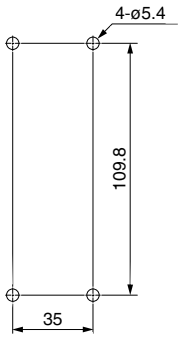
LC8-B□□□□-□ (In case that there is not bracket option.)

Please prepare M5 screws (4 pcs.). Select a screw length that does not exceed the thickness of the plate + 5 mm. Drill holes in the plate with a distance of 35 mm between the width of the holes and 109.8 mm between the height of the hole.

Note) Do not use screws with a longer length than designated. If longer, it is likely to cause an electrical shock or a fire.







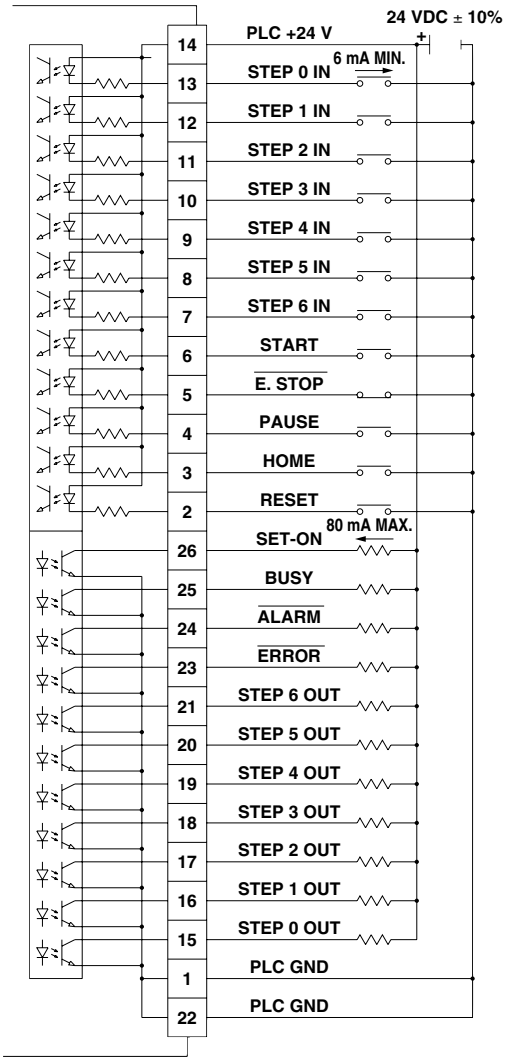
Precautions on Using Multi-axis Cable

⚠ Caution

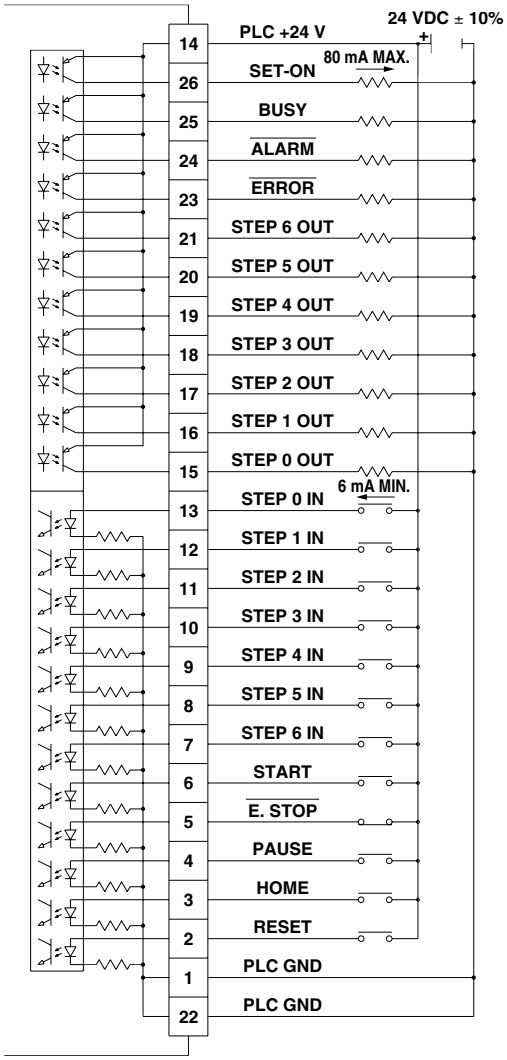
In case of connecting the LC8 with multi-axis cable, the cable should be 20 mm or longer but less than 30 mm to the driver.

