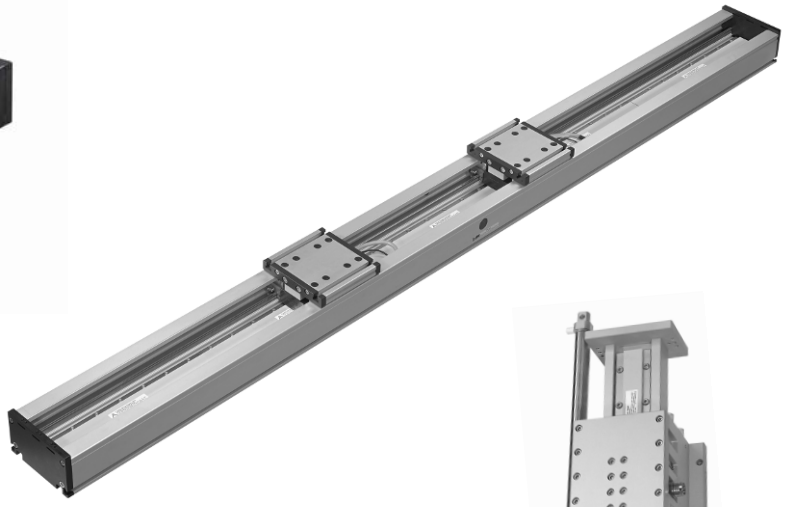
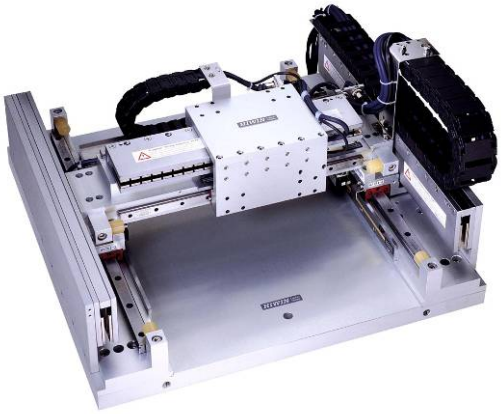
HIWIN®
Lineartechnologie





Assembly Instructions
for LMS, LMF and LMC Linear Motor Components and LMX, LMH, LMV and LMG linear motor axes and linear motor axis systems LMX..., LMH..., LMV..., LMG...

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Contents

1 Information about the document

These assembly instructions are aimed at planners, developers and operators of systems into which the linear motor axis is to be integrated. They are also intended for people who perform the following tasks:

- Transportation
- Assembly
- Electrical connection including connection to the higher-level control system
- Integration into a security system
- Retrofitting or upgrading
- Setup
- Putting into operation
- Operation
- Cleaning
- Maintenance
- Troubleshooting and error elimination
- Shutdown, disassembly and disposal

1.1 Applicability of these assembly instructions

These assembly instructions are intended for HIWIN linear motor axes with the following product designations:

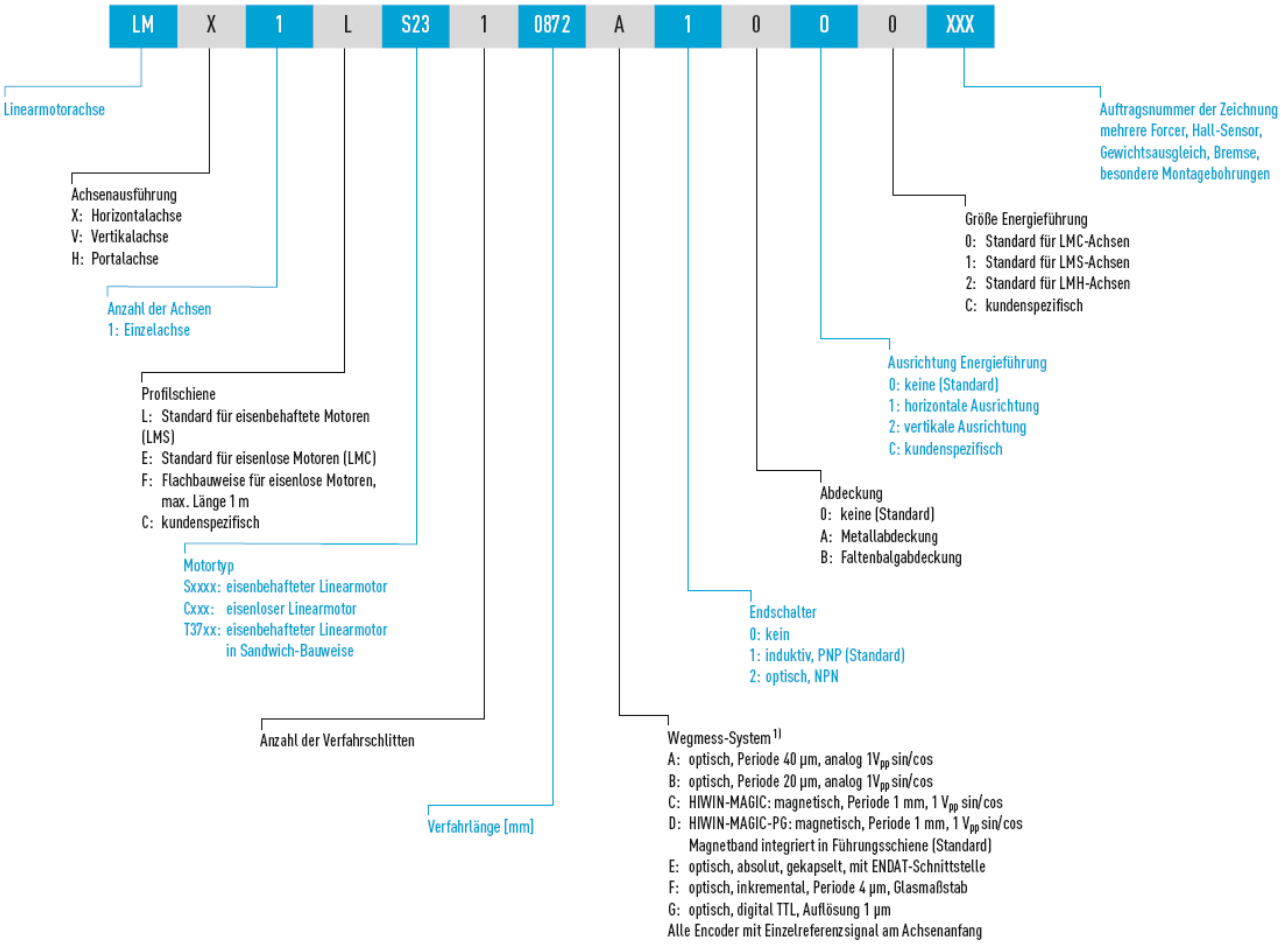
Linear motor	Type
LMS	13, 17, 23, 27, 37, 37L, 47, 47L, 57, 57L, 67, 67L
LMF	01, 02, 03, 11, 12, 13, 14, 21, 22, 23, 24, 31, 32, 33, 34, 41, 42, 43, 44
LMC	A2, A3, A4, A5, A6, B2, B3, B4, B5, B6, B7, B8, BA, C7, C8, D4, D6, D8, DA, E4, E6, E8, EA, EC

Linear motor axis	Type
LMX1E-	CB5, CB6, CB8
LMX1L-	S23, S27, S37, S37L, S47, S47L, S57, S57L, S67, S67L F01, F02, F03, F11, F12, F13, F14, F21, F22, F23, F24, F31, F32, F33, F34, F41, F42, F43, F44
LMX1L-	T37, T37L, T37D, T37LD
LMV1L-	S13, S23
LMH1L-	S13, S17, S23, S27, S27D, S47L, S47LD

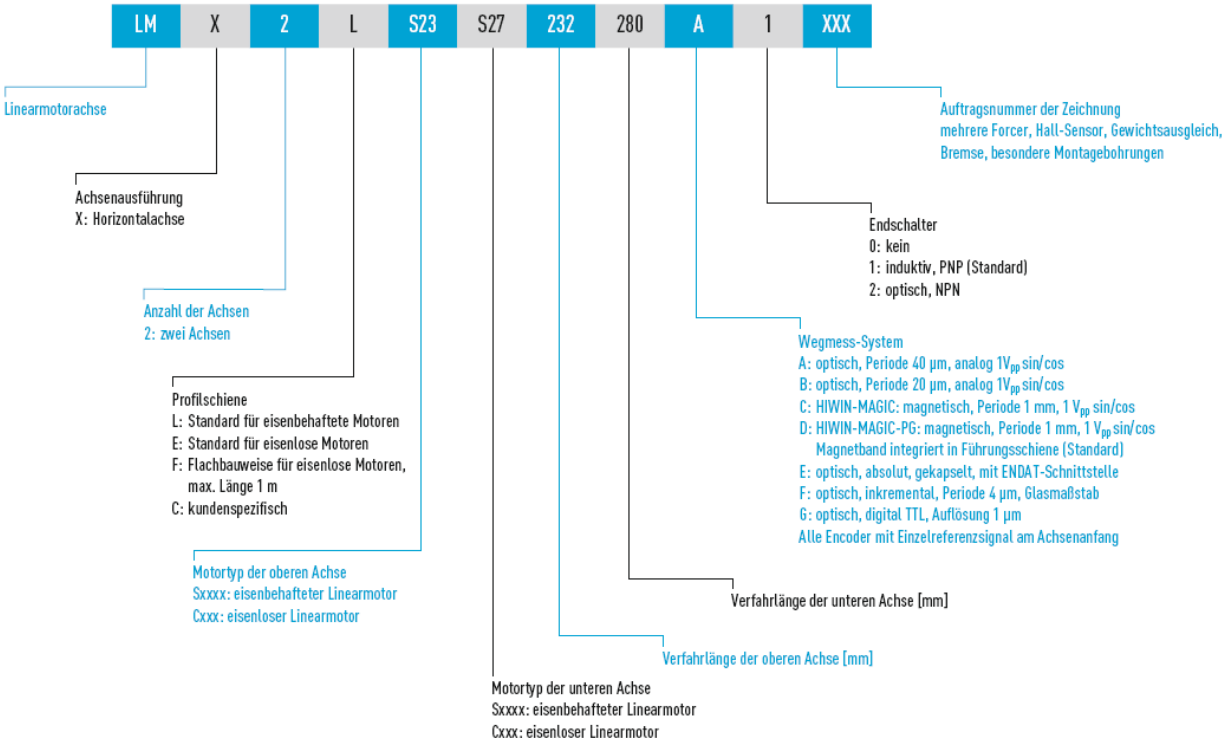
These assembly instructions are also applicable when two or more of the linear motor axes listed above are combined with each other or operated as a multi-axis system.

1.2 Type codes

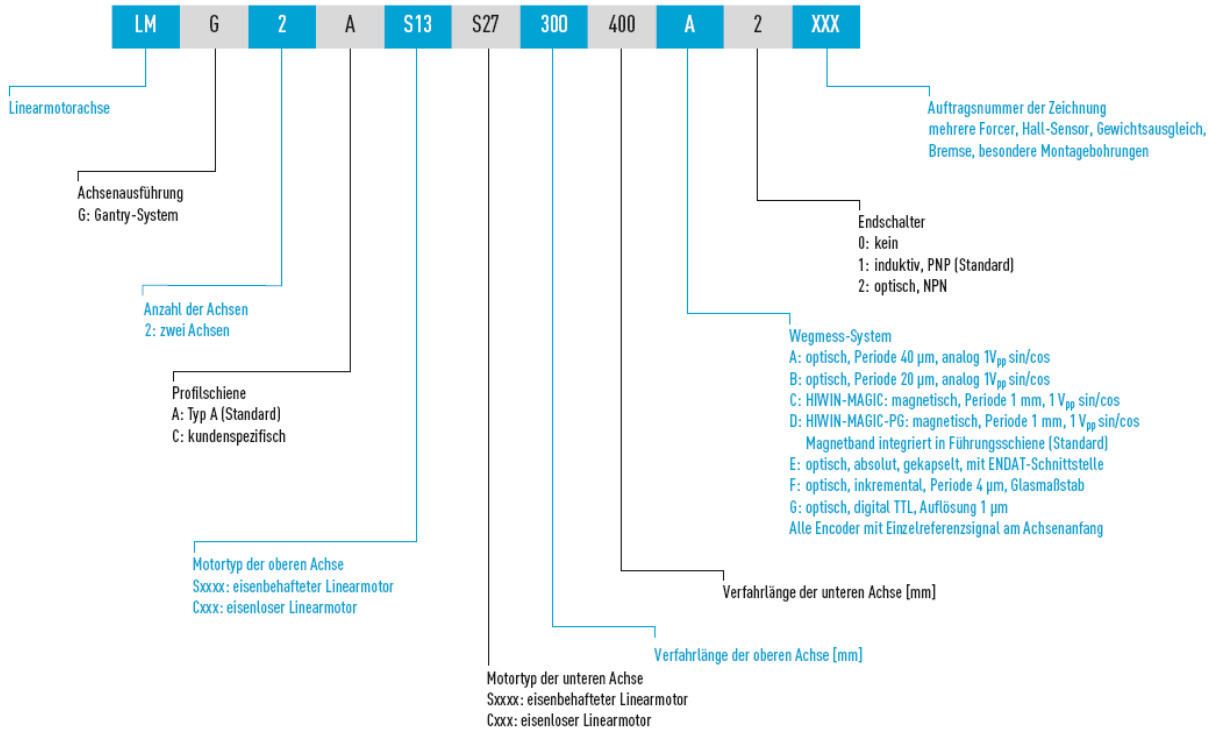
1.2.1 Type codes for individual axes



1.2.2 Type codes for compound tables



1.2.3 Type codes for gantry systems



1.3 Symbols used

WARNING
Warnings serve to protect people against concrete or possible dangers to life and health. It is absolutely imperative that warnings are heeded.

NOTE

NOTE
Notes are provided to protect the linear motor axis or other system components or to provide hints for the efficient design of work processes.

INFO
Info offer helpful additional information on the linear motor axis or its environment.

Work instructions are marked with the checklist symbol. The actions described must be carried out and adhered to in the sequence given.

2 Safety

This chapter is for the safety of all those who spend time in the vicinity of the linear motor axis and assemble, install, connect, operate, service or disassemble the equipment.

2.1 Proper use

The linear motor axis is a linear drive and guidance system for the exact, time-controlled positioning of permanently mounted loads such as system components in an automated system.

The linear motor axes LMX1 and LMH1 are designed for installation and operation in a horizontal position and therefore do not have a holding brake in the standard design. If installed vertically, a holding brake or a weight balance, or both, must be retrofitted. The loads being moved need to be permanently affixed to either the forcer or the end plates.

The LMV1 linear motor axes are designed for vertical installation and operation and are equipped with a pneumatic weight balance as standard. A holding brake can be integrated as an option. The loads being moved need to be permanently affixed to either the forcer or the end plates.

The linear axes can be fitted together to form multi-axis systems.

The linear motor axes described here must not be used outdoors or in hazardous areas where there is a risk of explosions.

All linear motor axes must be used exclusively as described.

2.2 Exclusion of liability in the event of alterations or improper use

No alterations of any kind may be made to the linear motor axes unless they are described in these assembly instructions. If it is necessary to change the design, please contact the manufacturer.

The manufacturer accepts no liability in the event of modifications or improper assembly, installation, putting into operation, operation, maintenance or repair.

Only original parts from HIWIN may be used as spare parts and accessories. Spare parts and accessories not supplied by HIWIN are not tested for operation with HIWIN linear motor axes and may jeopardize operational safety and reliability. The manufacturer accepts no liability for damage caused as a result of using non-approved spare parts and accessories.

2.3 Experienced personnel

The linear motor axis may only be assembled, integrated in higher-level systems, put into operation, operated and maintained by experienced personnel. Experienced is anyone who

- has suitable technical training;

and

- has been trained to operate the machine by the machine operator, received instruction in the applicable safety guidelines from the machine operator and can assess the risks to be expected;

and

- has read and understood these assembly instructions in their entirety and has access to them at all times.

2.4 General safety information

The following safety information must be heeded. Anyone disregarding this safety information is jeopardizing health and safety.

- Before and during all assembly, disassembly or repair work, the linear motor axis must be switched to zero current and it must be ensured that the power supply cannot be restored by other persons; otherwise, there is a danger of death and injury.
- The linear motor axes must not be used in hazardous areas where there is a risk of explosion.
- The linear motor axes must only be deployed and operated indoors.
- Linear motor axes must always be operated in combination with grounded safety devices (non-contact safety devices, mechanical safety devices); these safety devices must be designed, installed and checked on a regular basis in line with the applicable national and international laws and regulations.
- Persons with implants affected by magnetism (e.g. pacemakers) are at risk due to the strong magnetic fields that arise, even when the linear motor is switched off.
  As a general rule, anyone whose health could be endangered by strong magnetic fields must keep a safe distance away from the linear motor axis (at least 1 meter).
- Due to the strong magnetic fields, even when the linear motor is switched off, it is necessary to be particularly careful in the immediate vicinity of the magnetic track (keeping approx. 50 mm away). For this reason, you must not enter this area when holding heavy (>1 kg) or flat (>1 dm^2) objects made of steel or iron.
- The linear motor axis must have appropriate, easily understood and clearly visible warning signs warning against the strong magnetic fields.
- During operation the motor heats up. You can burn yourself badly if you touch it.
  Fit a suitable protective device to prevent contact!

