



Electric Actuators Precautions 1

Be sure to read this before handling products.

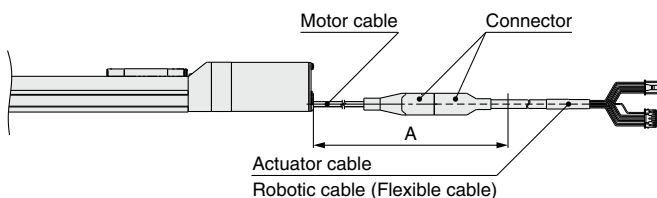
Wiring/Cables

⚠ Warning

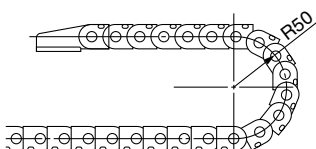
- 1. Adjustment, installation, inspection, or wiring changes should be conducted after the power supply to this product has been turned off.**
Electrical shock, malfunction, or damage can result.
- 2. Never disassemble the cable. Use only the specified cables.**
- 3. Never connect or disconnect the cable or connector with the power on.**

⚠ Caution

- 1. Wiring should be done correctly.**
For each terminal, voltages other than those stipulated in the operation manual should not be applied.
- 2. Connect the connector securely.**
Check for correct connector wiring and polarity.
- 3. Handling noise**
If the noise is at the same wavelength as the signal lines, it will lead to malfunction. As a countermeasure, separate the high and low electrical lines, shorten the length of wiring, etc.
- 4. Do not connect power or high-voltage cables in the same wiring path as the unit.**
The product can malfunction due to noise and surge voltage interference in the signal line from power and high-voltage cables.
Separate the wiring of the controller and its peripheral device from that of power and high-voltage cables.
- 5. Be careful that cables are not caught by actuator movement.**
- 6. Operate with cables such that they are not easily moved.**
Avoid bending cables at sharp angles where they enter the product.
- 7. Avoid twisting, folding, rotating, or applying external force to the cable.**
Electric shock, wire breakage, contact failure, or a loss of product control may occur.
- 8. Do not move cables connected to the actuator.**
The motor and lock cables are not robotic cables and can be broken when moved. Therefore, secure the cables and the connectors (part "A" in the figure below) in place during set up.



- 9. Select a "robotic cable (flexible cable)" when repeated bending of the actuator cable is required. Also, do not put cables into a flexible moving tube with a radius smaller than the specified value (50 mm or longer).**
Electric shock, wire breakage, contact failure, or a loss of product control may occur if "standard cables" are used for repeated bending.



⚠ Caution

- 10. Confirm wiring insulation.**
Insulation failure (interference with other circuits, poor insulation between terminals, etc.) could introduce excessive voltage or current to the controller or its peripheral devices, causing damage to them.
- 11. The speed and force may change depending on the cable length, load, and mounting conditions.**
Furthermore, if the cable length exceeds 5 m, then it will decrease by up to 10% for every additional 5 m. (At 15 m: Reduced by up to 20%)
- 12. When checking the conductivity of the cable, be careful not to deform the connector's mating hole and terminals.**
Inserting a non-compatible connector, tool, cylinder-shaped object, etc., into the connector's mating hole can cause the mating hole or terminals to become deformed, which may cause contact failure or disconnection.
- 13. Refrain from plugging in and unplugging the connector frequently.**
Doing so may result in contact failure or disconnection.

[Transportation]

⚠ Caution

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

Design/Selection

⚠ Warning

- 1. Be sure to read the operation manual (this manual and the one for the controller: LEC series).**
Handling or usage/operation other than that specified in the operation manual may lead to breakage or operation failure of the product.
Any damage attributed to use beyond the specifications is not covered by the warranty.
- 2. There is a possibility of dangerous sudden action by the product if the sliding parts of the machinery are twisted due to external forces, etc.**
In such cases, human injury may occur, such as by hands or feet getting caught in the machinery, or damage to the machinery itself may occur. Design the machinery so as to avoid such dangers.
- 3. A protective cover is recommended to minimize the risk of personal injury.**
If a driven object and the moving parts of the product are in close proximity, personal injury may occur. Design the system to avoid contact with the human body.
- 4. Securely tighten all stationary parts and connected parts so that they will not become loose.**
When the product operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.
- 5. Consider a possible loss of power source.**
Take measures to prevent injury and equipment damage in the event of a power source failure.
- 6. Consider emergency stops.**
Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, such as a power outage or a manual emergency stop.



