



Installation and Maintenance Manual

Card Motor
LAT3*-*-* LATC4-* Series



1 Safety Instructions

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of “Caution”, “Warning” or “Danger”, followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

Caution	Indicates a hazard with a low level of risk, which if not avoided, could result in minor or moderate injury.
Warning	Indicates a hazard with a medium level of risk, which if not avoided, could result in death or serious injury.
Danger	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.

Warning

- The compatibility of the product is the responsibility of the person who designs the system or decides its specifications. Since the products specified here can be used in various operating conditions, their compatibility with the specific system must be decided

by the person who designs the system or decides its specifications based on necessary analysis and test results to meet specific requirements.

- Only personnel with appropriate training should operate the machinery and equipment.**
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
 - The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
 - When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
 - Before machinery/equipment is re-started, take measures to prevent unexpected operation, sudden movement and malfunction etc.
- Do not use this product outside of the specifications. Contact SMC if it is to be used in any of the following conditions:**
 - Conditions and environments outside of the given specifications, or if the product is to be used outdoors or in a place exposed to direct sunlight.
 - Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
 - An application which could have negative effects on people, property, or animals requiring special safety analysis.
 - Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

2 Specifications

2.1 Card Motor

Model		LAT3-10	LAT3F-10	LAT3-20	LAT3F-20	LAT3-30	LAT3F-30
Stroke [mm]		10		20		30	
Motor	Type	Moving magnet type linear motor					
	Maximum instantaneous thrust [N] <small>Note 1) Note 2) Note 3)</small>	5.2		6		5.5	
	Continuous thrust [N] <small>Note 1) Note 2) Note 3)</small>	3		2.8		2.6	
Guide	Type	Linear guide with circulating balls					
	Maximum workload [g]	Horizontal: 500, Vertical: 100				Horizontal: 500, Vertical: 50	
Sensor	Type	Optical linear encoder (incremental)					
	Resolution [μ m]	30	1.25	30	1.25	30	1.25
	Home position signal	None	Provided	None	Provided	None	Provided
Pushing operation	Pushing speed [mm/s]	6					
	Set value of force <small>Note 1) Note 2) Note 3)</small>	1~5		1~4.8		1~3.9	
Positioning operation	Positioning resolution [μ m]	30	1.25	30	1.25	30	1.25
	Positioning repeatability [μ m] <small>Note 4) Note 5)</small>	±90	±5	±90	±5	±90	±5
Measurement <small>Note 4) Note 5)</small>	Accuracy [μ m]	±100	±10	±100	±10	±100	±10
Maximum speed [mm/s] <small>Note 6)</small>		400					
Operating temperature range [°C]		5~40 (No condensation)					
Operating humidity range [%]		35~85 (No condensation)					
Weight [g] <small>Note 7)</small>		130		190		250	
Table weight [g]		50		70		90	

- Note 1) Continuous thrust can be generated and maintained continuously. Instantaneous maximum thrust is the maximum peak thrust that can be generated.
- Note 2) When mounted on a base with good heat dissipating capacity at 20°C ambient temperature.
- Note 3) The pushing force varies depending on the operating environment, pushing direction and table position.
- Note 4) When the temperature of the Card Motor is 20°C.
- Note 5) The accuracy after mounting the Card Motor may vary depending on the mounting

conditions, operating conditions and environment, so please calibrate it with the equipment used in your application.

- Note 6) The maximum speed varies depending on the operating conditions (workload, total positioning distance).
- Note 7) The weight of the Card Motor itself. Controllers and cables are not included.

2.2 Controller

Model	LATC4-□□□
Applicable motor	LAT3 series
Power supply <small>Note 1)</small>	Power supply voltage: 24 VDC ±10% Current consumption: Rated 2 A (Peak 3 A) Power consumption: 48 W (Maximum 72 W) <small>Note 2)</small>
Parallel input	6 inputs (Optically isolated)
Parallel output	4 outputs (Optically isolated, open collector output)
Step data	15 points
Position display output <small>Note 3)</small>	A-phase and B-phase pulse signals, RESET signal (NPN open collector output)
LED display	2 LED's (Green and Red)
Operating temperature range	5 to 40°C (No condensation, no freezing)
Operating humidity range	35 to 85% (No condensation, no freezing)
Storage temperature range	-10 to 60 °C (No condensation, no freezing)
Storage humidity range	35 to 85% (No condensation, no freezing)
Insulation resistance	Between case and FG: 50 MΩ (500 VDC)
Weight <small>Note 4)</small>	130 g (Screw mounting type) 150 g (DIN rail mounting type)

- Note 1) Do not use an inrush current limited type power supply for the controller.
- Note 2) Rated current: Current consumption when continuous thrust is generated.
Peak current: Current consumption when maximum instantaneous thrust is generated.
- Note 3) Specification for the connection of the separately sold multi-counter (CEU5).
- Note 4) Cables are not included.