- The linear motor axes LMX1E, LMX1L-S, LMX1L-T and LMH1L are designed for horizontal usage only. They are not equipped with a holding brake as standard. For this reason, an angle of 1° from the horizontal on the x and y axes must not be exceeded when installing them. If this angle is exceeded, the travel block may move through the force of gravity and/or undesirable load torques may occur. During assembly and disassembly, the primary part (forcer) must be locked into position by fitting a holding device onto the side so that it no longer moves freely on the secondary part.
- Watches and magnetic data carriers (e.g. credit cards, floppy disks, etc.) can be destroyed by the strong magnetic forces of the linear motors. Do not take them into the vicinity (< 100 mm) of the linear motor.
- The air gap between the primary part (forcer) and secondary part (magnetic track) must be checked regularly and kept clear. Magnetic chips or other foreign materials may remain on the magnetic track. This could destroy the mechanics of the motor.
- The linear motor axes are supplied as a system. It is therefore important to read all of the system's documentation. The documentation can vary depending on the type of linear motor.

2.5 Safety information on storing the linear motor axes

The linear axes are shipped fitted with a transportation lock (see Figure 2.2.1 and 2.2) and packaged securely. The packaging and transportation lock must not be removed until assembly – and must then be removed carefully and correctly.

If the linear motor axis is to be placed in storage, it must be left in its protective packaging. It must be shock protected and kept dry during storage. There must also be clear warning signs about the strong magnetic forces of the linear motor axes when they are in storage.

2.6 Safety information on transporting the linear motor axes

Use suitable lifting gear when lifting the axes. Comply with the applicable industrial safety regulations for handling suspended loads.
When transporting long linear motor axes, support them at several points so that they do not sag and become bent. If the axes are allowed to sag during transportation, their operation and accuracy will be permanently impaired.

To position the linear motor axis, two suitable screws must be inserted into each threaded hole on the front sides to take up the load (see Figure 2.1). The linear motor axis must be affixed by all four screws in such a way that the load distribution is even. If the axis is very long, it must also be supported in the middle to prevent it from sagging.

When the linear motor axis is transported, the forcer must be held in place by means of a transportation lock at the side so that it cannot move freely on the secondary part (see Figure 2.2).

No additional loads may be mounted on the linear motor axis during transportation.

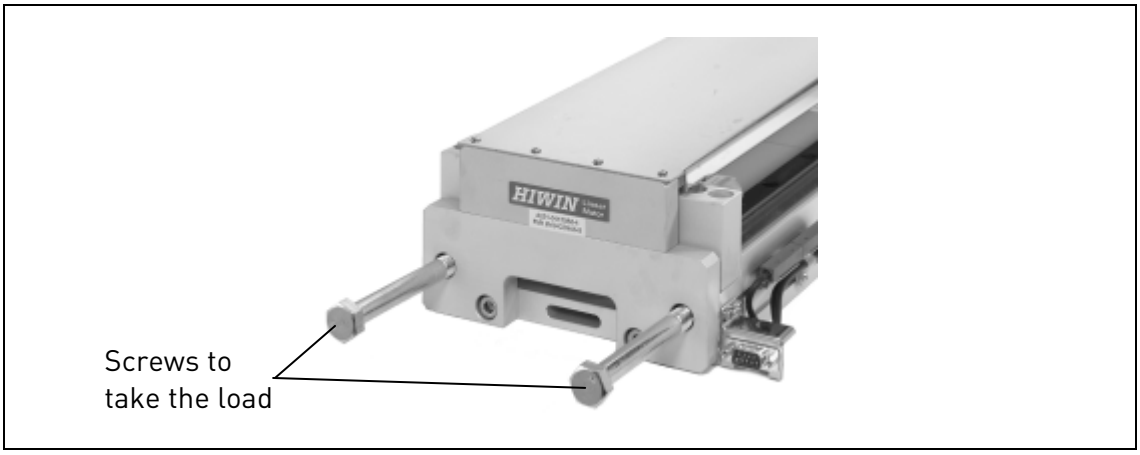


Figure 2.1:Screws to take the load during transportation

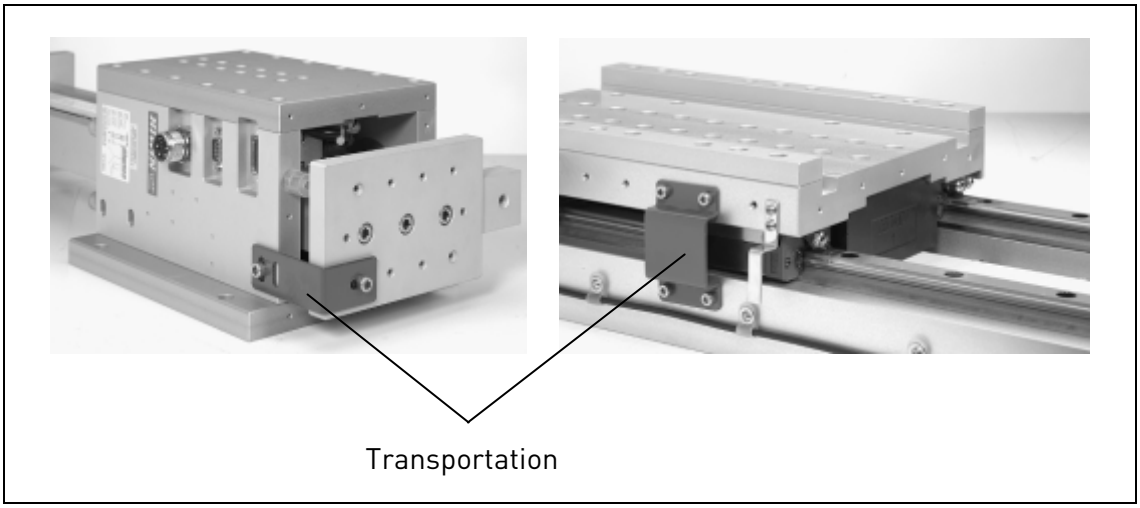


Figure 2.2: Transportation lock on different linear motor axes

2.7 Safety information on handling current-carrying, live products

- It is absolutely essential to ensure that the linear motor axis is properly grounded to the PE rail in the control cabinet to provide the reference potential. Without low-ohm grounding, safety is not guaranteed.
- Power connections may be live even when the motor is not moving. Never unfasten the electrical connections to the motors when live. In unfavourable cases, electric arcs can arise, injuring people and damaging contacts.
- The linear motor axes are generally connected to a separate servo amplifier (not described in these assembly instructions). After disconnecting the servo amplifier from the supply voltages, wait at least five minutes before touching live parts (e.g. contacts, threaded bolts) or removing connections. To be on the safe side, measure the voltage in the intermediate circuit and wait until it has dropped below 40 V.

2.8 Additional information

Please read the installation explanation in chapter 10.

If you have any questions, please contact the following hotline:

HIWIN Technical Support

Tel.: +49 (0)781 / 9 32 78-77

Fax: +49 (0)781 / 9 32 78-97

If you have questions about the documentation, suggestions or corrections, please send a fax to the following fax number:

+49 (0)781 / 9 32 78-97

3 Product descriptions

3.1 Assembly and configuration of linear motor axes

The linear motor axes consist of the components shown by way of example in section 9.2.
A configuration of linear motor axes ready for operation is shown schematically in figure 3.1.

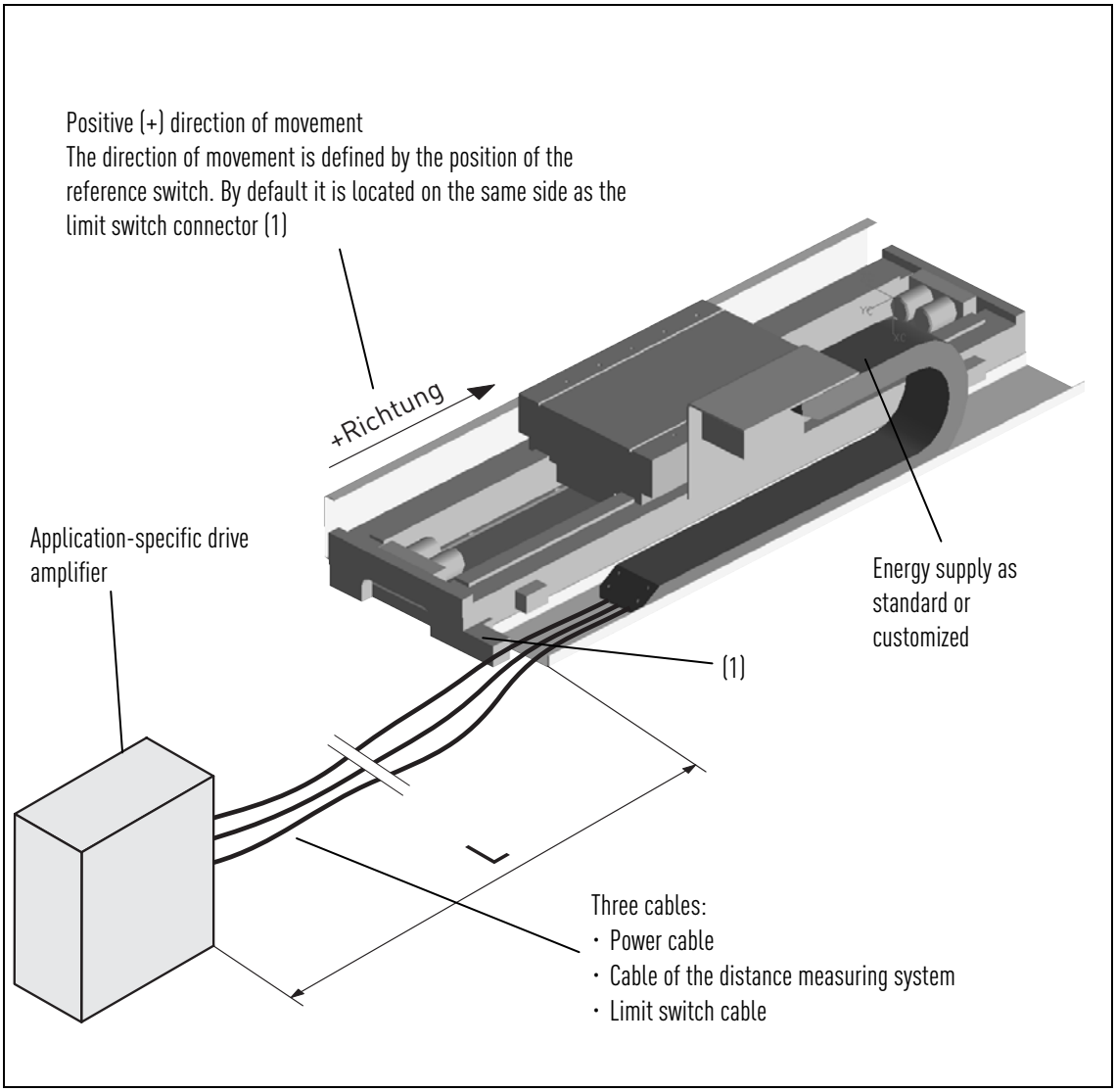


Figure 3.1: Example configuration of linear motor axes ready for operation

3.2 LMX1E product description

LMX1E linear motor axes are designed for moving a fixed load fitted onto the travel block. They must only be operated in a horizontal installation position. LMX1E linear motor axes have a coreless LMC motor and are particularly suitable for applications with high synchronization requirements. They can also be used in compound tables. They are notable for being very flat. The LMX1E linear motor axes have very high dynamics and are available with overall lengths of up to 4000 mm. The distance traveled is measured incrementally or absolutely by means of optical or magnetic distance measuring systems.

Figure 3.2: LMX1E linear motor axis

3.3 LMX1L-S product description

LMX1L-S linear motor axes are designed for moving a fixed load fitted onto the travel block. They must only be operated in a horizontal installation position. They have an iron-core LMS motor that offers high continuous forces. They can also be used in compound tables. LMX1L-S linear motor axes have a very compact design and are available with overall lengths of up to 4000 mm. The distance traveled is measured incrementally or absolutely by means of optical or magnetic distance measuring systems.

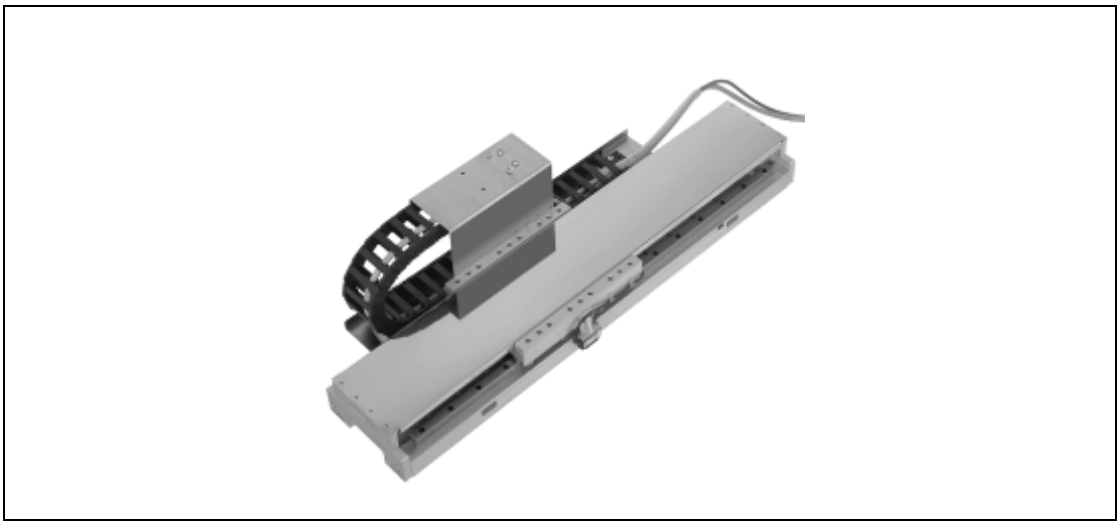


Figure 3.3: LMX1L-S linear motor axis

3.4 LMX1L-T product description

LMX1L-T linear motor axes are designed for moving a fixed load fitted onto the travel block. They must only be operated in a horizontal installation position. LMX1L-T linear motor axes have an iron-core LMT motor. The forcer is positioned between two stators, which neutralizes the forces of magnetic attraction. This reduces the load on the guide rail, in particular, and results in a high force density with a relatively short travel block. The LMX1L-T linear motor axis is notable for its high level of continuous force and exceptionally long service life. The distance traveled is measured incrementally or absolutely by means of optical or magnetic distance measuring systems.

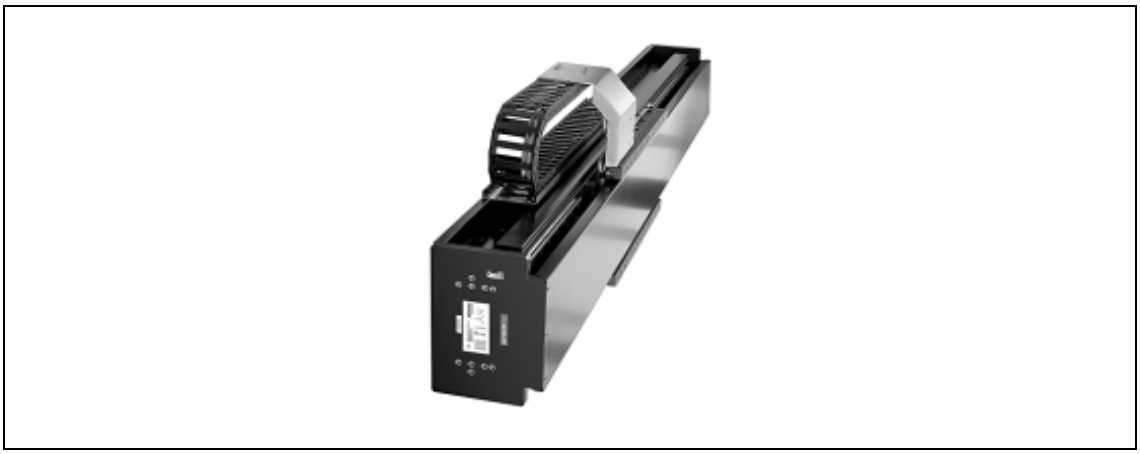


Figure 3.4: LMX1L-T linear motor axis

3.5 LMV1L product description

The LMV1L linear motor axes are designed for horizontal or vertical movement of a load either on the travel block or fixed to the end plates. They have an iron-core LMS motor that offers high continuous forces. To ensure highly dynamic vertical operation, these axes are fitted as standard with a pneumatic weight balance. Among other things, this prevents the load from being lowered when in a zero-current state. As an option, the axes are also equipped with a clamp cartridge or a holding brake. The distance traveled is measured out incrementally or absolutely by means of optical or magnetic distance measuring systems, depending on requirements.