Electric Actuators Precautions 2

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Design/Selection

⚠ Warning

7. Consider the whole system.

Design the system so that human injury or equipment damage will not occur upon the restart of operation of the whole system.

8. Never disassemble the product or make any modifications, including additional machining.

Doing so may cause human injury and/or an accident. It may also cause the deterioration of the product's performance.

9. Do not use the stop signals, the "EMG" of the controller and the stop switch on the teaching box, as the emergency stop of the system.

The stop signals, "EMG" of the controller and the stop switch on the teaching box, are for decelerating and stopping the actuator. Design the system with an emergency stop circuit which applies to the relevant safety standards separately.

10. When using the product vertically for applications, it is necessary to install a built-in safety device.

The table may fall due to the weight of a workpiece. The safety device should not interfere with the normal operation of the machine.

⚠ Caution

1. Operate within the limits of the maximum usable stroke.

The product will be damaged if it is used with a stroke which exceeds the maximum stroke. Refer to the specifications of the product.

2. When the product repeatedly cycles with partial strokes, operate it at a full stroke at least once a day or every 1000 strokes.

Otherwise, lubrication may run out.

3. Do not use the product in applications where excessive external force or impact force is applied to it.

The product can be damaged. The components, including the motor, are manufactured to precise tolerances. Even a slight deformation may cause a malfunction or seizure.

4. During operation (positioning operation or pushing operation), it cannot be returned to the origin position.

5. Refer to the Auto Switches Precautions (pages 15 to 19) if an auto switch is to be built in and used.

6. Step motor (servo/24 VDC) and servo motor (24 VDC) specifications with the following model number are not compliant with UL Standards: "Controller/Driver type: Without controller/driver (Nil)."

Individual actuators are not certified as UL Standards compliant products.

7. When UL Standards compliance is required, the electric actuator and controller/driver should be used with a UL1310 class 2 power supply.

8. Do not exceed the product specifications even if a work load is supported by external guides.

Although the actuator moment is reduced by external guides, the required transport ability (the relationship between the speed and the work load) is not reduced.

Mounting

⚠ Warning

1. Keep the manual in a safe place for future reference.

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

2. Observe the tightening torque for screws.

Tighten the screws to the recommended torque for mounting the product.

3. Do not make any alterations to this product.

Alterations made to this product may lead to a loss of durability or damage to the product, which can lead to human injury or damage to other equipment and machinery.

Mounting

⚠ Warning

4. When connecting, make sure the rod axis and the load, and the direction of the movement match.

Failure to do so may cause complications with the lead screw, such as wear or damage.

5. When an external guide is used, connect the moving parts of the actuator and the load in such a way that there is no interference at any point within the stroke.

Do not scratch or dent the sliding parts of the product tube, piston rod, etc., by striking or grasping them with other objects. The components are manufactured to precise tolerances. Even a slight deformation may cause a malfunction or seizure.

6. Prevent the seizure of rotating parts (pins, etc.) by applying grease.

7. Do not use the product until you confirm 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.

8. When one side is fixed

When an actuator is operated at a high speed with one end fixed and the other free (basic, flange, or direct mount types), a bending moment may act on the actuator due to the vibration generated at the stroke end, which can damage the actuator. In such a case, install a mounting bracket to suppress the vibration of the actuator body, or reduce the speed so that the actuator does not vibrate. Also, use a mounting bracket when moving the actuator body or when a long stroke actuator is mounted horizontally and fixed at one end.

9. Do not apply strong impact or an excessive moment while mounting the product or a workpiece.

If an external force over the allowable moment is applied, it may cause play in the guide or an increase in the sliding resistance.

