Dedicated Controller

Series *LC1*

Uniaxial Type
with Built-in AC Servo-driver

POWER
AIRE

Series *LC1*

Typical Equipment Configurations

<Operation from a personal computer>

Teaching box

Dedicated communication cable

Actuator

Controller setup software

CN4

CN5

∗ Exclusive controller setup software
(optional) is required.

CN3

<Operation from an operating panel>

Teaching box

Dedicated communication cable

Actuator

Controller setup software

CN5

CN4

CN1

CN2

Operating panel

Controlled by general-purpose input/output

Solenoid valve

Air cylinder

CN3

Solenoid valve

Air gripper

Vacuum ejector

POWER
AIRE

<Operation from a programmable logic controller (PLC)>

Teaching box

Dedicated communication cable

Actuator

Controller setup software

CN4

CN5

Programmable logic controller (PLC)

CN1

Controlled by general-purpose input/output

CN2

CN3

Solenoid valve

Air cylinder

Solenoid valve

Air gripper

Vacuum ejector

Uniaxial Electric Actuator

Dedicated Controller
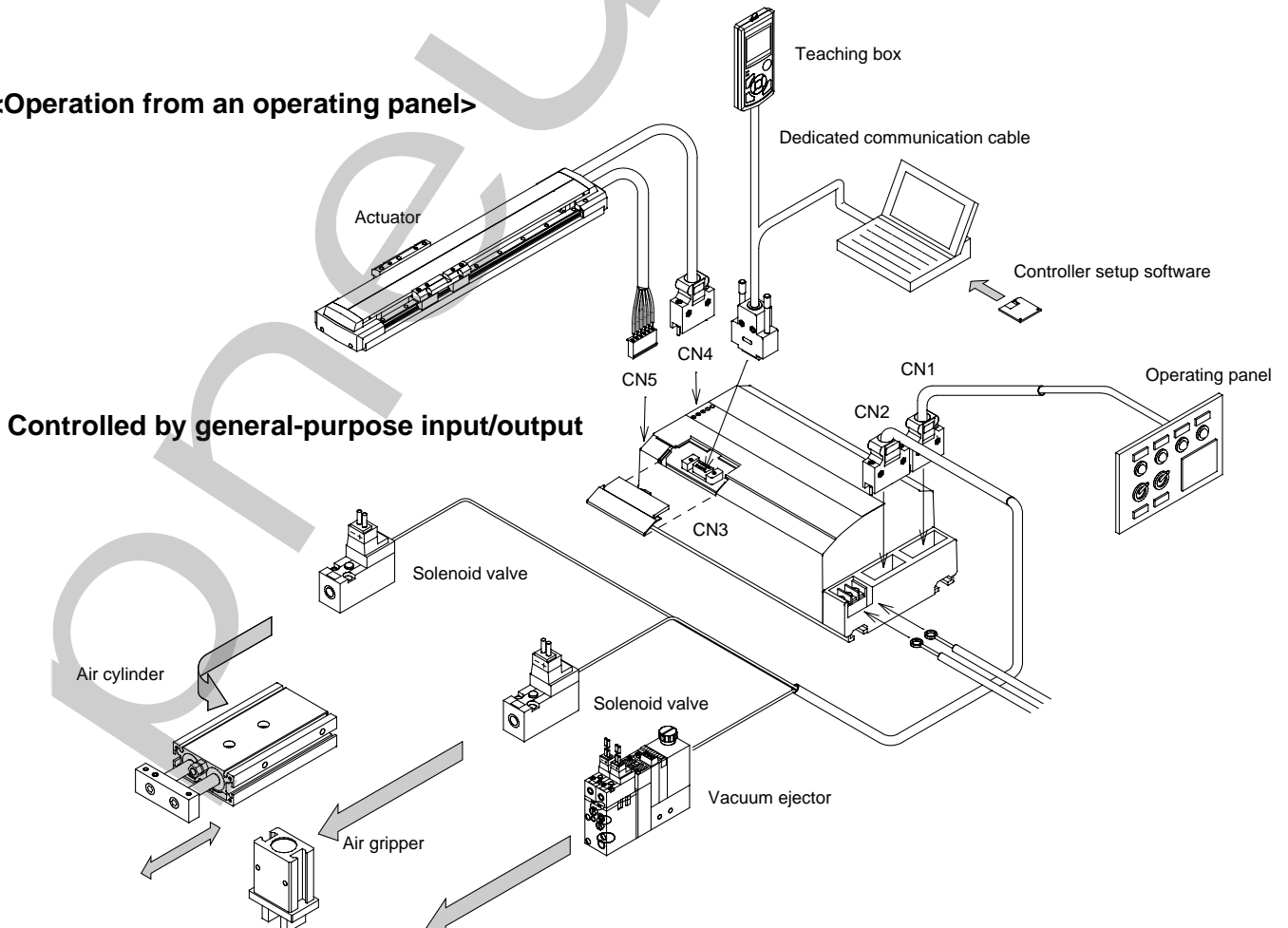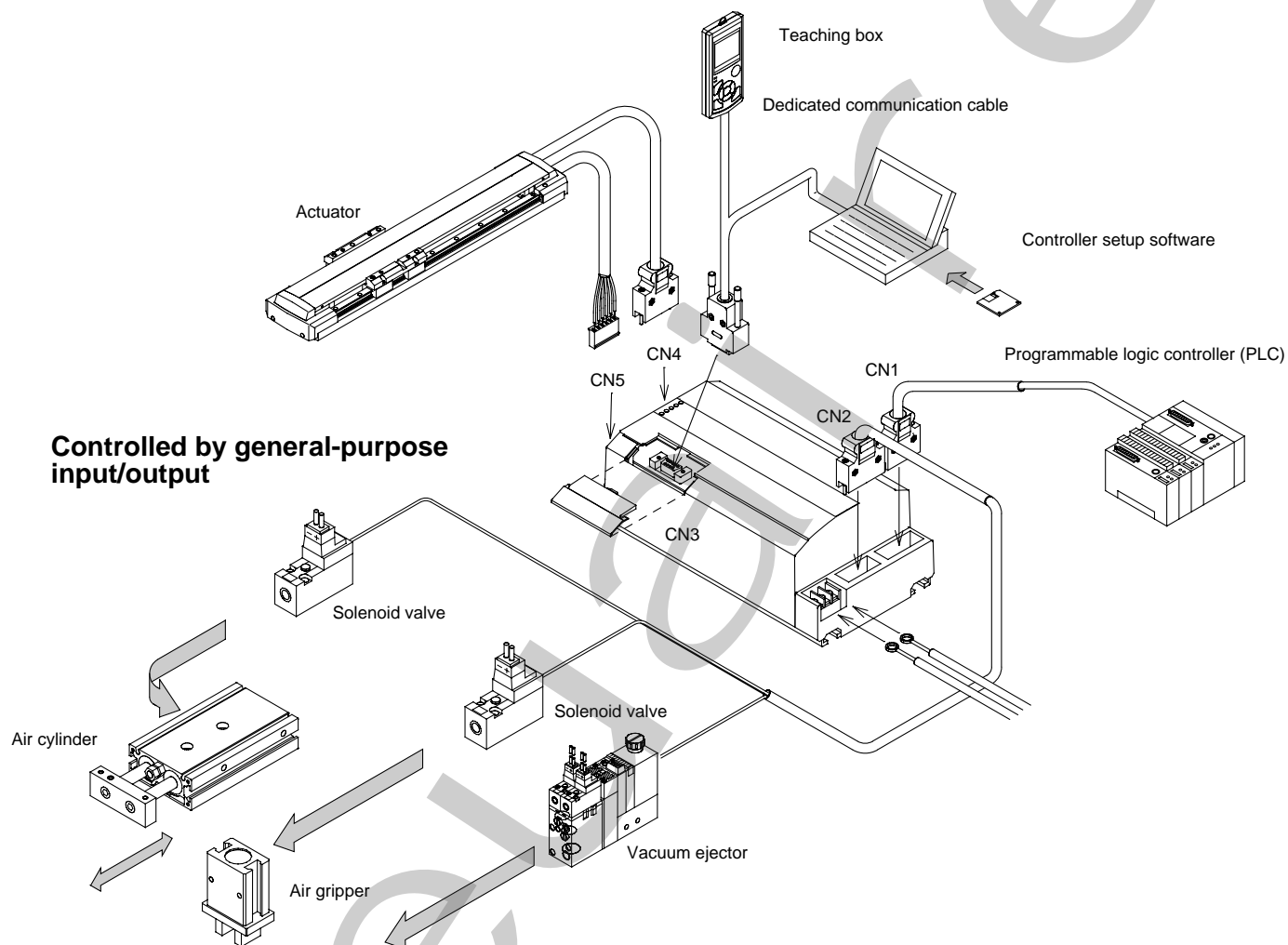
Series *LC1*
Uniaxial Type with Bult-in AC Servo-driver