3 Installation

3.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

3.2.1 Card Motor

Caution

- Do not use the products in an area where they could be exposed to dust, metallic powder, machining chips or splashes of water, oil or chemicals.
- Do not use the products in a magnetic field.**
Otherwise, the ambient magnetic field may affect the motor and malfunction and damage could result.
- Do not expose the product to strong light sources, such as direct sunlight.**
The Card Motor uses an optical sensor to detect the position, so if it is exposed to a strong light source such as direct sunlight, a malfunction could result. In such a case, install a light shielding cover to shield the sensor from light.
- Do not use the products in an environment where flammable, explosive or corrosive gases, liquids or other substances are present.
- Avoid heat radiation from strong heat sources, such as direct sunlight or a hot furnace.
- Do not use the products in an environment with cyclic temperature changes.
- The base oil of the grease can dissipate depending on the external environment and operating conditions. This may reduce the lubrication performance and shorten the life of the equipment.

3.2.2 Controller and Peripheral Devices

Caution

- Do not use the products in an area where they could be exposed to dust, metallic powder, machining chips or splashes of water, oil or chemicals.
- Do not use the products in a magnetic field.
- Do not use the products in an environment where flammable, explosive or corrosive gases, liquids or other substances are present.
- Avoid heat radiation from strong heat sources, such as direct sunlight or a hot furnace.
- Do not use the products in an environment with cyclic temperature changes.
- Do not use the products in an environment where surges are generated.**
Devices that generate a large amount of surge around the product (Ex. solenoid type lifters, high frequency induction furnaces, motors, etc.) may lead to deterioration or damage to the internal circuits of the products. Avoid supplies of surge generation and crossed power and signal lines.
- The Card Motor and the controller are not immune to lightning strikes.
- Do not install these products in a place subject to vibration and impact. It will cause damage or malfunction.
- If this product is used to drive a relay or solenoid, please use a voltage surge absorbing element.

3.3 Mounting

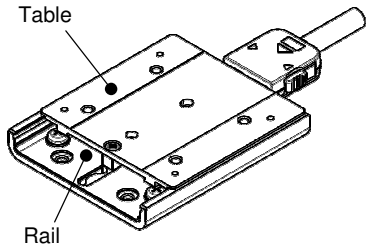
3.3.1 Card Motor

Warning

- The Card Motor contains a strong rare-earth magnet. If magnetized work pieces, tools and metallic parts are brought in the vicinity of the Card Motor, they will be attracted, which could cause injury to operators and damage the equipment. Take special care when handling and operating the product.
- Do not make any alterations or modification to this product.
- When an external guide is used, connect the moving part of the actuator and the load in such a way that there is no jamming at any point along the stroke.

3 Installation (continued)

- Do not use the product until you have verified that the equipment can operate properly.**
After mounting or repair, connect the power supply to the product and perform appropriate functional inspections to check it is mounted properly.
- When mounting a work piece, do not apply impact or large moment to the Card Motor.**
If an external force higher than the allowable moment is applied, it may cause play in the guide part and an increase in the sliding friction or other damage.
- Do not scratch or damage any sliding part by hitting it with an object.**
The components are manufactured to high precision. Therefore even a slight deformation may cause operation failure.
- The flatness of the mounting surface of the table and rail must be 0.02 mm or less.**
Insufficient flatness of the mounting base for the Card Motor, or of a work piece mounted to it can cause play in the guide and an increase in the sliding friction.



Caution

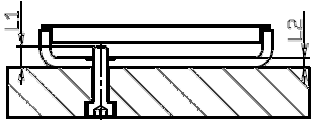
- Mount the Card Motor on a base with good cooling performance, for example a metal plate.**

If the cooling performance is not good enough, the temperature of the Card Motor will increase, which may cause damage.

- Do not apply strong impact or excessive moment while mounting a work piece.**
The product may overheat during operation and a temperature error or failure may occur.
- When mounting the Card Motor, use stainless steel screws with appropriate length and tighten with recommended tightening torque.**
If the maximum screw-in depth is exceeded, it may damage the internal components. Using a tightening torque higher than the specified torque may cause malfunction, and using a lower tightening torque may displace the work piece or cause it to drop off.