10. Maintenance space

Reserve sufficient space for maintenance.

Handling

⚠ Warning

1. Do not touch the motor during operation.

The surface temperature of the motor can increase to approx. 80°C due to operating conditions. The temperature may also increase due to energization. As it may cause burns, do not touch the motor when in operation.

2. If abnormal heating, smoking, fire, etc., occurs in the product, immediately shut off the power supply.

3. Stop operation at once if there are abnormal noises or vibrations.

Abnormal noises or vibrations may mean that the product is not properly mounted, and if allowed to continue in this state, damage to the equipment may occur.

4. Never touch the rotating parts of the motor while in operation.

5. Before installing, adjusting, inspecting, or performing maintenance on the product, controller, and related equipment, be sure to shut off the power supply. Then, lock it so that no one other than the person working can turn the power on, or implement measures such as a safety plug.

6. In the case of an actuator that has a servo motor (24 VDC), the motor phase detection step is conducted by inputting the servo's on signal just after the controller power is turned on. The motor phase detection step moves the table/rod the distance of the one screw-lead as the maximum.

(The motor rotates in the reverse direction if the table/rod hits an obstacle such as the end stop damper.) Take the motor phase detection step into consideration when installing and operating this actuator.



Electric Actuators Precautions 3

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Handling

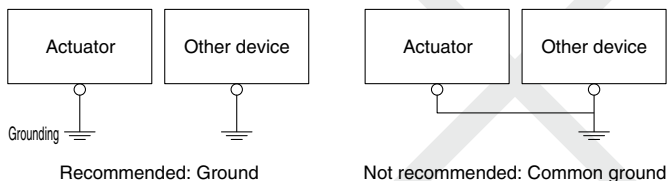
⚠ Caution

1. **Keep the controller and the actuator combined as delivered for use.**
The actuator's parameters are set at the time of shipment. If it is combined with a different set of parameters, failure can result.
2. **Conduct the following inspection before operation.**
 - a) Confirm that the power supply line and each signal line is not damaged.
 - b) Confirm that the power supply line and each signal line is not loosened.
 - c) Confirm that the electric actuator/cylinder/controller/driver is not mounted loosely.
 - d) Confirm that the electric actuator/cylinder/controller/driver is operating correctly.
 - e) Confirm the function of the emergency stop of the whole system.
3. **If several persons are to be working conjointly, determine the procedure, signs, measures against abnormality, and restarting measures in advance. Then, have someone else, supervise the work.**
4. **The product may operate at a speed different from the set speed depending on the load and resistance.**
When selecting a product, check the catalog for instructions regarding selection and specifications.
5. **Do not apply a load, impact, or resistance in addition to the transferred load during the return to origin.**
If the product is made to return to origin by pushing force, a displacement of the origin position may occur.
6. **Do not remove the name plate.**
7. **Operation tests should be done at a low speed. Start operation by predefined speed after confirming there are no problems.**
8. **Do not apply forces of impact, collision, or resistance to the moving parts of an actuator in operation.**
Doing so will cause a decrease in product life, damage to the product, etc.

[Grounding]

⚠ Warning

1. **Be certain to ground the actuator.**
2. **Dedicated grounding should be used.**
Grounding should be to a D-class ground. (Ground resistance of 100 Ω or less.)
3. **Grounding should be performed near the actuator to shorten the grounding distance.**
4. **The cross-sectional area of this wire shall be a minimum of 2 mm².**
5. **Avoid common grounding with other devices.**



[Unpackaging]

⚠ Caution

1. **Check that the received product is as ordered.**
If a product different from the one ordered is installed, injury or damage can result.