How to Order

LC1 — 1 B 1H 1 — N 3

Number of axes

1	1 axis

Actuator Classification

B	Series LJ1 (incremental)

Adaptable actuators

Symbol	Motor capacity	Compatible actuator models	
1H	50W	LJ1H101☐☐B	Ball screw
2H	100W	LJ1H202☐☐A	High rigidity direct acting guide
		LJ1H202☐☐C	
3H	200W	LJ1H303☐☐D	Without brake
1S	50W	LJ1S101☐SC	Slide screw Slider guide
2S	100W	LJ1S202☐SC	
3S	200W	LJ1S303☐SE	
1M	50W	LJ1H101☐SC	Slide screw High rigidity direct acting guide
2M	100W	LJ1H202☐SC	
3M	200W	LJ1H303☐SC	
1VH Note 1)	100W	LJ1H102☐☐H-☐☐☐K	Ball screw High rigidity direct acting guide With brake
1VB Note 1)	100W	LJ1H102☐☐B-☐☐☐K	
2VF Note 1)	100W	LJ1H202☐☐F-☐☐☐K	
2VA Note 1)	100W	LJ1H202☐☐A-☐☐☐K	
3VA Note 1)	200W	LJ1H303☐☐A-☐☐☐K	

⚠ **Caution Note 1)** LC1-1B1V☐☐ LC1-1B2V☐☐ LC1-1B3V☐☐ **Contact P/A regarding a regenerative absorption unit which must be considered for these models depending on the operating conditions.**
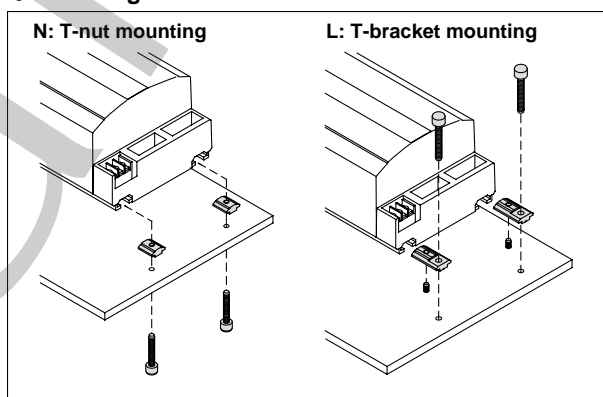
Power supply

1	100/110VAC 50/60Hz
2 Note 2)	200/220VAC 50/60Hz

Note 2) The power supply for model LC1-1B3H2 is 200VAC, 50/60Hz.

Mounting bracket

3	M3
5	M5

Mounting Note 1)

N: T-nut mounting   **L: T-bracket mounting**

Note 1) This controller includes the accessories listed below.

LC1-1-☐☐ /Either T-nuts or T-brackets for mounting
LC1-1-1000/Controller connector
LC1-1-2000/Controller connector

Note) The following options are necessary for operating and setting this controller.

LC1-1-S1 (PC-98 (MS-DOS) edition
LC1-1-W1 (Windows 95 edition)
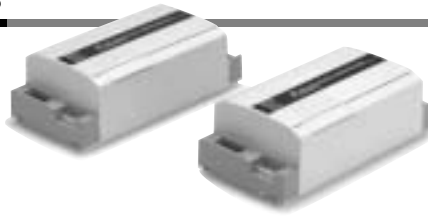and
LC1-1-R☐☐ (dedicated communication cable)

or

LC1-1-T1-☐☐ (Teaching box) are required.
For ordering information, refer to the option part numbers on page 62.

Dedicated Controller *Series LC1*

Performance/Specifications

General specifications

Item \ Model	LC1-1B□□1	LC1-1B□□2
Power supply	100V/110VAC±10% 50/60Hz	200V/220VAC±10% 50/60Hz (LC1-1B3H2 is 200VAC±10%)
Leakage current	5mA or less	
Dimensions	80 x 120 x 244mm	
Weight	2.2kg	
Housing type	Single unit installation type (resin housing)	

