

## TO USE THE LINEAR SERVO MOTOR SAFELY (FOR MOTORS)

Always read this book before using the equipment.

**B**

Thank you for choosing this Mitsubishi Linear Servo Motor. This guide gives handling information and precautions for using the servo motor. Incorrect handling may cause an unexpected fault. Before using the servo motor, please read this book and corresponding installation guide carefully to use the equipment to its optimum. Please forward this book and corresponding installation guide to the end user.

### ● Safety Instructions ●

(Always read these instructions before usage.)

Be sure to peruse all this guide and attached documents before the drive and maintenance and the check. After that, use these correctly. Use it after the motor is skilled of the knowledge of the equipment, information on safety, and all of notes.

In this guide, the safety instruction levels are classified into "WARNING" and "CAUTION".

**⚠ WARNING** Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

**⚠ CAUTION** Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury or may cause physical damage.

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

\* In this guide, the "product" indicates the primary side or secondary side of the linear servo motor.

#### 1. General instructions:

##### ⚠ WARNING

- The person involved in handling, including storage, installation, maintenance and disposal, should be the engineer who possesses adequate knowledge of the linear servo motor.
- Due to the magnetism of the permanent magnet, not only the workers but also the machine and device operators must be fully careful. Due consideration should be given to keep persons fitted with medical equipment, such as pacemakers, away from the product.
- As the permanent magnet of the secondary side generates the force of attraction in magnetic substances, take care to prevent accidents, e.g. not to get your hands caught.
- Keep iron and other magnetic substances away from the product.
- When handling the product, do not wear any metal, such as watches, piercing and necklaces.
- Use non-magnetic tools when installing the product and its peripheral structures.
- Do not leave the product (primary side or secondary side) unattended.
- When the product is not securely fixed to a machine/device, store it in the package properly.
- If you have felt anything unusual in the product, immediately stop operating it.

##### ⚠ CAUTION

- Do not modify the product or give it a shock.
- Do not climb or put heavy objects on the product.
- Wire the product correctly and securely.
- Especially for the power cable, securely fix the terminal or connector.
- Perform wiring after installing the product to a machine/device.
- The transportation, storage and operating environments should be under the specified conditions.
- Work with dry hands.

#### 2. To prevent electric shock

##### ⚠ WARNING

- Ground (earth) the product securely.
- The person involved in wiring and inspection should be an expert engineer.
- Wire the product after installing it. To prevent an electric shock.
- Operate the switches with dry hands. To prevent an electric shock.
- Do not damage, stress, load, or pinch the cables. Otherwise, you may get a electric shock.

#### 3. To prevent injury

##### ⚠ CAUTION

- The linear servo motor uses a strong magnet on the secondary side. Accordingly, not only the linear motor installers but also machine operators should be fully careful. For example, keep persons using medical equipment, such as pacemakers, away from the machine.
- Apply only the voltage specified in the Instruction Manual to each terminal. Otherwise, about, damage etc, may occur.
- Connect the terminals correctly. Failure to do so can cause a burst, damage, etc.
- Ensure that polarity (+, -) is correct. Failure to do so can cause a burst, damage, etc.
- The product may be hot during power-on or for some time after power-off. Take safety measures, e.g. provide covers, to prevent accidental access of your hands and parts (such as cables) to the product. Otherwise, it can cause a burn or damage to the parts.
- Never touch the movable parts of the product during operation. Otherwise, it can cause injury.

#### 4. To prevent fire

##### ⚠ CAUTION

- Install the linear motor (primary side) on a noncombustible. Installing it directly on or close to a combustible can cause a fire.
- If the servo amplifier has failed, switch power off at the power supply side input of the amplifier. Otherwise abnormally large currents flow continuously, causing a fire.

#### 5. Additional instructions

##### (1) Transportation and storage

##### ⚠ WARNING

- Transport/store the linear servo motor, with the product contained correctly in a package.
- Otherwise the permanent magnet built-in the secondary side can generate the force of magnetic attraction between the product and magnetic substances, e.g. iron, causing unexpected accidents or faults.
- When transporting/storing the product, mark "Strong magnet - Handle carefully", for example, on a package or storage shelf to urge people around to be careful.
- Do not use a deformed package.

##### ⚠ CAUTION

- When the product has a lifting eyebolt, use the eyebolt only for product transportation. Do not use the eyebolt to transport the product with the product installed on the machine.
- Do not hold the cable when transporting the product.
- Do not drop the product or give it a strong shock.
- Transport, storage and operate the product under the following conditions.

Environment		Conditions	
Storage temperature	[°C]	-15 to +70 (non-freezing)	
	[°F]	5 to 158 (non-freezing)	
Storage humidity		90%RH or less (non-condensing)	
Ambience		Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt	
Vibration	[m/s <sup>2</sup> ]	49	
	[ft/s <sup>2</sup> ]	161	
Altitude		Max. 1000m (3280 ft) above sea level	

- Do not modify the product or give it a shock.
- Do not climb or put heavy objects on the product.
- When lifting the product with a hoisting attachment or similar tool, do not give impact and stress to the molded areas.
- Note the following points when storing the product for an extended period of time (three or more months as a guideline).
- Always store the product indoors and in a clean, dry place.
- When storing the product in a dusty or damp place, take such a step as covering the whole product.
- Reconsider the storage method if the insulation resistance of the winding decreases.
- Rust may form depending on the storage conditions or storage period, although the product is rust-proofed with paint or anticorrosive oil before shipment from the factory. When storing the product for longer than six months, apply anticorrosive oil again to especially the machined surfaces.
- Be sure to store the product in the specified vertical orientation.
- Do not stack more products than the specified.

