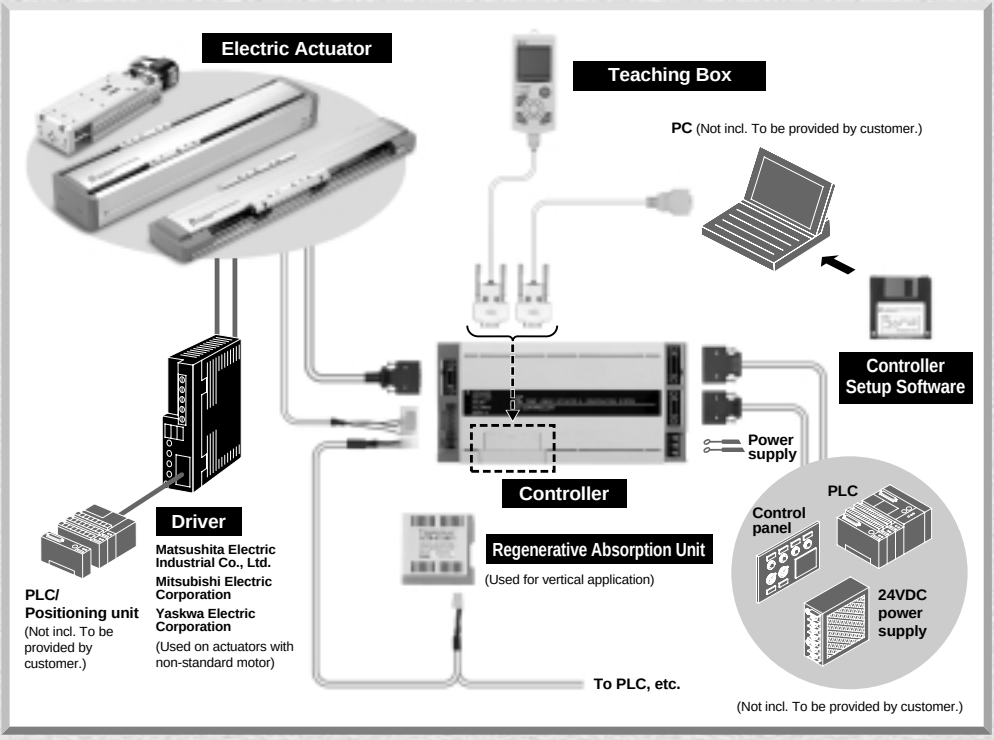
Dedicated Controller

Series LC1

Dedicated Controller for Standard AC Servomotor



Series LJ1/LG1: Standard Motor Compatible

How to Order

LC1– 1 B 1H 1 –N 3

Number of axes

1	1 axis

Actuator classification

B	Series LJ1 (Incremental encoder)
D	Series LG with coupling (Series LG1□H21) Incremental encoder
F	Series LG without coupling (Series LG1□H20) Incremental encoder

Applicable actuators

Symbol	Motor capacity	Compatible actuator models	
1H	50W	LJ1H101□□B	Ball screw High rigidity direct acting guide Without brake
2H	100W	LJ1H202□□A LJ1H202□□C	
3H	200W	LJ1H303□□D	
1S	50W	LJ1S101□SC	Slide screw Slider guide
2S	100W	LJ1S202□SC	
3S	200W	LJ1S303□SC	
1M	50W	LJ1H101□SC	Slide screw High rigidity direct acting guide
2M	100W	LJ1H202□SC	
3M	200W	LJ1H303□SE	
1VH[*1)]	100W	LJ1H102□□H-□□□K	Ball screw High rigidity direct acting guide With brake
1VB[*1)]	100W	LJ1H102□□B-□□□K	
2VF[*1)]	100W	LJ1H202□□F-□□□K	
2VA[*1)]	100W	LJ1H202□□A-□□□K	
3VA[*1)]	200W	LJ1H303□□A-□□□K	
2HA	100W	LG1H□□2□PA LG1H□□2□NA	Ball screw High rigidity direct acting guide Thread lead 10mm
2HC	100W	LG1H□□2□PC LG1H□□2□NC	Ball screw High rigidity direct acting guide Thread lead 20mm
2MC	100W	LG1H□□2□SC	Slide screw High rigidity direct acting guide Thread lead 20mm

Power supply

1[*1)]	100/110VAC (50/60Hz)
2[*1)]	200/220VAC (50/60Hz)

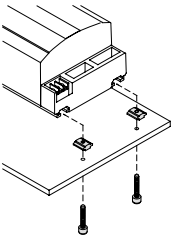
*1) Consult SMC if the supply voltage for LC1-1B□V□1 will be 110VAC or more, or the supply voltage for LC1-1B□V□2 will be 220VAC or more.

Mounting bracket

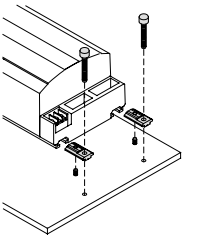
3	M3
5	M5

Mounting*

N: T-nut mounting



L: T-bracket mounting



* 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)
(Refer to page 199.)

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

[(LC1-1-S1 PC-98 (MS-DOS)
LC1-1-W1 (Windows 95 Japanese)
LC1-1-W2 (Windows 95 English)) and
LC1-1-R□□ (dedicated communication cable)]
(Refer to pages 194, 195, and 199.)

or

LC1-1-T1-□□ (Teaching box) are required.
For ordering information, refer to the option part numbers on page 196.

Performance/Specifications

General specifications

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

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□	LC1-1D2H□□	LC1-1D2MC□	LC1-1F2H□□	LC1-1F2MC□
Compatible actuator model	LJ1H101 □PB LJ1H101 □NB	LJ1H202 □PA LJ1H202 □NA	LJ1H303 □PD LJ1H303 □ND	LJ1H101 □SC	LJ1H202 □SC	LJ1H303 □SE	LJ1H102 □□□-□□□K	LJ1H202 □□□-□□□K	LJ1H303 □□□-□□□K	LJ1S101 □SC	LJ1S202 □SC	LJ1S303 □SC	LG1H212 □P□ LG1H212 □N□	LG1H212 □SC	LG1H202 □P□ LG1H202 □N□	LG1H202 □SC
Compatible guide	High rigidity direct acting guide									Slider guide			High rigidity direct acting guide			
Motor capacity	50W	100W	200W	50W	100W	200W	100W		200W	50W	100W	200W	100W			
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	5 to 50°C			
Electric power	180VA	300VA	640VA	180VA	300VA	640VA	300VA		640VA	180VA	300VA	640VA	300VA			
Control system	AC software servo/PTP control															
Position detection system	Incremental encoder															
Home position return direction	Can be selected between the motor side and the side opposite the motor.															
Maximum positioning point setting	1008 points (when step designation is actuated)															
Movement command	Absolute and incremental used in combination															
Position designation range	0.00mm to 4000.00mm Note)															
Speed designation range	1mm/s to 2500mm/s Note)															
Acceleration/deceleration designation range	Trapezoidal acceleration/deceleration 1mm/s² to 9800mm/s² Note)															

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

Programming

Item	Performance/Specifications
Means of programming	Dedicated controller setup software (LC1-1-S1, LC1-1-W1, LC1-1-W2) and dedicated teaching box (LC1-1-T1-□□)
Functions	Programming (JOG teaching, direct teaching*), Operation, Monitor, Test, Alarm reset
Number of programs	8 programs
Number of steps	1016 steps (127 steps x 8 programs)

* Direct teaching is only available with LC1-1-W1 and LC1-1-W2.

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

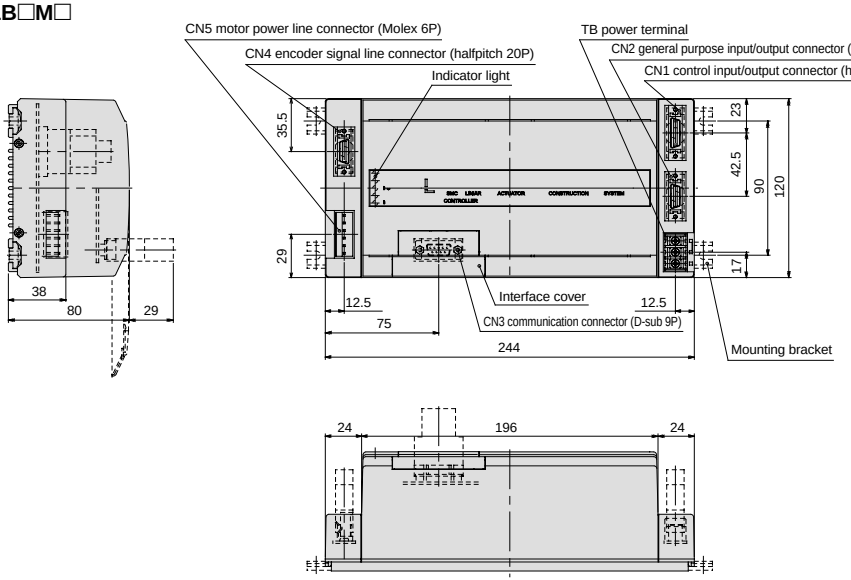
Item	Performance/Specifications
General purpose input	6 inputs, Photo-coupler insulation, 24VDC, 5mA
General purpose output	6 outputs, Open collector output, 35VDC max., 80mA/output (maximum load current)
Control commands	Output ON/OFF, Input condition wait, Condition jump, Time limit input wait

Safety items

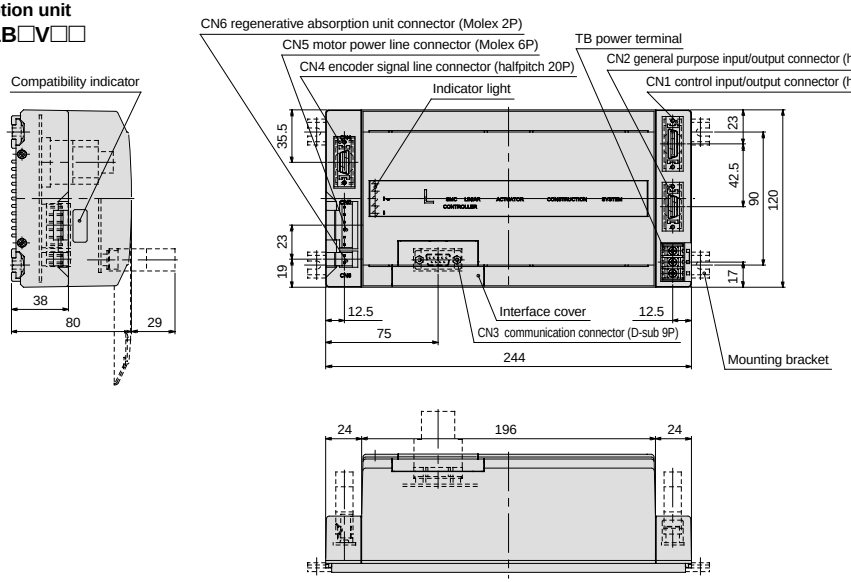
Item	Performance/Specifications
Protection functions	Over current, Over load, Over speed, Encoder error, Abnormal driver temperature, Abnormal drive power supply, Communication error, Battery error, Abnormal parameter, Limit out

Dimensions

LC1-1B□H□ LC1-1D2H□□ LC1-1F2H□□
LC1-1B□S□ LC1-1D2MC□ LC1-1F2MC□
LC1-1B□M□



With regenerative absorption unit
LC1-1B□V□□



Series LX: AC Servomotor compatible

How to Order

LC1 − 1 B1V D 1 − N 3 − 200 − X180

Number of axes

1	1 axis

Ball screw lead

C	2mm
D	5mm

Power supply

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

Actuator classification

X180	LXSAB□-□□□S□-□□□□-X12
	LXSAB□-□□□S□-□□□□-X13
X233	LXPAB□-□□□S□-□□□□-X12
	LXPAB□-□□□S□-□□□□-X13

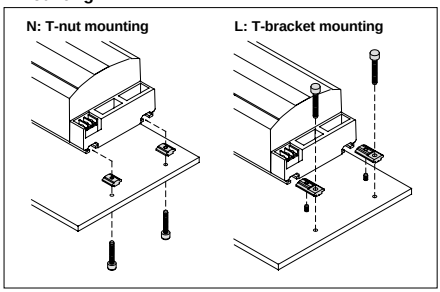
Stroke

50	50mm
75	75mm
100	100mm
125	125mm
150	150mm
175	175mm
200	200mm

Mounting bracket

3	M3
5	M5

Mounting∗



∗ 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
(Refer to page 199.)