Actuator control

Item \ Model	LC1-1B1H□	LC1-1B2H□	LC1-1B3H□	LC1-1B1M□	LC1-1B2M□	LC1-1B3M□	LC1-1B1V□□	LC1-1B2V□□	LC1-1B3V□□	LC1-1B1S□	LC1-1B2S□	LC1-1B3S□
Compatible actuator model	LJ1H101□NB LJ1H101□PB	LJ1H202□NA LJ1H202□PA	LJ1H303□ND LJ1H303□PD	LJ1H101□SC	LJ1H202□SC	LJ1H303□SE	LJ1H102□□ □-□□□K	LJ1H202□□ □-□□□K	LJ1H303□□ □-□□□K	LJ1S101□SC	LJ1S202□SC	LJ1H303□SC
Compatible guide	High rigidity direct acting guide						High rigidity direct acting guide with brake			Slider guide		
Motor capacity	50W	100W	200W	50W	100W	200W	100W	100W	200W	50W	100W	200W
Operating temperature range	5 to 50°C		5 to 40°C	5 to 50°C		5 to 40°C	5 to 50°C		5 to 40°C	5 to 50°C		5 to 40°C
Electric energy	180VA	300VA	640VA	180VA	300VA	640VA	300VA	300VA	640VA	100VA	300VA	640VA
Control system	AC software servo/PTP control											
Position detection system	Incremental encoder											
Home position return function	With magnet switch as adjacent switch, and encoder Z phase signal as home position signal. Home position return direction is selectable.											
Maximum positioning point setting	1008 points (when step designation is actuated)											
Addressing	Absolute and incremental used in combination											
Position designation range	0.00mm to 4000.00mm											
Speed designation range	1mm/s to 2500mm/s											
Acceleration/deceleration designation range	Trapezoidal acceleration/deceleration 1mm/s^2 to 9800mm/s^2											

Note) There are cases in which the position, speed and acceleration designations are not realized, depending upon the actuator that is connected and the operating conditions.

Programming

Item	Performance/Specifications
Means of programming	Exclusive controller setup software (LC1-1-S1/LC1-1-W1) and exclusive teaching box (LC1-1-T1-□□)
Communication method	Dedicated communication cable
Functions	Programming, Operation, Monitor, Test, Alarm reset
Number of programs	8 programs
Number of steps	1016 steps (127 steps x 8 programs)

Operating configuration

Item	Performance/Specifications
Operating methods	Operation by PLC, operating panel, etc. via control terminal; Operation by PC (controller setup software); Operation by teaching box
Summary of operations	Program batch execution (program designated operation), Step designated execution (position movement, point designated operation)
Test run functions	Program test, Step No. designated operation, JOG operation, Input/output operation
Monitor functions	Executed program indication, Input/output monitor

Peripheral device control

Item	Performance/Specifications
General-purpose input	6 point, photo-coupler insulation, 24VDC, 5mA
General-purpose output	6 point, open collector output, 35VDC, 80mA/1 point
Control commands	Ouput ON/OFF, Input condition wait, Condition jump, Time limit input wait

Safety Items

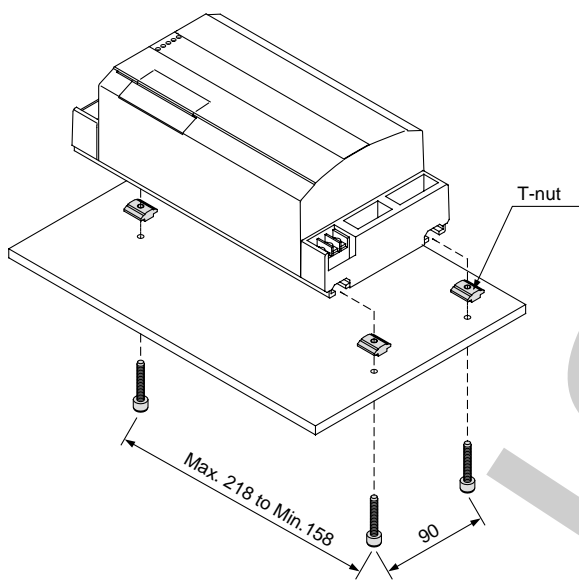| Item	Performance/Specifications
Protection functions	Over current, Over load, Over speed, Encoder error, Abnormal driver temperature, Drive power supply cut-off, Communication error, Battery error, Abnormal parameter, Limit out

POWER AIRE

Series *LC1*

Mounting of Controller

Mounting of the controller is performed by means of the two T-grooves provided on the bottom surface.

Mounting is possible from above or below using the special T-nuts or T-brackets. Refer to page 63 for further details.
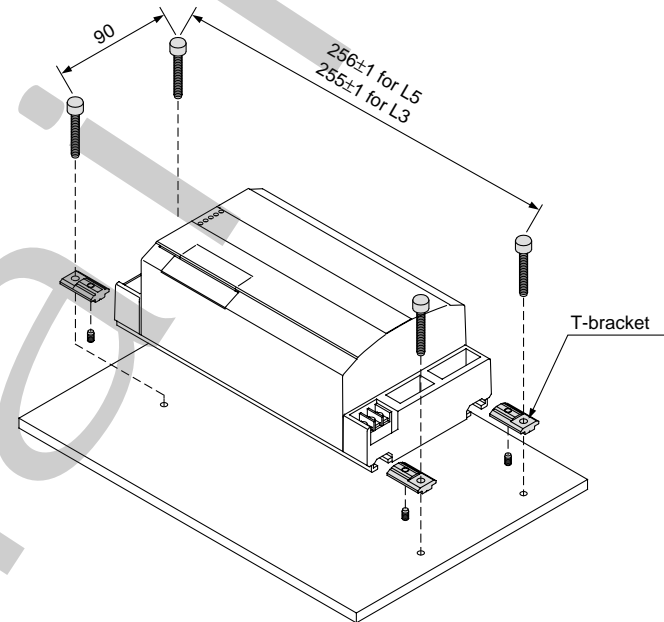
Note) This controller comes with either the T-nuts or T-brackets as accessories.

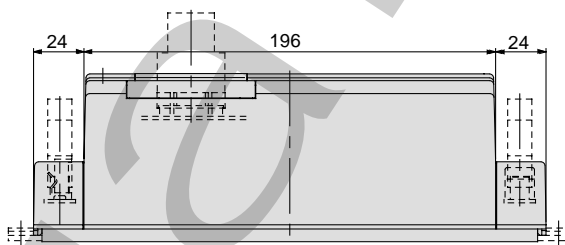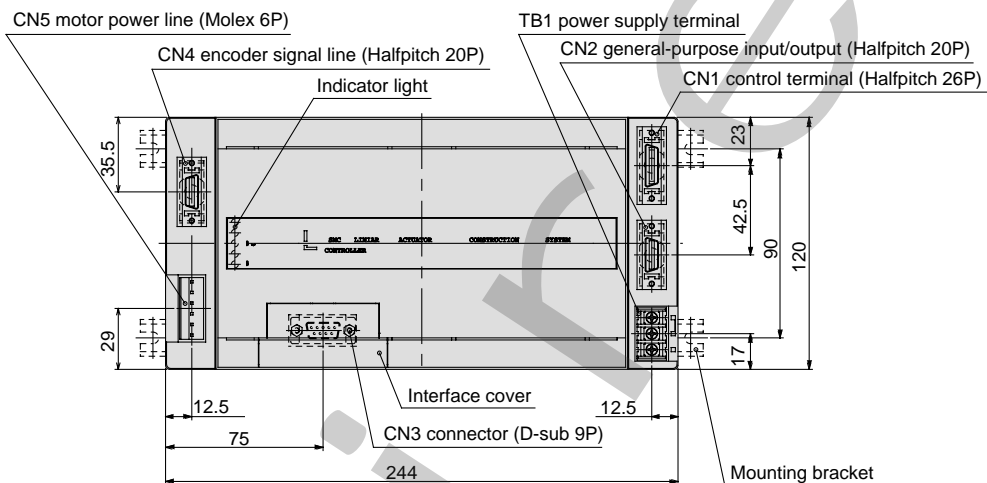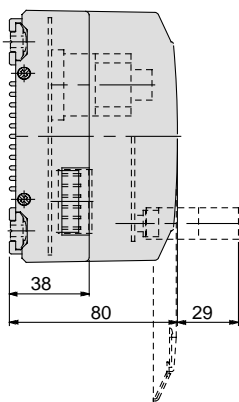| Controller model	Mounting screws	Mounting bracket Ass'y
LC1-1B☐☐-N3	M3 x 0.5	LC1-1-N3
LC1-1B☐☐-N5	M5 x 0.8	LC1-1-N5
LC1-1B☐☐-L3	M3	LC1-1-L3
LC1-1B☐☐-L5	M5	LC1-1-L5