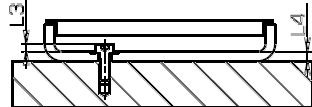
1) Body mounting from the bottom / tapped type

Screw material	SUS
Screw dimensions	M3 x 0.5
Recommended tightening torque [Nm]	0.48 to 0.63
L1 (Maximum screw-in depth) [mm]	4.6
L2 (Plate thickness) [mm]	2.1



2) Body mounting from above / through hole type

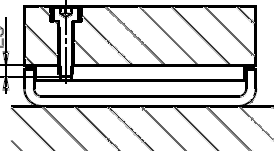
Screw material	SUS
Screw dimensions	M2.5 x 0.45
Recommended tightening torque [Nm]	0.27 to 0.36
L3 (Maximum screw-in depth) [mm]	2.5
L4 (Plate thickness) [mm]	2.1



3 Installation (continued)

3) Work piece mounting / top mounting type

Screw material	SUS
Screw dimensions	M3 x 0.5
Recommended tightening torque [Nm]	0.48 to 0.63
L5 (Maximum screw-in depth) [mm]	2.5



- When connecting the cables, avoid applying any stress to the connector from the cable side.
If an external force or vibration is applied to the connector, damage may result. Do not bend the cable for approximately 20 mm from the connector and fix this part of the cable with a cable fixture.
- Locating of the rail to the mounting surface and locating of the work piece onto the table using the dowel pin holes on the rail and table.

Dowel pin holes for locating the work piece

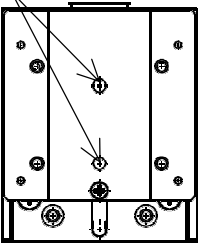
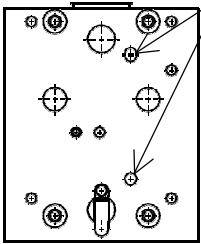


Table side

Dowel pin holes for locating the rail



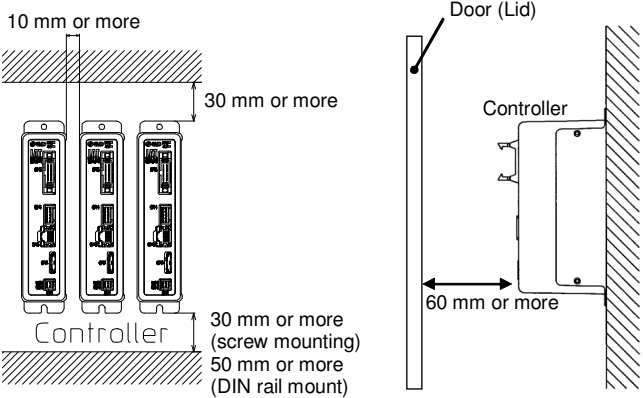
Rail side

3.3.2 Controller



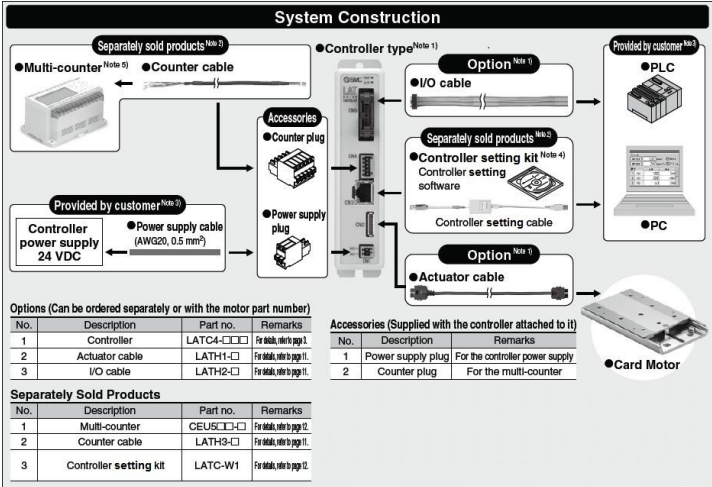
Warning

- Install the controller and its peripheral devices on fireproof material.
Direct installation on or near flammable material may cause fire.
- Do not install these products in a place subject to vibration and impact.
- Do not mount the controller and its peripheral devices on the same base together with a large-sized electromagnetic contactor or circuit breaker (fuse) that generate vibration. Mount them on different base plates, or keep the controller and its peripheral devices away from such sources of vibration.
- Install the controller and its peripheral devices on a flat surface.
If the mounting surface is not flat or uneven, excessive force may be applied to the housing and other parts resulting in malfunction.
- Make the size of the control panel and the installation so that the surrounding temperature of the controller is 40°C or less.
- Mount the controller vertically on the wall with 30 mm or more free space on the top and bottom of the controller as shown below.
- Leave 60 mm or more free space between the front of the controller and the control cabinet door (lid) for inserting and removing connectors.
- Leave enough space around the controllers so that the operating temperature of the controller stays within the specified range.