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

[(LC1-1-S1 PC-98 (MS-DOS) / LC1-1-W1 (Windows 95 Japanese) / LC1-1-W2 (Windows 95 English)) and LC1-1-R□□ (dedicated communication cable)]

(Refer to pages 194, 195, and 199.)

or

LC1-1-T1-□□ (Teaching box) are required.
For ordering information, refer to the option part numbers on page 196.

Performance/Specifications

General specifications

Item \ Model	LC1-1B1V□1-□□-□□□-X180 LC1-1B1V□1-□□-□□□-X233	LC1-1B1V□2-□□-□□□-X180 LC1-1B1V□2-□□-□□□-X233
Power supply	100V/110VAC ±10%, 50/60Hz	200V/220VAC ±10%, 50/60Hz
Leakage current	5mA or less	
Dimensions	80 x 120 x 244mm	
Weight	2.2kg	

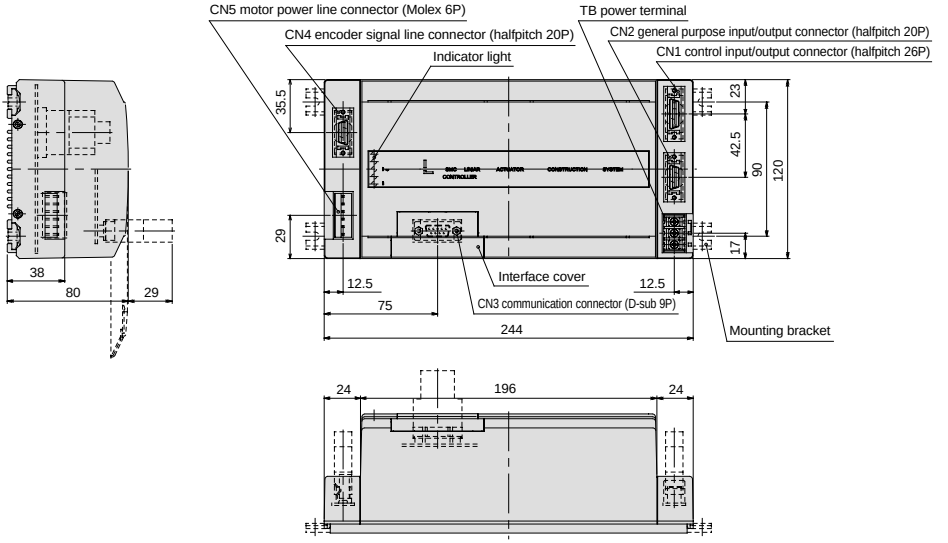
Actuator control

Item \ Model	LC1-1B1V□1-□□-□□□-X180	LC1-1B1V□1-□□-□□□-X233	LC1-1B1V□2-□□-□□□-X180	LC1-1B1V□2-□□-□□□-X233
Compatible actuator	LXSAB□-□□□S□-□□□-X12	LXPAB□-□□□S□-□□□-X12	LXSAB□-□□□S□-□□□-X13	LXPAB□-□□□S□-□□□-X13
Compatible guide	High rigidity direct acting guide	Guide rod	High rigidity direct acting guide	Guide rod
Motor capacity	30W			
Operating temperature range	5 to 5°C			
Electric power	180VA			
Control system	AC software servo/PTP control			
Position detection system	Incremental encoder			
Home position return direction	Can be selected between the motor side and the side opposite the motor.			
Maximum positioning point setting	1008 points (when step designation is actuated)			
Movement command	Absolute and incremental used in combination			
Position designation range	0.00mm to 4000.00mm Note)			
Speed designation range	1mm/s to 2500mm/s Note)			
Acceleration/deceleration designation range	Trapezoidal acceleration/deceleration 1mm/s² to 9800mm/s² Note)			

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

Dimensions

LC1-1B1V□□□-□□-□□□-X180
LC1-1B1V□□□-□□-□□□-X233



Controller Mounting

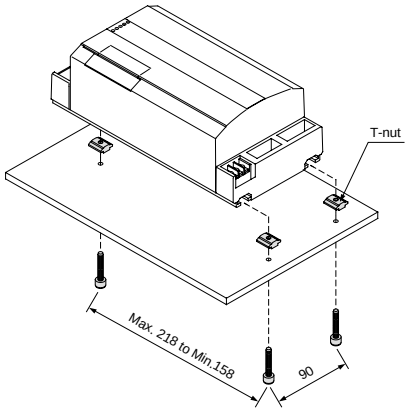
Mounting of the controller is performed by means of the two T-grooves provided on the bottom surface.

Mounting is possible from above or below using the special T-nuts or T-brackets. Refer to page 199 for further details.

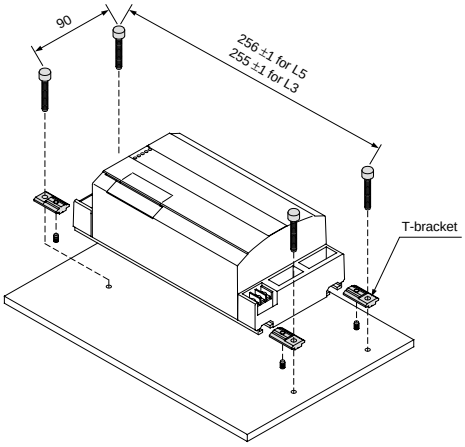
Note) This controller comes with either the T-nuts or T-brackets as accessories.

Controller model	Mounting screw	Mounting bracket assembly
LC1-1□□□-N3	M3 x 0.5	LC1-1-N3
LC1-1□□□-N5	M5 x 0.8	LC1-1-N5
LC1-1□□□-L3	M3	LC1-1-L3
LC1-1□□□-L5	M5	LC1-1-L5

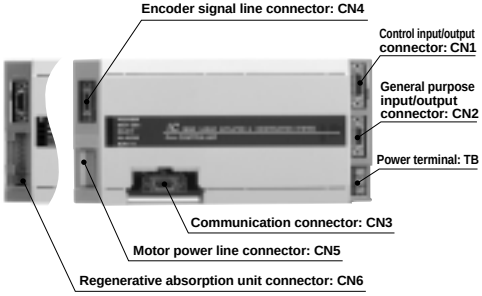
Mounting with T-nuts



Mounting with T-brackets



Part Descriptions



Controller Command Setting List

Actuator control commands

Classification	Function	Instruction	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	Instruction	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 input 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	Instruction	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

Connection Examples

Control Input/Output Terminal: CN1

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

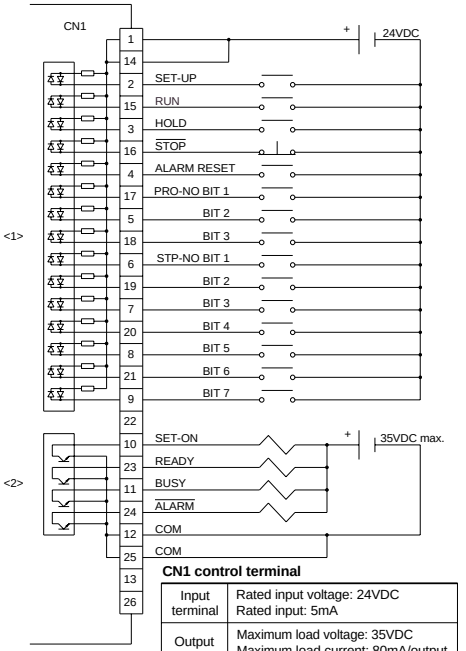
CN1. Control input terminal list

Terminal	Pin no.	Description	Function
+24V	1, 14	Common	The positive common of the input terminal.
SET-UP	2	Starting preparation	The terminal that performs setup operations (actuator starting preparation).
RUN	15	Starting	The terminal that performs program start.
Pro-no. bit1	17	Program designation	The terminal that designates the program to be executed. Can designate 8 types of programs with a total of 3 bits. (Set by the binary system.)
Pro-no. bit2	5		
Pro-no. bit3	18		
Stp-no. bit1	6	Step designation	The terminal that designates the step to be executed. Used when executing steps (position movement). (Set by the binary system.)
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.
$\overline{\text{STOP}}$	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.

CN1. Control output terminal list

Terminal	Pin no.	Description	Function
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.
$\overline{\text{ALARM}}$	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.

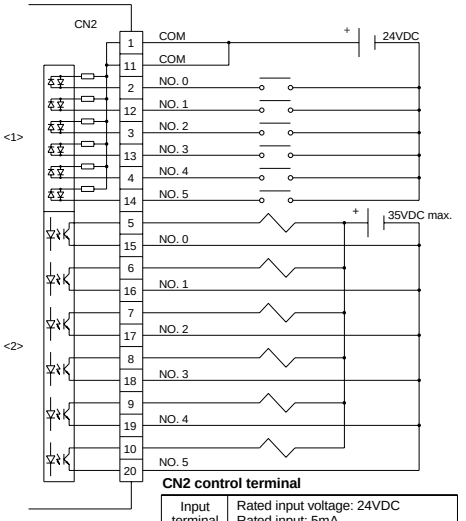
Control input/output terminal: CN1



CN1 control terminal

Input terminal	Rated input voltage: 24VDC Rated input: 5mA
Output terminal	Maximum load voltage: 35VDC Maximum load current: 80mA/output 320mA/COM

General purpose input/output terminal: CN2

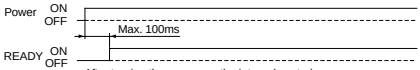


CN2 control terminal

Input terminal	Rated input voltage: 24VDC Rated input: 5mA
Output terminal	Maximum load voltage: 35VDC Maximum load current: 80mA/output

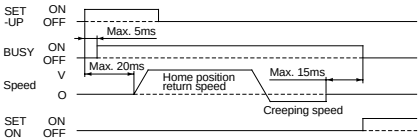
Control Method/Timing

Timing for READY signal generation immediately after turning on power

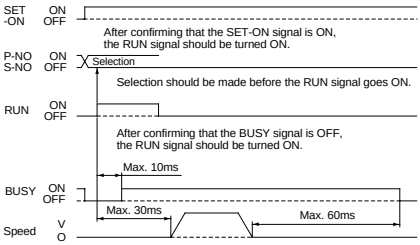


After turning the power on, the internal control power comes on, and after self diagnosis the READY signal goes ON.