Mounting with T-nuts

T-nut

Max. 218 to Min.158

90

Mounting with T-bracket

90

256±1 for L5
255±1 for L3

T-bracket

54

POWER AIRE

Dimensions

LC1-1B□H□
LC1-1B□S□
LC1-1B□M□

CN5 motor power line (Molex 6P)
CN4 encoder signal line (Halfpitch 20P)
Indicator light
TB1 power supply terminal
CN2 general-purpose input/output (Halfpitch 20P)
CN1 control terminal (Halfpitch 26P)

35.5 · 29 · 38 · 80 · 29 · 23 · 42.5 · 90 · 120 · 17
12.5 · 75 · 244 · 12.5
Interface cover
CN3 connector (D-sub 9P)
Mounting bracket

24 · 196 · 24

LC1-1B□V□□

Compatibility indicator
CN6 regenerative absorption unit connection terminal (Molex 2P)
CN5 motor power line (Molex 6P)
CN4 encoder signal line (Halfpitch 20P)
Indicator light
TB1 power supply terminal
CN2 general-purpose input/output (Halfpitch 20P)
CN1 control terminal (Halfpitch 26P)

35.5 · 23 · 19 · 38 · 80 · 29 · 23 · 42.5 · 90 · 120 · 17
12.5 · 75 · 244 · 12.5
Interface cover
CN3 connector (D-sub 9P)
Mounting bracket

24 · 196 · 24

Series LC1

Series LC1/Operating Part Names

Encoder/Limit switch signal connector: CN4

Motor power connector: CN5

POWER
SET-ON
BUSY
ALARM
BAT-V

IC SMC LINEAR ACTUATOR & CONSTRUCTION SYSTEM
SMC CONTROLLER

Control terminal: CN1

General-purpose input/output: CN2

Power supply terminal: TB

Connector: CN3
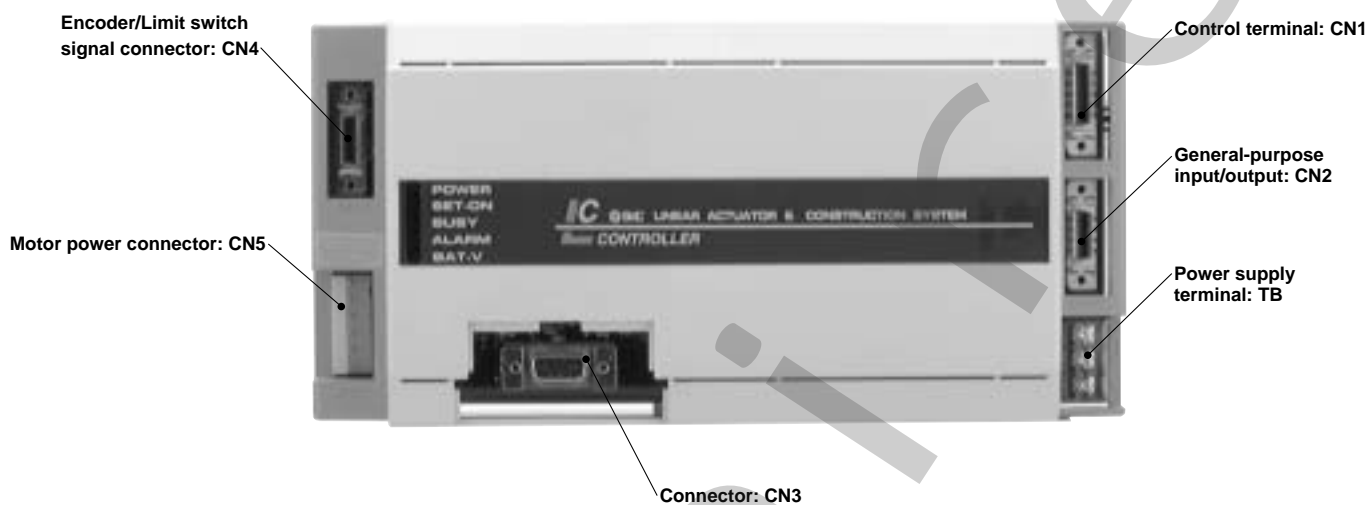
Controller Command Setting List

Actuator Control Commands

Classification	Function	Mnemonic	Parameter value
Movement	Absolute movement command	MOVA	Address (speed)
	Incremental movement command	MOVI	± Movement (speed)
Setting	Acceleration setting command	ASET	Acceleration

I/O Control Commands

Classification	Function	Mnemonic	Parameter value
Output control	Output ON command	O-SET	General-purpose output No.
	Output OFF command	O-RES	General-purpose output No.
	Output reversal command	O-NOT	General-purpose output No.
Input wait	AND output wait command	I-AND	General-purpose input No., State
	OR input wait command	I-OR	General-purpose input No., State
Input wait with time out function	AND input time out jump command	T-AND	General-purpose input No., State (P-No.) label
	OR input time out jump command	T-OR	General-purpose input No., State (P-No.) label
	AND input time out subroutine call command	C-AND	General-purpose input No., State (P-No.) label
	OR input time out subroutine call command	C-OR	General-purpose input No., State (P-No.) label
Condition jump	AND input condition jump command	J-AND	General-purpose input No., State (P-No.) label
	OR input condition jump command	J-OR	General-purpose input No., State (P-No.) label

Program Control Commands

Classification	Function	Mnemonic	Parameter value
Jump	Unconditional jump command	JMP	(P-No.) label
Subroutine	Subroutine call command	CALL	(P-No.) label
	Subroutine end declaration	RET	
Loop	Loop start command	FOR	Loop frequency
	Loop end command	NEXT	
End	Program end declaration	END	
Timer	Timer command	TIM	Timer amount