Operating Environment

⚠ Warning

1. **Avoid use in the following environments.**
 - a. Areas with large amounts of dust or cutting chips that could enter the product
 - b. Areas where the ambient temperature exceeds the specified range (Refer to the specifications.)
 - c. Areas where the ambient humidity exceeds the specified range (Refer to the specifications.)
 - d. Areas with corrosive gas, flammable gas, sea water, water, or steam that could adhere to the product
 - e. Areas where strong magnetic or electric fields are generated
 - f. Areas where direct vibration or impact shock is applied to the product
 - g. Areas where there are large amounts of dust or there is exposure to water/oil droplets

Operating Environment

⚠ Warning

- h. Areas that are exposed to direct sunlight (ultraviolet rays)
 - i. Areas at altitudes of over 1000 m
Heat radiation performance and withstand voltage may decline as a result. For details, consult with SMC.
2. **Do not use in an environment where the product is directly exposed to liquid, such as cutting oils.**
If cutting oil, coolant, or oil mist adheres to the product, failure or increased sliding resistance can result.
 3. **Install a protective cover when the product is used in an environment directly exposed to foreign matters, such as dust, cutting chips, and spatter.**
Looseness or increased sliding resistance can result.
 4. **Shade the product from direct sunlight.**
 5. **In locations near heat sources, block them off.**
When there is a heat source surrounding the product, the radiated heat from the heat source can increase the temperature of the product beyond the operating temperature range. Protect it with a cover, etc.
 6. **Levels of the base oil of grease may decrease due to the external environment and operating conditions, causing a decline in lubrication performance and a shortened life of the product.**

[Storage]

⚠ Warning

1. **Do not store the product in a place in direct contact with rain or water drops or where it is exposed to harmful gas or liquid.**
2. **Store in an area that is shaded from direct sunlight and has a temperature and humidity within the specified range (−10°C to 60°C and 35 to 85% no condensation or freezing).**
3. **Do not apply vibration or impact to the product during storage.**

Maintenance

⚠ Warning

1. **Do not disassemble or repair the product.**
Fire or electric shock can result. Contact SMC if the disassembly of the product is required for maintenance.
2. **Before modifying or checking the wiring, the voltage should be checked with a tester 5 minutes after the power supply has been turned off.**
Failure to do so may result in electrical shock.

⚠ Caution

1. **Perform maintenance and inspection according to the procedures indicated in the operation manual.**
Improper handling can cause an injury, damage, or the malfunction of equipment and machinery.
2. **Removal of equipment**
Before equipment is removed, first confirm that measures are in place to prevent the dropping or runaway of driven objects, etc. Proceed only after cutting off the electric power. When starting up again, proceed with caution after confirming that conditions are safe.
3. **Be sure to cut the power to the controller and disconnect the electric actuator cable before moving the electric actuator slider manually by hand.**
If the slider is moved with the electric actuator and controller still connected, the induced voltage of the motor will go to the controller, making it difficult to move the electric actuator smoothly. Moreover, frequently moving the electric actuator slider may result in controller damage or malfunction due to the induced voltage.

[Lubrication]

⚠ Caution

1. **The product has been lubricated for life by the manufacturer and does not require any further lubrication.**
When lubrication is applied, special grease must be used. Please read the maintenance manual of each actuator.



Electric Actuators Precautions 4

Be sure to read this before handling products.

Actuator with Lock

Warning

1. Do not use the lock as a safety brake or as a control that requires a locking force.

The lock used for the product with lock is designed to prevent the dropping of workpieces.

2. For vertical mounting, use the product with lock.

If the product is not equipped with a lock, the product will move and drop the workpiece when the power is removed. Please ensure that your safe equipment designs include measures to prevent the falling of workpieces.

3. “Drop prevention” is a safety precaution that prevents a workpiece from dropping due to its weight when the product operation is stopped and the power supply is turned off.

4. Do not apply an impact load or strong vibration while the lock is activated.

If an external impact load or strong vibration is applied to the product, the lock will lose its holding force and damage to the sliding parts of the lock or a reduced service life may result. The same adverse effects may also occur when the lock slips due to a force exceeding the holding force, as this accelerates the wear of the lock.

5. Do not apply liquid, oil, or grease to the lock or the area surrounding it.

When liquid, oil, or grease are adhered to the sliding parts of the lock, its holding force will reduce significantly. Any changes in lock sliding performance and condition may cause a lock release malfunction.

6. Take measures against drops and check that safety is assured before the mounting, adjustment, and inspection of the product.