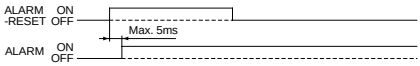
Timing for home position return



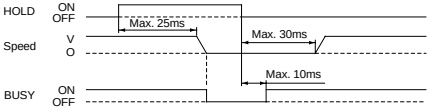
Timing for program/step execution



Timing for alarm reset

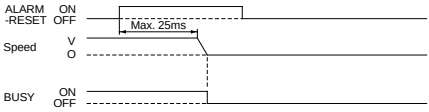


Timing for temporary stop during operation



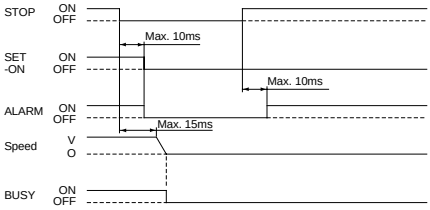
BUSY-OFF timing is controlled by actuator deceleration.

Timing for stop by ALARM-RESET during operation



BUSY-OFF timing is controlled by actuator deceleration.

Timing for emergency stop during operation



Response time with respect to controller input signals

The following factors 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

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

Factors (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.

Windows/LC1-1-W2 (English)

Windows edition controller setup software includes all of the functions of PC-98 (MS-DOS) edition software, and the following functions have also been added.

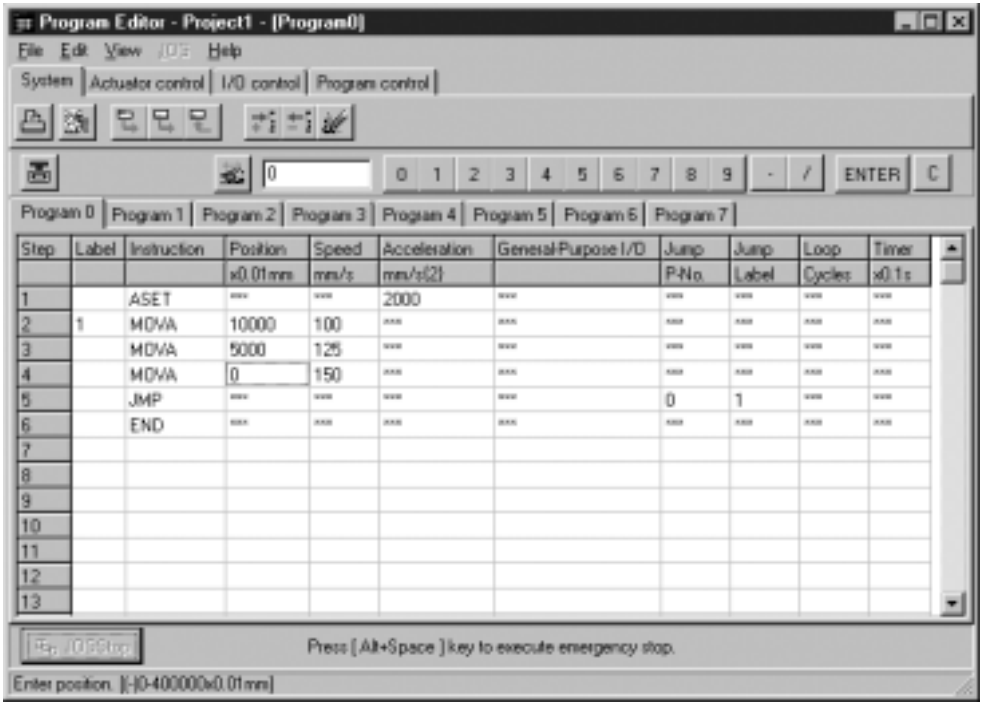
- Direct teaching
- Program printing
- Batch editing and sending/receiving of all programs
- Batch management and multiple saving of parameters and programs

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
Hard disk	5MB or more of disk space required

- The dedicated communications cable (LC1-1-R□□□) is required when using this software.
- This software cannot be used with Windows 3.1.

Windows/LC1-1-W2 (English)



Screen example

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- Pentium is a trade mark of Intel Corporation.
- PC-98 Series is a registered trade mark of NEC Corporation.

How to Order

LC1—1—T1—0 2

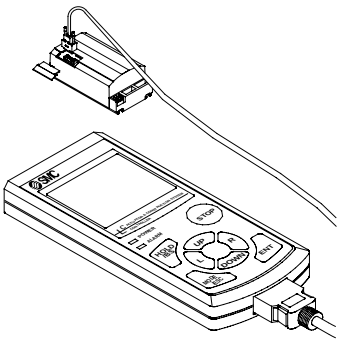
Cable length

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

- **Interactive input display**
- **Programming with the same language as PC software**

Able to execute operations such as programming 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)



Performance/Specifications

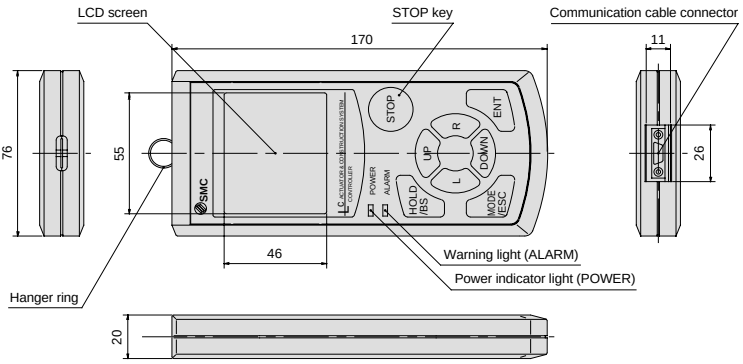
General specifications

	LC1-1-T1-0□
Power supply	Supplied from **LC1**
Dimensions (mm)	170 x 76 x 20
Weight (g)	158
Case type	Resin case
Display unit	46 x 55mm LCD
Operating unit	Key switches, LED indicators
Cable length	2m, 3m, 4m, 5m

Basic performance

	Performance/Specifications
Compatible controller	**LC1** (all models)
Operating temperature range	5 to 50°C
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 supply, Communication error, Battery error, Limit out, Abnormal driver parameter, RAM malfunction
Protection function indicator	Alarm code

Dimensions

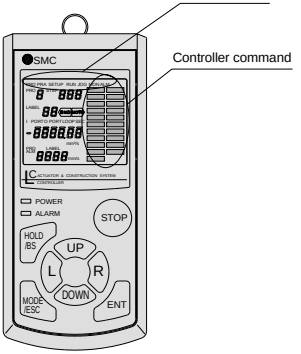


Alarm Code List

Alarm code	Alarm	Reset	Description
10	**Emergency stop**	○	An emergency stop condition exists or has occurred in the past due to the controller setup software or the CN1 control STOP terminal.
11	**Limit switch ON**	○	Limit switch is turned ON.
12	**Battery error**	●	The memory backup battery voltage is low. Contact SMC.
13	**Communication error**	○	Communication with the controller is interrupted.
14	**RAM malfunction**	●	The parameter is damaged.
15	**Soft stroke limit**	○	The program is about to exceed the stroke length set by the parameter.
20	**Over current**	●	Three times the rated current or more is flowing into the driver unit.
21	**Over load**	●	The driver unit continuously received a current exceeding the rated current for a prescribed time or longer.
22	**Over speed**	●	The controller exceeded the maximum operational speed.
24	**Abnormal driver temperature**	●	A temperature increase of the driver unit activated the temperature sensor.
25	**Encoder error**	●	An encoder or actuator cable malfunction has occurred.
26	**Abnormal drive current**	●	The driver unit power supply is shut off due to a regeneration problem, etc.
28	**Abnormal driver parameter**	●	A driver parameter abnormality in the controller system has occurred.
30	**Unsuccessful home position return**	○	Trying to execute a program/step without completing the setup (home position return).
31	**No designated speed**	○	No speed designation with MOVA or MOVI, and no prior speed designation found.
32	**No jump destination**	○	No label found at the program designated jump destination.
33	**Nesting exceeded**	○	Sub-routine nesting (calling a sub-routine from another sub-routine) exceeds 14 levels.
34	**No return destination**	○	No return destination found for the RET command operation.
35	**Executing FOR**	○	A forbidden command is found between FOR and NEXT.
36	**No FOR**	○	NEXT command was executed without executing FOR command.
37	**No operation program**	○	Trying to execute a program/step with no commands.
38	**Invalid movement command**	○	Trying to execute a command other than MOVA, MOVI, or ASET with a step (position movement) designated operation.
39	**Format error**	○	An error is found in the attached value of a command being programmed.

∗ Refer to the Series LC1 instruction manual for alarm details.
∗ Explanation of "Reset" symbols above:
○: Can be reset by the alarm reset.
●: Turning OFF the controller power is required for resetting.

Key Arrangement and Functions



Main modes

Mode	Display	Function
Programming mode	PRO	Sets a program.
Parameter input/output mode	PRA	Sets a parameter.
Home position return mode	SETUP	Directs home position return.
Operation mode	RUN	Directs a program operation.
JOG operation mode	JOG	Executes a JOG operation.
Monitor mode	MON	Monitors operating condition.
Alarm reset mode	ALM	Directs alarm code display and clear.

For the operation of each mode, refer to the product's instruction manual.

Key	Functions
UP	Moves upward for item selections. Also used to increase values for data entry. In combination with L/R keys, this key drives the actuator at high speed during a JOG operation.
DOWN	Moves downward for item selections. Also used to decrease values for data entry.
L	Moves to the left for item selections. Also used to move a numerical valve place to the left for data entry. It drives the actuator to the end side during a JOG operation.
R	Moves to the right for item selections. Also used to move a numerical valve place to the right for data entry. It drives the actuator to the motor side during a JOG operation.
HOLD/BS	Returns to the previous mode during item selections. It becomes the temporary stop key during actuator operation.
MODE/ESC	Returns to the main mode during item selections. It exits all modes.
STOP	Becomes the emergency stop key during actuator operation. In combination with the ENT key, it launches JOG teaching and aids program editing.
ENT	Determines data during item selections. In combination with the STOP key, it launches JOG teaching and aids program editing.

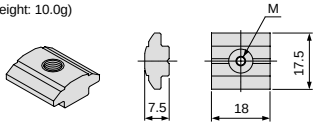
T-nuts and T-brackets for Mounting

Be sure to use when mounting the controller.

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

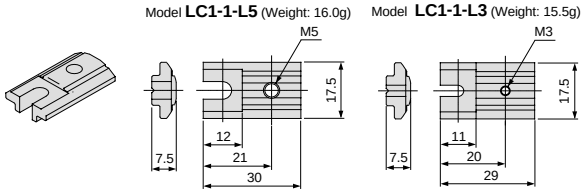
T-nuts

(Weight: 10.0g)



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

T-brackets

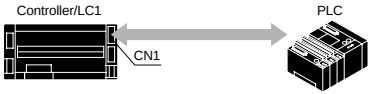


Controller Connectors

These are connectors 'all halfpitch type' used for CN1 (control input/output) and CN2 (general purpose input/output).