Series **LC1**

Control Terminal: CN1

Terminal to perform actuator operation (connects PLC and operating panel)

CN1. Control terminal list

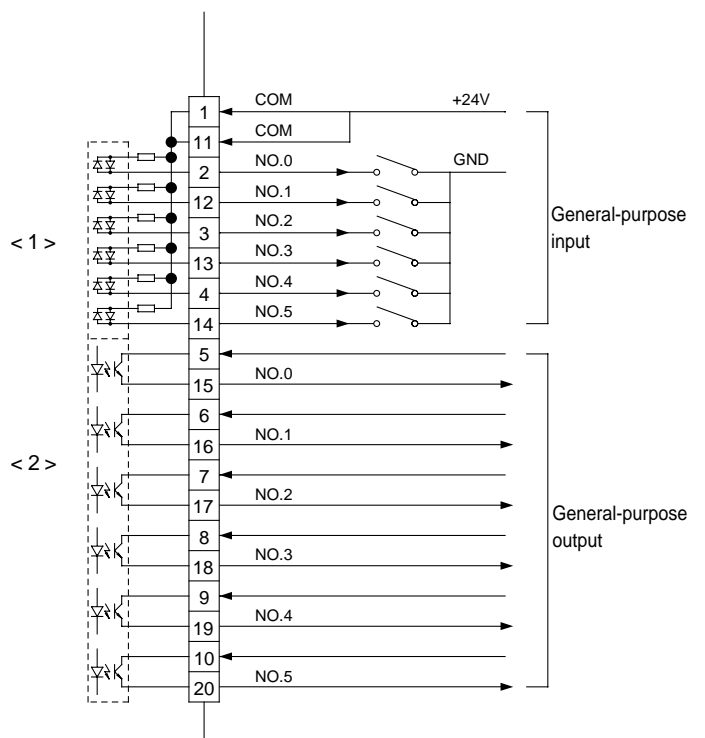| Terminal	Pin No.	Description	Content
+24V	(1,14)	Common	The positive common of the input terminal.
SET-UP	(2)	Starting preparation	The terminal which performs setup operations (actuator starting preparation).
RUN	(15)	Starting	The terminal which performs program start.
Pro-No.bit1	(17)	Program designation	The terminal which designates the program to be executed. Can designate 8 types of programs with a total of 3 bits. (a combination of 1.2.4)
Pro-No.bit2	(5)		
Pro-No.bit3	(18)		
Stp-No.bit1	(6)	Step designation	The terminal which designates the step to be executed. Used when executing steps (position movement). (a combination of 1. 2. 4. 8. 16. 32. 64.)
Stp-No.bit2	(19)		
Stp-No.bit3	(7)		
Stp-No.bit4	(20)		
Stp-No.bit5	(8)		
Stp-No.bit6	(21)		
Stp-No.bit7	(9)		
HOLD	(3)	Temporary stop	Temporarily stops the program run by means of the ON input.
STOP	(16)	Emergency stop (nonlogical input)	Performs an emergency stop when ON input stops.
ALARM RESET	(4)	Alarm release	Releases the alarm being generated by means of the ON input.

Output terminals

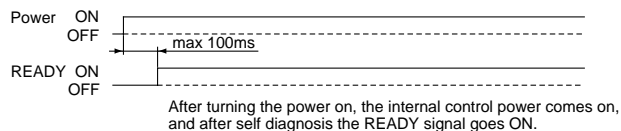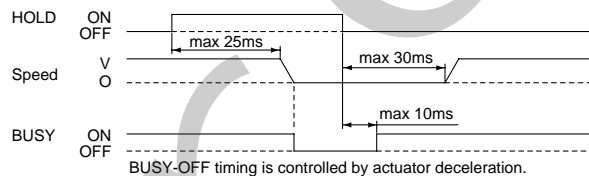| Terminal	Pin No.	Description	Content
READY	(23)	System ready signal	Indicates ability to perform control terminal input and communication via the dedicated communication cable when ON.
SET-ON	(10)	Start readiness signal	Indicates that the SET-UP operation (start ready operation: return to home position after servo ON) is complete when ON. The state in which the program can be run.
BUSY	(11)	Operating signal	Indicates operation in progress when ON. ON when program is being executed and when returning to the home position.
ALARM	(24)	Alarm output	When this signal is off, an alarm is being generated for the actuator/controller.
COM	(12, 25)	Common	The output terminal common.

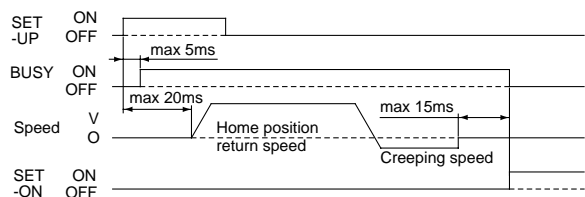### Control Terminal: CN1
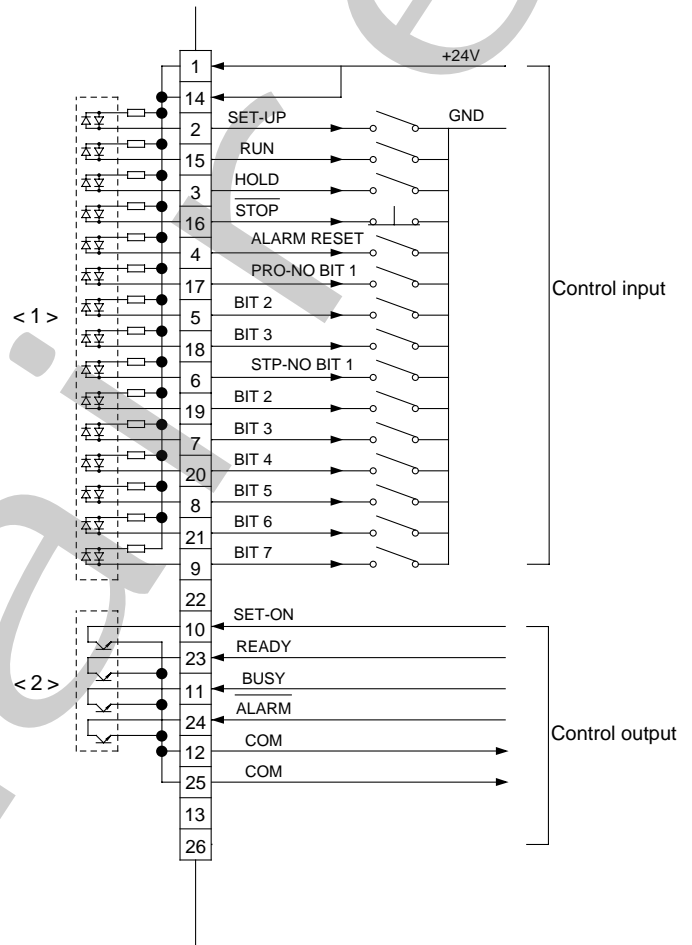
Control Terminal: CN2

Series LC1

Series LC1

Timing for READY signal generation immediately after turning on power

Power ON/OFF
max 100ms
READY ON/OFF

After turning the power on, the internal control power comes on, and after self diagnosis the READY signal goes ON.