If the lock is released with the product mounted vertically, a workpiece can drop due to its weight.

7. When the actuator is operated manually (when the SVRE output signal is off), supply 24 VDC to the [BK RLS] terminal of the power supply connector.

If the product is operated without releasing the lock, the wearing of the lock sliding surface will be accelerated, causing a reduction in the holding force and the life of the locking mechanism.

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

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

9. The actuator may be unable to unlock when the sliding part for locking reaches its life due to the rotation sliding of the shoe during operation. When the lock mechanism reaches its life, please contact SMC sales office for the replacement parts.

The sliding part for locking may make noise during operation, but this is normal.



Electric Actuators Precautions 5

Be sure to read this before handling products.

Controller (Including Driver) and Peripheral Devices

Design/Selection

Warning

- 1. Be sure to apply the specified voltage.**
Otherwise, malfunction or breakage may occur. If the applied voltage is lower than the specified voltage, it is possible that the load will not be able to be moved due to an internal voltage drop of the controller. Please check the operating voltage before use.
- 2. Do not operate the product beyond the specifications.**
Otherwise, a fire, malfunction, or actuator damage may result. Please check the specifications before use.
- 3. Install an emergency stop circuit.**
Please install an emergency stop outside of the enclosure so that the system operation can be stopped immediately and the power supply can be intercepted.
- 4. In order to prevent any damage caused by the breakdown or malfunction of the controller and its peripheral devices, a backup system should be established in advance by giving a multiple-layered structure or a fail-safe design to the equipment, etc.**
- 5. If a danger of human injury is expected due to abnormal heat generation, smoking, ignition, etc., of the controller and its peripheral devices, cut off the power supply of the product and the system immediately.**

Caution

- 1. Use an actuator with the lock option if the actuator will not be mounted horizontally for use.**
Burnout of the internal parts of the controller may occur. If the actuator is not equipped with a lock, it will move and drop the workpiece when the power and servo are turned OFF.

Handling

Warning

- 1. Do not touch the inside of the controller and its peripheral devices.**
Doing so may cause an electric shock or damage to the controller.
- 2. Do not perform the operation or setting of the product with wet hands.**
Doing so may cause an electric shock.
- 3. Products with damage or those missing any components should not be used.**
An electric shock, fire, or injury may result.
- 4. Use only the specified combination between the electric actuator and controller.**
Failure to do so may cause damage to the actuator or the controller.
- 5. Be careful not to be hit by workpieces while the actuator is moving.**
It may cause an injury.
- 6. Do not connect the power supply or power on the product before confirming the area to which the workpiece moves is safe.**
The movement of the workpiece may cause an accident.
- 7. Do not touch the product when it is energized and for some time after power has been disconnected, as it is very hot.**
Doing so may lead to a burn due to the high temperature.

Handling

Warning

- 8. Before installation, wiring, and maintenance, the voltage should be checked with a tester 5 minutes after the power supply has been turned off.**
Otherwise, an electric shock, fire, or injury may result.
- 9. Static electricity may cause malfunction or break the controller. Do not touch the controller while power is supplied.**
When touching the controller for maintenance, take sufficient measures to eliminate static electricity.
- 10. Do not use the product in an area where dust, powder dust, water, chemicals, or oil is in the air.**
It will cause failure or malfunction.
- 11. Do not use the product in an area where a magnetic field is generated.**
It will cause failure or malfunction.
- 12. Do not install the product in an environment containing flammable gas, explosive gas, or corrosive gas.**
It could lead to fire, explosion, or corrosion.
- 13. Radiant heat from strong heat sources, such as a furnace, direct sunlight, etc., should not be applied to the product.**
It will cause failure of the controller or its peripheral devices.
- 14. Do not use the product in an environment subject to a temperature cycle.**
It will cause failure of the controller or its peripheral devices.
- 15. Do not use the product in a place where surges are generated.**
When there are units that generate a large amount of surge around the product (e.g. solenoid type lifters, high-frequency induction furnaces, motors, etc.), this may cause deterioration or damage to the product's internal circuit. Avoid sources of surge generation and crossed lines.
- 16. Do not install the product in an environment under the effect of vibrations and impacts.**
It will cause failure or malfunction.
- 17. When a surge-generating load, such as a relay or solenoid valve, is driven directly, use a product that incorporates a surge absorption element.**
- 18. The power supplies should be separated between the controller power and the I/O signal power, and both power supplies must not be of the "inrush-current limited" type.**
If the power supply is of the "inrush-current limited" type, a voltage drop may occur during the acceleration or deceleration of the actuator.