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

CN1 (Control input/output)



Controller connector (CN1: Control input/output)

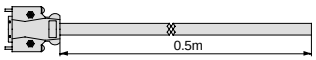
Model **LC1-1-1000**

10326-52A0-008
Halfpitch hood (26P)
Sumitomo/3M Limited

10126-3000VE
Halfpitch plug (26P)
Sumitomo/3M Limited

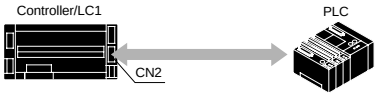
Single side wired controller connector (CN1: Control input/output)

Model **LC1-1-1050**



Cable is connected to LC1-1-1000.

CN2 (General purpose input/output)



Controller connector (CN2: General purpose input/output)

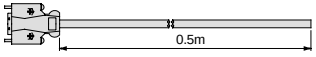
Model **LC1-1-2000**

10320-52A0-008
Halfpitch hood (20P)
Sumitomo/3M Limited

10120-3000VE
Halfpitch plug (20P)
Sumitomo/3M Limited

Single side wired controller connector (CN2: General purpose input/output)

Model **LC1-1-2050**



Cable is connected to LC1-1-2000.

Dedicated Communication Cables

These are cables used to connect controllers and PCs.

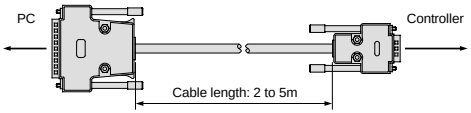
Note) Be aware of the configuration of the connector on the PC when selecting a dedicated communication cable..

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

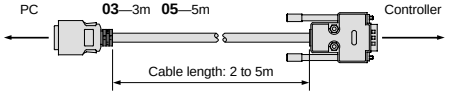


Dedicated communication cable (halfpitch) (For NEC PC-98 Series)

Model **LC1-1-R□H**

● **Cable length**

02—2m **04**—4m
03—3m **05**—5m



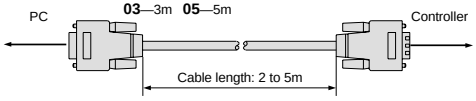
∗ PC-98 Series is a registered trade mark of NEC Corporation.

Dedicated communication cable (IBM PC/AT compatible computer)

Model **LC1-1-R□C**

● **Cable length**

02—2m **04**—4m
03—3m **05**—5m

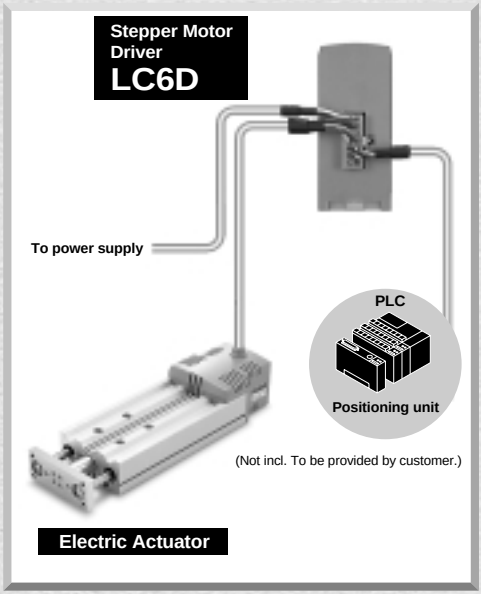


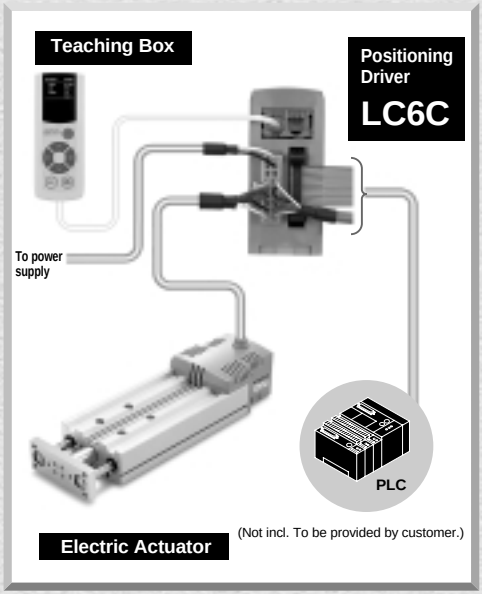
Series LC6D

Series LC6C

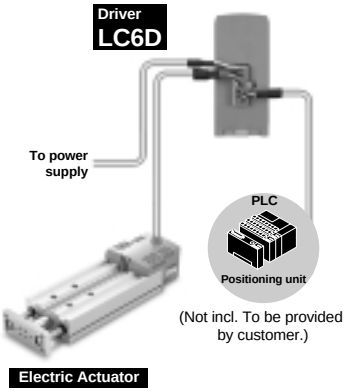
Series LX Dedicated
Stepper Motor Driver and Positioning Driver

Series LC6D/LC6C





- **Can be mounted on a DIN rail**
- **Driver position controlled by pulse signal**
- **Can be controlled by a general positioning unit or controller**



(Not incl. To be provided by customer.)

How to Order

LC 6 D — 220 A D —

Applicable motor

6	Stepper motor

Function

D	Driver function only

CE marking

Nil	Standard
Q	CE marking

Driver power supply

D	24VDC

Input/Output type

A	Photo coupler input/output

Motor type

220	2 phase motor (2.0A/phase)
507	5 phase motor (0.75A/phase)

Applicable Actuators

Driver model	Applicable actuator		Motor type
LC6D-220AD	Guide rod type	LXPB2	2 phase stepper motor
	High rigidity slide table type	LXSH2	
LC6D-507AD	Low profile slide table type	LXFH5	5 phase stepper motor
	High rigidity slide table type	LXSH5	
	Guide rod type	LXPB5	

Specifications

Part no.	LC6D-220AD	LC6D-507AD
Power supply	24VDC ±10%, 3A	24VDC ±10%, 2.5A
Energization (Step angle °)	Full step (1.8°) Half step (0.9°)	Full step (0.72°) Half step (0.36°)
Motor current	2.0A/phase	0.75A/phase
Input signal	Photo coupler input (Input impedance 330Ω)	
Maximum input frequency (See caution below.)	10kHz for full step 20kHz for half step	
Function	Auto current down, Power down input	
Connection method	Connector	
Operating environment	5° to 40°C	
	35 to 85% (with no condensation)	
Accessories	Connectors (receptacle, female terminal) Cable should be arranged by customer.	

CE marking

1. **The combination of Series LC6D and Series LX has been certified for CE marking.**
   When using Series LX with CE marking, use it in combination with Series LC6D with CE marking.
2. **The combination of Series LC6D and Series LX has been certified for EMC conformity.**
   EMC changes depending on the customer's control panel configuration, and the relationship between other electrical equipment and wiring. Therefore, conformity cannot be certified for the customer's equipment in the actual operating environment. As a result, it is necessary for the customer to verify final EMC conformity for the machinery and equipment as a whole.

⚠Caution

Maximum speeds of actuators vary depending on the type. Observe the maximum speed of the actuator in use.

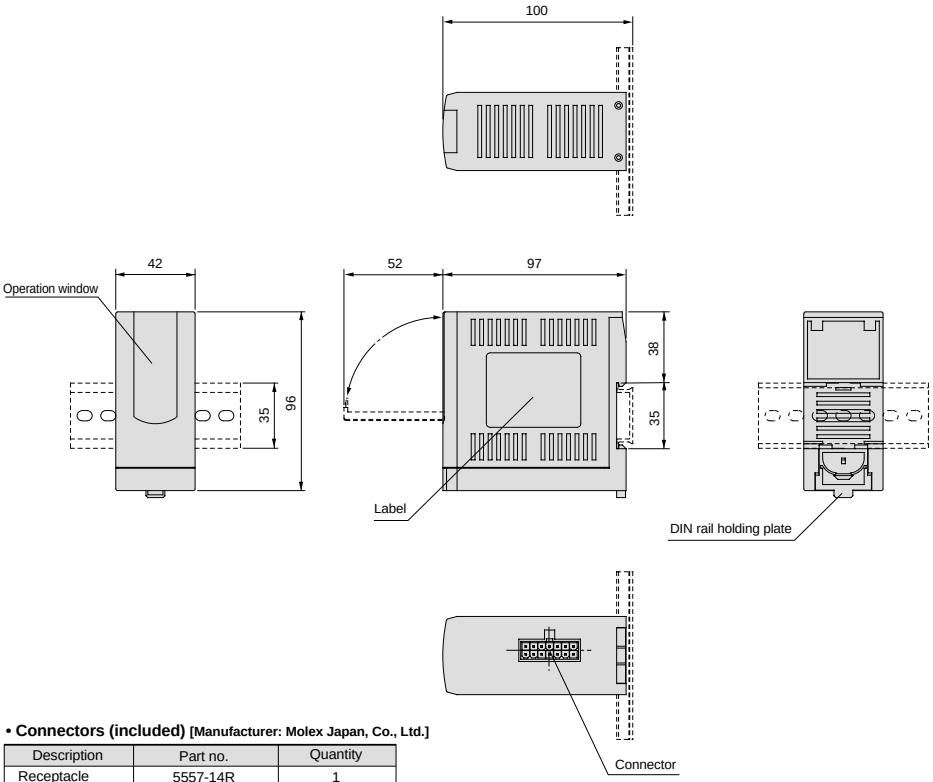
Pulse Signals

LC6D positioning is controlled by the number of pulse signal inputs to the CW and CCW terminals, and speed is controlled by pulse frequencies.

- Calculation for speed and pulse frequencies
  Pulse frequency [pps] = (Speed [mm/s]/Lead [mm]) x Divisions per rotation
- Calculation for moving distance and pulse numbers
  Pulse numbers = (Moving distance [mm]/Lead [mm]) x Divisions per rotation
- The divisions per rotation are as shown in the table below.

Driver	Energization type	Divisions per rotation
LC6D-220AD-□	Full step	200
	Half step	400
LC6D-507AD-□	Full step	500
	Half step	1000

Dimensions



- **Connectors (included)** **[Manufacturer: Molex Japan, Co., Ltd.]**

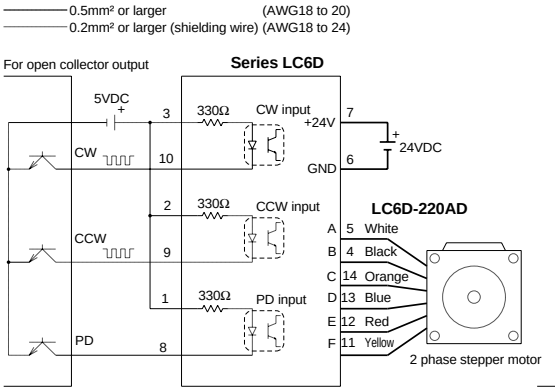
Description	Part no.	Quantity
Receptacle	5557-14R	1
Female terminal	5556PBTL	14

- **Wiring tools** **[Manufacturer: Molex Japan Co., Ltd.]**
  Wiring tools should be arranged by the customer.