Timing for home position return

SET-UP ON/OFF
max 5ms
BUSY ON/OFF
max 20ms
Speed V/O
Home position return speed
max 15ms
Creeping speed
SET-ON ON/OFF

Timing for program/step execution

SET-UP ON/OFF
After confirming that the SET-UP signal is ON, the RUN signal should be turned ON.

P-NO S-NO ON/OFF
Selection
Selection should be made before the RUN signal goes ON.

RUN ON/OFF
After confirming that the BUSY signal is OFF, the RUN signal should be turned ON.

BUSY ON/OFF
max 10ms
Speed V/O
max 60ms

Timing for alarm reset

ALARM-RESET ON/OFF
max 5ms
ALARM ON/OFF

Timing for temporary stop during operation

HOLD ON/OFF
max 25ms
max 30ms
Speed V/O
BUSY ON/OFF
max 10ms

BUSY-OFF timing is controlled by actuator deceleration.

Timing for stop by ALARM-RESET during operation

ALARM-RESET ON/OFF
max 25ms
Speed V/O
BUSY ON/OFF

BUSY-OFF timing is controlled by actuator deceleration.

Timing for emergency stop during operation

STOP ON/OFF
max 10ms
SET-ON ON/OFF
max 10ms
ALARM ON/OFF
max 15ms
Speed V/O
BUSY ON/OFF
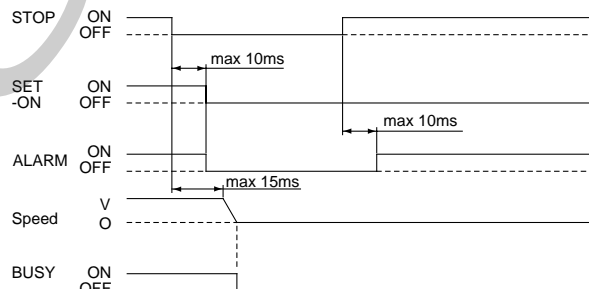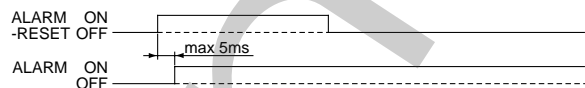
Response time with respect to controller input signals

The following requisites exist for delay of response with respect to controller input signals.

1) Scanning delay of the controller input signal.
2) Delay by the input signal analysis computation.
3) Delay of command analysis processing.

Points (1) and (2) above apply to delay with respect to the SET-ON, ALARM-RESET and STOP signals.

Points (1), (2) and (3) above apply to delay with respect to cancellation of the RUN and HOLD signals.

When signals are applied to the controller by means of a PLC, the PLC processing delay and the controller input signal scan delay should be considered, and

the signal state should be maintained for 50ms or longer.

It is recommended that the input signal state be initialized with the response signal to the input signal as a condition.

Controller Setup Software (1)

Software for operating the LC1 series controller is provided in the PC-98 (MS-DOS) edition.
Features:
- Reading and saving of parameters and programs.
- JOG teaching when creating programs.
- Easy confirmation of program operation with test mode.
- Diagnosis of I/O and observation of operating conditions with task monitor.
- Support of all controller functions.

PC-98 (MS-DOS) Edition

Model: LC1-1-S1
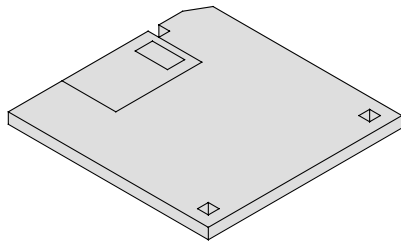
Operating environment

Computer	PC-9821, PC-98, PC-9801 with 80286 or higher CPU. PC-H98 series and compatible machines (except for high resolution mode)
OS	MS-DOS Ver 3.3 or higher
Memory	640KB or more
Disk drive	1MB capacity 3.5 inch floppy disk drive

∗ MS-DOS is a registered trade mark of the Microsoft Corporation.
∗ PC-98 Series is a registered trade mark of NEC Corporation.
∗ The dedicated communications cable (LC1-1-R□□) is required when using this software.
∗ Available only in Japanese edition.

ステップ	ラベル	命令	位置 x0.01mm	速度 mm/s	加速度 mm/s^2	汎用入出力	ジャンプ先 P-NO.	ラベル	ループ 回数	タイマ x0.1s
1		ASET	********	*****	2000	***************	*****	*****	*****	******
2	1	MOVA	10000	100	******	***************	*****	*****	*****	******
3		MOVA	5000	125		***************	*****	*****	*****	******
4		MOVA	0	150		***************	*****	*****	*****	******
5		JMP	********	*****	******	***************	0,	1	*****	******
6		END	********	*****	******	***************	*****	*****	*****	******
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

```
アクチュエータ制御    1:MOVA    2:MOVI    3:ASET              プログラムNO.[0]    ページ: 0
プログラム制御   E:JMP    F:CALL    G:RET    H:FOR    I:NEXT    J:END    K:TIM
I/O制御       4:O-SET    5:O-RES    6:O-NOT    7:I-AND    8:I-OR    9:T-AND
             0:T-OR    A:C-AND    B:C-OR    C:J-AND    D:J-OR

SHIFT+DEL : 行削除    INS : 行挿入    HOME CLR : プログラム消去    ESC : 終了
1 ～ 99のラベル番号を入力します。（省略可）
```

**Screen example**

Series LC1

Controller Setup Software (2)

Windows edition controller setup software includes all of the functions of PC98 (MS-DOS) edition software, and the following functions have also been added.
- Direct teaching.
- Program printing.
- Batch editing and sending/receiving of all programs.
- Batch management and multiple saving of parameters and programs.

Windows Edition

Model: LC1-1-W1
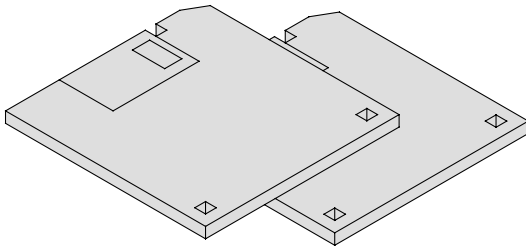
Operating environment

Computer	A model with a Pentium 75MHz or faster CPU, and able to fully operate Windows 95.
OS	Windows 95
Memory	16MB or more
Disk drive	5MB of disk space required

∗ Windows is a registered trade mark of the Microsoft Corporation.
∗ Pentium is a domestic trade mark of the Intel Corporation.
∗ PC-98 Series is a registered trade mark of NEC Corporation.
• The dedicated communications cable (LC1-1-R∗∗∗) is required when using this software.
• This software cannot be used with Windows 3.1.