#### (2) Installation and wiring

##### ⚠ WARNING

- The person involved in installation should be the engineer who possesses adequate knowledge of the linear servo motor.
- Keep such equipment as pacemakers and watches away from the product as they may be damaged or malfunction due to the magnetism of the permanent magnet.
- Keep iron and other magnetic substances away from the product.
- When installing the product, do not wear any metal, such as watches, piercing and necklaces.
- Use **non-magnetic tools** when installing the product and its peripheral structures.
- Do not leave the product (primary side or secondary side) unattended.
- When the product is not securely fixed to a machine/device, store it in the package properly.
- If you have felt anything unusual in the product, immediately stop using it.
- When you work with other people, switch power on after making sure that no one is within the moving area of the product. Also, take measures to prevent the product from moving if any one is within the moving area, e.g. provide interlocks.
- The motor does not produce a holding force with power off. For vertical lift applications, therefore, take drop prevention measures as there is a risk of dropping.

##### ⚠ CAUTION

- Install the product in a load-bearing place in accordance with the Instruction Manual.
- Connect the output side cable (terminals U, V, W) correctly, on the linear servo motor run abnormally.
- Do not connect a commercial power supply directly to the linear servo motor, or a failure can be caused.
- Be sure to install the product in the correct orientation.
- Do not install or operate the product that is damaged or lacking any parts.
- Do not modify the product or give it a shock.
- Do not climb or put heavy objects on the product.
- Wire the product correctly and securely.
- Especially for the power cable, securely fix the terminal or the connector.
- Perform wiring after installing the product to a machine/device.
- Completely remove iron powder and similar substances that have stuck to the product during installation.
- Do your work with dry hands.
- Install the product under the following environmental conditions.

Environment		Conditions	
Storage temperature	[°C]	0 to +40 (non-freezing)	
	[°F]	32 to 104 (non-freezing)	
Ambient humidity		80%RH or less (non-condensing)	
Ambience		Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt	
Vibration	[m/s <sup>2</sup> ]	49	
	[ft/s <sup>2</sup> ]	161	
Altitude		Max. 1000m (3280 ft) above sea level	

#### (3) Test run and adjustment

##### ⚠ CAUTION

- Before starting operation, check or adjust the parameter settings. Improper settings may cause some machines to operate unexpectedly.
- The parameter settings must not be changed excessively, or it will make operation instable.

#### (4) Usage

##### ⚠ CAUTION

- Install an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- Do not disassemble or repair the product.
- Do not modify the product.
- Use a noise filter, etc. to minimize the influence of electromagnetic interference, which may give may give electromagnetic interference to electronic equipment used near the servo amplifier.
- Use the servo motor with the specified servo amplifier.

#### (5) Corrective action

##### ⚠ CAUTION

- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.

#### (6) Maintenance and inspection

##### ⚠ WARNING

- The person involved in maintenance, inspection and product replacement should be the engineer who possesses adequate knowledge of the linear servo motor.
- Keep such equipment as pacemakers and watches away from the product as they may be damaged or malfunction due to the magnetism of the permanent magnet.
- Completely switch power off before starting maintenance, inspection or production replacement.
- Keep iron and other magnetic substances away from the product.
- When performing maintenance, inspection or production replacement, do not wear any metal, such as watches, piercing and necklaces.
- Use **non-magnetic tools** when installing the product and its peripheral structures.
- Do not leave the product (primary side or secondary side) unattended.
- Especially when replacing the secondary side, strictly follow the procedure, e.g. put the removed one in a package securely, then take a new secondary product out of its package, and install it.
- If there are magnetic substances around the product, take safety measures to prevent such accidents as pinching by the force of attraction of the secondary side.
- When you work with other people, switch power on after making sure that no one is within the moving area of the product. Also, take measures to prevent the product from moving if any one is within the moving area, e.g. provide interlocks.
- The motor does not produce a holding force with power off. For vertical lift applications, therefore, take drop prevention measures as there is a risk of dropping.

#### (7) Disposal

##### ⚠ WARNING

- The person involved in disposal should be the engineer who possesses adequate knowledge of the linear servo motor.
- Keep such equipment as pacemakers and watches away from the product as they may be damaged or malfunction due to the magnetism of the permanent magnet.
- Keep iron and other magnetic substances away from the product.
- When disposing of the product, do not wear any metal, such as watches, pierced earrings, earrings and necklaces.
- Use non-magnetic tools when disposing of the product.
- Do not leave the product (primary side or secondary side) unattended.
- Dispose of the primary side in accordance with the following "About processing of waste".
- Dispose of the secondary side in accordance with the following "About processing of waste" after heating it at higher than 300°C for demagnetization.

### ● About processing of waste ●

When you discard linear servo motors, and other option articles, please follow the law of each country (area).

##### ⚠ FOR MAXIMUM SAFETY

- This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to forestall serious accidents when it is used in facilities where a breakdown in the product is likely to cause a serious accident.