Command I/O Connector's Wiring

Wiring diagram
LC8-B□□□N-M□ (NPN specification)



LC8-B□□□P-M□ (PNP specification)



No.	Name of signals		Contents
14	PLC +24V	—	Connect + 24 V for power supply for signal.
1	PLC GND	—	Connect 0V for power supply for signal.
22	PLC GND	—	
13	STEP 0 IN	Input	Input the step number.
12	STEP 1 IN	Input	
11	STEP 2 IN	Input	
10	STEP 3 IN	Input	
9	STEP 4 IN	Input	
8	STEP 5 IN	Input	
7	STEP 6 IN	Input	
6	START	Input	Operate the step number.
5	E.STOP	Input	Turn the emergency stop condition to OFF.
4	PAUSE	Input	Motion stops temporarily.
3	HOME	Input	Return to home position.
2	RESET	Input	Reset alarm and error.

No.	Name of signals		Contents
26	SET-ON	Output	Turn ON when returning to home position is completed.
25	BUSY	Output	Turn ON while an actuator is traveling.
24	ALARM	Output	Turn OFF when alarming
23	ERROR	Output	Turn OFF when an error occurs.
21	STEP 6 OUT	Output	Output the step number in motion
20	STEP 5 OUT	Output	
19	STEP 4 OUT	Output	
18	STEP 3 OUT	Output	
17	STEP 2 OUT	Output	
16	STEP 1 OUT	Output	
15	STEP 0 OUT	Output	

Input	Rated input voltage: 24 VDC Rated input: 6 mA/1 point
Output	Maximum load voltage: 24 VDC Maximum load current: 80 mA/1 point

Selection Flow for Actuators Compliant to LC8

Series	Workload (kg)	Maximum speed (mm/s)	Positioning repeatability (mm)	Lead screw	Guide type	Standard stroke (mm) and Speed (mm/s) 100	200	300	400	500	600
Series LJ1 	5	300	±0.1	Slide screw	Slide guide	to 300					
	10	300	±0.1			to 300					
		500	±0.1		High rigidity, direct acting guide	to 500					
		600	±0.02	Ground ball screw		to 600					
		600	±0.05	Rolled ball screw		to 600					
	15	500	±0.1	Slide screw		to 500					
	20	300	±0.1		Slide guide		to 500				
	30	500	±0.02	Ground ball screw	High rigidity, direct acting guide	to 500					
		500	±0.05	Rolled ball screw		to 500					
		500	±0.1	Slide screw			to 500				
		1000	±0.02	Ground ball screw						to 1000	
		1000	±0.05	Rolled ball screw						to 1000	
	60	1000	±0.02	Ground ball screw			to 1000				
		1000	±0.05	Rolled ball screw			to 1000				
Series LG1 	15	500	±0.1	Slide screw	High rigidity, direct acting guide	to 500					
	30	500	±0.02	Ground ball screw		to 500					
			±0.05	Rolled ball screw		to 500					
		1000	±0.02	Ground ball screw						to 1000	
			±0.05	Rolled ball screw						to 1000	
Series LTF 	15	500	±0.02	Ground ball screw	Frame type linear guide	to 500					390
			±0.05	Rolled ball screw		to 500					390
	25	1000	±0.02	Ground ball screw		to 1000					
			±0.05	Rolled ball screw		to 1000					
	30	300	±0.02	Ground ball screw		to 300					230
			±0.05	Rolled ball screw		to 300					230
	50	500	±0.02	Ground ball screw		to 500					
			±0.05	Rolled ball screw		to 500					

Note 1) The actuator's external dimensions and its specifications are equivalent to its corresponding partnumber's. Please confirm each actuator by referring to its corresponding catalog.