Program Editor - Project1 - [Program0]

File Edit View JOG Help

System | Actuator control | I/O control | Program control

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | - | / | ENTER | C

Program 0 | Program 1 | Program 2 | Program 3 | Program 4 | Program 5 | Program 6 | Program 7

| Step	Label	Instruction	Position x0.01mm	Speed mm/s	Acceleration mm/s{2}	General-Purpose I/O	Jump P-No.	Jump Label	Loop Cycles	Timer x0.1s
1		ASET	×××	×××	2000	×××	×××	×××	×××	×××
2	1	MOVA	10000	100	×××	×××	×××	×××	×××	×××
3		MOVA	5000	125	×××	×××	×××	×××	×××	×××
4		MOVA	0	150	×××	×××	×××	×××	×××	×××
5		JMP	×××	×××	×××	×××	0	1	×××	×××
6		END	×××	×××	×××	×××	×××	×××	×××	×××
7										
8										
9										
10										
11										
12										
13										

JOGStop   Press [Alt+Space] key to execute emergency stop.

Enter position. [(-)0-400000x0.01mm]

Screen example

Contact P/A for further details related to the controller setup software.

Series LC1
Dedicated Teaching Box
Series LC1-1-T1

The new teaching box makes the electric actuator and controller even easier to use.

• Interactive input display
• Programming with the same language as PC software

SMC

LC ACTUATOR & CONSTRUCTION SYSTEM CONTROLLER

POWER
ALARM

STOP
HOLD /BS
UP
R
L
DOWN
ENT
MODE /ESC
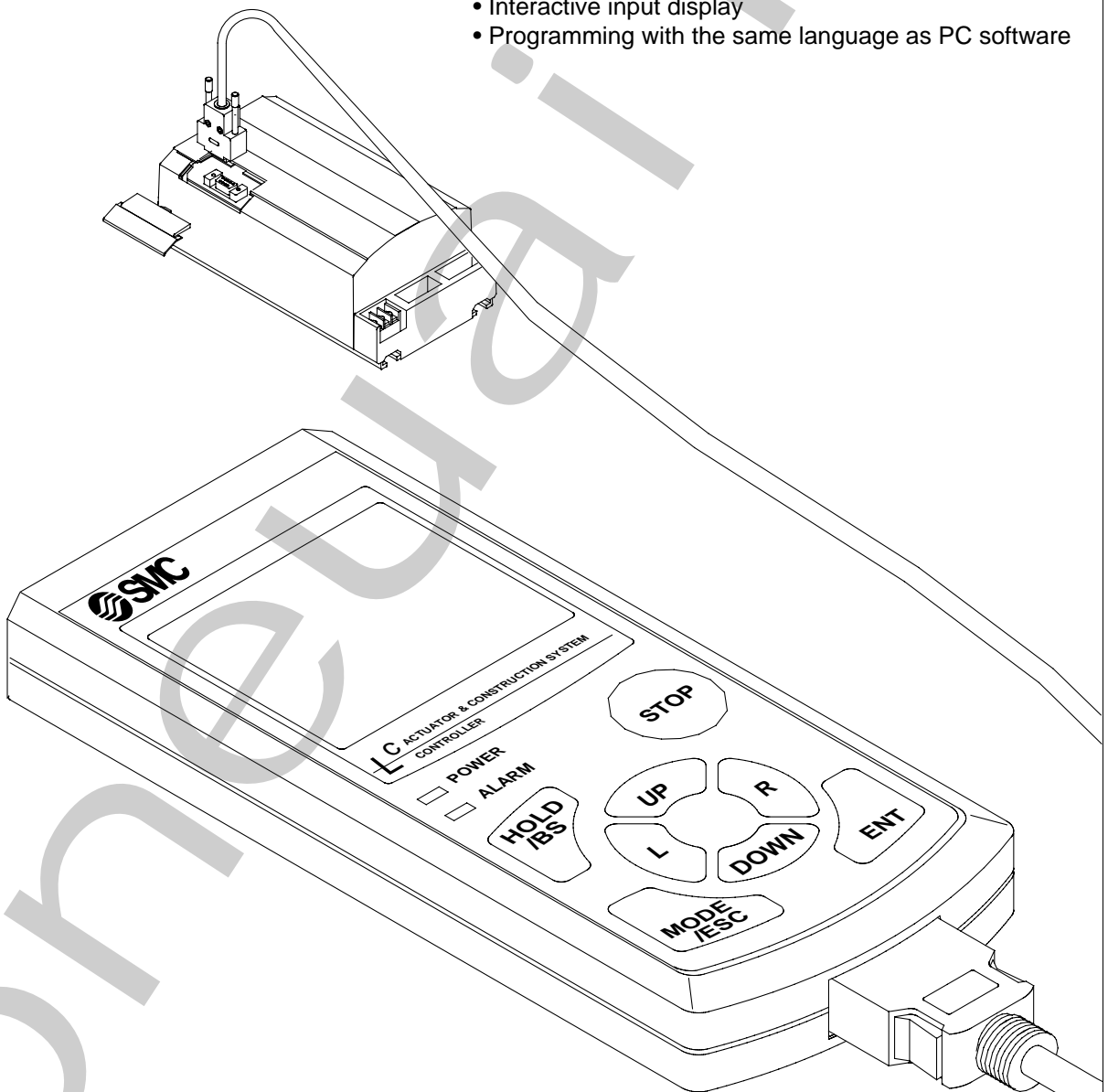
Able to execute operations such as programming, test runs and parameter changes, which up until now have been performed from a PC.

∗ The special cable is packed with the teaching box. (2 to 5m)

Series *LC1*

How to Order

LC1 - 1 - T1 - 0☐

Cable length

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

Performance/Specifications

General Specifications

	LC1-1-T1-0☐
Power supply	Supplied from **LC1**
Dimensions (mm)	169 x 76 x 20
Weight (g)	158
Case type	Resin case
Display unit	46 x 55 liquid crystal screen
Operating unit	Keyswitches, LED indicators
Cable length	2m, 3m, 4m, 5m

Basic Performance

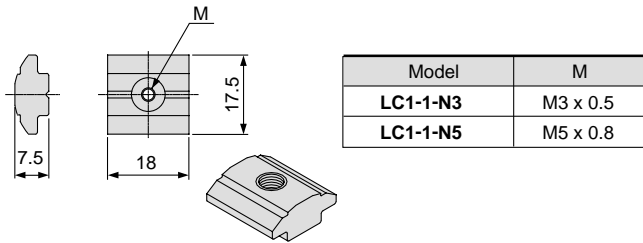|	Performance
Compatible controller	**LC1** (all models)
Operating temperature range	5 to 50°C
Communication method	RS232C
Functions	Programming, Parameter change, Setup, Operation, JOG operation, Monitor, Alarm reset, JOG Teaching
Monitor functions	Movement position, Movement speed
Protection functions	Over current, Over load, Over speed, Encoder error, Abnormal driver temperature, Abnormal drive power, Communication error, Battery error, Limit out, Abnormal driver parameter, RAM malfunction
Protection function indicator	Alarm code

