

2.6 Mechanical Hazards

WARNING



Mechanical hazard!

Danger from moving parts with possible risk of death or very serious injuries.

- ▶ Make sure all precautions have been taken.
- ▶ Never go into the travel range of a linear drive on an unsecured machine.

3 Product Information

- Moog flat linear motors of L3S, L3SK, LNS series are supplied in form of active parts (built-in motors). The air-cooled L3S and liquid-cooled L3SK represents an ironcore linear motors, while LNS utilizing ironless design. In both cases those motors are consisting from primary parts with motor winding and secondary parts with permanent magnets (magnet tracks).

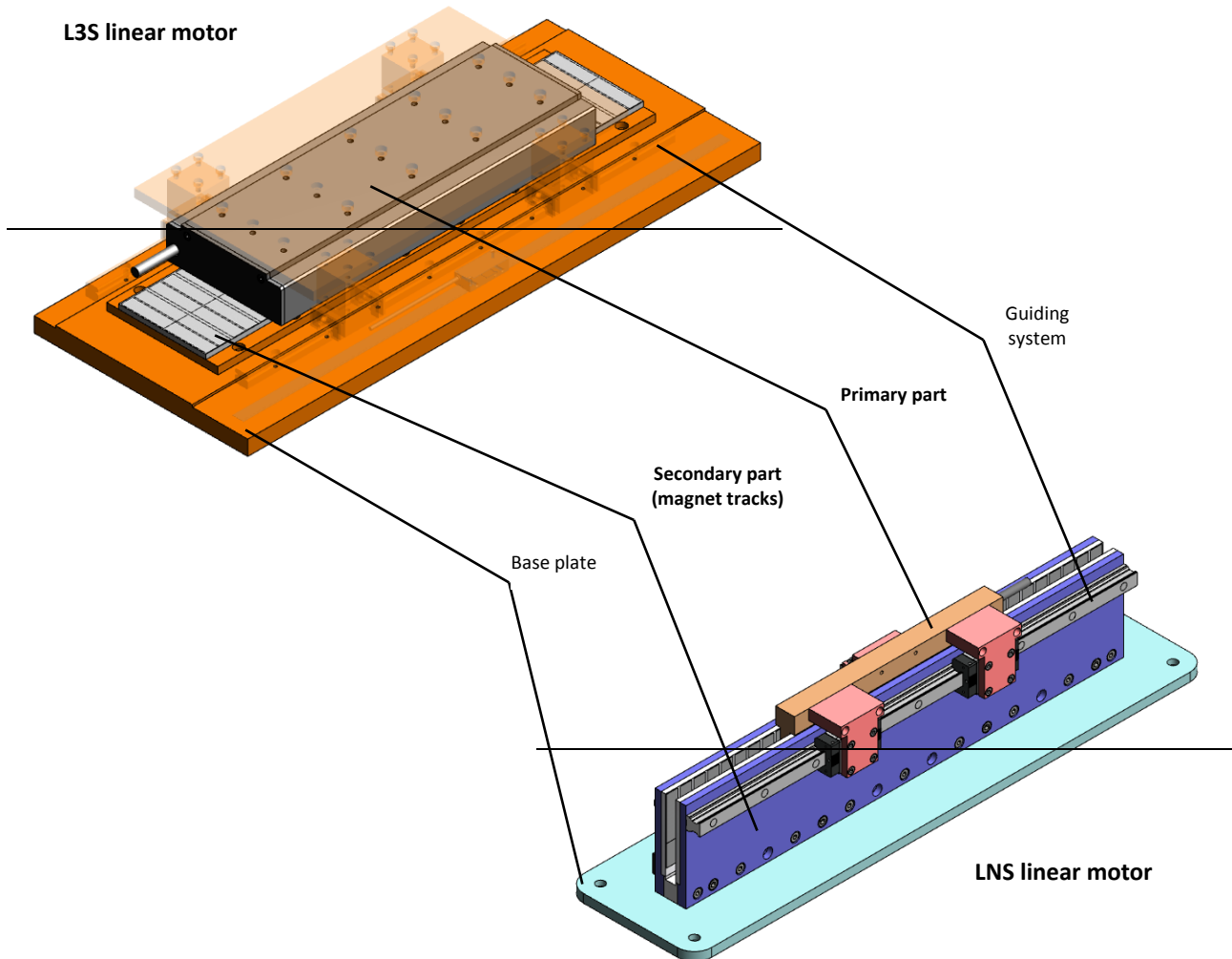


Figure 2: Basic parts of L3S and LNS linear motors

- All Moog linear motors comply with 2014/30/EC (Low voltage directive) and 2014/35/EC (EMC Directive) directives, 2011/65/EU (RoHS) and related harmonized standards.
- Moog linear motors of L3S, L3SK and LNS series are designed and manufactured in accordance with strict CE standards, using rugged components with proven reliability in harsh thermal and shock load environments.
- CE certified

3.1 Intended Use

The motors in our product range are intended exclusively for commercial systems. They comply with the applicable standards and regulations. Serious personal injury and property damage can result from:

- Improper use
- Incorrect installation or operation

The technical data and information on the nameplates or in the product-specific data sheets for the motors form the basis for the proper commissioning of the motors. All instructions must be followed at all times.

Warranty and claims for defects: For related information, please check Conditions of Purchase of Moog Brno.

3.2 Manufacturer Name and Address

The following table shows all the information regarding the manufacturer:

Info	Description
Moog Company	Moog Brno s.r.o.
Address	Mostecká 992/26, 614 00 Brno, Czech Republic
Phone	+420 545 551 111