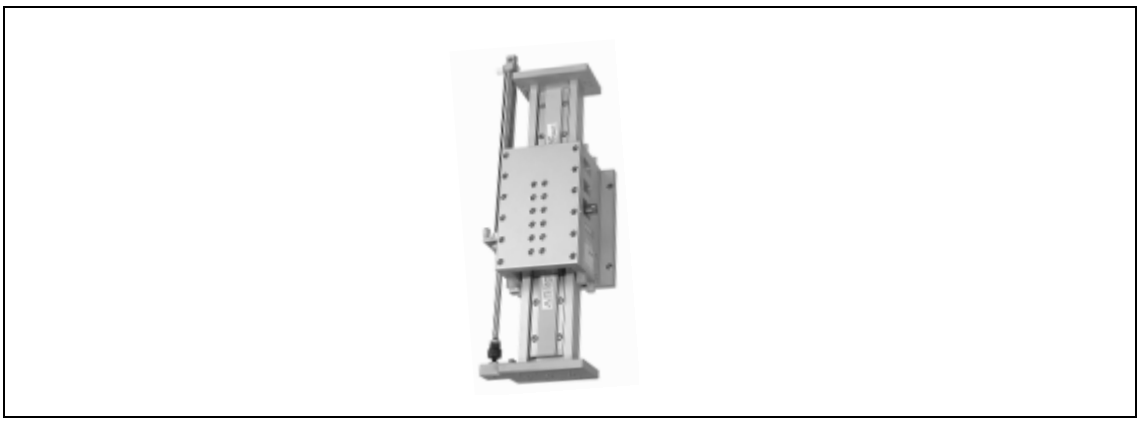


Figure 3.5: LMV1L linear motor axis

3.6 LMH1L product description

LMH1L linear motor axes are designed for moving a fixed load fitted onto the travel block. They must only be operated in a horizontal installation position. They are equipped with two different carrier profiles. One is optimized for feed forces of up to 1360 N (LMH1L-S1 and LMH1L-S2), while the other is optimized for feed forces of up to 2600 N (LMH1L-S4).

The LMH1L-S1, LMH1L-S2 and LMH1L-S4 gantry axes, which are fitted with LMS linear motors, are designed as complete axes with travel ranges of up to 30 m. The linear motor technology allows multiple travel blocks to be positioned independently of each other. The distance is measured incrementally and permits positioning accuracies of up to 0.04 mm (LMH1L-S1 and LMH1L-S2) or 0.05 mm (LMH1L-S4). An absolute measuring system is available as an option.

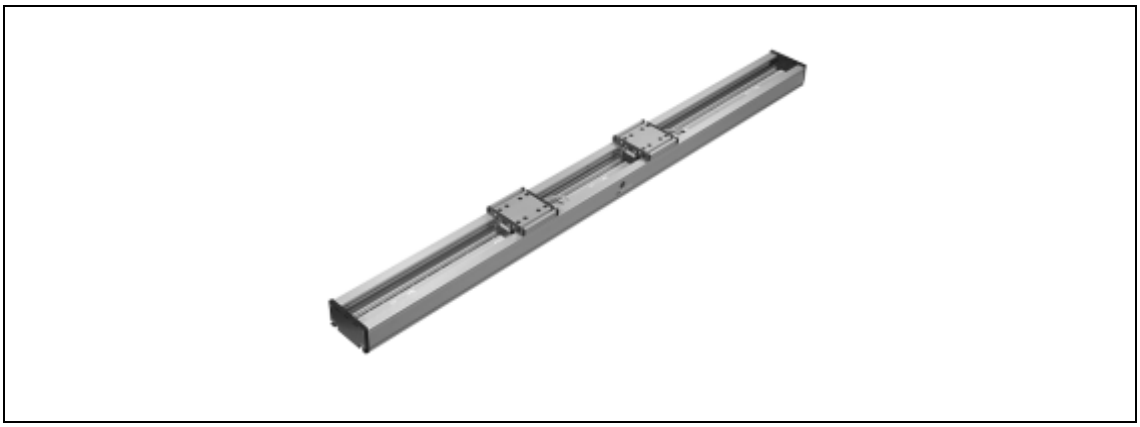


Figure 3.6: LMH1L-S2-2 linear motor axis with two travel blocks

3.7 LMX2xxx product description

LMX2xxx subsystems consist of two LMX1xxx axes that are fitted together to form a compound table or in a T-shaped arrangement. Often there are also customer-specific solutions that are described in detail in a separate drawing.

3.8 LMGxxx product description

LMGxxx subsystems are gantry systems. They are also referred to as H-systems. They consist of two parallel axes and a transverse axis that may also have a vertical axis. These systems are partly a combination of standardized individual axes and partly customer-specific designs with iron-core or coreless motors. In addition to these assembly instructions, there is usually a drawing with the customer-specific details.

3.9 Component description

3.9.1 Motors

The motors installed in the linear motor axes are brushless 3-phase synchronous motors. See chapter 8, "Technical data", for more information.
The maximum force of the motor is limited at high speeds by how much intermediate circuit voltage is available. If the speeds during motion are greater than the maximum speed at peak force specified for the motor type, it may be necessary to have the cycle checked by HIWIN.

3.9.1.1 LMCxx motor type

The coreless LMCxx motors in the LMX1E linear motor axis are lightweight and extremely dynamic. The primary part (forcer) with epoxide cast coils only has to move a very low dead weight. These motors are designed for an intermediate circuit voltage of up to 340 VDC. They are thus suitable for drive amplifiers with a power supply of up to 240 VAC.

3.9.1.2 LMSxx motor types

The LMS iron-core synchronous linear motors feature a very high force density and a very low cogging torque.

The three-phase motors are suitable for drive amplifiers with an intermediate circuit voltage of up to 600 VDC. They are thus suitable for all drive amplifiers with a power supply of up to 3 x 420 VAC.

3.9.1.3 LMTxx motor types

Synchronous LMT linear motors are iron-core motors with similar attributes to the motors in the LMS series. The special positioning of the forcer between two stators means that the forces of magnetic attraction are neutralized in the LMT motors. This reduces the load on the guide rail, in particular, and results in a high force density with a relatively short travel block.

The three-phase motors are suitable for drive amplifiers with an intermediate circuit voltage of up to 600 VDC. They are thus suitable for all drive amplifiers with a power supply of up to 3 x 420 VAC.

3.9.1.4 LMFxx motor types

The LMF iron-core synchronous linear motors feature a very high force density and a very low cogging torque. It is possible to include water cooling.

The three-phase motors are suitable for drive amplifiers with an intermediate circuit voltage of up to 800 VDC. They are thus suitable for all drive amplifiers with a power supply of up to 3 x 560 VAC.

3.9.2 Linear distance measuring system

Depending on its type, the linear motor axis is fitted with an optical or magnetic distance measuring system. See section 1.2, "Type code". The installed distance measuring system is supplied cabled and ready for use and is connected to the control unit by means of a separate connector. You will find the pin assignment in section 5.3.

NOTE If the measuring system used is not described in this document, please read the accompanying documentation.

3.9.2.1 Optical distance measuring system

The optical distance measuring system works on a non-contact basis. It is available in various resolutions and has a flexible measuring scale and a reference marker.

NOTE The measuring scale of the optical measuring systems is gold-plated to prevent scratches, but is sensitive to damage. On the LMX1L and LMX1E axes it is protected from contact by a cover plate.

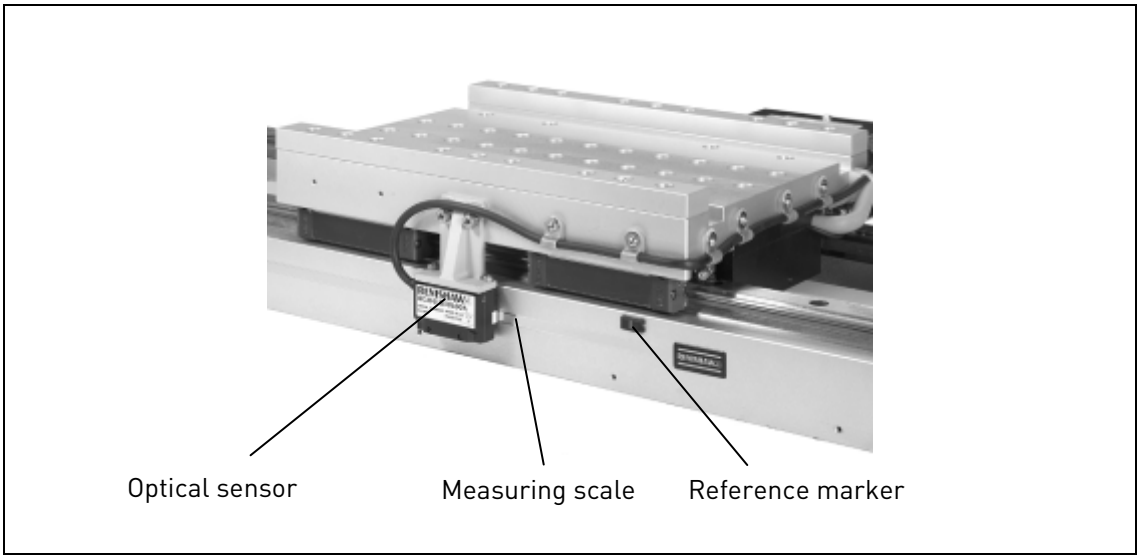


Figure 3.7: Optical distance measuring system

3.9.2.2 HIWIN-MAGIC and HIWIN-MAGIC-PG magnetic distance measuring systems

The measuring scale of the magnetic measuring systems must not be exposed to strong magnetic fields. Strong shocks (e.g. a hammer blow) can also damage the magnetization of the measuring scale.

The magnetic distance measuring systems of the HIWIN-MAGIC series are optimized for measuring the distance of linear movements, particularly on linear motor axes. They are particularly suitable for use in harsh environmental conditions and are resistant to oil, dirt, vibrations and shocks. The robust housing is electrically shielded, and signals are output in real time (see section 8.8, "Technical data for the HIWIN-MAGIC and HIWIN-MAGIC-PG distance measuring systems", for more information).

3.9.2.2.1 HIWIN-MAGIC magnetic distance measuring system

The measuring systems consist of a magnetic measurement strip on a stainless steel carrier strip and an encoder unit. The measuring scale is fitted to the side of the linear motor axis and protected from contact by a cover plate. The sensor is fitted in the guide rail on the block.

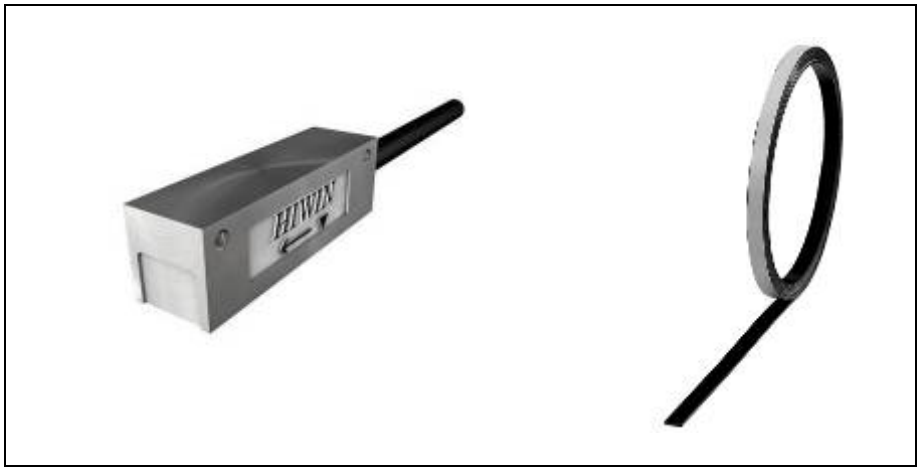


Figure 3.8: HIWIN MAGIC: Encoder and magnetic scale

3.9.2.2.2 HIWIN-MAGIC-PG magnetic distance measuring scale

The measuring scale is integrated in a profile rail. The encoder is fitted to the block of the linear guideway. It is available for the HG20 and HG25 sizes.

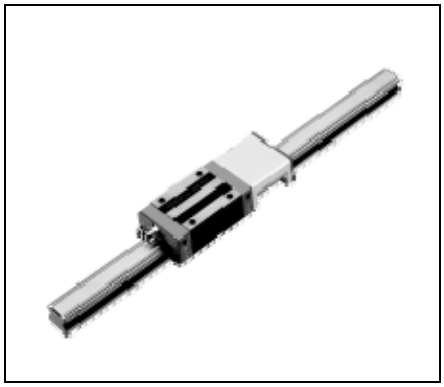


Figure 3.9: HIWIN-MAGIC-PG magnetic distance measuring system

3.10 Limit switches

Depending on its type, the linear motor axis is equipped with two optical or two inductive PNP-switching proximity switches that indicate to the control unit that the limit positions of the stroke have been reached. The limit switches are supplied cabled and ready for use and are connected to the control unit by means of a separate connector. You will find the pin assignments in section 5.4.

3.11 Energy chain cable carrier (optional)

An energy chain cable carrier that guides and protects the cables is available in a standard size or in custom sizes and is supplied fitted and ready for use.

The energy chain cable carrier meets the requirements of the UL, CSA, CEI and CE standards and is optimized for use on linear axes. The manufacturer's instructions must be followed when retrofitting a cable carrier.

3.12 Clamping element (optional)

Depending on its type, the linear motor axis is equipped with a pneumatic clamping element. The clamps used are emergency stop compatible. In other words, they are activated without pressure.

The clamping elements are not suited to repeated braking because the brake linings wear quickly.

The clamping elements are fitted between the blocks as standard. This means that the dimensions of the travel block and the effective stroke remain unchanged.

Clamping elements are available in different sizes with holding forces of 200 N or 800 N. The operating pressure is between 5.5 and 6 bar.

If greater holding forces are required, appropriate additional clamping elements can be used.

The response time of the clamping element depends, in particular, on the cross-section and length of the compressed-air supply hose between the brake and the vent switching valve. The switching time of the valve also needs to be taken into account.

See section 5.8 for more information on connecting the clamping element to the compressed-air supply.

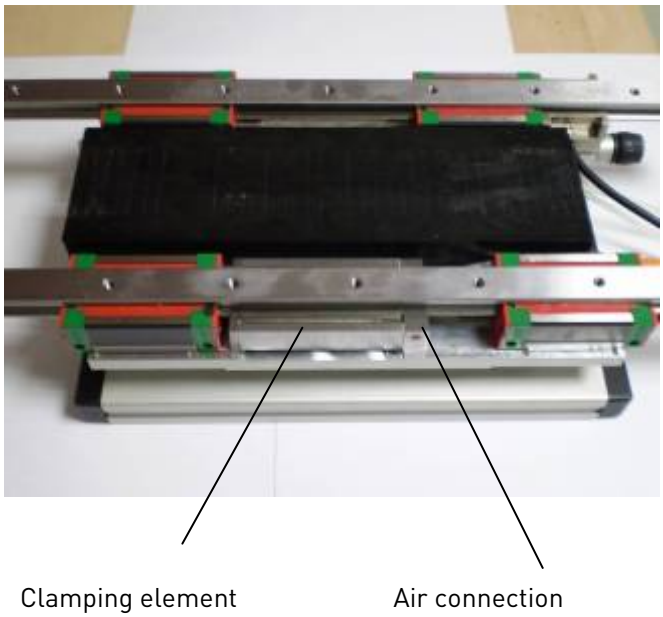


Figure 3.10: Pneumatic clamping element on a linear motor axis

(Shown without a forcer plate)

3.13 Pneumatic weight balance (optional)

The pneumatic weight balance reduces the additional force loading of the linear motor required with vertical applications due to gravity.

The pneumatic weight balancing device is shown in figure 3.11 and consists of a pressure cylinder with a control valve, rapid vent valve, solenoid valve and clamping element. The clamping element prevents the axis failing in the event of a power failure.

As a general rule, all LMX and LMV linear motor axes can be fitted with a pneumatic weight balance.