Dimensions
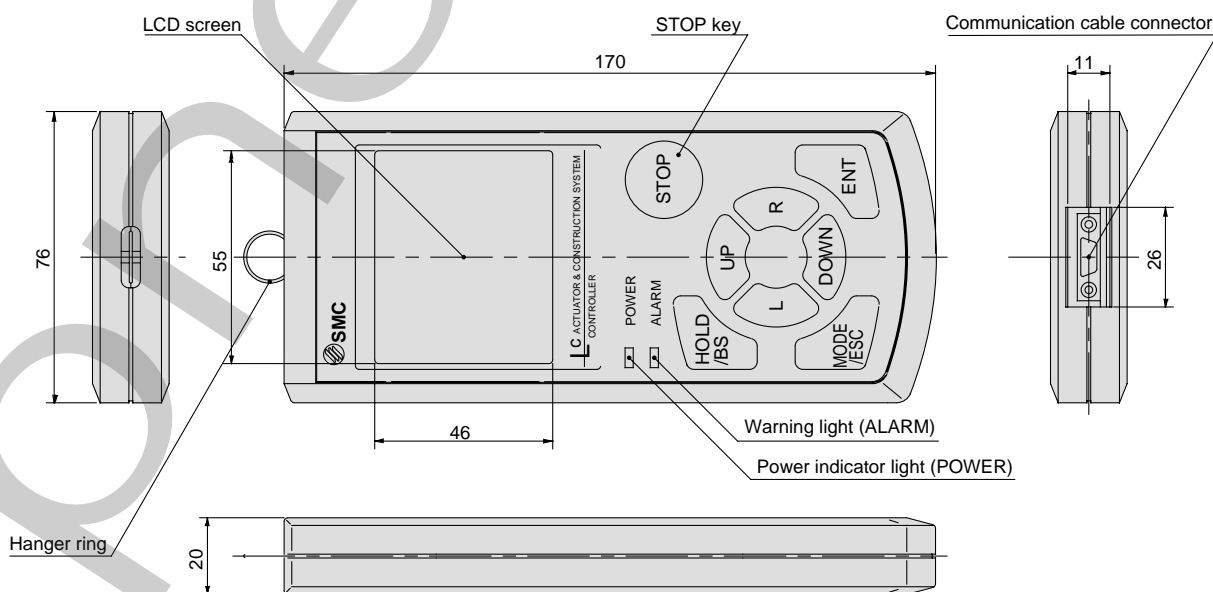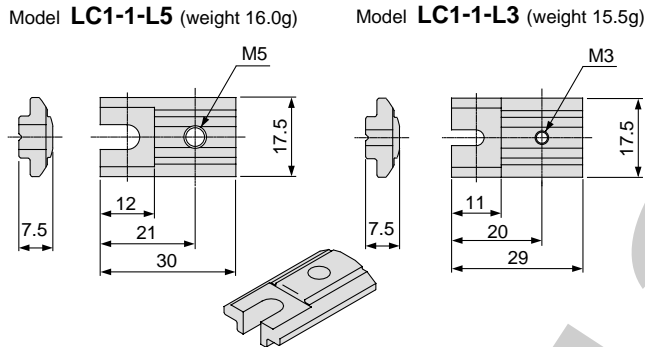
Series **LC1**/Options

T-nuts & T-brackets for mounting

Be certain to use when mounting the controller.

Note) The controller unit includes either T-nuts or T-brackets.

T-nuts (weight 10.0g)

Model	M
LC1-1-N3	M3 x 0.5
LC1-1-N5	M5 x 0.8

T-brackets

Model **LC1-1-L5** (weight 16.0g)   Model **LC1-1-L3** (weight 15.5g)

Controller connector

The connector used for CN1 (control terminal) and CN2 (general-purpose input/output).
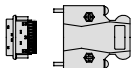
These are each Halfpitch types.

Note) The controller unit includes a controller connector for use with CN1 and CN2.

CN1: Control terminal

Model **LC1-1-1000**

User connector (CN1: Control terminal)
Model **LC1-1-1050**

0.5m

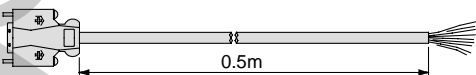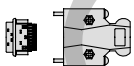**Cable is connected to LC1-1-1000**.
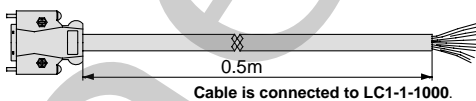
10326-52A0-008
Halfpitch hood (26P)
Made by 3M

10126-3000VE
Halfpitch plug (26P)
Made by 3M

CN2: General-purpose input/output terminal

Model **LC1-1-2000**

User connector (CN2: General-purpose input/output terminal)
Model **LC1-1-2050**

0.5m

Cable is connected to LC1-1-2000.

10320-52A0-008
Halfpitch hood (20P)
Made by 3M

10120-3000VE
Halfpitch plug (20P)
Made by 3M

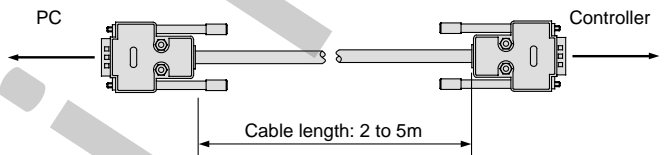## Dedicated communication cable

The connector which connects the controller and PC.

Note) Pay attention to the shape of the connector on the PC.

Dedicated communication cable (IBM PC/AT compatible computer)
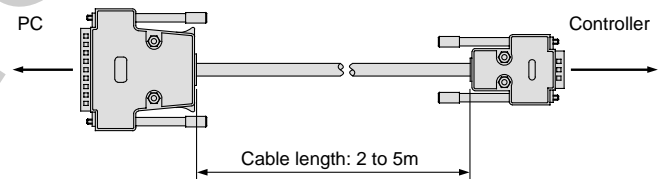
Model **LC1-1-R☐C**

● **Cable length**
02 - 2m   **04 -** 4m
03 - 3m   **05 -** 5m

PC   Controller

Cable length: 2 to 5m

Dedicated communication cable (D-Sub) (for NEC PC-98 Series)

Model **LC1-1-R☐D**

● **Cable length**
02 - 2m   **04 -** 4m
03 - 3m   **05 -** 5m

PC   Controller

Cable length: 2 to 5m

Dedicated communication cable (Halfpitch) (for NEC PC-98 Series)

Model **LC1-1-R☐H**

● **Cable length**
02 - 2m   **04 -** 4m
03 - 3m   **05 -** 5m

PC   Controller

Cable length: 2 to 5m

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