Fax	+420 545 551 222
E-Mail	info.czech@moog.com
Web Site	http://www.moogbrno.cz

Table 2: Manufacturer name and address

3.3 Authorized Representative for the EU

The following table shows all the information regarding the authorized representative in the EU and Switzerland:

Info	Description	
Moog Company	Moog GmbH Niederlassung Griesheim	Moog Brno s.r.o.
Address	Wiesenstraße 6 DE-64347 Griesheim Germany	Mostecká 992/26 614 00 Brno Czech Republic
Phone	+49 6155 7974 21-0	+420 545 551 111
Fax	+49 6155 7974 21-22	+420 545 551 222
E-Mail	info-vsm@moog.com	info.czech@moog.com
Web Site	http://www.moog-servo.de	http://www.moogbrno.cz

Table 3: Authorized Representative for the EU and Switzerland

4 Shipment and Storage

Please check the contents of each delivery are as ordered and that no damage has occurred during transit. Any problems should be immediately addressed to a Moog representative with a description of the fault or damage.

CAUTION


Danger of personal injury and damage to property!

Failure to observe these safety procedures could result in personnel injury or equipment damage.

- ▶ Do not forget to observe the safety signs on the motor.

4.1 Transport and Storage


⚠ WARNING



Heavy weight!
Danger during lifting and transporting procedures!

- ▶ Improper handling, unsuitable or defective devices, tools etc. can cause injuries and/ or property damage. Lifting devices, ground conveyors and lifting tackle must respond to all relevant regulations.

⚠ WARNING



Magnetic hazard!

- ▶ In storage areas, the secondary parts must be marked with a warning label ("CAUTION! STRONG MAGNETS!")
- ▶ Secondary parts must not be stored without a protective cover - it is always necessary to use special non-magnetic packaging from the manufacturer with prescribed electromagnetic gap.
- ▶ When transporting machines or machine parts with integrated primary and secondary parts, it must be ensured that these parts do not move freely relative to each other.