How to Order

Series LJ1

LJ1 H 10 8 1 1 N B — Stroke — F 2

Guide type

H	High rigidity direct acting guide
S	Slider guide

Series

10	10 series
20	20 series
30	30 series

Motor specifications

Nil	Standard motor for LC1
8	Standard motor for LC8

Motor capacity

1	50 W
2	100 W
3	200 W

Power voltage

1	100/115 VAC (50/60 Hz)
2	200/230 VAC (50/60Hz)

Feed screw type

P	Ground ball screw
N	Rolled ball screw
S	Slide screw

Feed screw lead

A	10 mm
B	12 mm
C	20 mm
D	25 mm
E	40 mm

Cable entry direction

F	Axial
R	Right
L	Left
T	Up
B	Down

Cable length

2	2 m
3	3 m
4	4 m
5	5 m

Series LG1

LG1 ☐ H 21 8 2 1 N A — Stroke — F 2

Frame material

Nil	Aluminum alloy
T	Stainless steel

Series

20	20 series
21	21 series

Motor specifications

Nil	Standard motor for LC1
8	Standard motor for LC8

Power voltage

1	100/115 VAC (50/60 Hz)
2	200/230 VAC (50/60Hz)

Feed screw type

P	Ground ball screw
N	Rolled ball screw
S	Slide screw

Feed screw lead

A	10 mm
C	20 mm

Cable length

2	2 m
3	3 m
4	4 m
5	5 m

Standard stroke (mm) and Speed (mm/s)						Actuator model	Driver model	Remarks Note 1) (Equivalent actuator)
700	800	900	1000	1200	1500			
to 300						LJ1S1081□SC	LC8-B1H□□-□□	LJ1S101□SC
to 300						LJ1S2082□SC	LC8-B2H□□-□□	LJ1S202□SC
to 500						LJ1H1081□SC	LC8-B1H□□-□□	LJ1H101□SC
						LJ1H1081□PB	LC8-B1H□□-□□	LJ1H101□PB
						LJ1H1081□NB	LC8-B1H□□-□□	LJ1H101□NB
to 500						LJ1H2082□SC	LC8-B2H□□-□□	LJ1H202□SC
	500		to 500			LJ1S3083□SC	LC8-B3H□□-□□	LJ1S303□SC
						LJ1H2082□PA	LC8-B2H□□-□□	LJ1H202□PA
						LJ1H2082□NA	LC8-B2H□□-□□	LJ1H202□NA
	500		to 500			LJ1H3083□SE	LC8-B3H□□-□□	LJ1H303□SE
930	740	600	500			LJ1H2082□PC	LC8-B2H□□-□□	LJ1H202□PC
930	740	600	500			LJ1H2082□NC	LC8-B2H□□-□□	LJ1H202□NC
	1000		1000	700	500	LJ1H3083□PD	LC8-B3H□□-□□	LJ1H303□PD
	1000		1000	700	500	LJ1H3083□ND	LC8-B3H□□-□□	LJ1H303□ND
to 500						LG1□H2□82□SC	LC8-B2H□□-□□	LG1□H2□2□SC
						LG1□H2□82□PA	LC8-B2H□□-□□	LG1□H2□2□PA
						LG1□H2□82□NA	LC8-B2H□□-□□	LG1□H2□2□NA
930	740	600	500			LG1□H2□82□PC	LC8-B2H□□-□□	LG1□H2□2□PC
930	740	600	500			LG1□H2□82□NC	LC8-B2H□□-□□	LG1□H2□2□NC
						LTF68E□PH	LC8-B2H□□-□□	LTF6E□PH
						LTF68E□NH	LC8-B2H□□-□□	LTF6E□NH
890	710	580	480			LTF88F□PL	LC8-B3H□□-□□	LTF8F□PL
890	710	580	480			LTF88F□NL	LC8-B3H□□-□□	LTF8F□NL
						LTF68E□PF	LC8-B2H□□-□□	LTF6E□PF
						LTF68E□NF	LC8-B2H□□-□□	LTF6E□NF
440	350	290	240			LTF88F□PH	LC8-B3H□□-□□	LTF8F□PH
440	350	290	240			LTF88F□NH	LC8-B3H□□-□□	LTF8F□NH