3 Installation (continued)

3.4 System Construction



Note 1) "Options" such as controller and cables can be added to the How to Order for the main products (Card Motor and Card Motor controller). Refer to How to Order for details.
Note 2) "Separately sold products" cannot be added to the How to Order for the main products (Card Motor and Card Motor controller). These should be ordered separately.
Note 3) Power supply, power supply cables, PLC, and PC should be prepared by the user.
Note 4) These items are used to set the parameters and step data and to perform test operations.
Note 5) These items are used to display the table position and to signal active pre-set positions to external devices via digital outputs when measuring the length.

3.5 Wiring



Warning

- Switch the power supply off before wiring or plugging and unplugging of connectors. Mount a protective cover over the terminals after the wires have been connected.
- Do not route the digital I/O signal and power cables together.
Malfunctions stemming from noise may occur if the digital I/O signal and power cables are routed together.
- Confirm proper wiring before switching the power on.
Incorrect wiring will lead to malfunction or may damage the controller or its peripheral devices. Confirm that there is no miswiring before switching the power on.
- Leave enough space for the routing of the cables
If the cables are forced into unreasonable positions, it may damage the cables and connectors, which may lead to misconnection or short-circuit and result in malfunction. Avoid bending the cables in sharp angles close to the connectors or where they enter the product. Fix the cable as close as possible to the connectors so that mechanical stress cannot be applied to the connectors.

3.6 Grounding



Warning

- Always ground the Card Motor.
- Make sure the product is grounded to ensure the noise tolerance of the controller.
Otherwise it may cause malfunction, damage, electric shock or fire. Do not share the earth with devices or equipment that generate a strong electromagnetic noise.
- Use a dedicated grounding.
Use a D-class grounding. (Ground resistance less than 100Ω.)
- The grounding point should be as close as possible to the actuator, and the ground wires as short as possible.
- In the unlikely event that malfunction may be caused by the ground, it may be disconnected.

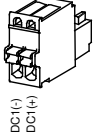
3 Installation (continued)

3.7 Connecting

3.7.1 Power Supply Connector: CN1

The power supply plug is an accessory (supplied with the controller). Use an AWG20 (0.5 mm²) cable for connecting the power supply plug to a 24 VDC power supply.

Power supply plug

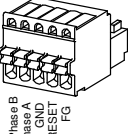


Terminal	Function	Description
DC1(-)	Power supply (-)	Terminal for the negative (-) power supply to the controller.
DC1(+)	Power supply (+)	Terminal for the positive (+) power supply to the controller.

3.7.2 Counter Connector: CN4

The counter plug is an accessory (supplied with the controller). Use the counter cable for connecting the counter to the counter plug.

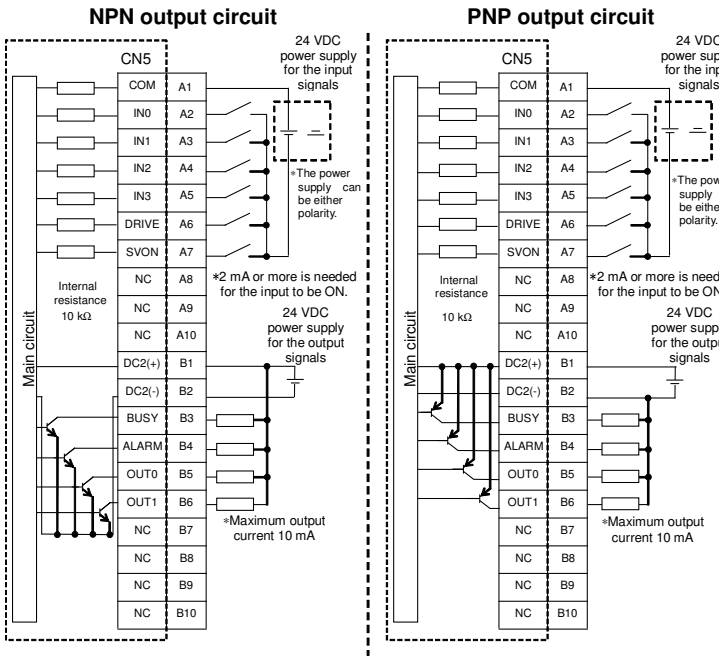
Counter plug



Terminal	Details	Wire colour
Phase B	Connect the phase B wire of the counter cable	White
Phase A	Connect the phase A wire of the counter cable	Red
GND	Connect the GND wire of the counter cable	Light gray
RESET	Connect the Reset wire of the counter cable	Yellow
FG	Connect the FG wire of the counter cable	Green

3.7.3 Parallel I/O connector: CN5

Use the I/O cable to connect a PLC, etc., to the CN5 parallel I/O connector. The wiring is specific to the type of parallel I/O (NPN or PNP). Please refer to the wiring diagrams below for correct wiring of NPN and PNP type controllers.