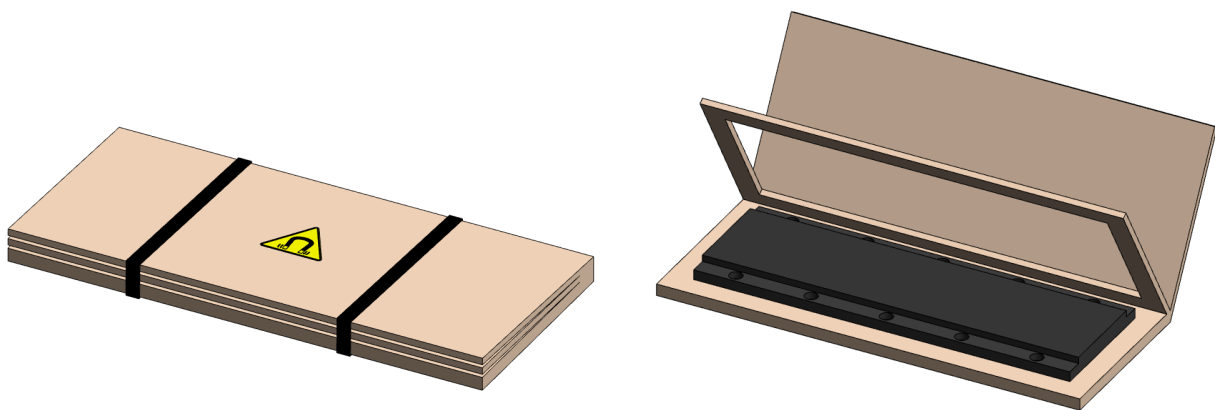


Figure 3: Special non-magnetic packaging of secondary parts

In case of intermediate storage, observe the following storage conditions:

- Recommended ambient temperature: +15 to +25°C (+60 to +78°F),
- Permissible temperature: 0 to +70°C (+32 to +158°F), temperature fluctuation: < 10°C (18°F) per day.
- Relative humidity: < 65 % non-condensing is recommended, 90 % is permissible.
- Ensure there are minimal vibration and shock where servo motors are stored.

NOTICE**Damage due to dirt, moisture**

Storage outside or under the wrong climatic conditions can cause corrosion and other damage to the servo motor. Condensation due to temperature fluctuations can result in electronic malfunctions.

 **CAUTION****Air transportation**

Please note that air transportation of secondary parts must be in accordance with appropriate IATA Packing Instructions.

Corresponding certificate to ensure such a transportation will be issued by manufacturer upon customers request.

6.3 Liquid Cooled Motors (L3SK)

Liquid cooled motors must have a proper closed loop cooling circuit. The cooling medium has to be composed from desalted and demineralized water chemically neutral and with the addition of anti-corrosion agent. Such products must be compatible with all the components of the circuit.

CAUTION

Do not connect the cooling system to a regular water line!

Using regular, untreated water can cause severe damage to the cooling system and it is to be avoided in any circumstance.

For additional conditions, refer to the following notes:

- Maximal water inlet pressure (< 1 min) $P_{max} = 1 \text{ MPa}$ (10 Bar)
- Rated water inlet pressure $P_n = 0,5 \text{ MPa}$ (5 Bar) max.
- Minimal water flow and minimal pressure drop: listed in the catalogue or relevant datasheet (varies according to motor, size)
- PH-value: 6,5 to 7,5
- The recommended water hardness is 0,7 mmol/l. If cooling water does not meet this parameter, plasticizers should be used

The use of inhibitors to prevent corrosion in aluminum is strongly recommended. The ratio of anticorrosive agent (25%) to water (75%) should not be exceeded, otherwise a reduction in performance may occur.

Alternatively, other coolant can be used, such as water-glycol antifreeze, various coolant oils, etc. In this case, however, reduced performance is to be expected. The specific derating is determined by calculation after consultation with the manufacturer.

A constant monitoring of cooler flow is recommended.