Series LTF

LTF 6 8 E 1 P F — Stroke — R 2

Series

6	6 series
8	8 series

Motor capacity

Nil	Standard motor for LC1
8	Standard motor for LC8

Motor output

E	100 W
F	200 W

Power voltage

1	100/115 VAC (50/60 Hz)
2	200/230 VAC (50/60 Hz)

Feed screw type

P	Ground ball screw
N	Rolled ball screw

Feed screw lead

F	6 mm
H	10 mm
L	20 mm

Motor cable switch entry direction

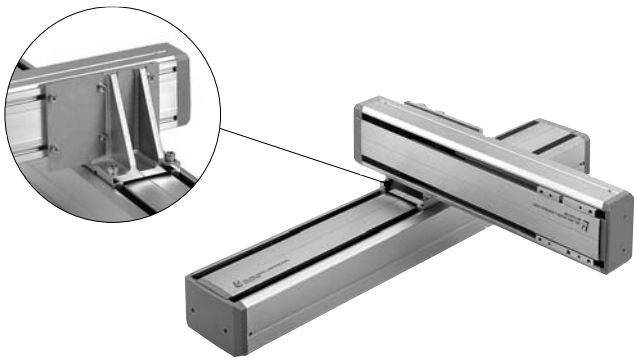
R	Right
L	Left

Cable length

2	2 m
3	3 m
4	4 m
5	5 m

X-Y Bracket

Bracket for combining X-axis actuator and Y-axis actuator



LJ1 BXY—J2J1 LS

Direction for Y-axis installation (Refer to "Table 1".)

LS	Extended direction: Left
RS	Extended direction: Right

Note) Extended direction viewed from X-axis motor side.

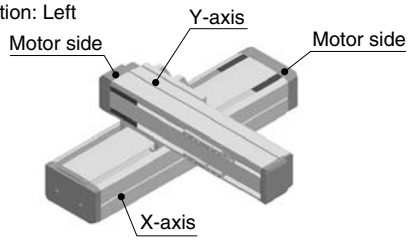
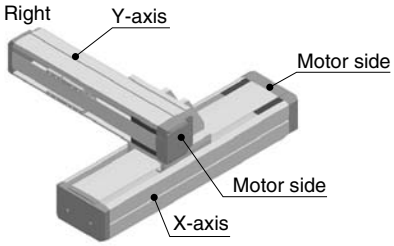
Applicable actuators

Symbol	X-axis	Y-axis
J2J1	Series L1H20	Series L1H10
J3J2	Series L1H30	Series L1H20

Y-axis, Maximum transferable weight for each stroke (kg)

Y-axis Stroke (mm)	Applicable actuator symbol	
	J2J1	**J3J2**
100	10	30
200	10	22
300	10	14
400	—	8

Table 1 Y-axis installation direction (Y-axis extended direction viewed from the X-axis motor side)

LS	Extended direction: Left 
RS	Extended direction: Right 

When selecting X-Y bracket, please contact SMC.

Electric Actuator/Controller/Driver
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 10218 Note 1), JIS 8433 Note 2) and other safety practices.

⚠ **Caution:** Operator error could result in injury or equipment damage.

⚠ **Warning:** Operator error could result in serious injury or loss of life.

⚠ **Danger:** In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 10218: Manipulating industrial robots - Safety
Note 2) JIS 8433: General Rules for Robot Safety

⚠ Warning

1. The compatibility of electric actuators is the responsibility of the person who designs the system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate this equipment.

Electric actuators can be dangerous if an operator is unfamiliar with them. Assembly, handling or repair of systems using electric actuators should be performed by trained and experienced operators.

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

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above, and shut off the power supply for this equipment.
3. Before machinery/equipment is restarted, confirm that safety measures are in effect.

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, medical equipment, food and beverages, or safety equipment.
3. An application which has the possibility of having negative effects on people, property or animals, requiring special safety analysis.

5. Prior to use, thoroughly read the "Instruction Manual" and use the product appropriately after first confirming the product's operation with the distributor or SMC.

6. Before using, carefully read the handling cautions described in this catalog.

7. Some products listed in this catalog have limitations to the operating usage and locations. Please confirm the limitations with the distributor or SMC.

Electric Actuator/Precautions 1

Be sure to read before handling.