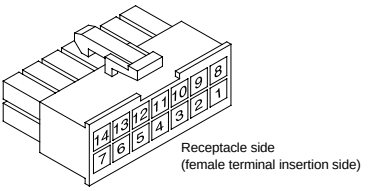
Description	Part no.
Crimping tool	57026-5000 (for UL1007) 57027-5000 (for UL1015)
Puller	57031-6000

Connection Examples

• Electrical wires

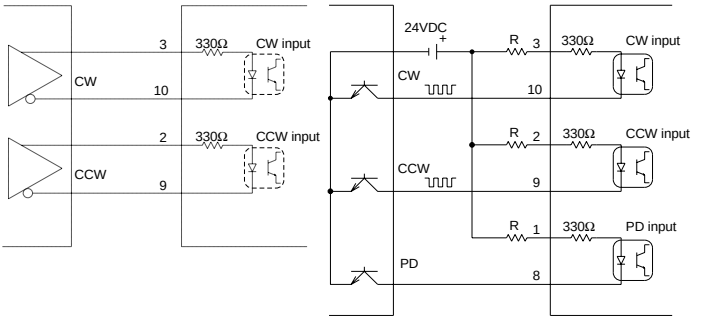


• Wiring numbers



For line driver output

For a signal power supply of 24VDC, connect an external resistor R (1.3kΩ 1/2W) in order to hold the current to 15mA or lower.



Signal description	Function	Pin no.
+24V	Driver power supply +24V	7
GND	Driver power supply GND	6
CW+	CW pulse input terminal (+)	3
CW–	CW pulse input terminal (–)	10
CCW+	CCW pulse input terminal (+)	2
CCW–	CCW pulse input terminal (–)	9
PD+	Power down input terminal (+)	1
PD–	Power down input terminal (–)	8
A	Motor drive output A	5
B	Motor drive output B	4
C	Motor drive output C	14
D	Motor drive output D	13
E	Motor drive output E	12
F	Motor drive output F (LC6D-2□□□□ only)	11

Functions

• Function change-over switch

Use the function change-over switch to set each function.
It is set as follows when shipped.

1. ON ..... Energization type: Half step
2. OFF ... Auto current down function

	ON	OFF
1	Half step	Full step
2	Release	Set

• Input signal terminal

• CW pulse input terminal
By applying the pulse input, the actuator moves from the motor side to the end side.

• CCW pulse input terminal
By applying the pulse input, the actuator moves from the end side to the motor side.

• Power down input terminal
By applying the "H" level input, the motor current is shut off and the motor becomes de-energized.

• Functions

• Auto current down
This is a function that reduces the motor current to half when the motor stops. This will prevent the motor and driver from generating heat.
Although auto current down causes the holding torque to be reduced when the motor stops, the holding torque that supports the actuator transfer load is maintained.

• Power down
This function shuts off the motor current and de-energizes the motor. Use this function to release the electric actuator for maintenance, etc.

How to Order

LC 6 C – 220 A D

- **Applicable motor**: 6 — Stepper motor
- **Function**: C — Position control/Driver
- **Motor type**: 220 — 2 phase motor (2A/phase)
- **Input/Output type**: A — Photo coupler input
- **Power supply**: D — 24VDC

- **Built-in position control function added to LC6D**
- **Up to 28 patterns of movement data can be set.**
- **Point movement can be easily achieved with a PLC, etc.**
- **Compatible with Series LX two phase stepper motor**

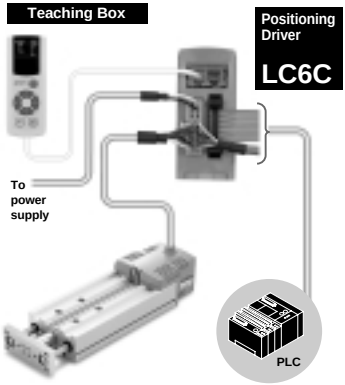
Applicable Actuators

Driver	Applicable actuator		Motor type
LC6C-220AD	Guide rod type	LXPB2	2 phase stepper motor
	High rigidity slide table type	LXSH2	

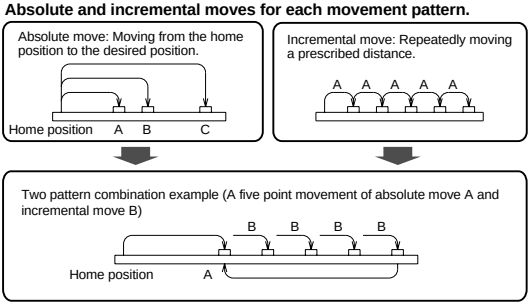
∗ Select a 3 wire NPN type when using an auto switch.

Specifications

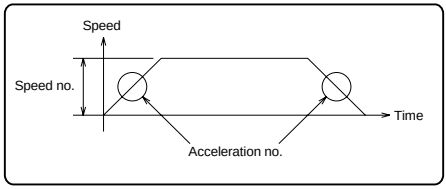
Part no.	LC6C-220AD
Power supply	24VDC ±10%, Max. 3.0A
Number of position settings	28 patterns
Position setting method	Setting with dedicated teaching box (LC5-1-T1-02)
Position control method	Absolute and incremental moves Speed: 6 to 200mm/s (with lead screw lead of 12mm)
Input signal capacity	Photo coupler input 24VDC, Max. 6mA
Output signal capacity	Photo coupler output Max. 30VDC or less, Max. 20mA
Parameter setting	Position data setting, Speed/Acceleration setting, etc.
Indication LED	Power supply LED, Alarm LED
Operating temperature	5° to 40°C
Accessories	Power connector, Interface connector (Cables should be arranged by customer.)



Absolute and incremental moves for each movement pattern.

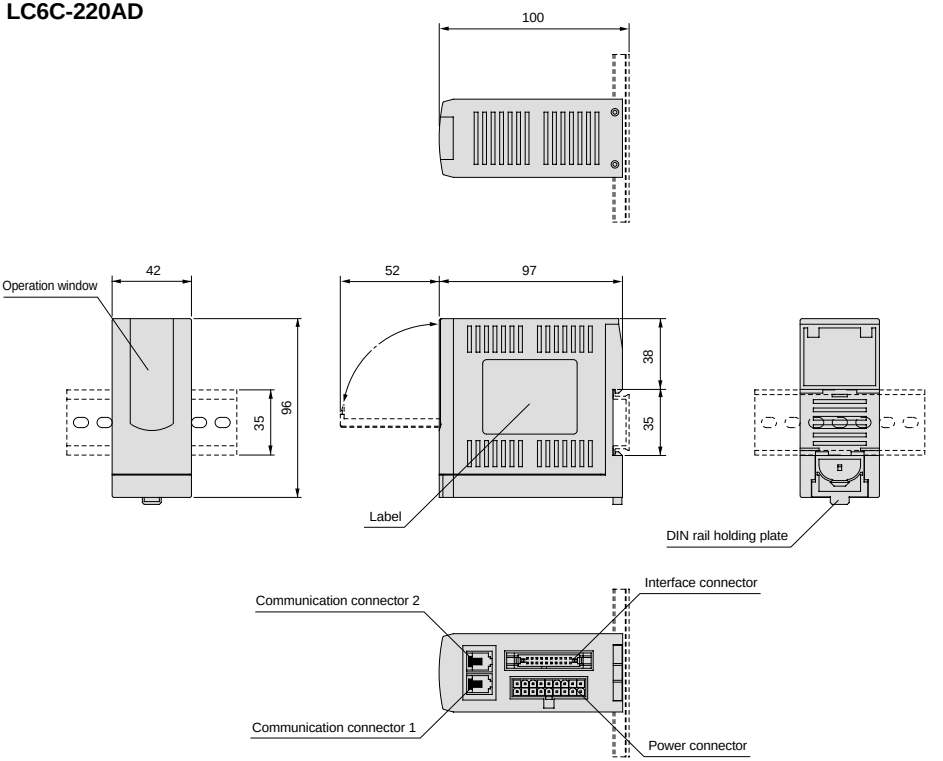


Eight speed patterns based on the speed number and acceleration number can be set, and a speed pattern can be selected for each movement pattern.



Dimensions

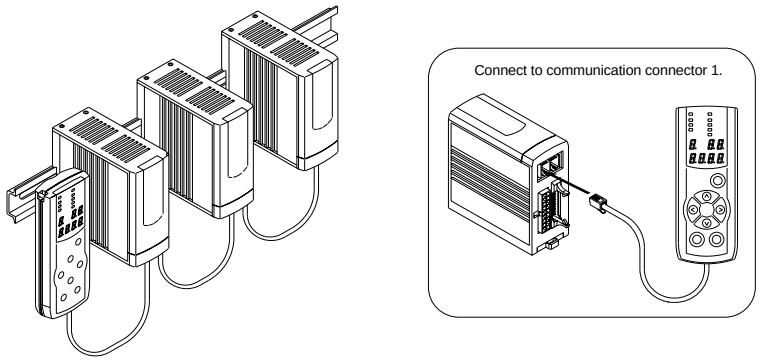
LC6C-220AD



Connection Example

Wiring to the teaching box

By connecting multiple drivers (maximum of 16), they can be set by one teaching box.
(When the teaching box is in use, external input to the drivers become invalid.)

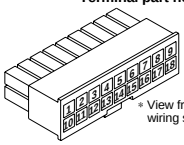


Connection Examples

Power connector wiring

Connector: Power connector (included)
Manufacturer: Molex Japan, Co., Ltd.
Part no.: Receptacle 5557-18R
Female terminal 5556PBTL

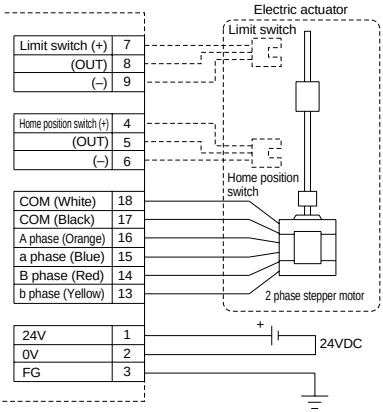
Terminal part no.



Switches

Home position switch: This switch indicates the home position. Connect this switch when returning to the origin point. This switch also acts as a sensor that detects overrun in the motor direction.

Limit switch: This sensor detects overrun in the end direction. Connect this switch as needed.

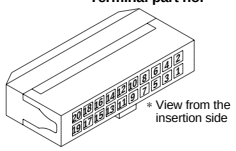


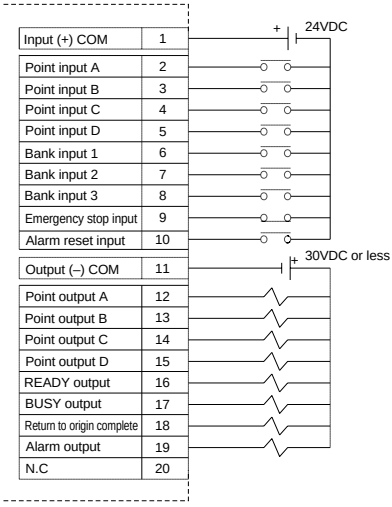
Interface connector wiring

Connector: Interface connector (included)
Manufacturer: OMRON Corporation
Part no.: Connector XG4M-2030-T

A ▽ mark is located on the connector number 1 side.

Terminal part no.