Input signal details

Name	Details
COM	Connect a 24 VDC power supply for the input signals. (Polarity is reversible.)
IN0 to IN3	Selection of step data number specified by a Bit No. (combinations of IN0 to IN3)
DRIVE	Command to drive the motor
SVON	Command to turn the servo motor ON.
NC	Not connected.

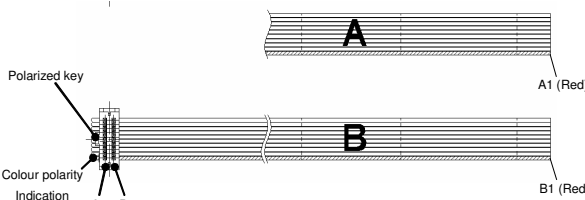
Output signal details

Name	Details
DC2(+)	Connect the 24 V power supply terminal for the output signals
DC2(-)	Connect the 0 V power supply terminal for the output signals
BUSY	ON when the actuator is moving
ALARM	OFF when an alarm has been generated
OUT0~OUT1	OUT0: Default output for the INP (in position) signal. OUT1: Currently not used.
NC	Not connected

Note 1) This output signal is ON when power is supplied to the controller, and OFF when an alarm is generated.
Note 2) The INP signal (OUT0) is turned ON when the actuator comes close to the target position.

3 Installation (continued)

3.8 I/O cable



Parallel I/O Plug Terminal List

Terminal number	Function	Terminal number	Function
A1	COM	B1	DC2(+)
A2	IN 0	B2	DC2(-)
A3	IN 1	B3	BUSY
A4	IN 2	B4	ALARM
A5	IN 3	B5	OUT 0
A6	DRIVE	B6	OUT 1
A7	SVON	B7	NC
A8	NC	B8	NC
A9	NC	B9	NC
A10	NC	B10	NC

3.9 Power Supply



Warning

- Use a power supply with low noise between lines and between power and ground.
In cases where noise is high, use an isolation transformer.
- The power supplies for the controller and for the parallel I/O should be separate, and both power supplies must not be of "inrush-current limited" type.
If the power supply is of "inrush-current limited" type, a voltage drop may occur during the acceleration or deceleration of the actuator.
- Take appropriate measures to prevent surges from lightning.
Ground the surge absorber for lightning separately from the grounding of the controller and its peripheral devices.
- Use the UL-certified products listed below as direct current power supplies.

1) Limited voltage current circuit in accordance with UL508.
A circuit which power is supplied by secondary coil of an insulated transformer that meets the following conditions:

- Maximum voltage (No load):	30 Vrms (42.4 V peak) or less
- Maximum current:	8 A or less (including short circuit)

Limited by circuit protector (such as fuse) with the following ratings.

Voltage without load (V peak)	Maximum current rating (A)
0 to 20 [V]	5.0
Over 20 [V] up to 30 [V]	100 Peak voltage

2) Circuit (class 2) with maximum 30 Vrms (42.4 V peak) or less, which uses class 2 power supply unit in accordance with UL1310 or class 2 transformer in accordance with UL1585 as the power supply.

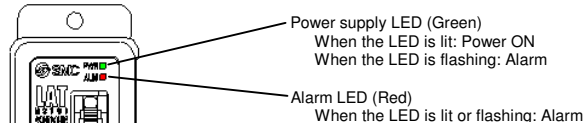
4 Settings

4.1 Setting and operation

In order to move the Card Motor to a specific position, it is necessary to set the operation patterns in the LATC4 controller using a PC with the controller setting software installed, or using the teaching box. The sequence of the step data set in the controller is programmed and controlled using a PLC connected to the controller. Refer to the LATC4 series controller operation manual for details of the step data setting procedure, step data selection using a PLC and operation instructions.