General

Caution on Handling

⚠Caution

1. **In order to ensure proper operation, be certain to read the instruction manual carefully. As a rule, handling or usage/operation other than those contained in the instruction manual are prohibited.**
2. **If the actuator will be used in an environment where it will be exposed to chips, dust, cutting oil (water, liquids), etc., a cover or other protection should be provided.**
3. **Operate with cables secured. Avoid bending cables at sharp angles where they enter the actuator, and also be sure that cables do not move easily.**

Caution on Design

⚠Warning

1. **In cases where dangerous conditions may result from power failure or malfunction of the product, install safety equipment to prevent damage to machinery and human injury. Consideration must also be given to drop prevention with regard to suspension equipment and lifting mechanisms.**
2. **Consider possible loss of power sources.**
   Take measures to protect against human injury and machine damage in the event that there is a loss of air pressure, electricity or hydraulic power.
3. **Consider emergency stops.**
   Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions such as a power outage or a manual emergency stop.
4. **Consider the action when operation is restarted after an emergency stop or abnormal stop.**
   Design the machinery so that human injury or equipment damage will not occur upon restart of operation.

Selection

⚠Warning

1. **Confirm the specifications.**
   The products in this catalog should not be used outside of the range of specifications, since this may cause damage malfunction, etc. (Refer to specifications.)
2. **In case of using in 3-axis or more, please contact us for how-to-use and operating conditions prior to selection.**

Mounting

⚠Caution

1. **Please make sure that cables are not caught by actuator movement.**
2. **Do not use in locations where there is vibration or impact shock. Contact SMC before using in this kind of environment, as damage may result.**
3. **Give adequate consideration to the arrangement of wiring, etc., when mounting. If wiring is forced into inappropriate arrangement, this may lead to breaks in the wiring and result in malfunction.**

Operating Environment

⚠Caution

1. **Avoid use in the following environments.**
   1. Locations with a lot of debris or dust, or where chips may enter.
   2. Locations where the ambient temperature exceeds a range of 5 to 40°C.
   3. Locations where the ambient humidity exceeds a range of 10 to 90%.
   4. Locations where corrosive or combustible gases are generated.
   5. Locations where strong magnetic or electric fields are generated.
   6. Locations where direct vibration or impact shock, etc., will be applied to the actuator unit.
   7. Locations where a lot of dusts, water drops and oil drops are applied to a product.

Maintenance

⚠Warning

1. **Perform maintenance according to the procedures indicated in the instruction manual.**
   If handled improperly, malfunction and damage of machinery or equipment may occur.
2. **Removal of equipment**
   When equipment is removed, first confirm that measures are in place to prevent dropping or runaway of driven objects, etc., and then proceed after shutting off the electric power. When starting up again, proceed with caution after confirming that conditions are safe.

Back page 2

Electric Actuator/Precautions 2

Be sure to read before handling.

Actuator

Caution on Design

⚠ Warning

1. There is a possibility of dangerous sudden action by actuators if sliding parts of machinery are twisted due to external forces, etc.

In such cases, human injury may occur, e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be adjusted for smooth operation and designed to avoid such dangers.

2. A protective cover is recommended to minimize the risk of human injury.

If a driven object and moving parts of an actuator pose a danger of human injury, design the structure to avoid contact with the human body.

3. Securely tighten all stationary parts and connected parts of electric actuators so that they will not become loose.

Avoid use in locations where direct vibration or impact shock, etc., will be applied to the body of the actuator.

Operation

⚠ Caution

1. Conduct the following inspection before actuator/controller is operated.

a) Confirm that the power supply line or each signal line for actuator/controller is not broken.
b) Confirm that the power supply line or each signal line for actuator/controller is not loosened.
c) Confirm that the actuator/controller is not mounted loosely.
d) Confirm that the actuator/controller is operated correctly.
e) Confirm the function of the emergency stop.

2. Take measures such as installing a fence, etc., to prevent any person from entering the operational area of the actuator/controller and related equipment.

3. If a person should enter an area as previously mentioned 2), take measures to ensure that the emergency stop is controlled by a sensor, etc.

4. In case the actuator/controller is stopped by abnormalities, take necessary measures to prevent danger from related equipment.

5. In case of abnormalities of related equipment, take the necessary measures to prevent danger from an actuator/controller.