Power connector input/output signal details

Connector no.	Signal description	Detail
1	24V	Connect to power supply (+24VDC)
2	0V	Connect to power supply (0V)
3	FG	Connect to frame ground
4	Home position switch (+)	Connect to home position switch positive power supply line
5	Home position switch (OUT)	Connect to home position switch output line
6	Home position switch (–)	Connect to home position switch 0V power supply line
7	Limit switch (+)	Connect to limit switch positive power supply line
8	Limit switch (OUT)	Connect to limit switch output line
9	Limit switch (–)	Connect to limit switch 0V power supply line
10	N.C.	Do not connect.
11	N.C.	Do not connect.
12	N.C.	Do not connect.
13	b phase (Yellow)	Connect to actuator power line (Yellow)
14	B phase (Red)	Connect to actuator power line (Red)
15	a phase (Blue)	Connect to actuator power line (Blue)
16	A phase (Orange)	Connect to actuator power line (Orange)
17	COM (Black)	Connect to actuator power line (Black)
18	COM (White)	Connect to actuator power line (White)

⚠ Caution

Use a 3 wire NPN type for each switch.

Interface connector input/output signal details

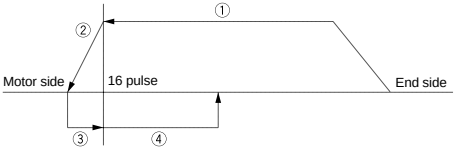
Connector no.	Signal description	Details
1	Input (+) COM	Input COM signal
2	Point input A	Point setting input (point A)
3	Point input B	Point setting input (point B)
4	Point input C	Point setting input (point C)
5	Point input D	Point setting input (point D)
6	Bank input 1	Bank setting input (binary, first bit)
7	Bank input 2	Bank setting input (binary, second bit)
8	Bank input 3	Bank setting input (binary, third bit)
9	Emergency stop input	Emergency stop input
10	Alarm reset input	When an alarm occurs, this signal turns off the alarm after the cause is resolved.
11	Output (–) COM	Output COM signal (GND)
12	Point output A	This signal indicates move completion for point input A.
13	Point output B	This signal indicates move completion for point input B.
14	Point output C	This signal indicates move completion for point input C.
15	Point output D	This signal indicates move completion for point input D.
16	READY output	This signal indicates that the controller is ready.
17	BUSY output	This signal indicates motor control in progress.
18	Home position return output	This signal indicates that home position returen is completed.
19	Alarm output	This signal indicates occurrence of alarm.
20	N.C.	Do not connect.

⚠ Caution

If input is not provided as prescribed for the operation, this may cause malfunction or failure.

Home Position Return

1 Operation



Home position sensor position

① Moves to the motor side at home position return speed
② Decelerates and stops at the home position sensor ON position
③ Moves to the end side at low speed
④ Moves and stops at 16 pulse position from the home position sensor OFF position

2 Operating procedures

1. Confirm that both READY output and alarm output are ON.
2. Turn OFF bank inputs 1 to 3. [Specify bank 0.]
3. When point input A is turned ON, the actuator begins to return to the home position.
4. BUSY output is turned ON during home position return.
5. BUSY output is turned OFF when the actuator reaches the home position, and home position return output turns ON.
6. Turn OFF point input A.

Note) The actuator stops if point input A is turned OFF when BUSY output is ON (home position return movement in progress).

3 Home position return speed

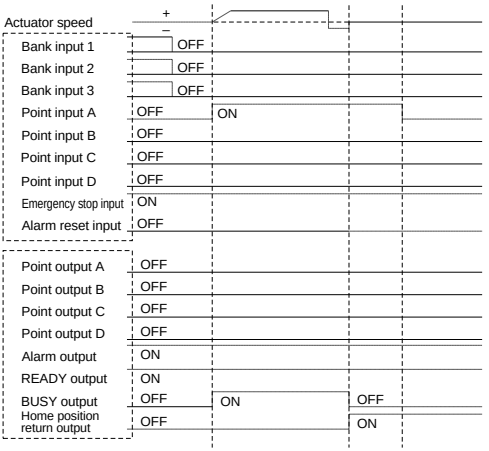
Speed is set by parameter number 0D.

1.	015
Acceleration no.	Speed no.

4 Home position return signal

This signal output turns ON when the home position return movement completes. It turns OFF when an alarm occurs or when JOG movement takes place.

5 Time chart

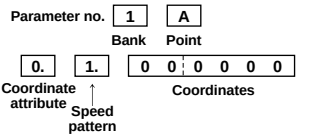


Point Movement

With this driver, a maximum of 28 point positions can be set by combining banks and points. With the combination of bank and point inputs, the actuator can move to the position indicated by each point.

1 Setting detail

To set point settings, use the parameter setting and teaching functions of the dedicated teaching box.

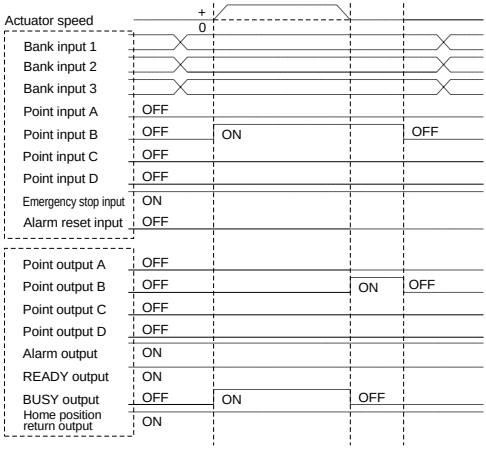


2 Operating procedures

1. Confirm that both READY output and alarm output are ON.
2. Set bank with bank inputs 1 to 3. [Bank 1 to 7.]
3. When points are specified with point inputs A to D, the actuator starts to move.
4. BUSY output is ON while the actuator is moving.
5. BUSY output turns OFF when the move completes and point outputs A to D turn ON. These correspond to point inputs A to D that are ON.
6. When point inputs A to D are turned OFF, point outputs A to D turn OFF.

Note) The actuator stops moving if point inputs A to D are turned OFF or two or more of point inputs A to D are turned ON while BUSY output is ON (during movement).

3 Time chart (when specifying point B)



Performance/Specifications

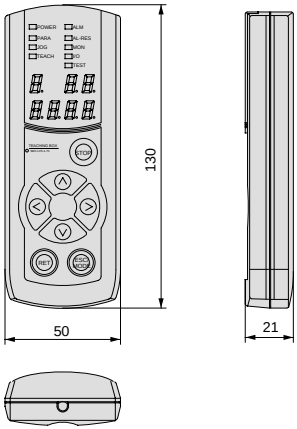
General specifications

Part no.	LC5-1-T1-02
Power supply	Supplied by **LC6C-220AD**
Dimensions	130mm x 50mm x 21mm
Weight	110g
Body type	Resin body
Indication unit	7 LED numerical indicators, 9 LED indicator lights
Operation unit	Key switches
Cable length	2m

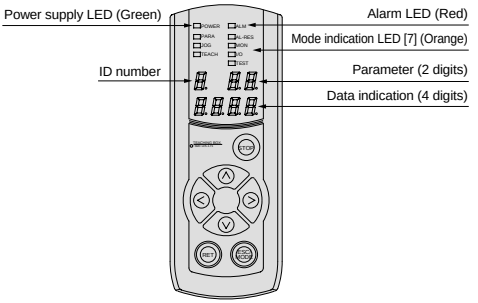
Basic performance

	Performance/Specifications
Applicable controller	**LC6C-220AD**
Operating temperature range	5° to 40°C
Communication method	Conforming to RS485
Functions	Parameter change, JOG operation, alarm reset, teaching, test
Protective function indication	Alarm code

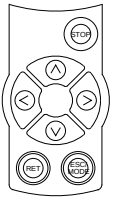
Dimensions



Part Descriptions



Key Arrangement and Functions



Mark	Key description	Function
∧	UP	Increases a numerical value.
∨	DOWN	Reduces a numerical value.
<	L	Moves a numerical value place to the left. Rotates the motor counter clockwise during JOG operation.
>	R	Moves a numerical value place to the right. Rotates the motor clockwise during JOG operation.
STOP	STOP	Becomes the emergency stop key when the actuator is moving.
ESC/ MODE	ESC/ MODE	Selects a mode. Completes each mode and returns to the mode level.
RET	RET	Determines the mode and records data.

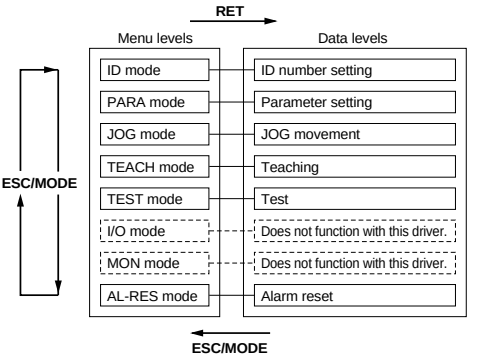
⚠ Caution

STOP key only stops the driver that is in communication.

Alarm Details

Alarm no.	Alarm description	Presumed cause and solution
1	Emergency stop input	Emergency stop input is turned OFF (open).
2	Temperature abnormality	The temperature inside the driver is high. Check the installation environment and operation frequency.
3	Power supply abnormality	Operating beyond the range of the specified power supply. Adjust the power supply.
4	Limit switch abnormality	Home position switch and limit switch are operating. Malfunction such as loss of synchronism may have occurred. Check the equipment.

Operating Method



As shown above, 6 modes are available. (I/O mode and MON mode do not function with this driver.) When the communication mode is started by the teaching box, a menu can be selected with [ESC/MODE]. Select the mode indication LED for the mode to be implemented (all mode indication LEDs turn Off in the ID mode) and press [RET] to start each mode.
Refer to the instruction manual for the operation of each mode.

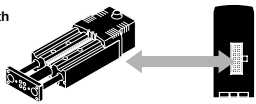
⚠ Caution

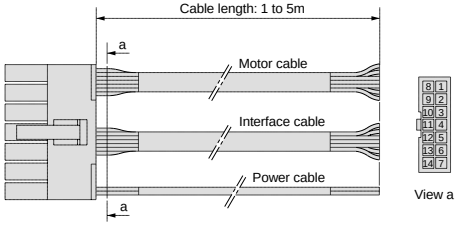
- **Do not repeatedly apply bending stress or tension to the cables.**
  Wiring that subjects cables to repeated bending stress and tension causes line breakage.
- **Make connections based on each driver's connection example.**

LC6D Connector Cable

Model **LC6-1-C1-□-X258**

● **Cable length**
1 - 1m
3 - 3m
5 - 5m





Wiring

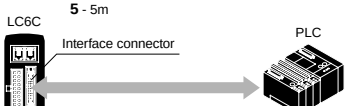
Pin no.	Cable description	Signal description	Color
1	Interface cable	PD+	Yellow
2		CCW+	Red
3		CW+	Black
4	Motor cable	Motor B	White
5		Motor A	Black
6	Power cable	GND	Black
7		+24V	White

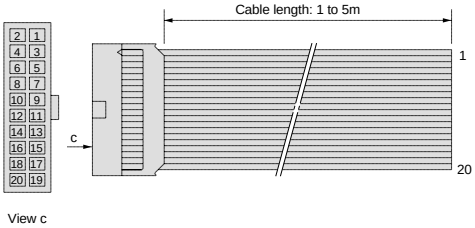
Pin no.	Cable description	Signal description	Color
8	Interface cable	PD–	Brown
9		CCW–	Green
10		CW–	White
11	Motor cable	Motor F	Brown
12		Motor E	Yellow
13		Motor D	Green
14		Motor C	Red