4.2 LED of Controller

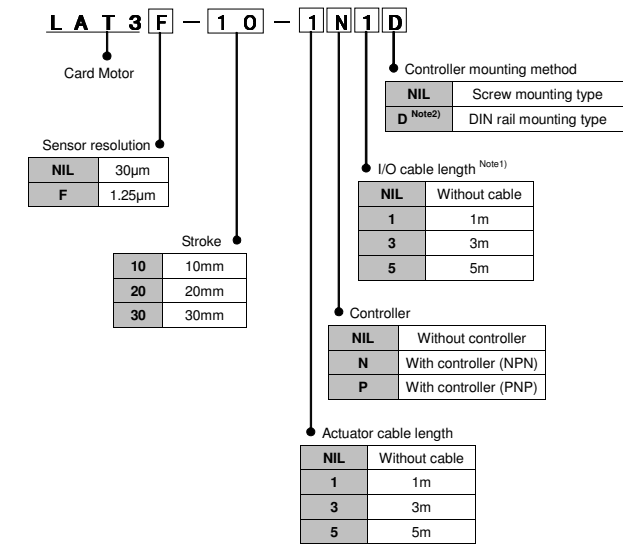
If the LED [ALM] on the front of the controller turns red or flashes, an alarm has been generated. Switch the SVON signal OFF and ON again for at least 2 msec to reset and cancel the alarm after the cause of the alarm has been cleared.



Refer to the LAT3 operation manual for a list of alarm patterns and the causes.

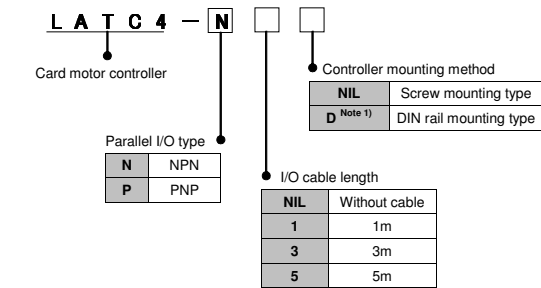
5 How to Order

5.1 Card Motor



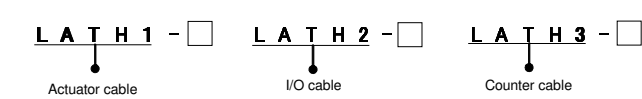
Note 1) If "Without controller" has been selected, the I/O cable is not included.
Note 2) The DIN rail is not included. If the DIN rail is required, please order separately. (Refer to the LAT3 series catalogue for details.)

5.2 Controller



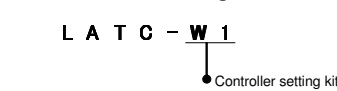
Note 1) The DIN rail is not included. If the DIN rail is required, please order separately. (Refer to the LAT3 series catalogue for details.)

5.3 Cables



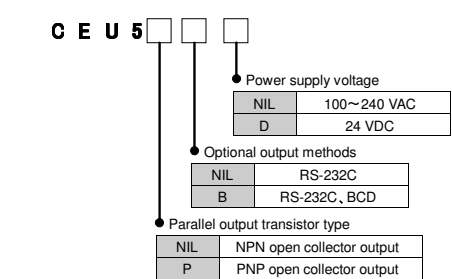
Cable length: [1]: 1 m, [3]: 3 m, [5]: 5 m

5.4 Controller setting kit



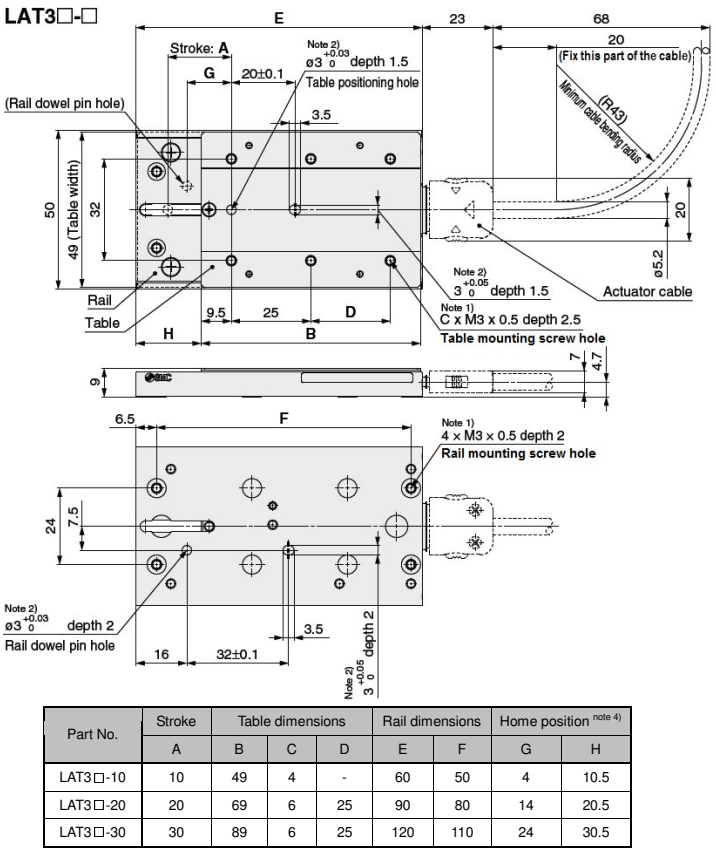
- Contents of kit
 - Controller setting software (CD-ROM)
 - Controller setting cable (Communication cable, conversion unit, USB cable)
- Hardware and operating system requirements
PC/AT compatible computer installed with Windows XP and equipped with USB1.1 or USB2.0 port.