- Connect the air supply via a pressure reducer with a rapid vent valve; the maximum operating pressure is 6 bar, depending on the useful load being compensated.
  The operating pressure is normally set so that the axis does not drop when the linear motor is not connected to the power supply.
- The maximum travel speed is V_{max} = 1.8 m/s

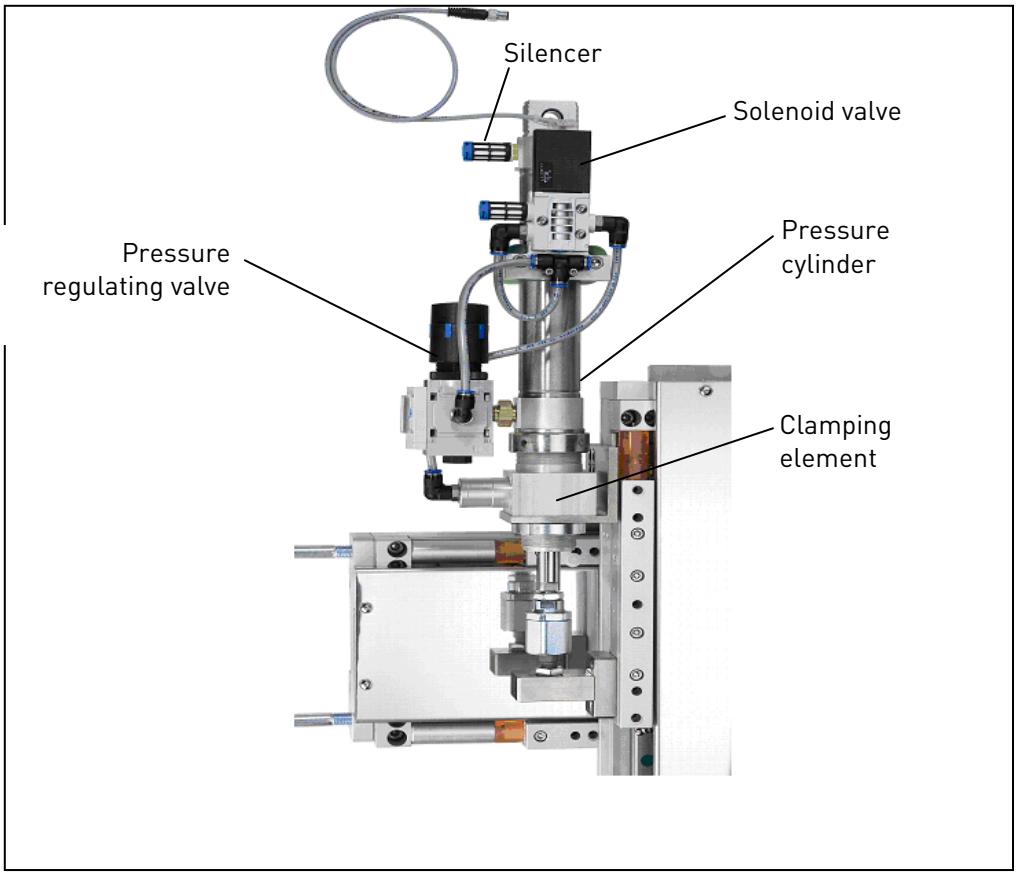


Figure 3.11: Pneumatic weight balancing device for linear motor axes in vertical applications

3.14 Hall effect sensor (optional)

In a linear motor (synchronous motor) with an incremental measuring system, the pole positions of the motor have to be aligned with the rotor position for field-oriented control. This is often known as commutation. Depending on the algorithms, small or large movements may be necessary that are often not permitted or not possible in a machine. Particularly in the case of vertical linear motor axes on which a clamping element is installed, commutation generally cannot be carried out.

Hall effect sensors make it possible to determine an angle offset that sets the ideal amount of current for the motor and energizes it when it is switched on without moving it.

Two types of Hall effect sensor are available:

- An analog Hall effect sensor with a 90° phase offset between the A and B tracks
- A digital Hall effect sensor with a 120° phase offset between the A, B, and C tracks

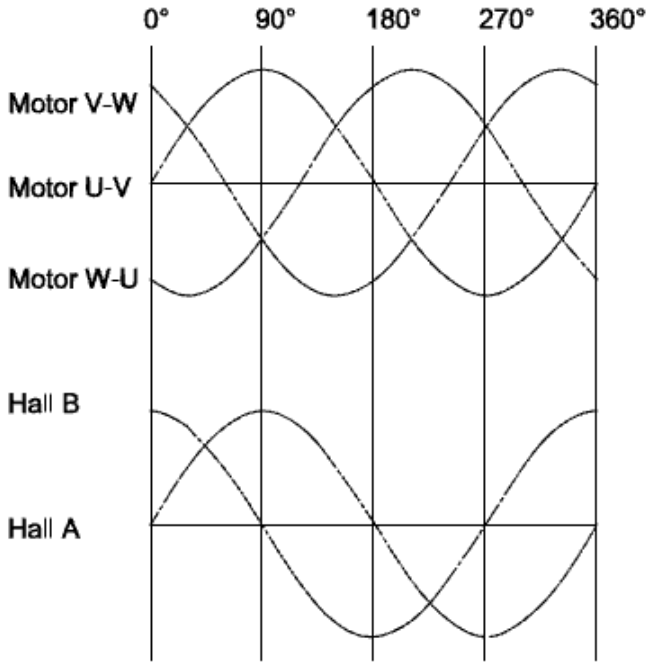


Figure 3.12: Output signal for an analog Hall effect sensor with a differential output

In the case of a Hall effect sensor with a digital output, the sensor signal switches from "0" to "1" or vice versa. In particular, as a result of the combined evaluation of the parameter of the motor supply voltage and of this sensor signal, it is possible to determine the motor's direction of rotation without any doubt.

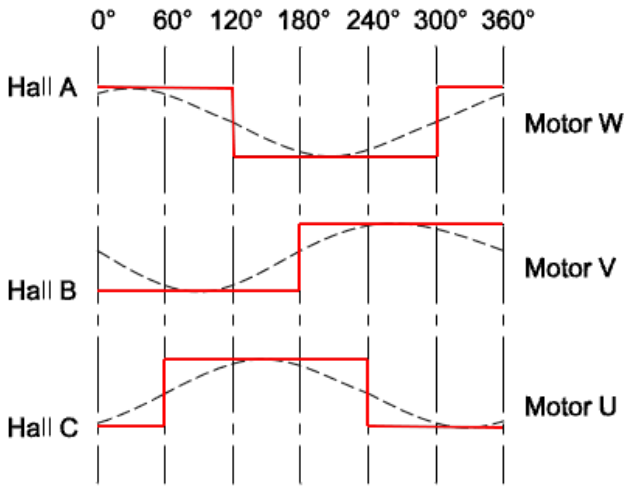


Figure 3.13: Output signal for a digital Hall effect sensor with a single-ended output

The device for detecting the direction of rotation is suitable for evaluating the sensor signal and/or the parameter of the motor supply voltage by means of an offset of the rotor angle of between 0° and 90°. However, a range between 0° and 60° is preferable, and a range between 0° and 45° is better. This makes it possible to select a suitable window for signal acquisition in which both clockwise and counter-clockwise rotation of the single-phase synchronous motor can be determined.

4 Assembly

Before and during all assembly, disassembly or repair work, the linear motor axis must be switched to zero current and it must be ensured that the power supply cannot be restored by anyone else. Otherwise, there is danger of death and significant danger of injury.
To position the linear motor axes, use suitable lifting equipment where appropriate; lifting large loads without tools is a health risk. Follow the applicable industrial safety regulations for handling suspended loads.
No spacers, washers or similar should be used in the assembly of the **linear motor axes.**

4.1 Assembly of the linear motor axes

The linear motor axes are supplied already assembled and are mechanically ready for operation. Before assembly, they must be carefully removed from the protective packaging; the transportation lock on the forcer is not removed until after assembly.

They must be installed on a level surface. The surface must not vary by more than 0.03 mm over 300 mm.

4.1.1 Assembly of the LMX1E, LMX1L-S and LMX1L-T linear motor axes

The LMX and LMH linear motor axes are designed only for horizontal use as standard. They are not equipped with any brakes in the standard version.
For this reason, an angle of 1° from the horizontal on the x and y axes must not be exceeded during installation. If this angle is exceeded, the travel block may move through the force of gravity and/or undesirable load torques may occur.
During assembly and disassembly, the primary part (forcer) must be held in place by means of a transportation lock at the side (see section 2.6) so that it cannot move freely on the secondary part.

These linear motor axes are only fixed from above. For this purpose, holes are available for M6 and M8 cylinder head screws. The number of holes depends on the length of the stator.

- Make suitable fixing holes on the mounting surface if they are not there already.
- Clean the mounting surface and position the linear motor axis on it.
- Screw the fixing screws into all of the mounting holes and tighten them to 10 Nm from the inside to the outside in a spiral sequence.

The screws must be secured with snap rings to prevent them from coming loose accidentally.

4.1.2 Assembly of the LMV1L linear motor axes

The LMV1L linear motor axes have a pneumatic weight balance fitted as standard and are therefore designed for vertical installation. The LMV1L linear motor axis can be installed with either a moveable forcer or a moveable axis.

4.1.2.1 LMV1L assembly with a moveable forcer

For assembly with a moveable forcer, the end plates of the linear motor axis are fixed to the machine or system or to another linear motor axis.

- Choose mounting surfaces for the end plates and make suitable fixing holes if they do not already exist.
- Clean the mounting surface and position the linear motor axis on it.
- Screw the fixing screws into all of the fixing holes and tighten them to 10 Nm from the inside to the outside in a spiral sequence.
-

The screws must be secured with snap rings to prevent them from coming loose accidentally.

4.1.2.2 LMV1L assembly with a moveable axis

For assembly with a moveable axis, the forcer of the linear motor axis is fixed to the machine or system or to another linear motor axis.

- Choose mounting surfaces for the forcer and make suitable fixing holes if they do not already exist.
- Clean the mounting surface and position the linear motor axis on it.
- Screw the fixing screws into all of the fixing holes and tighten them to 10 Nm from the inside to the outside in a spiral sequence.

The screws must be secured with snap rings to prevent them from coming loose accidentally.

4.1.3 Assembly of the LMH1L linear motor axes

The LMH1L linear motor axes are designed for horizontal use. They are not equipped with a holding brake as standard.
For this reason, an angle of 1° from the horizontal on the x and y axes must not be exceeded when installing them. If this angle is exceeded, the travel block may move through the force of gravity and/or undesirable load torques may occur.
During assembly and disassembly, the primary part (forcer) must be held in place by means of a transportation lock at the side (see section 2.6) so that it cannot move freely on the secondary part.

NOTE The LMH1L-S2 axis must be fixed to the machine bed using T-grooves. The installed load is also fixed to the travel block by means of T-grooves. The axis is fixed in place by means of fixing holes.

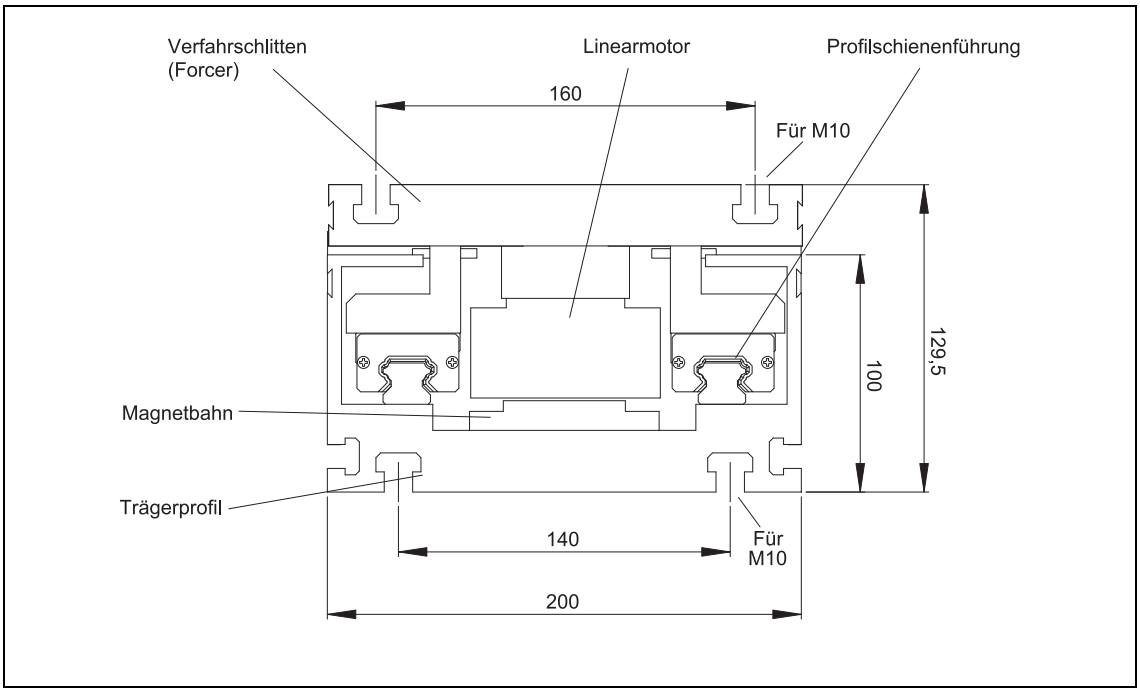


Figure 4.1: Groove fixing of the LMH1L-S2 linear motor axis

- Make holes suitable for the LMH1L-S4 on the mounting surface if they are not already there.
- Clean the mounting surface and position the linear motor axis on it.
- Screw the fixing screws into all of the fixing holes and tighten them to 10 Nm from the inside to the outside in a spiral sequence.

The screws must be secured with snap rings to prevent them from coming loose accidentally.

4.1.4 Assembly of the moving load

Use suitable lifting equipment to position the loads to be moved where necessary; lifting large loads without tools is a health risk. Comply with the applicable industrial safety regulations for handling suspended loads.

- Clean the mounting surfaces for the load on the linear motor axis (the forcer or, in the case of the LMV1L linear motor axis, the forcer or end plate).
- Clean the mounting surface for the load.
- Position the load on the linear motor axis.
- Tighten the fixing screws to 10 Nm from the inside to the outside in a spiral sequence.
- Remove the transportation lock from the forcer.
- Check that the load can move freely along the entire stroke.

4.1.5 Assembly of the Hall effect sensor

To install the Hall effect sensor you have to make two threaded holes on the cable side of the linear motor (see figures 4.2 to 4.5)