6. Take necessary measures to prevent broken or cut power lines or signal lines by pinching, shearing, curling, scratching and grazing.

7. In case there is abnormal heat, fume and flame, etc., cut off the power supply immediately.

8. In the event of an installation, adjustment, inspection or maintenance of an actuator/controller, as well as related equipment, be sure to cut off the power supply and take measures such as locking or safety-lock, etc., so that persons other than workers are not able to restart the operation again. Furthermore, display the information for doing those jobs at the places where anyone can see easily.

Operation

⚠ Caution

9. In case several persons are doing the job, determine the procedure, signs, measures against abnormality and restarting measures in advance. Then let the person who isn't doing the job supervise that job.

Caution on Handling

⚠ Caution

1. The actuator can be used with a load directly applied to it, as long as it is within the allowable range. However, it is necessary to design an appropriate connecting method and use careful alignment when a load with external support and guide mechanisms is connected. Please note that the reference plane for the actuator body mounting should only be used as a guideline to install the body. Never use it as a reference plane to align the entire equipment with external support and guide mechanisms. The longer the stroke is, the larger the variation in the axial center becomes. Therefore, devise a connection method to absorb the variation.

2. Since the bearing parts and parts surrounding the lead screw are adjusted at the time of shipment, do not change the setting of the adjusted parts.

3. The product can be used without lubrication. In case the product is lubricated, special grease is required. Please contact the distributor or SMC.

4. If the electric actuator is repeatedly operated with the short stroke cycles (20 mm for LJ, 10 mm for LX), loss of grease may occur. Therefore, operate the actuator with a full stroke once every scores of cycles.

Mounting

⚠ Caution

1. Do not use until you verify that the equipment can operate properly.

2. The product should be mounted and operated after thoroughly reading the instruction manual and understanding its contents.

3. Do not dent, scratch or cause other damage to the body and table mounting surfaces.

This may cause a loss of parallelism in the mounting surfaces, looseness in the guide unit, an increase in operating resistance or other problems.

4. When attaching a workpiece, do not apply strong impact shock or a large moment.

If an outside force exceeding the allowable moment is applied, this may cause looseness in the guide unit, an increase in sliding resistance or other problems.

5. When connecting a load having an external support or guide mechanism, be sure to select a suitable connection method and perform careful alignment.

Electric Actuator/Precautions 3

Be sure to read before handling.

Controller/Driver/Positioning Driver/Regenerative Absorption Unit

Caution on Handling

⚠ Warning

1. Never touch the controller or driver inside. It will likely lead to an electrical shock or other trouble.
2. Use only the designated combination between motor and controller driver.

⚠ Caution

1. Do not disassemble and modify. It may result in the trouble, malfunction, fire, etc.
2. Do not touch for a while when being energized or after cut off the power source because it is high temperature.
3. If a fire or danger against the human being is expected by abnormal heat generation of the product, emitting fume and catching on fire, etc., cut off the power supply for the main body and the system immediately.

Power Supply

⚠ Caution

1. In cases where voltage fluctuations greatly exceed the required voltage, a constant voltage transformer, etc., should be used to allow operation within the required range.
2. 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.
3. The power supply line to the controller and the interface power supply line to general input/output and control terminals (24 VDC) must be wired separately in different systems.
4. The wire must not be bundled with or arranged in close proximity to the input/output lines of control terminals or encoder signal lines.
5. To prevent surges from lightning, connect a varistor for lightning. Ground the surge absorber for lightning separately from the grounding of the controller.

Grounding

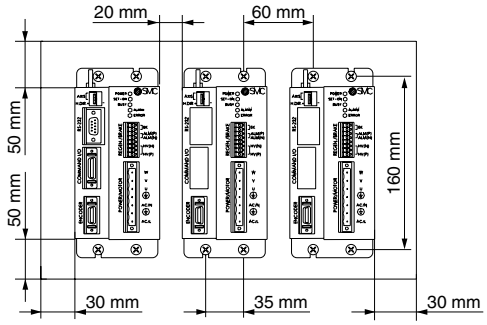
⚠ Caution

1. Be sure to carry out grounding in order to ensure the noise tolerance of the controller.
2. Dedicated grounding should be used as much as possible. Grounding should be to a type 3 ground. (Ground resistance of 100 Ω or less.)
3. Use a wire with a sectional area of 2 mm² or larger for grounding. Grounding should be as close as possible to the controller, and the ground wires should be as short as possible.
4. In the unlikely event that malfunction is caused by the ground, it may be disconnected.