5.5 Multi-Counter



6 Outline Dimensions (mm)

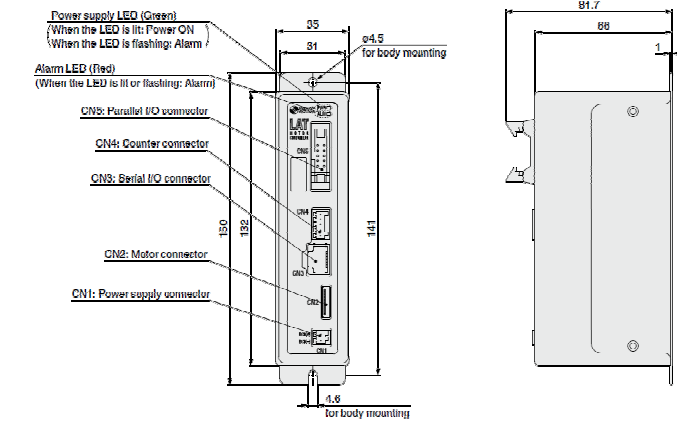
6.1 Card Motor



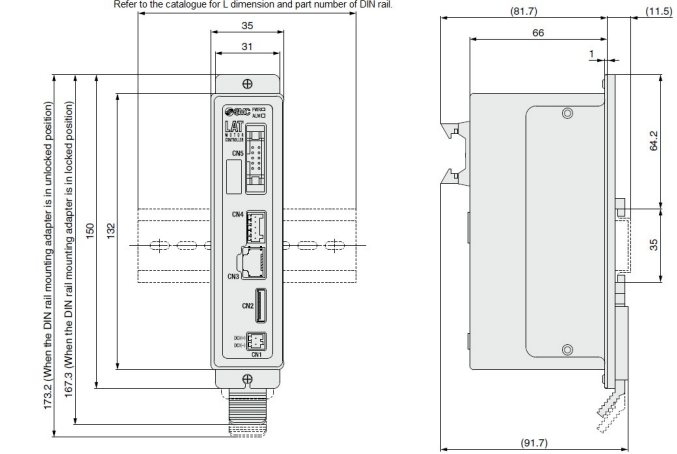
Note 1) See "Mounting screw specifications and tightening torques" in section "3.3 Mounting".
Note 2) The length of the part of the dowel pin inserted into the positioning hole should be shorter than the specified depth.
Note 3) This drawing shows the home position.
Note 4) The G and H home position dimensions are reference values (guidelines).

6.2 Controller

1) Screw mounting type (LATC4-**-)

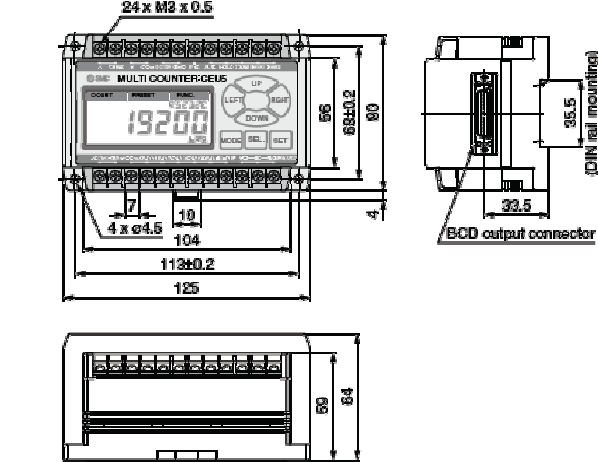


2) DIN rail mounting type (LATC4-**-D)



6 Outline Dimensions (mm) (Continued)

6.3 Multi-Counter



7 Maintenance

7.1 General Maintenance

- Caution**
- Failing to follow proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
 - If handled improperly, machinery and equipment can be dangerous. Maintenance of electromechanical systems should be performed only by qualified personnel.
 - Before performing maintenance, turn off the power supply and be sure there is no accumulated voltage.
 - After installation and maintenance, perform an appropriate functional inspection and test to make sure the equipment is installed correctly.
 - Do not make any modification to the products.
 - Do not disassemble the products, unless required by installation or maintenance instructions.