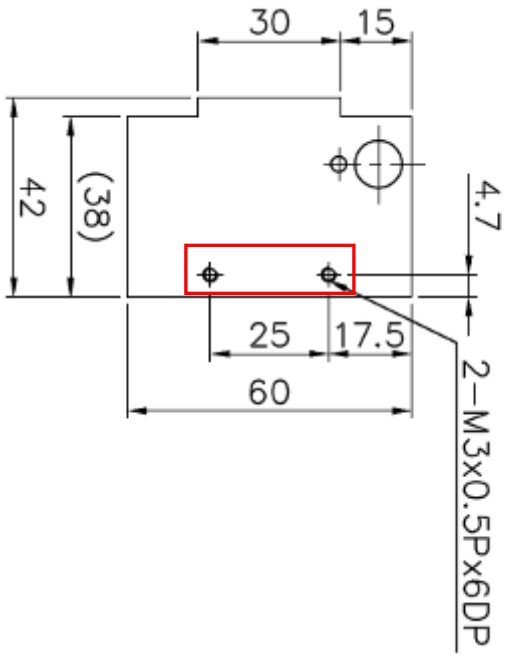


Figure 4.2: Hall effect sensor fixing hole for the LMS series

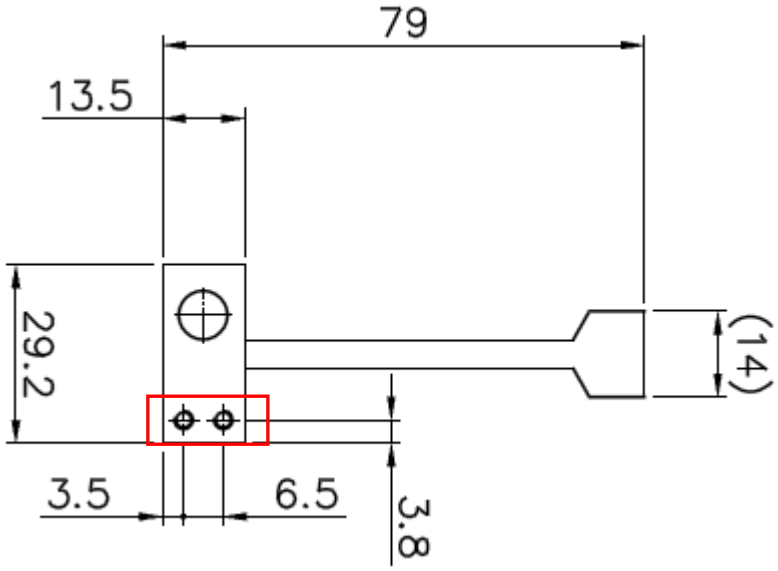


Figure 4.3: Hall effect sensor fixing hole for the LMC series

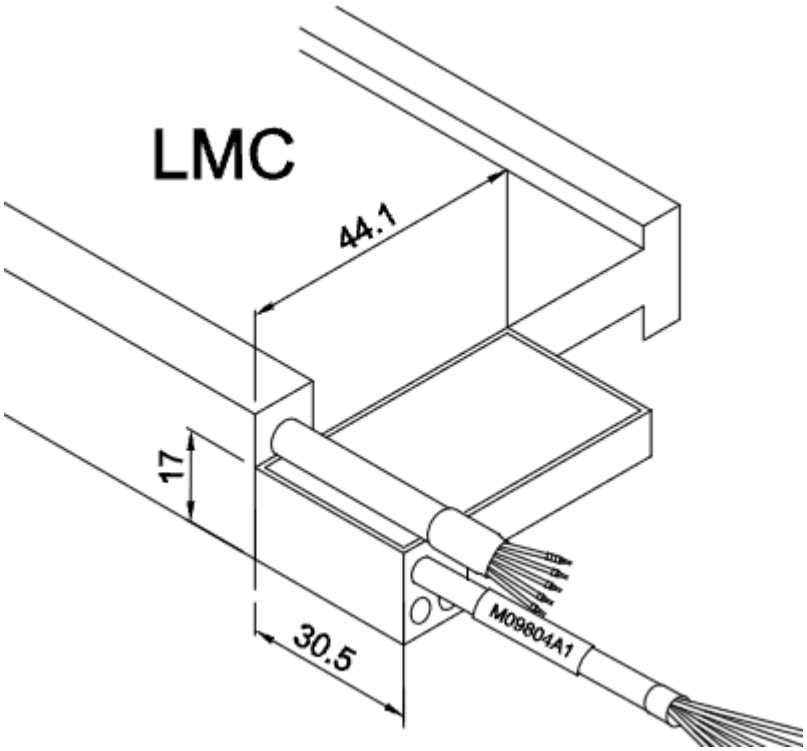


Figure 4.4: Installation of the analog Hall effect sensor for the LMC series

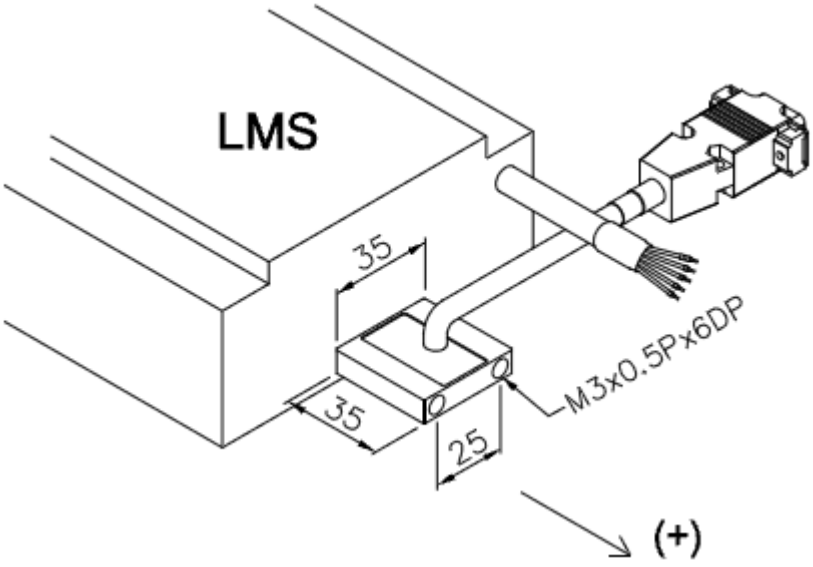


Figure 4.5: Installation of the digital Hall effect sensor for the LMS series

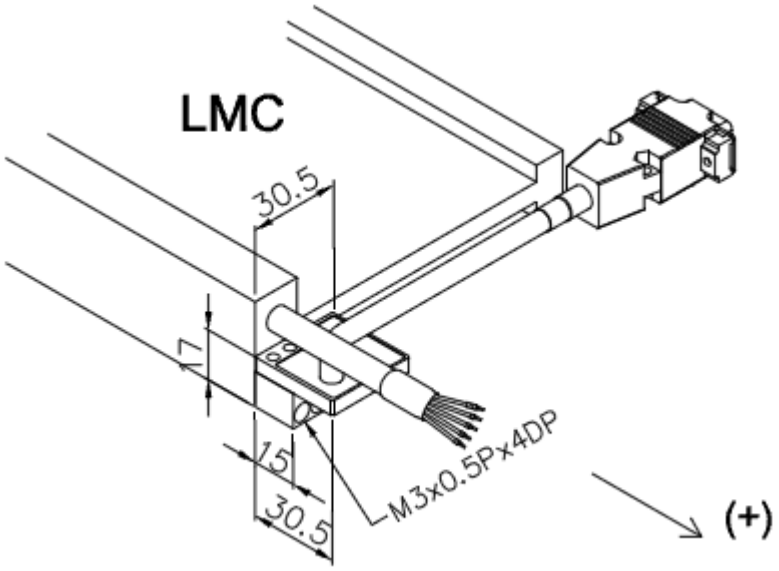


Figure 4.6: Installation of the digital Hall effect sensor for the LMC series

4.2 Assembly and disassembly of axis components

Before and during all assembly, disassembly or repair work on a linear motor axis, the distance measuring system, the linear motor and the associated systems and controls must be disconnected from the power source, and it must be ensured that the power supply cannot be restored by anyone else. Otherwise, there is danger of death and significant danger of injury.
The distance measuring sensor is operated at a low voltage, so there is not normally any risk of injuries or fatalities from this alone.

NOTE

The measuring scale of the magnetic measuring systems may not be subjected to any strong magnetic fields (keep it well away from the permanent magnets of linear motor axes!).

Exercise caution when using magnetic devices (gauge holders) to align the profile rails, for example!

Strong shocks (e.g. hammer blows) can also damage the magnetization of the measuring scale.

The system is not suitable for environments where there is magnetic dust (e.g. graphite dust). This can falsify the encoder signal or damage the measuring system.

4.2.1 Profile rails and blocks

A linear guideway can take loads up/down and to the right/left. The installation position depends on the requirements of the machine and the load direction.
The accuracy of the profile rail is determined by how straight and level the contact surfaces are because the profile rail is pressed against them when the screws are tightened. Profile rails that are not pressed against a contact surface may have greater tolerances in terms of straightness.
The basic profiles of the linear motor axes used by Hiwin have a stop edge on one side. The linear guideway fitted on this edge is known as the reference rail. When a HIWIN MAGIC-PG measuring system is used, the measuring scale is generally also integrated in the reference rail (see also figure 5.6).
In the same way, there is a stop edge for the two reference blocks on one side of the forcer carrier plate (figure 4.1).

Remove all dirt and contamination from the contact surfaces before installation!

The reference blocks are pressed against the stop edge and the fixing screws tightened (minimum torque 6 Nm). The follow-on blocks are merely placed in position.

NOTE

To prevent the screws from coming loose during operation, they must be secured by means of a medium-strength thread locker.

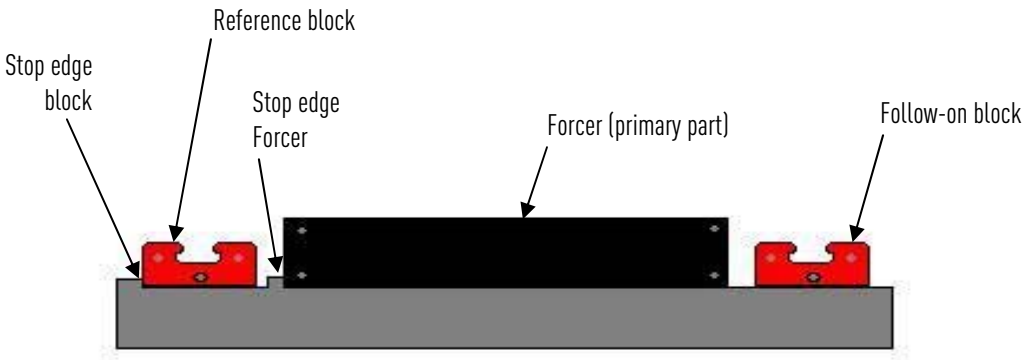


Figure 4.7: Layout of the block and the forcer on the travel block

The reference linear guideway (generally used with the MAGIC-IG measuring system) is fitted onto the stop edge parallel to the basic profile or to a reference edge (e.g. a granite surface).
The follow-on linear guideway is aligned and fitted parallel to the reference rail using a dial gauge. The profile rails must be parallel +/- 10µm (figure 4.8).

4.2.2 Travel block with forcer

The forcer (the primary part of the linear motor) is attracted very strongly by the permanent magnets of the stator (the secondary part of the linear motor). During assembly, it is essential to ensure that the forcer does not come near the stators until the linear guideway can take up the forces.
The forcer is therefore initially fitted onto the travel block. It is pressed against the stop edge, and the fixing screws are tightened securely (torque: 8 Nm, figure 4.7).
It is also important to ensure that the forcer does not come into contact with the stators during disassembly.

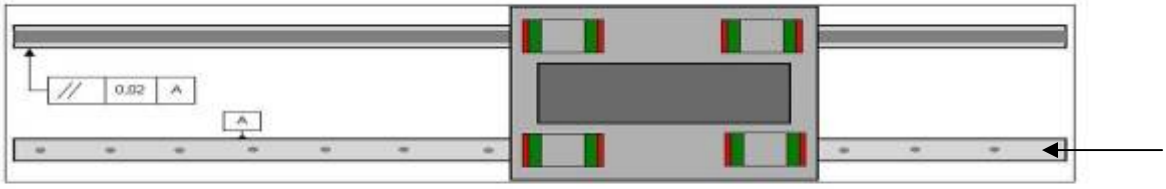


Figure 4.8: Installation of the travel block on the guide rails

The simplest option is to place the travel block with the forcer on the guide rails when the stators are not yet fitted (figure 4.8). The travel block is placed in position, and the screws on the follow-on blocks are then tightened. Do not forget to use a thread locker!

4.2.3 Stators (magnetic tracks)

To install the stators, the travel block is moved onto one side of the axis (figure 4.9). The stators are fitted onto the other side.

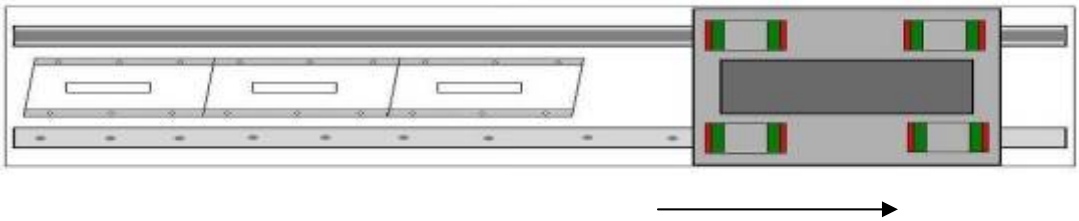


Figure 4.9: Installation of the stators once the travel block is installed

The Hiwin magnetic tracks (stators) are installed on the shunt principle. The next stator must start with the opposite pole. In other words, magnetic north at the end of the preceding stator is followed by magnetic south at the beginning of the next stator (or vice versa).

Caution: There is a risk of injury from crushing because the stators are magnetically attracted.

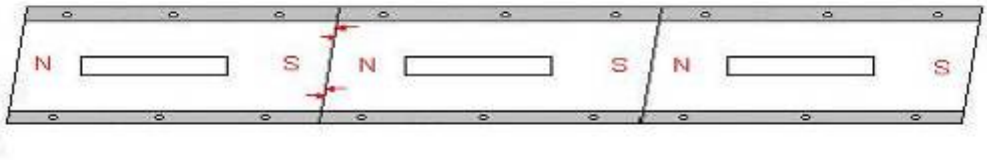


Figure 4.10: Installation of the stators on the shunt principle

Once the stators have been installed on one side, the travel block is moved across them. The forces of magnetic attraction between forcer and stator are taken up by the linear guideways (figure 4.11).
The remaining missing stators can then be installed easily.

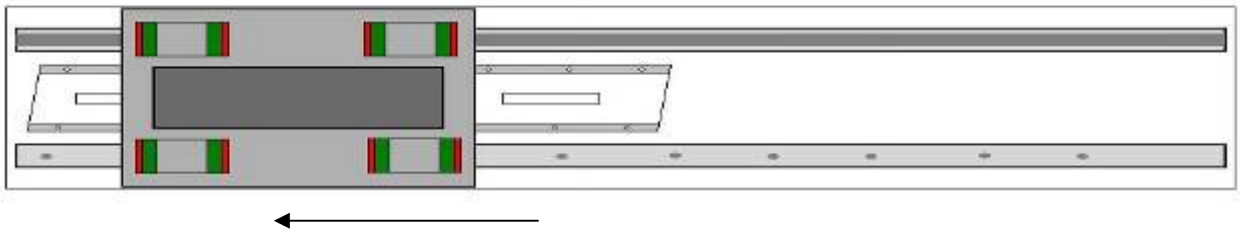


Figure 4.11: The travel block is moved across the stators that have already been installed to allow the remaining stators to be installed

4.2.4 MAGIC-PG distance measuring system

4.2.4.1 Installation of the measuring scale

- Pull the block from the rail using the tool provided.
- Clean the groove [5] thoroughly with alcohol or acetone so that it is grease-free.
- Glue on the magnetic scale [2] and use a mounting roller to press it on with a force of approx. 250 N/cm^2. Ensure that the tape is neither compressed nor overstretched.
- Degrease the surface of the magnetic scale.
- Glue the stainless steel protective cover tape [3] onto the magnetic scale. Make sure that no bubbles form under the tape while you are gluing. Use a mounting roller to press down the stainless steel protective cover tape with a force of approx. 250 N/cm^2.
- Re-grease the rail in order to prevent rusting.
- Put the block on the rail using the tool provided. Ensure no balls fall out while you are doing this.

NOTE **The bond strengthens under pressure. The final strength is obtained after approx. 48 hours at room temperature.**

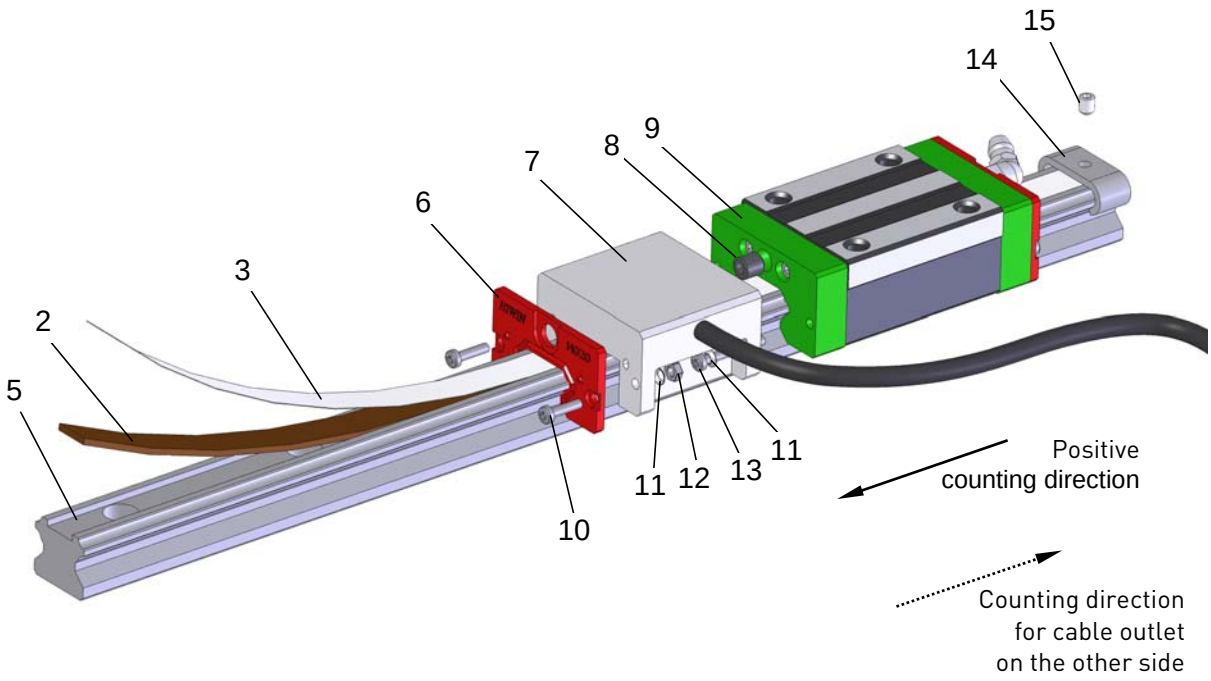


Figure 4.12 HIWIN MAGIC-PG assembly

4.2.4.2 Installation of the MAGIC-PG encoder

Work may only be carried out on the encoder when there is no supply voltage present. The connector must not be removed if the encoder is energized. This can destroy the electronic components.

- On the side where the MAGIC encoder [7] is to be installed, remove the end seal [6] by loosening the screws. Do not remove the deflection unit [9]!
- Screw the headless screw [8] into the threaded hole of the deflector.
- Install the MAGIC encoder on the reflector. The housing can be fitted in two directions, depending on the required counting direction and/or cable outlet side. The counting direction is as shown in figure 4.12 when the cable is connected as shown in the table on page 43. Do not tighten the screws [13] all the way (use lock washers [11]).
- The height of the encoder must be adjusted. There must be a clearance of 0.10 mm +0.10/-0.05 mm between the cover tape and the encoder. It is advisable to use a feeler gauge to set the correct height. Then tighten the screws [13] all the way.
- Fix the end seal to the MAGIC-IG housing using screws [10] and nuts [12] (use lock washers [11]). The block must be on the rail to ensure that the seal is correctly aligned.
-

NOTE **When fitting the encoder or the glider, ensure that you do not violate the connecting cable's minimum bending radius (40 mm)!**

4.2.4.3 Signal voltage amplitude

The output voltage of the encoder (1 V_{pp}) depends on its distance from the magnetic scale. The relationship between the amplitude and reading distance is given in figure 4.13.