Inlet cooling media temperature must be between 5° and 25°C to avoid condensation inside of the motor; in any case the inlet coolant temperature must be higher than the motor frame temperature of at least 2°C

Before activating the motor, make sure the cooling circuit is completely filled and leak free.

CAUTION

Risk of damage!

Note that connection to the cooling circuit must be provided with use of flexible hosing. Otherwise there is a risk of motor damage.

Take extra care when handling with liquid cooled motors. Careless handling can easily cause damage of the connection fitting.

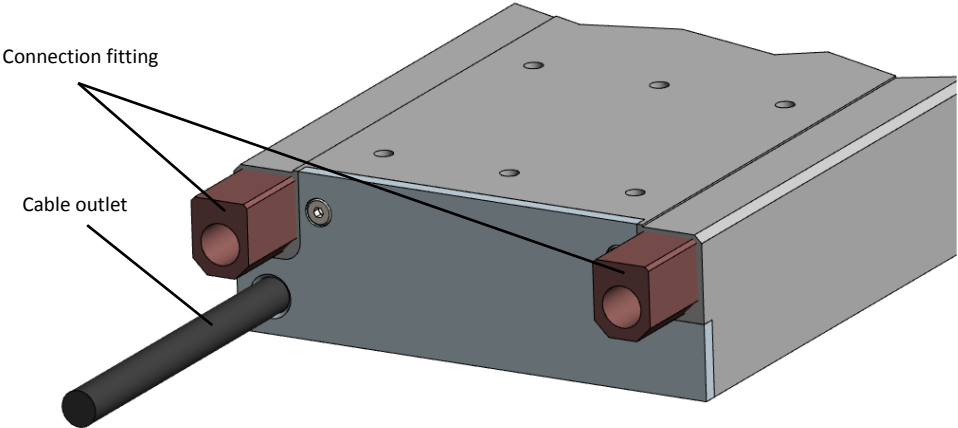



Figure 6: Position of liquid cooling connection points

7 Electrical Interfaces

For the correct connection, it is best to use the cable characteristics indicated by Moog. When using non-Moog components, the cable specifications must be fulfilled in every way.

⚠ WARNING	
	<p>Hazardous voltage!</p> <ul style="list-style-type: none"> ▶ Always make sure that there are no exposed cables. ▶ Only use appropriate power cables - electrical connection of linear motors must be provided with use of special cables intended to be used for dynamic applications. ▶ Corresponding support for those cables (e.g. with use of energy chains) must be ensured.

Connection and disconnection of the motors must be made with the controller switched off. Simply disabling the controller is not sufficient. During installation, special attention should be paid to the diameter of the protective earth (PE) conductor, which must be sized according to legal safety rules.

We recommend shielding cables. The shielding should be connected to earth at both ends.

7.1 Cables

The electrical connection of linear motors is performed with using of free cable ends. For specific wiring schematic, please check the relevant documentation or contact the manufacturer.

The cable outlet is configurable. In the standard version, the cable outlet is placed parallel to x-axis, but other variants (y and z-axis) are also possible.

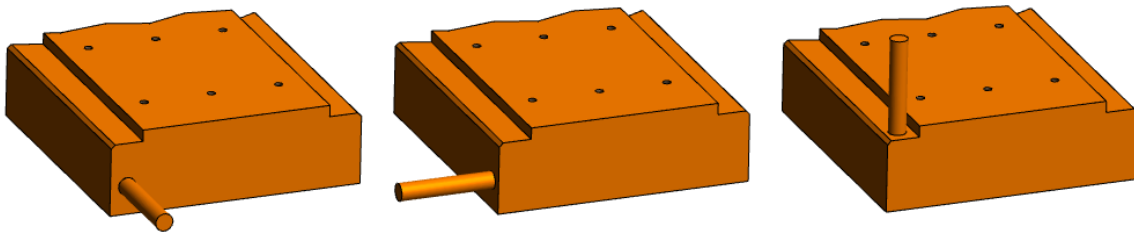


Figure 7: Cable outlet variants in x, y and z-axis

EMC

For compliance with Directive 2014/30/EC (EMC), and for correct system operation, used cables must be shielded (minimum cover 85%). Cable shielding must be connected to ground on both ends using a radio frequency connection (i.e. 360°). The cables and cable shields must be connected in accordance with the EMC requirements of the used drive.