7.2 Card Motor Maintenance

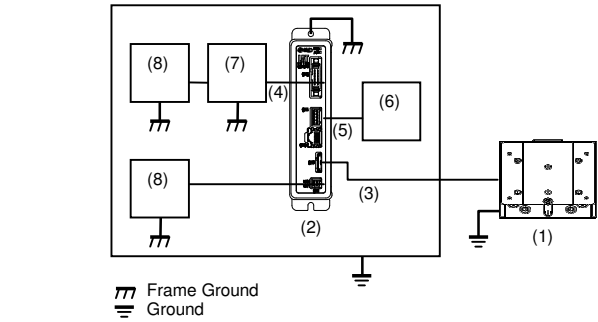
- Warning**
- Before performing installation, wiring and maintenance, check for accumulated voltage using a tester at least 5 minutes after the power supply has been switched off.
- Caution**
- Perform regular maintenance and inspections. Confirm that there is no twisting of wires, play in the table or large sliding friction. This may result in malfunction.
 - Conduct an appropriate functional inspection and test after completed maintenance. Stop operation if a device or equipment does not work correctly. Safety cannot be assured in the event of unexpected malfunction. Conduct a test of the emergency stop to confirm the safety of the equipment.
 - Do not disassemble, modify or repair the products.
 - When the equipment is serviced, first confirm that measures are in place to prevent dropping of driven objects and loss of equipment, etc., and then cut the power supply from the system. Confirm safety before restarting the equipment.
 - Allow sufficient space for maintenance and inspection.

8 CE Directive

8.1 CE Directive

The LA series of actuators, controllers conform to the EU EMC directive, if they are installed in accordance with the following instructions. These components are intended for incorporation into machinery and assemblies forming part of a larger system. The CE compliance was achieved when the above two components were connected as shown in the diagram below. Please note that the EMC changes according to the configuration of the customers control panel and the relationship with other electrical equipment and wiring. Therefore conformity to the EMC directive cannot be certified for SMC components incorporated into the customer's equipment under actual operating conditions. As a result it is necessary for the customer to verify conformity to the EMC directive for the machinery and equipment as a whole.

8 CE Directive (Continued)

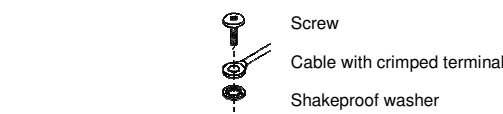


Machinery parts list

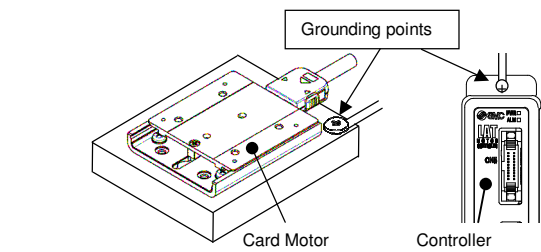
No.	Part name	Part no.
1	Card Motor	LAT3 Series
2	Controller	LATC4 Series
3	Actuator cable	LATH1-*
4	I/O cable	LATH2-*
5	Counter cable	LATH3-*
6	Multi-Counter	CEU5 Series
7	Programmable controller	
8	Switching power supply	

8.1 Grounding

The Card Motor and the Controller must be grounded to shield the actuator and the controller from electric noise, as shown below. The screw and the cable with crimping terminal and shakeproof washer should be prepared separately.



Location of grounding points



9 Limitations of Use

Warning

Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue.

10 Contacts

AUSTRIA	(43) 2262 62280-0	LATVIA	(371) 781 77 00
BELGIUM	(32) 3 355 1464	LITHUANIA	(370) 5 264 8126
BULGARIA	(359) 2 974 4492	NETHERLANDS	(31) 20 531 8888
CZECH REP.	(420) 541 424 611	NORWAY	(47) 67 12 90 20
DENMARK	(45) 7025 2900	POLAND	(48) 22 211 9600
ESTONIA	(372) 651 0370	PORTUGAL	(351) 21 471 1880
FINLAND	(358) 207 513513	ROMANIA	(40) 21 320 5111
FRANCE	(33) 1 6476 1000	SLOVAKIA	(421) 2 444 56725
GERMANY	(49) 6103 4020	SLOVENIA	(386) 73 885 412
GREECE	(30) 210 271 7265	SPAIN	(34) 945 184 100
HUNGARY	(36) 23 511 390	SWEDEN	(46) 8 603 1200
IRELAND	(353) 1 403 9000	SWITZERLAND	(41) 52 396 3131
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