LC6C Interface Connector Cable

Model **LC6-1-C3-□-X252**

● **Cable length**
1 - 1m
2 - 2m
5 - 5m

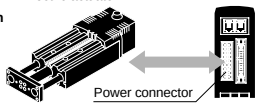


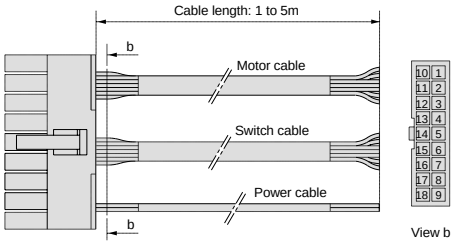


LC6C Power Connector Cable

Model **LC6-1-C2-□-X252**

● **Cable length**
1 - 1m
2 - 2m
5 - 5m





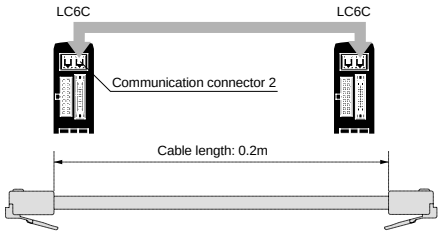
Wiring

Pin no.	Cable description	Signal description	Color
1	Power cable	+24V	White
2		0V	Black
3		FG	Red
4	Switch cable	Home position switch (+)	White
5		Home position switch (OUT)	Black
6		Home position switch (–)	Brown
7		Limit switch (+)	Yellow
8		Limit switch (OUT)	Green
9		Limit switch (–)	Red
13	Motor cable	Motor wire (Yellow)	Red
14		Motor wire (Red)	Green
15		Motor wire (Blue)	Yellow
16		Motor wire (Orange)	Brown
17		Motor wire (Black)	Black
18		Motor wire (White)	White

LC6C Driver Connection Cable

Model **LC5-1-C1-02-X252**

● **Cable length 0.2m**



Directional Control Driver for Electric Cylinder

Series LC3F2

LC3F212-5A3□ *LC3F212-5A5□*

Able to contro the stroke with only ON/OFF signals

Directional control driver like a solenoid valve

Able to set thrust arbitrarily.

Thrust can be adjusted by adjustment trimmer

Able to control with only 3 different types of input signals

① Directional nstruction ② Thrust selection ③ Output ON/OFF

Can be operated manually

Maintenance performance for wiring check has been improved

Product Specifications

Model	LC3F212-5A3□	LC3F212-5A5□
Power supply voltage	24 VDC ± 10%	
	Max. 1.3 A	Max. 2.3 A
Front side label color	Gray	Blue
Input signal	Photocoupler input 24 VDC ±10% Max. 8 mA/point	
Selction of thrust	100% or set value (setting range 10 to 70% F.S.)	
Operating temperature range	+5 to 40°C	
Operating humidity range	35 to 85% Rh (with no condensation)	
Environment	Indoor (Direct sunlight should be avoided.) No corrosive gas, inflammable gas, oil mist or dust particle	
Display LED	POWER, A-PHASE, OFF, SET	
Weight	145 g	

Directional Control Driver for Electric Cylinder

Series LC3F2

How to Order

LC3 F2 12 5 A3 B

Series

F2	Small sized DC motor driver

Power supply

5	24 VDC

Applicable motor

A3	DC motor (cylinder size 3)
A5	DC motor (cylinder size 5)

Housing set (Connector set)

A	Housing for CN1, 2, 3 (connector) & contact (connector pin) are included as an accessory.
B	Nothing included.

Option

● **Cable for power supply terminal**

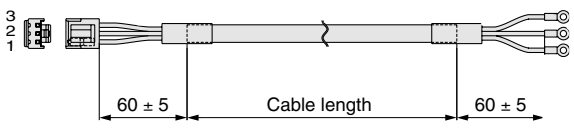
LC3F2 1 C1–02–1

Cable type

C1	Cable for CN1 power supply terminal

Cable length

01	1 m
02	2 m



CN1 Power Supply Terminal Table

Terminal	Function	Pin number	Optional cable color
FG	Frame ground	1	Yellow/Green
DC (+)	Driver power supply (+24 V)	2	Brown
DC (–)	Driver power supply (0 V)	3	Blue

● **Cable for control terminal**

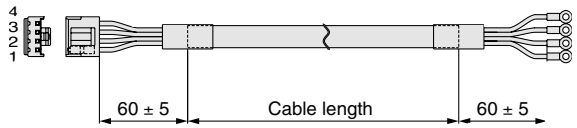
LC3F2 1 C2–02–1

Cable type

C2	Cable for CN2 control terminal

Cable length

01	1 m
02	2 m



CN2 Control Terminal Table

Terminal	Function		Pin number	Optional cable color
COM	Common terminal		1	White
ON	Output ON command input	ON: Motor output	2	Red
		OFF: No motor output		
SET	Adjusted thrust command input	ON: Adjusted thrust	3	Yellow
		OFF: 100% thrust (Max. thrust)		
A-PHASE	Traveling direction command input	ON: A-PHASE (Retracted side)	4	Orange
		OFF: B-PHASE (Extended side)		

● **Cable for motor output terminal**

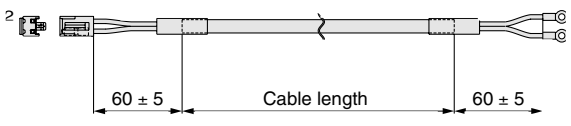
LC3F2 1 C3–02–1

Cable type

C3	Cable for CN3 motor output terminal

Cable length

02	2 m
05	5 m



CN3 Motor Output Terminal Table

Terminal	Function	Pin number	Optional cable color
OUTA	Motor output A (Blue)	1	Blue
OUTB	Motor output B (Red)	2	Red

● **Housing set (Connector set)**

LC3F2 1–C0

Housing for power supply terminal (Connector)	1 pc.	VHR-3N: J.S.T. Mfg Co., Ltd.)
Housing for control terminal (Connector)	1 pc.	VHR-4N: J.S.T. Mfg Co., Ltd.)
Housing for motor output terminal (Connector)	1 pc.	VHR-2N: J.S.T. Mfg Co., Ltd.)
Contact (Connector pin)	12 pcs.	BVH-21T-P1.1: J.S.T. Mfg Co., Ltd.)

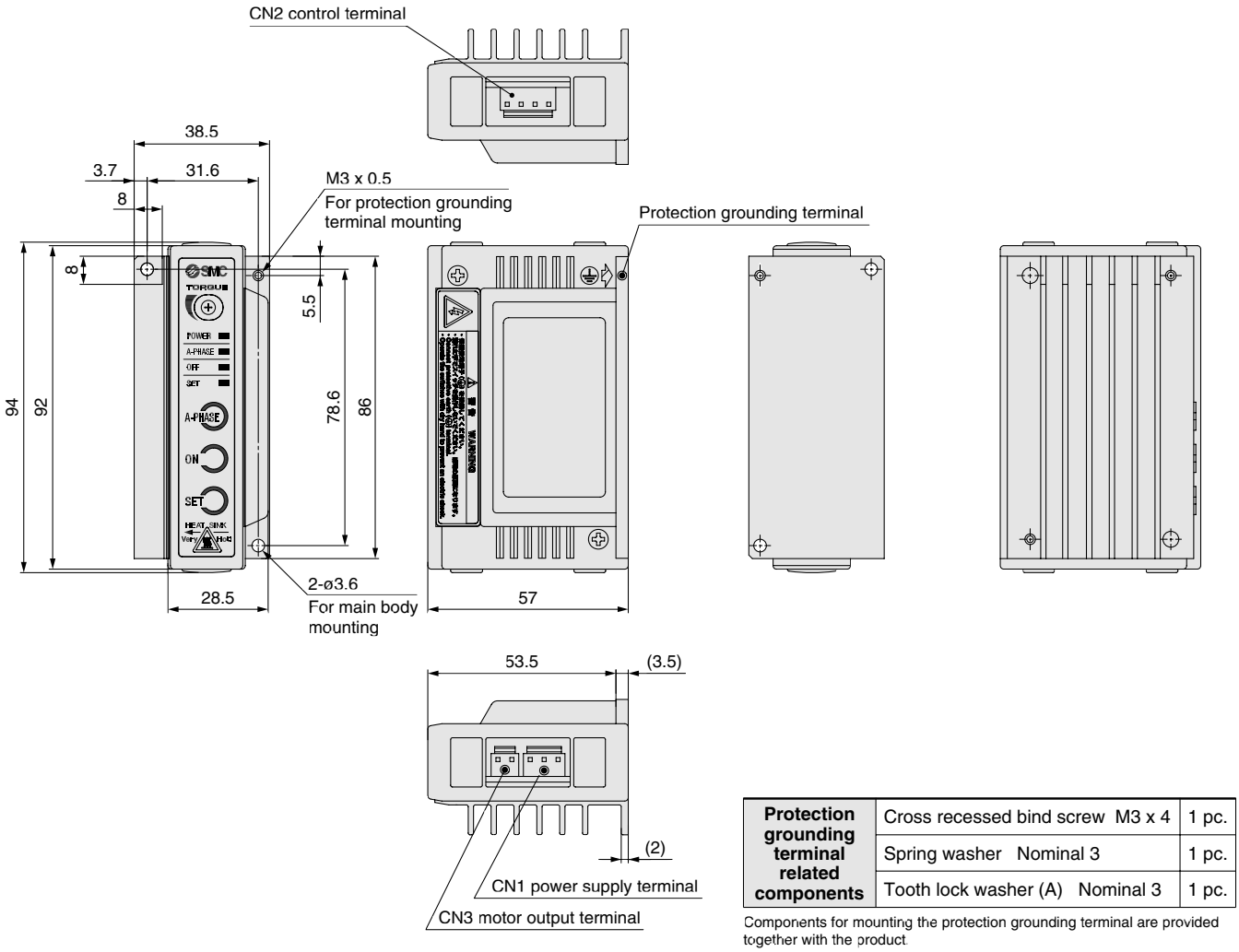
⚠Caution

- **Do not apply repetitive bending or pulling stress to the cable.**
  Wiring with repetitive bending or pullling stress to the cable will likely cause the cable to break.
- **In the event of crimping the contact (connector pin) and wire, use the specified tools as well as the recommended cable.**
  Crimping tool: YC-160R (J.S.T. Mfg Co., Ltd.)
  Pulling tool: EJ-NV (J.S.T. Mfg Co., Ltd.)
  Recommended cable connection (common for individual cable) AWG21 (0.5 mm²), Insulated wire O.D. 1.7 to 3.0 mm, with shield
  Heat resistance is more than 80°C.
  Maximum cable length: CN1 cable for power supply terminal 2 m
  CN2 cable for control terminal 2 m
  CN3 cable for motor output terminal 5 m
- **Shield is attached with an optional cable for the LC3F2 series.**
  When grounding a shield, remove the sheath and use a metal U-clip or P-clip.

Applicable Cylinder Table

Cylinder part no.	Applicable directional control driver
L□Z□3□-□□□A3□□-□□□□	**LC3F212-5A3□**
L□Z□5□-□□□A5□□-□□□□	**LC3F212-5A5□**

Dimensions



Protection grounding terminal related components	Cross recessed bind screw M3 x 4	1 pc.
	Spring washer Nominal 3	1 pc.
	Tooth lock washer (A) Nominal 3	1 pc.