Mounting

⚠ Caution

1. Mount the controller driver on incombustible materials. Mounting on combustible materials directly or mounting closely to it may lead to a fire.
2. Consider the cooling period, so that the operating temperature of main body should be within the range of specifications. Also, allow enough distance from each side of the main body, construction and the parts.



3. Avoid placing with large-sized solenoid contact apparatus or vibrating source such as no fuse insulator and then make a separate panel or mount in the distance.
4. The construction of this product enables the connectors to be inserted or removed after installation.
5. If there are concave or convex or distorted parts on the mounting face, an unreasonable force can be applied to the frame or case, which can cause trouble. Mount on the flat face.

Wiring

⚠ Danger

1. Adjustment, installation, or wiring changes should be conducted after power supply to this product is turned off. Otherwise, there is a possibility of an electrical shock.

⚠ Caution

1. Wiring should be done correctly.
   For each terminal, voltages other than stipulated in the operation manual should not be applied. Otherwise, the product may break.
2. Connect the connector securely.
3. Treat the noise securely.
   If the noise is at the same wavelength as the signal lines, it will lead to malfunction. As a countermeasure, separate the high and low electrical lines and shorten the length of wiring, etc.
4. In the event of connecting the electric actuator's motor power line and encoder signal line, use adequate care in identifying the lines and the connector's direction.

Back page 4

Electric Actuator/Precautions 4

Be sure to read before handling.