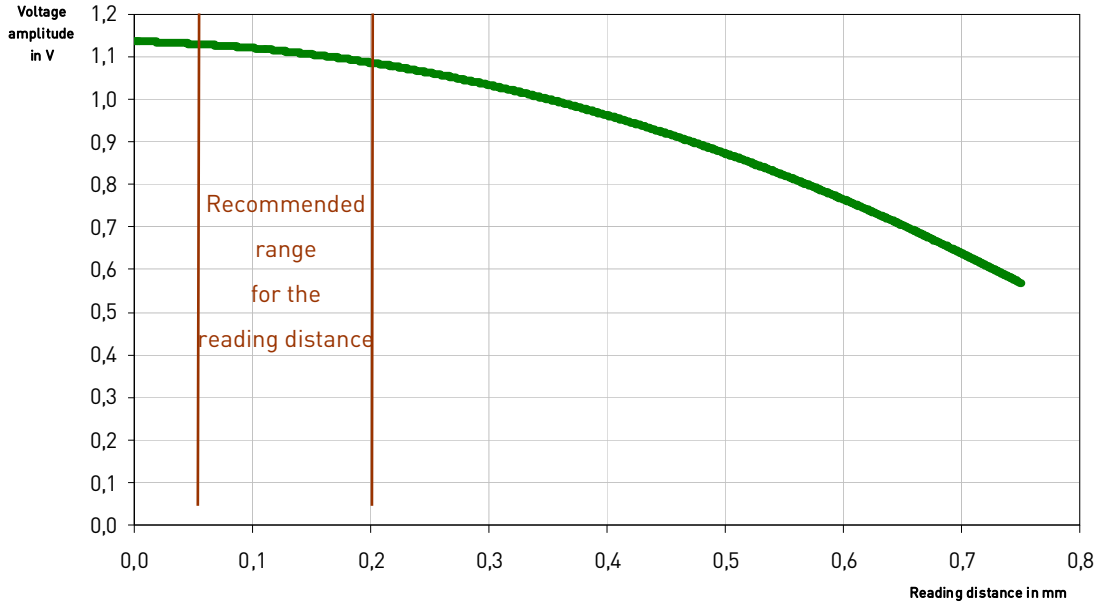


Figure 4.13: Voltage amplitude depending on the reading distance of the HIWIN MAGIC

4.2.4.4 Electronic evaluation system for the MAGIC-PG encoder signals

Figures 4.14 and 4.15 show the recommended downstream electronic circuits for the individual channels for the analog and digital encoders.

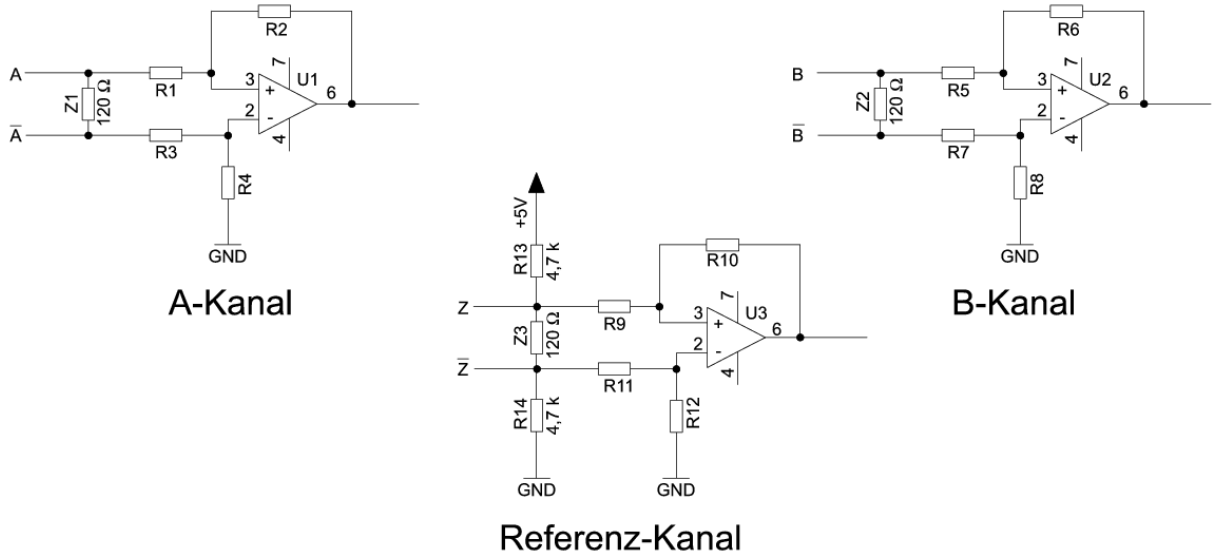


Figure 4.14: Recommended downstream electronic circuit with sin/cos 1Vpp output

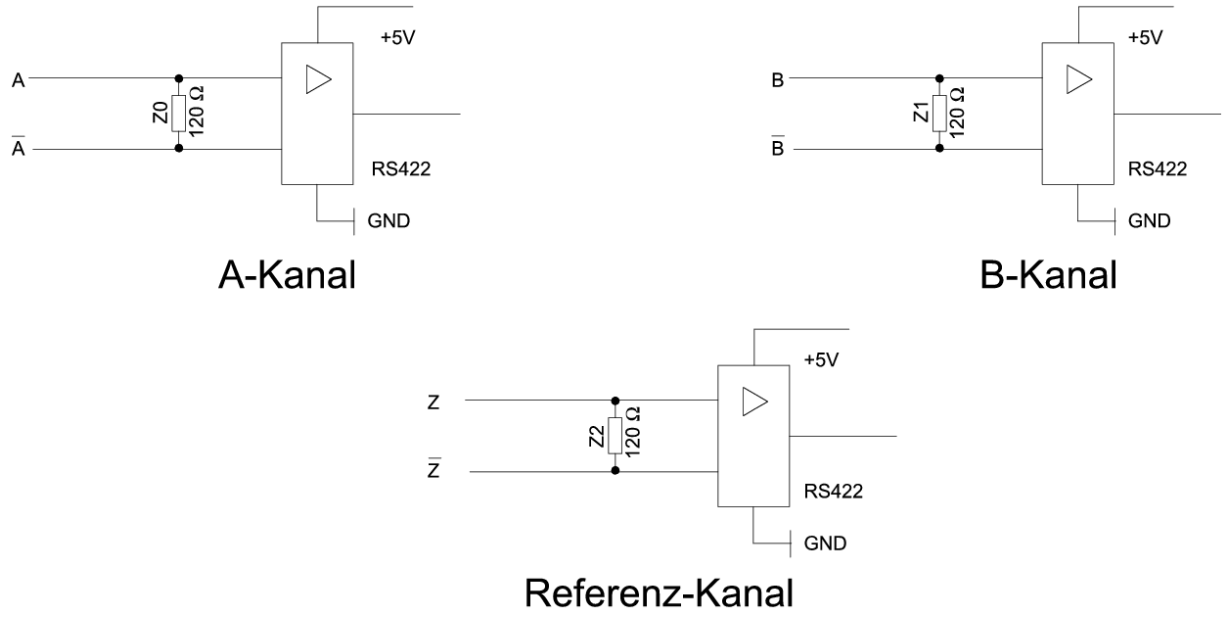


Figure 4.15: Recommended downstream electronic circuit with digital TTL output

4.2.5 Reference switch

The reference switch is generally attached to the fixed part of the system, and the cam switch is attached to the moving part.

NOTE

The cam switch and reference switch must not be more than 2 mm apart.

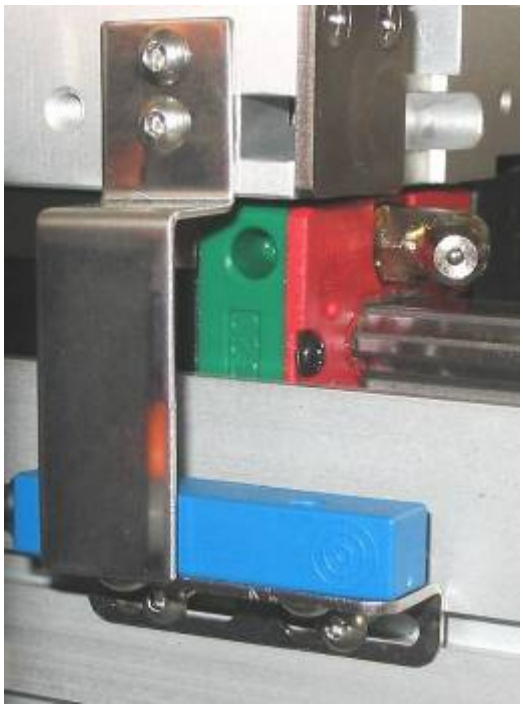


Figure 4.16: Reference switch and cam switch (installation example for a linear motor axis)

The reference switch defines the zero point of the position measurements – usually by adopting the next index mark on the MAGIC magnetic scale after the drive amplifiers are switched. The MAGIC magnetic scale has multiple index marks that generate an index pulse every millimeter.

NOTE

If the position measurement changes by exactly one millimeter after the machine is switched back on, this is because the position of the reference switch in relation to the magnetic scale is unclear. You can resolve this by moving the reference switch by 0.5 mm, for example.

5 Electrical connection

It is absolutely essential to ensure that the linear motor axis is properly grounded to the PE rail in the control cabinet to provide the reference potential. Without low-ohm grounding, safety is not guaranteed.
Power connections may be live even when the motor is not moving. Never remove the electrical connections to the motors when they are live. In unfavourable cases, electric arcs can form, causing injury and damage to contacts.
The linear motor axes are normally connected to a separate servo amplifier. Read the separate assembly instructions for the servo amplifier.
After disconnecting the servo amplifier from the supply voltages, wait at least five minutes before touching live parts (e.g. contacts, threaded bolts) or disconnecting connectors. To be on the safe side, measure the voltage in the intermediate circuit and wait until the voltage has dropped below 40 V.

5.1 Overview

The linear motor axes are supplied ready cabled for operation. All necessary connections are created via three connectors on the linear motor axis. The schematic overview shows the basic construction:

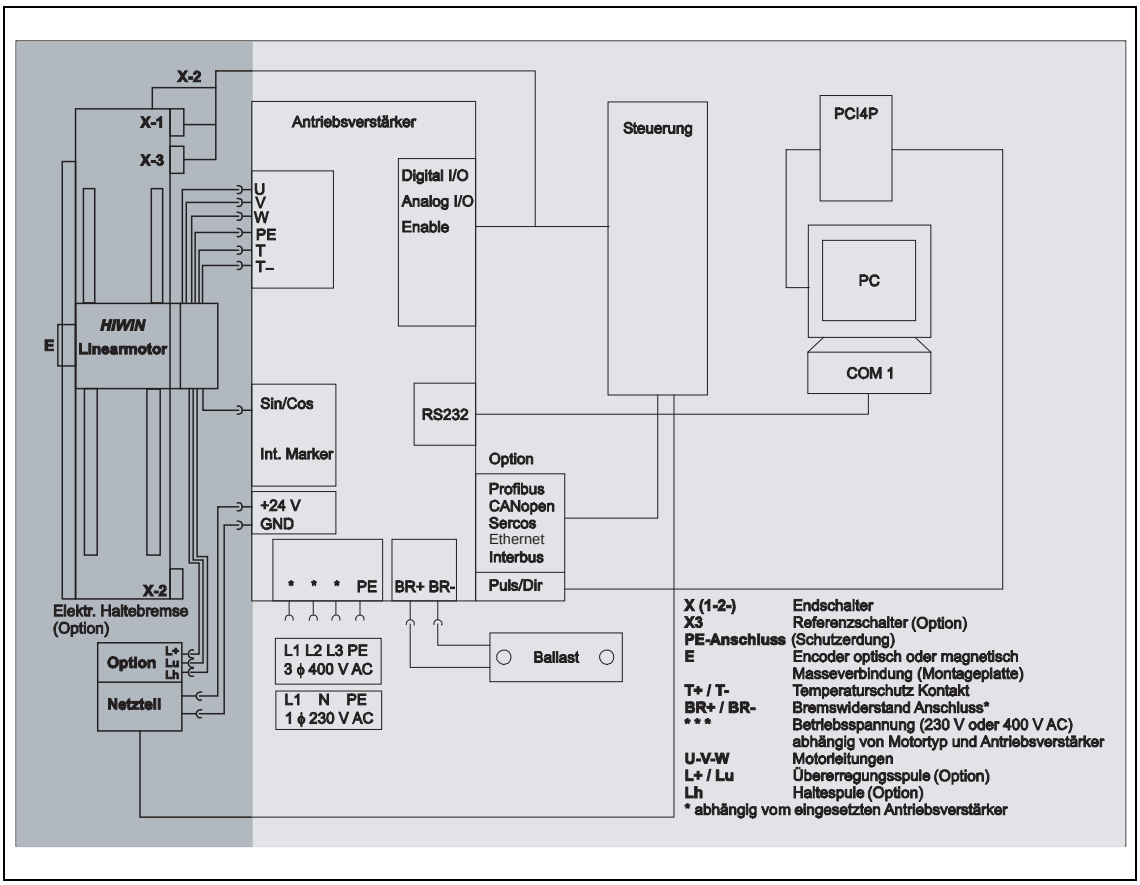


Figure 5.1: Schematic overview of the electrical connections

5.2 Motor connection

The motors used in linear motor axes are brushless 3-phase synchronous motors.
The connection is made using a motor connector.

The motors of type LMCxx (axis type LMX1Exx) are designed for an intermediate circuit voltage of up to 340 VDC. They are thus suitable for drive amplifiers with a power supply of up to 240 VAC.
The motors of types LMS and LMT (axis types LMX1L-Sxx, LMX1L-Txx, LMV1L and LMH1L) are suitable for driver amplifiers with an intermediate circuit voltage of up to 600 VDC. They are thus suitable for all drive amplifiers with a power supply of up to 3 x 420 VAC. The motors of type LMFxx (axis types LMX1L-Fxx) are designed for an intermediate circuit voltage of 800 VDC.
The power cable must not be longer than 10 m. With longer cables, appropriate filters must be used to attenuate any voltage peaks effectively. The power connector (motor connector) approved for a maximum voltage of 630 VDC/AC.

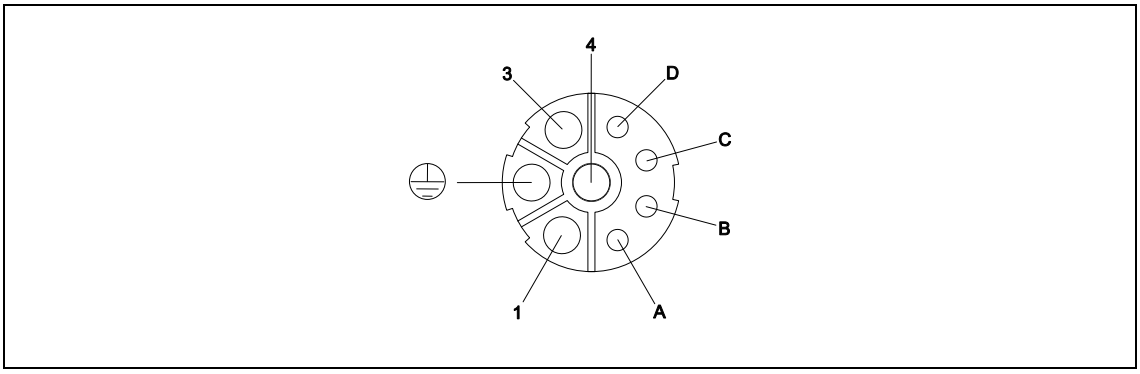


Figure 5.2: PIN assignment of the M23 / 8-pin motor connector for LMX1L linear motor axes

Motor connection color	Pin no.	Signal	Function	Motor cable color
Black-1	1	U	Motor phase	Black-1
Black-2	4	V	Motor phase	Black-2
Black-3	3	W	Motor phase	Black-3
Black-4	A	T +*	Thermal protection	Black-4
Black-5	B	T–*	Thermal protection	Black-5
Black-6	C	T+ **	Thermal protection	Black-7
Black-7	D	T- **	Thermal protection	Black-8
Green/yellow	Protective earth/ground		GND	Green/yellow

Pin assignment of the motor connector for axes with linear motors with an iron core

LMS motors have two possible types of motor protection equipment: bimetal switches or PTCs
LMF motors have PTC sensors in addition to KTY84 sensors
** only assigned for LMF motors