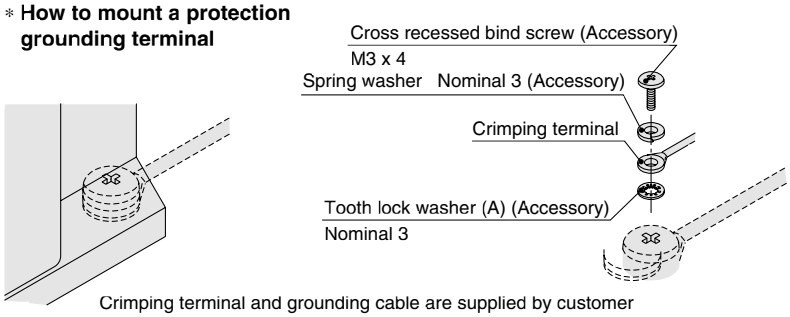
Components for mounting the protection grounding terminal are provided together with the product.

How to Mount

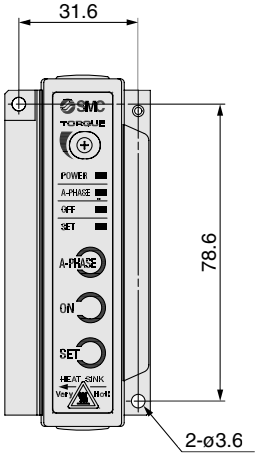
Mount the directional control driver vertically against the wall, using two mounting screw holes, so the front side (on which its adjustment trimmer and manual switch are located) is facing to an operator

Applicable mounting screw: M3 (2 pcs.) [to be supplied by customer]

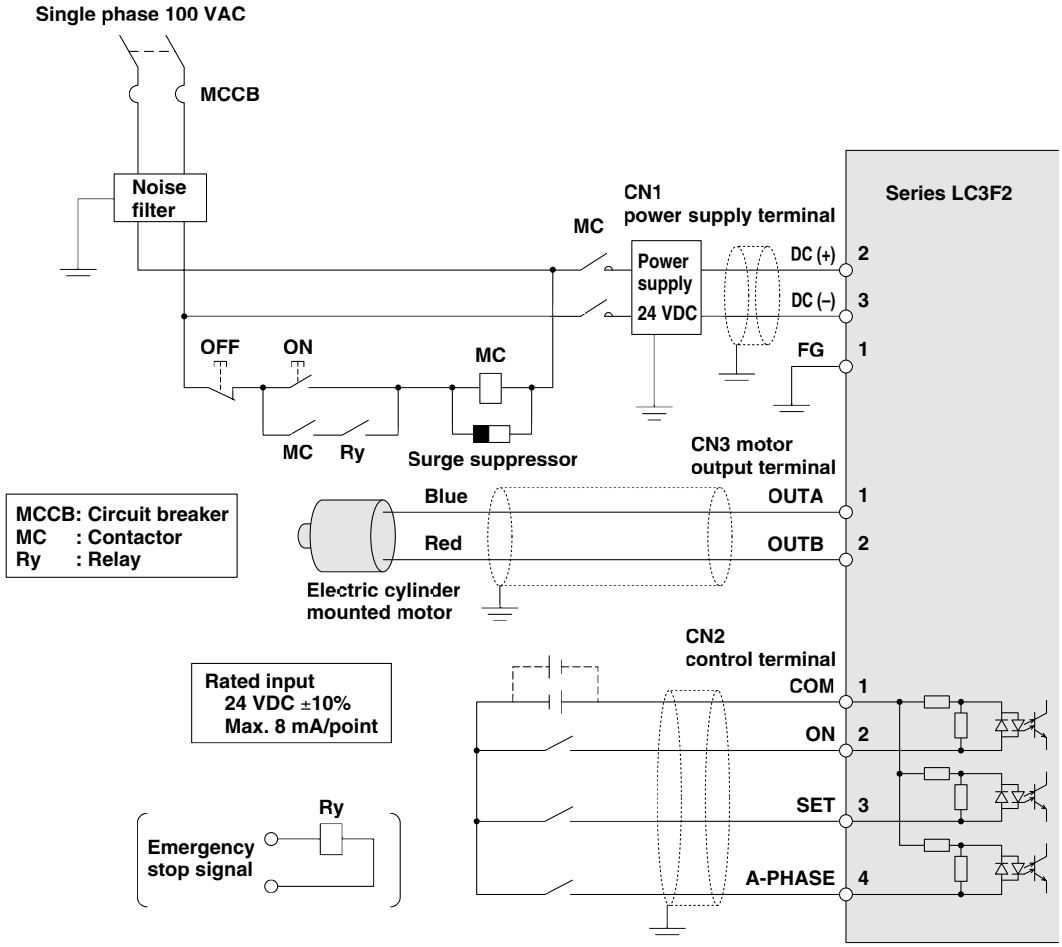
∗ **How to mount a protection grounding terminal**



Crimping terminal and grounding cable are supplied by customer



Wiring Example

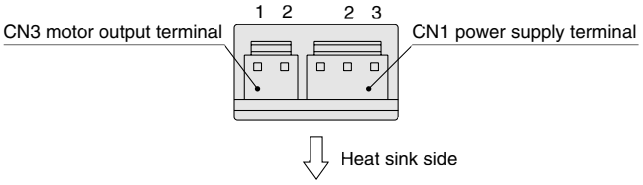


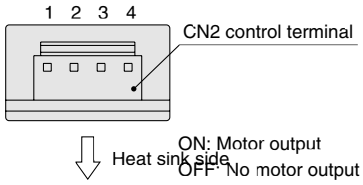
For System Chart, refer to Features 1

⚠Caution

There is no emergency stop function or power supply switch in the directional control driver Please be sure to provide an emergency stop and power supply insulation (insulator) device as a total machine equipment, referencing the above wiring examples. Also, please be sure to turn off the power supply for the whole equipment prior to wiring the directional control driver.

How to wire





CN1 Power Supply Terminal

Pin no.	Terminal	Function
1	FG	Frame ground
2	DC (+)	Driver power supply (+24 V)
3	DC (–)	Driver power supply (0 V)

Housing: VHR-3N (J.S.T Mfg Co., Ltd.)
Contact: BVH-21T-P1 (J.S.T. Mfg Co., Ltd.)

CN3 Motor Output Terminal

Pin no.	Terminal	Function
1	OUTA	Motor output A (Blue wire)
2	OUTB	Motor output B (Red wire)

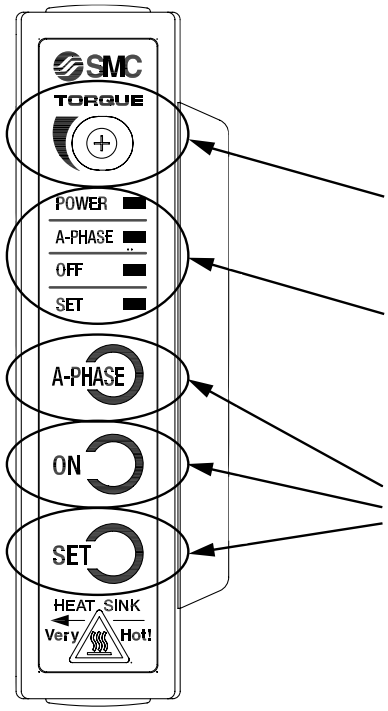
Housing: VHR-2N (J.S.T Mfg Co., Ltd.)
Contact: BVH-21T-P1 (J.S.T. Mfg Co., Ltd.)

CN2 Control Terminal

Pin no.	Terminal	Function	
1	COM	Common terminal	ON: Motor output OFF: No motor output
2	ON	Output ON command input	ON: Adjusted thrust OFF: 100% thrust (Max. thrust)
3	SET	Adjusted thrust command input	ON: A-PHASE (Retracted side) Note) OFF: B-PHASE (Extended side) Note)
4	A-PHASE	Traveling direction command input	

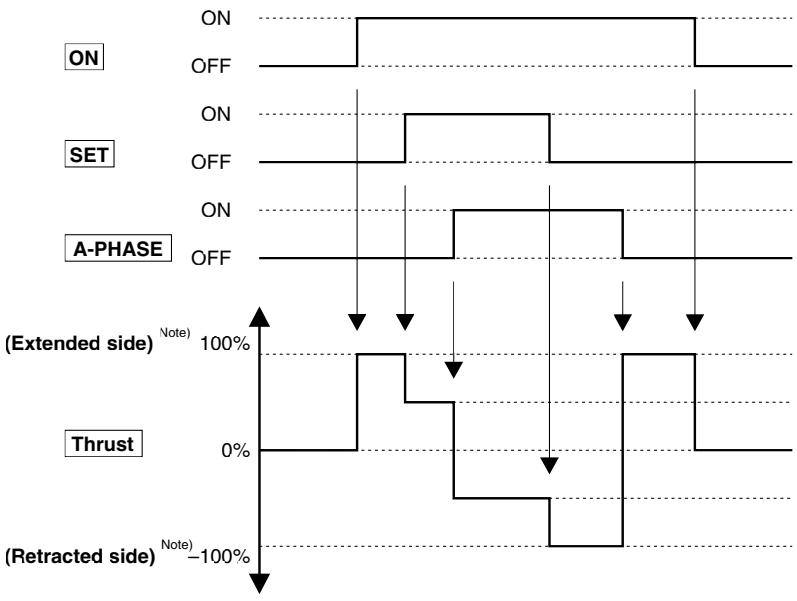
Housing: VHR-4N (J.S.T. Mfg Co., Ltd.)
Contact: BVH-21T-P1.1 (J.S.T Mfg Co., Ltd.)
Note) For the travelling direction (retracted, extended side), refer to the dimensions in page 4, 6, 10 and 1.

Description of Each Part and its Function



Category	Description	Details
Trimmer	**Thrust adjustment trimmer**	Thrust changes through adjustment.
Indicator light	**POWER**	Light illuminates when power is supplied.
	A-PHASE	Light illuminates by A-PHASE command. (Travelling to the retracted side when illuminated)
	OFF	Light illuminates when turning OFF. (No motor output is generated when illuminated.)
	SET	Light illuminates by SET command. (Thrust set by the thrust adjustment trimmer, when illuminated, will be outputted.)
Manual switch	**A-PHASE**	A-PHASE command while pressing (Travelling to the retracted side)
	ON	ON command while pressing (Motor output will be generated.)
	SET	SET command while pressing (Thrust set by the thrust adjustment trimmer will be outputted.)

Timing Chart



Note) For the travelling direction (retracted, extended side), refer to the dimensions in page 4, 6, 10 and 11

CN2 Control Terminal

Pin no.	Terminal	Function	
1	COM	Common terminal	
2	ON	Output ON command input	ON: Motor output
			OFF: No motor output
3	SET	Adjusted thrust command input	ON: Adjusted thrust
			OFF: 100% thrust (Max. thrust)
4	A-PHASE	Traveling direction command input	ON: A-PHASE (Retracted side) Note)
			OFF: B-PHASE (Extended side) Note)

Housing: VHR-4N (J.S.T. Mfg Co., Ltd.)
Contact: BVH-21T-P1.1 (J.S.T. Mfg Co., Ltd.)
Note) For the travelling direction (retracted, extended side), refer to the dimensions in page 4, 6, 10 and 11.