Controller/Driver

Wiring

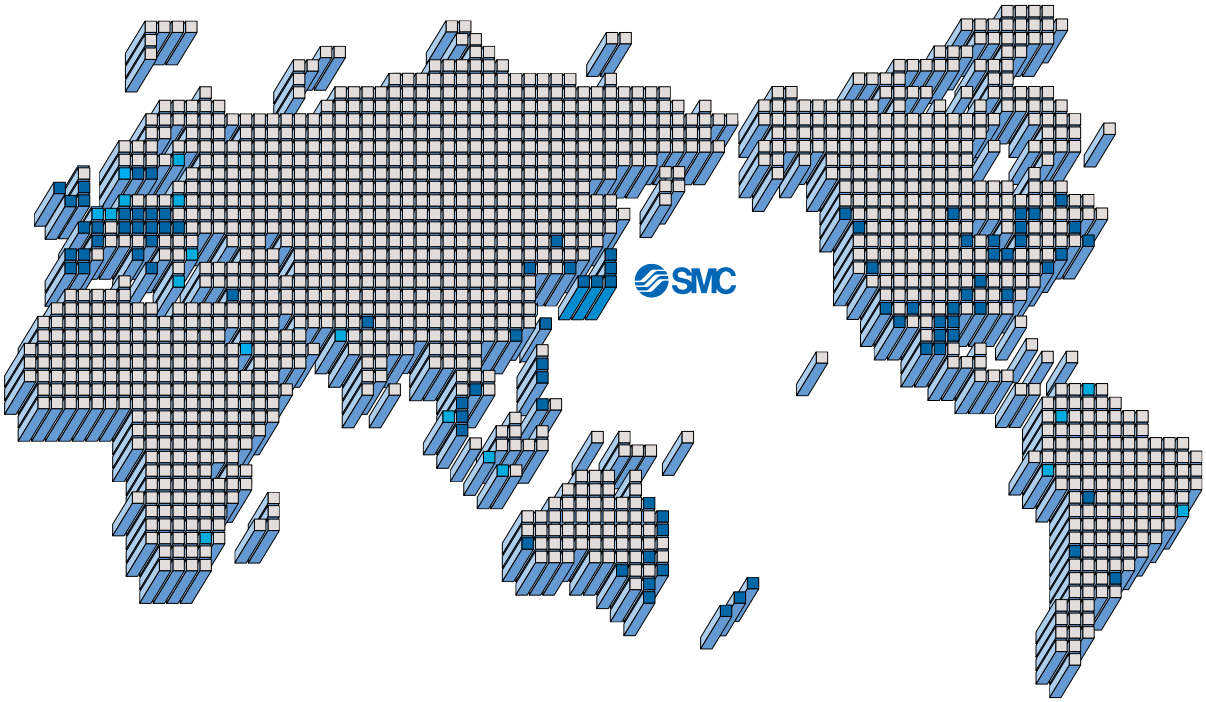
⚠ Caution

5. Never disassemble the motor power lines for the electric actuator and the encoder signal lines. Also, in the event of using a cable prepared by customer (user), use it only after confirming the cable size can provide enough electricity as stipulated in the instruction manual and that there is no noise effect.

6. The motor power lines for the electric actuators and the encoder signal lines, 100 VAC lines, as well as other high voltage lines, should not be bundled together. They should be placed as far away as possible.

7 Terminals for controlling, for general-purpose input/output, motor power lines and encoder signal lines should never be inserted or pulled out while the main power supply for the controller is ON.

SMC'S GLOBAL MANUFACTURING, DISTRIBUTION AND SERVICE NETWORK



EUROPE

AUSTRIA
SMC Pneumatik GmbH

CZECH
SMC Industrial Automation CZ s.r.o.

DENMARK
SMC Pneumatik A/S

FINLAND
SMC Pneumatiikka Oy

FRANCE
SMC Pneumatique SA

GERMANY
SMC Pneumatik GmbH

HUNGARY
SMC Ipari Automatizálási Kft

IRELAND
SMC Pneumatics (Ireland) Ltd.

ITALY
SMC Italia S.p.A

LATVIA
SMC Pnuematics Latvia SIA

NETHERLANDS
SMC Pneumatics BV

NORWAY
SMC Pneumatics Norway A/S

POLAND
SMC Industrial Automation Polska Sp.z.o.o

ROMANIA
SMC Romania s.r.l.

RUSSIA
SMC Pneumatik LLC

SLOVAKIA
SMC Priemyselná Automatizáciá, s r o.

SLOVENIA
SMC Industrijska Avtomatika d.o.o.

SPAIN/PORTUGAL
SMC España, S.A.

SWEDEN
SMC Pneumatics Sweden AB

SWITZERLAND
SMC Pneumatik AG.

UK
SMC Pneumatics (U.K.) Ltd.

ASIA

CHINA
SMC (China) Co., Ltd.

HONG KONG
SMC Pneumatics (Hong Kong) Ltd.

INDIA
SMC Pneumatics (India) Pvt. Ltd.

INDONESIA
PT SMC Pneumatics Indonesia

MALAYSIA
SMC Pneumatics (S.E.A.) Sdn. Bhd.

PHILIPPINES
SHOKETSU-SMC Corporation

SINGAPORE
SMC Pneumatics (S.E.A.) Pte. Ltd.

SOUTH KOREA
SMC Pneumatics Korea Co Ltd.

TAIWAN
SMC Pneumatics (Taiwan) Co., Ltd

THAILAND
SMC Thailand Ltd.

NORTH AMERICA

CANADA
SMC Pneumatics (Canada) Ltd.

MEXICO
SMC Corporation (Mexico) S.A. de C.V.

USA
SMC Corporation of America

SOUTH AMERICA

ARGENTINA
SMC Argentina S.A

BOLIVIA
SMC Pneumatics Bolivia S.R.L.

BRAZIL
SMC Pneumaticos Do Brazil Ltda.

CHILE
SMC Pneumatics (Chile) S.A.

VENEZUELA
SMC Neumatica Venezuela S.A

OCEANIA

AUSTRALIA
SMC Pneumatics (Australia) Pty Ltd.

NEW ZEALAND
SMC Pneumatics (N.Z.) Ltd.

SMC Corporation
-16-4 Shimbashi, Minato-ku, Tokyo 105-8659 JAPAN
Tel: 03-3502-2740 Fax: 03-3508-2480
URL http://www.smcworld.com

D-DN 1st printing IU printing IU 120DN Printed in Japan.

This catalog is printed on recycled paper with concern for the global environment.