NOTICE
<p>Small wire diameters can lead to an unacceptable heating of the cable. This might result in a power loss to the motor, proportionally more severe as the cable length increases.</p>

8 Maintenance

WARNING



Electrical hazard!

In case of motor disassembly, make sure that all electrically powered parts of the motor, windings and any accessory device which otherwise may lead to fatal injury is safely disassembled.

WARNING



Mechanical hazard!

Danger from moving parts with possible risk of death or very serious injuries.

- ▶ Make sure all precautions have been taken.
- ▶ Never go into the travel range of a linear drive on an unsecured machine.

WARNING



Magnetic hazard!

Due to the presence of permanent magnets on the surface of magnet tracks (secondary parts), special care must be taken when maintenance of those parts and related machine parts.



- ▶ In case of an accident, respectively to release of body parts (fingers, hands, foot etc.) stuck between two magnetic components, always have at least two wedges made of solid non-magnetic material (e.g. stainless steel or hardwood) with an apex angle between 10 and 15 ° and a hammer (approx. 3 kg, made from solid non-magnetic material).
- ▶ Do not place metal objects (e.g. work tools) near the secondary parts.
- ▶ Avoid spontaneous (uncontrolled) movement of primary and secondary parts due to the magnetic forces.

NOTICE

Because of product liability issues any motor damage should be repaired by Moog. Non-Moog staff may be unable to comply with safety rules (e.g. VDE guidelines) and Moog quality standards.

NOTICE

Each time the motor is disassembled, the phasing of the encoder system must be done properly by, or with assistance from, authorized Moog personnel.

Observe the following prescriptions:

- Follow the instructions of the guiding system supplier.
- Make sure that the guide surfaces are clean.
- Check for bearing noise and vibrations during normal operation at regular intervals.
- Keep the motor clean in order to ensure free ventilation flow for cooling.
- Check that the motor is not noisy during operation and vibration does not exceed standard levels.
- To detect and correct any irregularities at early stages it is recommended to carry out an inspection after the first 50/75 operation hours.
- For liquid cooled motors (L3SK) it is recommended to periodically clean and check the cooling circuit. The use of cleaning products and/or deposit removers has to be subjected to preventive verification of compatibility with the used materials of the primary and secondary parts (polyurethane), and with all the components of the circuit.

NOTICE

Risk of damage!

Keep the air gap clean. If dirt occurs in this area, there is a risk of damage of the machine.

If there is a risk of ferromagnetic particles (metal chips and sawdust), it is necessary to provide the machine path with protective covers along the entire stroke length.

Linear motor must be operated in accordance with its technical specification. Otherwise, it may be damaged.

9 Troubleshooting

Problem	Cause	Action
Motor does not start	Wrong connections	Check the connections of the motor.
	Mechanical failure	Check that the mechanics coupled to the linear motor allow free movement.
	Parameters	Check the parameter settings of the drive system.
	Overload	Reduce the load or contact application engineer for more details.
	Parameters	Check the parameter settings of the drive system.
Motor does not reach the rated speed	Overload	Reduce the load or contact application engineer for more details.
	Connections	Check connections on the motor and drive side.
Motor runs in wrong direction	Overload	Reduce the load or contact application engineer for more details.
Motor overheats	Wrong connections	Check that no phase is incidentally open or grounded.
	Harmonic distortion	High harmonic distortion in the frequency converter output is not allowed.
Vibrations or loud noise	Misalignment	Check the correct alignment of the motor and load. Ignoring misalignment can cause serious damage.