Electric Actuators Precautions 6

Be sure to read this before handling products.

Controller (Including Driver) and Peripheral Devices

Installation

Warning

- 1. Install the controller and its peripheral devices on a fire-proof material.**
Direct installation on or near a flammable material may cause a fire.
- 2. Do not install the product in a place subject to vibrations and impacts.**
It will cause failure or malfunction.
- 3. Do not mount the controller and its peripheral devices together with a large-sized electromagnetic contactor or no-fuse breaker, which generate vibration, on the same panel. Mount them on different panels, or keep the controller and its peripheral devices away from such a vibration source.**
- 4. Install the controller and its peripheral devices on a flat surface.**
If the mounting surface is distorted or uneven, an unacceptable force may be added to the housing, etc., causing problems.
- 5. Take measures to ensure that the operating temperatures of the controller and its peripheral devices are within the range of the specifications. Also, the controller should be installed with spaces between its sides and the other structures or components.**
Failure to do so may cause the malfunction of the controller and its peripheral devices or a fire.

Power Supply

Caution

- 1. Use a power supply that has low noise between lines and between the power and ground.**
In cases where noise is high, an isolation transformer should be used.
- 2. To prevent lightning surges, appropriate measures should be taken. Ground the surge absorber for lightning separately from the grounding of the controller and its peripheral devices.**

Grounding

Warning

- 1. Be sure to carry out grounding in order to ensure the noise tolerance.**
- 2. Dedicated grounding should be used.**
Grounding should be to a D-class ground. (Ground resistance of 100 Ω or less)
- 3. Grounding should be performed near the controller and its peripheral devices to shorten the grounding distance.**
- 4. In the unlikely event that a malfunction is caused by the ground, please disconnect it.**

Wiring

Warning

- 1. Do not apply any excessive force to cables, such as repeated bending, tensioning, or placing a heavy object on the cables.**
It may cause an electric shock, fire, or the breaking of a wire.
- 2. Connect wires and cables correctly.**
Incorrect wiring could break the controller or its peripheral devices depending on the seriousness.
- 3. Do not connect wires while power is being supplied.**
It may cause the controller to break or its peripheral devices could be damaged, causing a malfunction.
- 4. Do not carry the product by holding its cables.**
It may cause an injury or damage to the product.
- 5. Do not connect power or high-voltage cables in the same wiring path as the unit.**
The product can malfunction due to noise and surge voltage interference in the signal line from the power and high-voltage cables.
Separate the wiring of the controller and its peripheral devices from that of the power and high-voltage cables.
- 6. Confirm wiring insulation.**
Insulation failure (interference with other circuits, poor insulation between terminals, etc.) could introduce excessive voltage or current to the controller or its peripheral devices and damage them.

Maintenance

Warning

- 1. Perform a maintenance and inspection periodically.**
Confirm wiring and screws are not loose.
Loose screws or wires may cause unintentional malfunction.
- 2. Conduct an appropriate functional inspection after completing the maintenance and inspection.**
At times where the equipment or machinery does not operate properly, conduct an emergency stop of the system. Otherwise, an unexpected malfunction may occur and it will become impossible to ensure safety. Conduct a test of the emergency stop in order to confirm the safety of the equipment.
- 3. Do not disassemble, modify, or repair the controller and its peripheral devices.**
- 4. Do not put anything conductive or flammable inside of the controller.**
It may cause a fire.
- 5. Do not conduct an insulation resistance test or withstand voltage test on this product.**
- 6. Ensure sufficient space for maintenance activities.**
Design the system allowing the required space for maintenance and inspection.