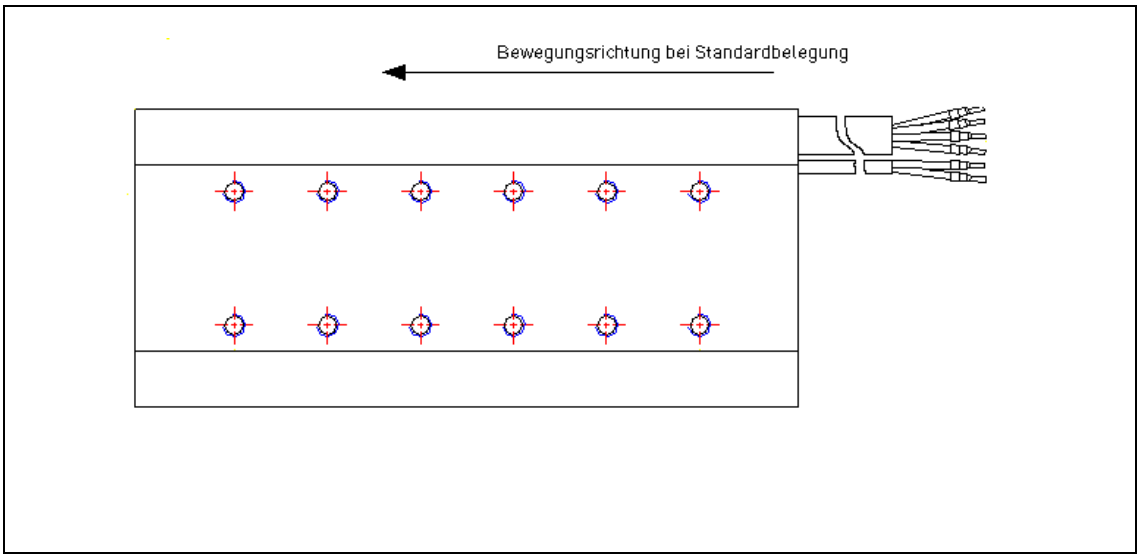


Figure 5.3: Direction of movement with the standard assignment: cable outlet is "behind"

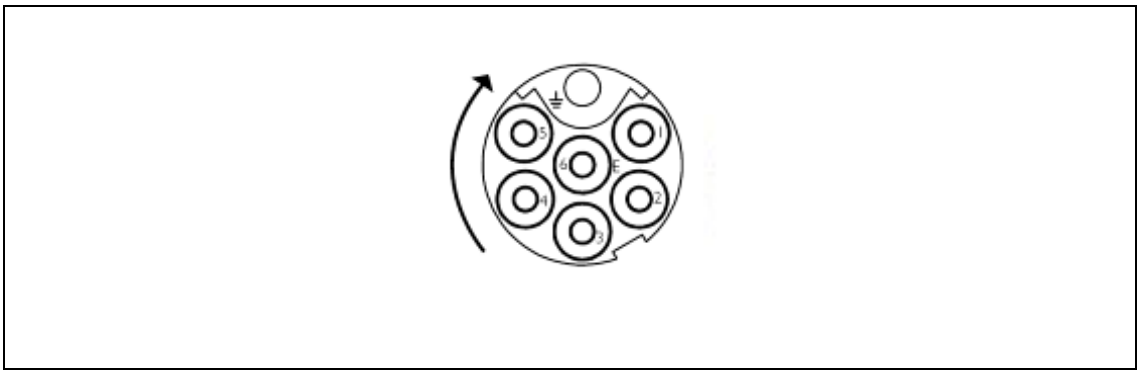


Figure 5.4: PIN assignment of the M17 motor connector / 7-pin for LMX1E linear motor axes (Looking down onto the axis)

Motor connection color	Pin no.	Signal	Function	Motor cable colour
Brown	1	U	Motor phase	Black-1
White	4	V	Motor phase	Black-2
Gray	3	W	Motor phase	Black-3
Yellow	5	T+	Thermal safety contact	Black-4
Green	6	T–	Thermal safety contact	Black-5
	2		Not assigned	
Green/yellow	Protective earth/ground		GND	Green/yellow

Pin assignment of the connector for axes with linear motors without an iron core

LMC motors have two possible types of motor protection equipment: bimetal breakers or PTCs

5.3 Connecting the linear distance measuring system

5.3.1 Pin assignment and output signals

A linear distance measuring system that is ready for operation is integrated in the linear motor axis. The connection is made by means of a 15-pin sub-D connector or a 17-pin round connector. Depending on the equipment level, either an optical or a magnetic incremental distance measuring system will be integrated that functions using sine/cosine signals. The pin assignment of the connector is identical for both magnetic and optical distance measuring systems.

A moving encoder results in a counting direction as shown in figure 9.1 and figure 9.3 when the encoder is connected as shown in the table given below.

NOTE

If a positive counting direction is required in the opposite direction, "V1+" must be swapped over with "V2+" and "V1-" with "V2–" when connecting to the electronic evaluation system.

To avoid EMC errors in the encoder signal, the encoder cable must be shielded, and the shielding must be in full contact across the connector. In addition, the wire pairs with the analog sine and cosine signals must be also be shielded.

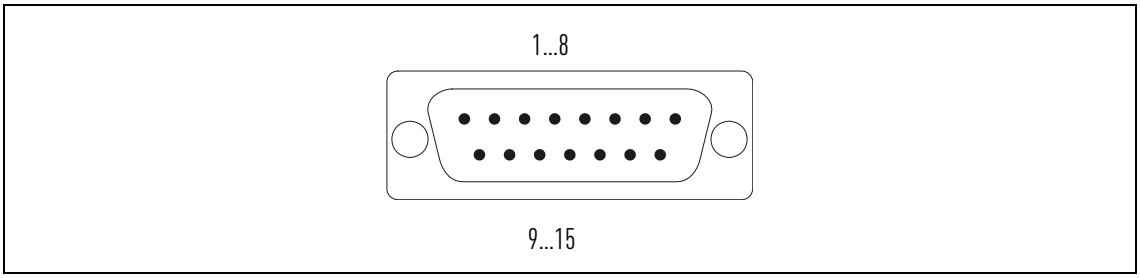


Figure 5.5: PIN assignment of the sub-D connector for the distance measuring system (looking down onto the axis)

Figure 5.6: PIN assignment of the round connector for the distance measuring system (looking down onto the axis)

Encoder head cable color			Sub-D connector and round connector PIN no.	Signal	Color of cable on the measuring system	Output signals from the distance measuring system
Optical	**Magic/ MAGIC-PG**					
Blue	Yellow	Yellow	1	V_1-	Green	cos –
Red	Green	Green	9	V_1+	Yellow	cos +
Brown	Brown	Brown	4 and 5	5 V	Red 0.5	Power supply
Green	Red	Red	2	V_2-	Black	sin –
White	White	White	12 and 13	0 V	Black 0.5	GND
Gray	Gray	Gray	11	V_0-	Red	Ref –
Purple	Violet	Violet	3	V_0+	Orange	Ref +
Yellow	Blue	Blue	10	V_2+	Brown	sin +
			15		Inner shielding	
			Connector housing		Outer shielding	
Option: Motor temp. evaluation	Brown		6	T+	Yellow	
	Blue		8	T–	Blue	

Pin assignment of the connector for the distance measuring system on all linear motor axes

5.4 Limit switch connection

NOTE **Note the technical data in section 8.10.**

Two inductive or optical proximity switches of the PNP type that are ready for operation are integrated in the linear motor axis as limit switches. Both limit switches are connected via 9-pin sub-D connectors.

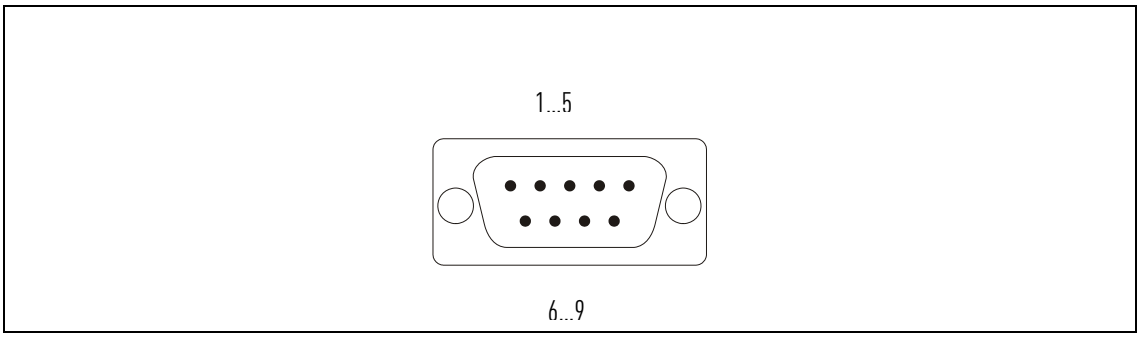


Figure 5.7: PIN assignment of the connector for the limit switches (looking down onto the axis)

Limit switch cable	Pin no.	Limit switch cable color	Signal
Switch 2, black	1	White (positive)	2 – A\
Blue	2	Blue	GND- 0 V
Switch 3, black	3	Green (reference)	3 – A\
	4	Yellow	
	5	Gray	
Brown	6	Brown	+ 24 VDC
Switch 1, black	7	Pink (negative)	1 – A\
	8	Red	
	9	Black	

Pin assignment for inductive limit switches

Pin assignment for optical limit switches

When the L contacts (1 – L, 2 – L) are connected to +24 V, the optical limit switch acts as an opener.
When the L contacts (1 – L, 2 – L) are connected to 0 V, the optical limit switch acts as a closer.

Limit switch cable	Pin no.	Limit switch cable color	Signal
Switch 2, black	1	White (positive)	2 – OUT
Blue	2	Blue	GND- 0 V
Switch 2, pink	3	Green	2 – L
Switch 3, black	4	Yellow	3-OUT
Switch 3, pink	5	Gray	3- L
Brown	6	Brown	+ 24 VDC
Switch 1, black	7	Pink (negative)	1 – OUT
Switch 1, pink	8	Red	1 – L
	9	Black	

Pin assignment for optical limit switches

5.5 Cables

The LMCx and LMSx linear motor axes have an integrated bimetal switch as a temperature sensor. This is connected separately via a wire pair from the motor. This provides the option of extending the temperature sensor wiring via the sensor cable, provided the amplifier permits this connection.

With HIWIN axes, the temperature sensor is normally connected via the motor power cable. The temperature sensor cable is therefore also wired to the motor connector.

5.5.1 Motor cable of the linear motor axes

A suitable cable must be used in the energy chain cable carrier. HIWIN uses IGUS energy chain cable carriers with the appropriate cables.

In linear motor axes with LMS motors, the following motor cables are used:

Igus Chainflex cable, type CF27.07.05.02.01.D with (4G0.75+(2x0.5)C)C
Igus Chainflex cable, type CF27.15.10.02.01.D with (4G1.5+(2x1.0)C)C
Igus Chainflex cable, type CF27.25.10.02.01.D with (4G2.5+(2x1.0)C)C

Figure 5.8: LMS motor cable

5.5.2 Encoder cable of the linear motor axes

The quality of the encoder cable has a significant impact on the control performance of the linear motor axis. For this reason, the use of a high quality cable suitable for cable carriers is very important.
In the HIWIN linear motor axes, the Perform Igus Chainflex type CF211.002 cable with (3x(2x0.14)C+(2x0.5)C)C is used.
The separate shielding of the wire pairs that transmit the analog sine and cosine signals of the 1Vss output signals is particularly important. This means that longer encoder cables (up to 15m) can be used without problems and EMC errors are shielded off effectively.

Figure 5.9: Encoder cable in HIWIN linear motor axes

5.5.3 Limit switch cable of the linear motor axes

The limit switch cables only have to meet the requirements of the energy chain cable carriers. HIWIN uses the Igus Chainflex type CF240.01.14 cable with (14x0.14)C.

Figure 5.10: Limit switch and reference switch cables in HIWIN linear motor axes

5.6 Circuit diagram outline: Connecting a pneumatic weight balancing device

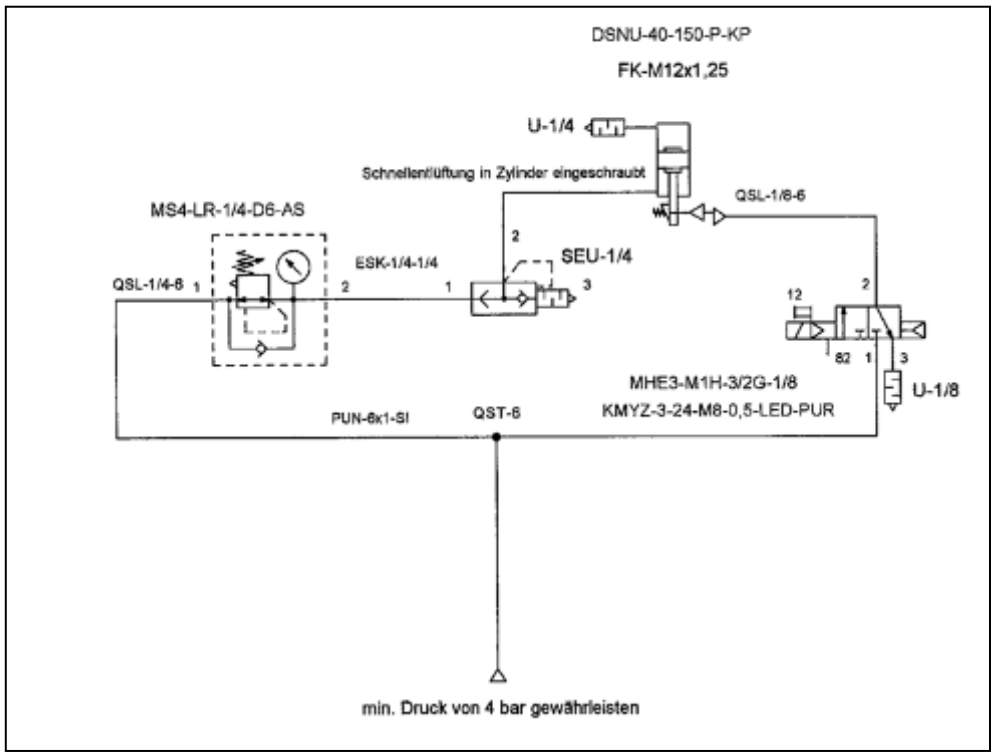


Figure 5.11: Circuit diagram of the pneumatic weight balance

To avoid switching delays caused by the pneumatics, the switching valve is located right next to the clamping element.
The pneumatic packages of the different LM axes are listed in chapter 9, Spare parts, order codes.

5.7 Power supply – typical values

The minimum cross-section of the mains supply cable is based on the local regulations (see VDE 0100 part 523, VDE 0298 part 4), the ambient temperature and the required nominal voltage of the converter.

Amplifier nominal voltage **[A]**	**Connected load [kVA]**	**Max. cable cross-section of the clamps [mm²]**	Recommended fuse **(gL) [A]**
4	1.7	2.5	1X10
5.5	2.3	2.5	1X16
5.7	4.2	2.5	3X10
10	7.3	2.5	3X16
17	12.4	4	3X25

Typical values for the power supply

5.8 Connecting the clamping element

5.8.1 Pneumatic clamping element

Connect the air to the prepared air input of the pneumatic clamping element.

If the response time of the clamping element is important, the compressed-air connecting line should be as short as possible. It is advisable to position the solenoid switching valve as close as possible to the clamping element.