10 Motor Disposal

In accordance with directive 2012/19/EC electronic devices are "special waste" (WEEE) and must be subjected to treatment and professional elimination.

Moog motors may contain environmentally regulated materials, such as lead solder and circuit boards. It is the user's sole responsibility to dispose of the motors in accordance with specific local and national regulations. Be sure to send the material to authorized disposal facilities under controlled conditions. If it is possible to recycle the component materials, always do so with the support of authorized professionals.

10.1 What to Do if Repairs Are Required?

The servo motor can be repaired only by Moog; opening of the motor will void the warranty.

For warranty as well as post-warranty repairs please follow the procedure described below:

- Perform all required procedures for safely placing out of service your motor and re-send it to the address of the manufacturer (with the original packing material if available).
- All parts such as carriages, feedback sensors, components of guiding system etc. not fitted by Moog should be removed because Moog cannot guarantee a correct disassembly.
- Moog would appreciate a detailed failure or breakdown report attached to the delivery paperwork. "**For Repair**" should be clearly stated on the delivery note.
- After the motor has been received a complete analysis will be performed by our technicians. During this process, Moog may request details about the operating conditions (duty cycle, loading forces, etc.) from the customer.
- Based on the performed analysis, a repair proposal is issued, together with a price calculation for labor and material, (if the motor is not repairable, a commercial proposal for its replacement can be issued).
- If the repair proposal is approved, the motor is repaired and sent back to the customer.

WARNING



Magnetic hazard!

- ▶ For transportation of secondary parts back to the manufacturer please use original protective cover if available. If it is not available use the similar way of packaging like the one described in chapter 4.1. to prevent any risk related to presence of magnetic field.
- ▶ Transported secondary parts must be marked with a warning label ("CAUTION! STRONG MAGNETS!")



MORE PRODUCTS. MORE SUPPORT.

Moog designs a range of motion control products to complement those featured in this document. Moog also provides service and support for all of our products. For more information, contact the Moog facility closest to you.

Australia
+61 3 9561 6044
Service + 61 3 8545 2140
info.australia@moog.com
service.australia@moog.com

Brazil
+55 11 3572 0400
info.brazil@moog.com
service.brazil@moog.com

Canada
+1 716 652 2000
info.canada@moog.com

China
+86 21 2893 1600
Service +86 21 2893 1626
info.china@moog.com

Czech Republic
+420 545 551 111
info.czech@moog.com

France
+33 1 4560 7000
Service +33 1 4560 7015
info.france@moog.com
service.france@moog.com

Germany
+49 6155 7974 21-0
info-vsm@moog.com

Hong Kong
+852 2 635 3200
info.hongkong@moog.com

India
+91 80 4057 6666
Service +91 80 4057 6604
info.india@moog.com
service.india@moog.com

Ireland
+353 21 451 9000
info.ireland@moog.com

Italy
+39 010 96 7200
info.casella@moog.com
service.italy@moog.com

Japan
+81 46 355 3767
info.japan@moog.com
service.japan@moog.com

Korea
+82 31 764 6711
info.korea@moog.com
service.korea@moog.com

Luxembourg
+352 40 46 401
info.luxembourg@moog.com

Russia
+7 8 31 713 1811
Service +7 8 31 764 5540
info.russia@moog.com
service.russia@moog.com

Singapore
+65 677 36238
Service +65 651 37889
info.singapore@moog.com
service.singapore@moog.com

South Africa
+27 12 653 6768
info.southafrica@moog.com

Spain
+34 902 133 240
info.spain@moog.com

Sweden
+46 31 680 060
info.sweden@moog.com

Turkey
+90 216 663 6020
info.turkey@moog.com

United Kingdom
+44 (0) 1684 858000
Service +44 (0) 1684 278369
info.uk@moog.com
service.uk@moog.com

USA
+1 716 652 2000
info.usa@moog.com
service.usa@moog.com

www.moog.com/industrial

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