5.9 Connecting the Hall effect sensor

The following Hall effect sensor types are used:

- Analog Hall effect sensors
  Output signal: sine and cosine 1Vss signals
  Connection: Open cable ends, M17 round connector or the 9-pin sub-D version
- Digital Hiwin Hall effect sensors
  Output signal: 3 square-wave signals offset by 120°
  Connection: Open cable ends, M17 round connector or the 9-pin sub-D version

5.9.1 Analog Hall effect sensor

5.9.1.1 Pin assignment with open cable end

Cable length: 500 mm

Hall effect sensor cable color	Signal
Blue	Hall A+
Green	Hall A-
Yellow	Hall B+
Gray	Hall B-
White	+5 V
Brown	0 V
Shielding	Shielding

5.9.1.2 Pin assignment of round connector (coupler), M17, 17-pin

Cable length: 500 mm

Hall effect sensor cable color	M17 coupler Pin no.	Signal
Blue	9	Hall A+
Green	1	Hall A-
Yellow	10	Hall B+
Gray	2	Hall B-
White	4	+5 V
Brown	12	0 V
Housing	Housing	Shielding

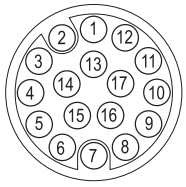


Figure 5.8: Pin assignment of the round connector for the analog Hall effect sensor

5.9.1.3 Pin assignment of the 9-pin connector

Cable length: 500 mm

Hall effect sensor cable color	M17 coupler Pin no.	Signal
Blue	2	Hall A+
Green	3	Hall A-
Yellow	4	Hall B+
Gray	5	Hall B-
White	1	+5 V
Brown	6	0 V
Housing	Housing	Shielding

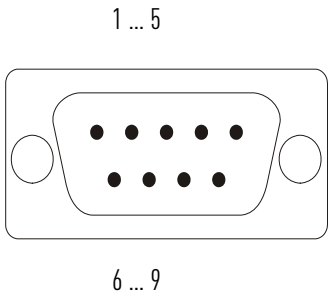


Figure 5.9: Pin assignment of the sub-D connector for the analog Hall effect sensor

5.9.2 Digital Hall effect sensor

5.9.2.1 Pin assignment with open cable end

Cable length: 500 mm

Hall effect sensor cable color	Signal
White	Hall A
Gray	Hall B
Yellow	Hall C
Brown	5 V
Green	0 V
Shielding	Shielding

5.9.2.2 Pin assignment of the round connector (coupler) M17; 17-pin

Cable length: 500 mm

Hall effect sensor cable color	M17 coupler Pin no.	Signal
White	14	Hall A
Gray	16	Hall B
Yellow	17	Hall C
Brown	5	5 V
Green	13	0 V
------	Housing	Shielding

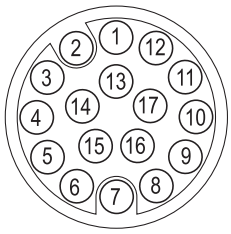


Figure 5.10: Pin assignment of the round connector for the digital Hall effect sensor

5.9.2.3 Pin assignment of the 9-pin connector

Cable length: 500 mm

Hall effect sensor cable color	9-pin connector Pin no.	Signal
White	2	Hall A
Gray	3	Hall B
Yellow	4	Hall C
Brown	1	5 V
Green	5	0 V
------	Housing	Shielding

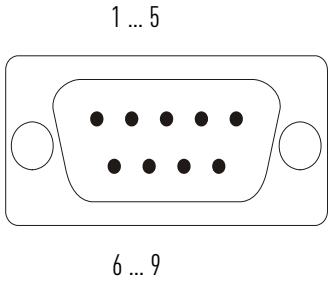


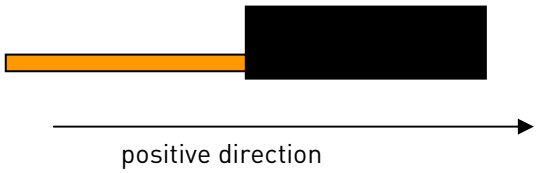
Figure 5.11: Pin assignment of the connector for the digital Hall effect sensor

Note:

NOTE

The evaluation of an analog Hall effect sensor is generally implemented with a second sensor input. Depending on the position in which the motor is installed and on the counting direction of the measuring system, tracks A and B have to be adjusted:

- Positive direction of movement away from the motor cable
  Hall effect sensor counts in the direction of the distance measuring system
  Distance measuring system Track SIN Track COS
  Hall effect sensor: Track A Track B



- Positive direction of movement toward the motor cable
  Hall effect sensor counts in the opposite direction to the distance measuring system
  Distance measuring system Track SIN Track COS
  Hall effect sensor Track B Track A

6 Putting into operation and programming

6.1 Putting into operation

Linear motor axes must always be used in conjunction with suitable safety equipment (non-contact safety devices, mechanical safety devices); these safety devices must be designed, installed and checked on a regular basis in line with the relevant national and international legislation and regulations.
In the event of a power failure, the moving part of linear motor axes without holding brakes and weight balancing runs to the limit position. The stop buffers on both sides must therefore not be removed.
Applies to LMX1L-S, LMX1L-T and LMV1L and LMH1L: People with implants affected by magnetic fields (e.g. pacemakers) are at risk due to the presence of strong magnetic fields. As a general principle, anyone whose health could be affected by strong magnetic fields should keep a safe distance of at least 1 meter away from the linear motor axis. The linear motor axis must be fitted with an appropriate, easily understood and clearly visible warning sign.
Applies to LMX1L-S, LMX1L-T and LMV1L and LMH1L: Due to the strong magnetic forces of attraction, special care must be taken in the immediate vicinity (distance approx. 50 mm) of the magnetic track. For this reason, heavy (>1 kg) or flat (>1 dm²) objects made of steel or iron must not be moved into this area by hand. Fit clearly visible and easily understood warning signs (e.g. permanent adhesive signs) onto the machine.
During operation the motor heats up. You can burn yourself badly if you touch it. Fit a safety device to prevent contact!

- Switch off the control unit
- Disconnect the motor cable
- Connect the cable of the distance measuring system
- Switch on the control unit and check that the distance measuring system works; to find out how to do this, read the assembly instructions for the drive amplifier and distance measuring system
- Switch off the control unit
- Connect the motor cable
- Switch on the control unit
- Carry out a trial run at a slow speed
- If the trial run completes successfully, perform a test under operating conditions

6.2 Programming

The programming depends on which control unit and amplifier are used. Read the assembly instructions of the control unit and drive amplifier.

7 Maintenance

Before and during all maintenance work, the linear motor axis must be completely disconnected, then ensure that the power supply cannot be reconnected by other persons; otherwise there is deadly peril and danger of injury.

7.1 Maintenance on the linear motor

The linear motors are essentially maintenance-free.

However, from a technical point of view, a free air gap between the primary part (forcer) and secondary part (magnetic track) must be ensured. There may be magnetic chips or other metal parts may remaining on the magnetic track. These foreign materials could find their way into the air gap, forming a wedge and destroying the mechanics of the motor. It is therefore important to ensure that no large particles can become stuck in the air gap between the stator and forcer.

7.2 Maintenance of the distance measuring system

The MAGIC-PG magnetic distance measuring system works on a non-contact basis and thus requires no maintenance. However, dirt particles between the encoder and the measuring scale can affect it. In addition, foreign bodies on the measuring scale and rub against it and remove the scale.

The magnetic measuring scale of the MAGIC-PG has a steel cover for protection. This can be scratched without any issues arising, but the stainless steel protective cover tape may come loose from the basic unit if continuous pressure is applied by a wedged dirt particle. For this reason, the distance measuring system must also be checked regularly for dirt and cleaned when necessary.

The optical measuring system is sensitive to any dirt on the measuring scale. A soft cloth only should be used to clean the measuring scale as otherwise the delicate coating could be scratched.

7.3 Maintenance of the electromechanical components

The cables and energy chains have a limited service life. The energy chain is specified at approx. 4 million cycles, for example. The service life depends greatly on the environmental conditions and the travel dynamics, however. For this reason it is not generally possible to calculate a precise service life.

It is therefore essential to watch for traces of wear on the cables in the chain, e.g. signs of abrasion on the cable. It is also a good idea to check that the cable connections are positioned correctly.

Incorrect functions of the limit switches or reference switches are often caused by a bent cam switch. Ensure therefore that the cam switches are the correct distance from the sensors.

7.4 Maintenance of the pneumatic weight balance and spring-loaded clamp (optional)

As an option, the HIWIN linear motor axes can have integrated emergency stop-capable clamping elements or, in the case of vertical applications, pneumatic weight balancing cylinders.

These elements are maintenance-free, but can be subject to wear.

Wear of the brake linings → complete replacement of the clamping element.

If the weight balancing effect drops off → replace completely.

7.5 Maintenance of the linear guideways

7.5.1 Lubrication

NOTE

General information on lubrication is provided here. You will find further information on lubrication and selecting lubricants in our technical information document entitled "Lubrication Instructions for Linear Guideways" (Lubrication Instructions for Linear Guideways) at www.hiwin.de.

The linear guideways of the linear axes require adequate lubrication like all rolling bearings. The lubricants reduce wear, protect against dirt, prevent corrosion and lengthen service life.

The information from the lubricant manufacturer must be observed. Always check the miscibility of different lubricants. Lubricant oils based on mineral oil of the same classification (e.g. CL) and of a similar viscosity (maximum one class difference) can be mixed. Greases can be mixed if their base oil and the thickening type are the same. The viscosity of the base oil must be similar. There must not be more than one level of difference in NGLI class.

Once the linear guideway is fitted, initial lubrication is carried out at the factory. |The linear motor axes are fitted as standard with lubricating nipples on the ends of the block for filling with standard commercial grease guns; as an option, lubricant adapters can be used to connect the linear motor axis directly to the lubrication line from the central lubrication system.

Relubrication should be carried out after every 200 to 600 operating hours or 1000 km.

0.6 g of grease should be used for profile rails with a nominal size of 20. In the case of vertical installations, the relubrication quantity should be increased by approx. 50%.

NOTE

In general, old grease, dirt and chips should be removed from the profile rails before lubrication.

The following lubricating greases should be used for HIWIN linear motor axes:

Lubricating grease to DIN 51825: KP2K of the consistency class NGLI2 to DIN 51818

Do not use grease containing any solid lubricants (e.g. graphite or MoS2).

NOTE

In the case of axes with a plate cover, the lubricating nipples are only accessible if the travel block is moved to the limit stop. When covered with a bellows, the bellows must be removed from the travel block.

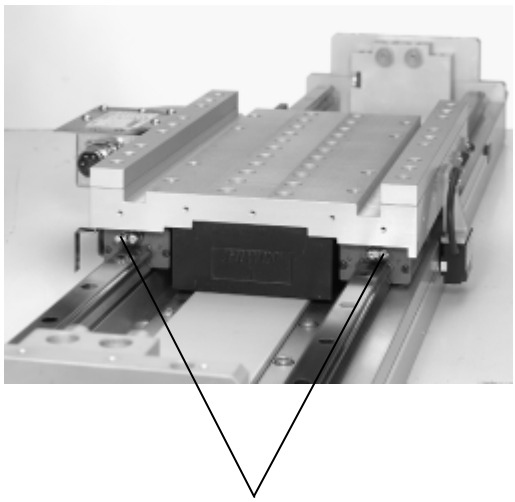


Figure 7.1: Layout of the lubricating nipples on the ends of the block (example)

7.5.2 Strip lubrication

The LMH1L linear motor axes have a strip lubricating system to reduce the maintenance effort required.

The order numbers for the components of the strip lubricating system are listed in section 9.4.

Figure 7.2: Strip lubricating system

7.5.3 Cleaning

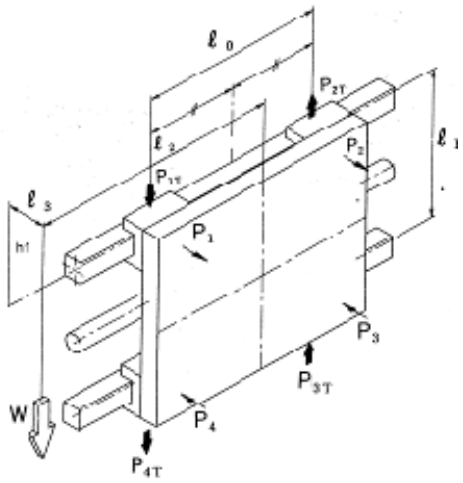
Dirt can settle and solidify on unprotected profile rails. This dirt must be removed on a regular basis.

7.6 Calculating the service life

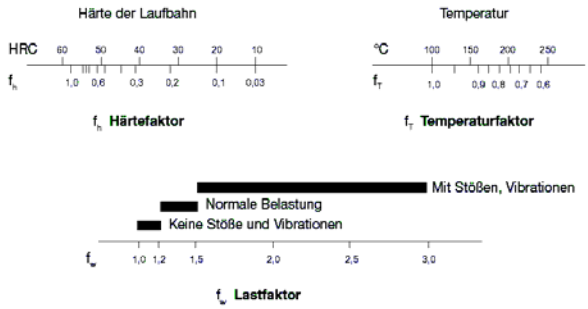
The service life of the linear motor axes depends primarily on the service life of the linear guideways.
By way of example, the following table shows the service life of the LMX1L-S23 linear motor axis with a useful load of 12 kg and accelerating at 22 m/s^2.

Customer:		**Doc.no.:**	**0**	**Date:**	**07.10.2005**	
Project:		**Rev.:**	**0**	**Author:**		
Technical data on the linear guideway:						
Block	Type:	HGH20CA				
Dynamic bearing rate	Cdyn:	17750	N			
Static bearing rate	C0:	37840	N			
Stroke	ls:	1200	mm			
Technical conditions:						
Weight force in load center	W:	250	N			
Block spacing in the direction of the rail axis	l0:	124	mm			
Spacing of the rails	l1:	136	mm			
Center of gravity spacing in axis direction	l2:	0	mm			
Center of gravity spacing vertical to axis direction	l3:	300	mm			
Center of gravity spacing vertically	h1:	100	mm			
Moderate speed	vm:	2.2	m/s			
Acceleration	a:	22	m/s²			
Delay	(-)a:	22	m/s²			
Standstill per cycle	tp:	0.20	s			
Acceleration due to gravity	g:	9.81	m/s²			

Application:



Operating factors:						
Hardness factor	fH:	1.000				
Temperature factor	fT:	1.000				
Load factor	fW:	1.300				



Calculation results:						
Max. dynamic equivalent load per block	Pm:	645	N	Cycle duration:	1.10	s
Load taking into account the operating factors	P:	838	N	Cycles / hour:	3280	z/h
Static support stability	S0:	29		Operating hours / day:	24	h/d
Service life in kilometers	L:	474,916	km	Working days / year:	365	d/y
Service life in operating hours	Lh:	59,964	H			
Service life in cycles	Lz:	240,504,472	z			
Service life in years	Ly:	8	y			

The calculation results are based on the technical specifications we have available.
Values have been assumed for any missing information.
The service life durations calculated are theoretical minimum values assuming correctly performed assembly and lubrication as well as a clean environment.
If these assumed conditions do not apply, the results calculated will be invalid.

Figure 7.3: Example of a service life calculation

7.7 Service lives of towing chain and cables

The service lives of the towing chain and cables depend primarily on the number of cycles run rather than on time.
The service lives of the cables and towing chain depends on a large number of external factors. The towing chain is designed so that the service life is approx. 4 million cycles. However, this is reduced in the event of operation at high speeds (> 2 m/s), high acceleration rates (> 20 m/s^2), with low bending radii of the towing chain and cables or if there is dirt around. The use of dividing webs between the cables in the towing chain is also important for a long service life.

8 Technical data

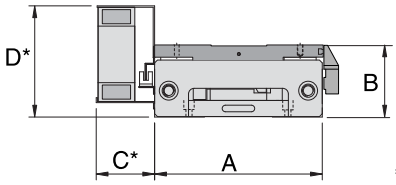
8.1 General technical data

Linear motor axis	Motor type	v max	a max	Overall length L max	Repeat-ability	Accuracy	Straightness	Levelness
		[m/s]	[m/s2]	[mm]	[mm]	[mm/ 300 mm]	[mm/ 300 mm]	[mm/ 300 mm]
LMX1E-...	LMC	5	100***	4000	+/- 0.001*	+/- 0.005*	+/- 0.005	+/- 0.005
LMX1L-S...	LMS	4	50***	4000	+/- 0.001*	+/- 0.005*	+/- 0.005	+/- 0.005
LMX1L-T...	LMT	4	50	4000	+/- 0.001*	+/- 0.005*	+/- 0.005	+/- 0.005
LMV1L-...	LMS	1.8	30	600	+/- 0.001*	+/- 0.005*	+/- 0.005	+/- 0.005
LMH1L-...	LMS	4	50	100000	+/- 0.02**	+/- 0.05**	+/- 0.02	+/- 0.02

* Values apply to the optical incremental distance measuring system (sine/cosine signals) with a period of 40 µm.
** Values apply to the magnetic incremental HIWIN-MAGIC distance measuring system with sine/cosine signals.
*** When using bellows covers, there may be restrictions in terms of maximum acceleration rates.

8.2 Technical data for LMX1E

8.2.1 Parameters for LMX1E



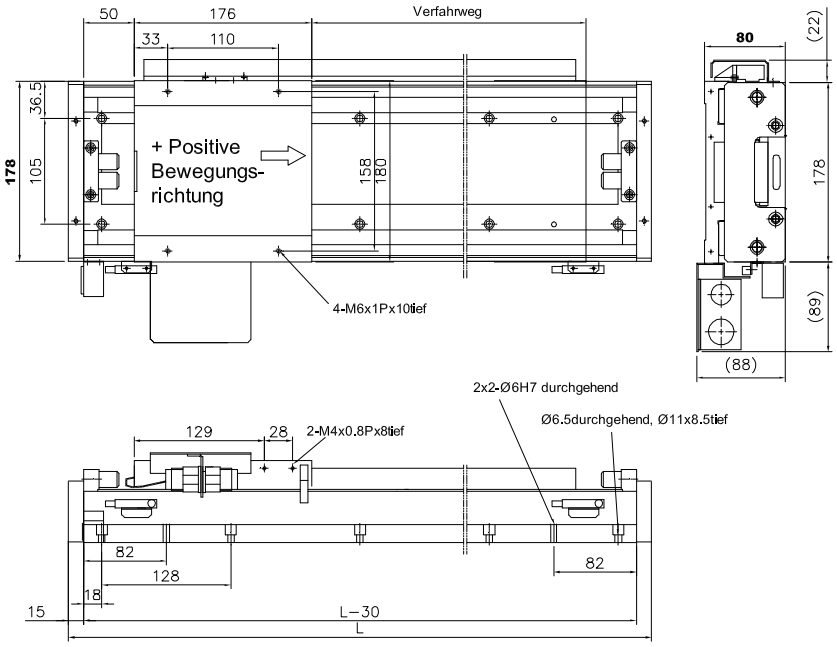
*Dimensions C and D are customer-specific

Designation (order code)	Motor type	F_C	F_p	Travel block		v_{max}	a_{max}	Dimension A xxxx = stroke [mm]	Dimension B
				Mass	Length				
		[N]	[N]	[kg]	[mm]	[m/s]	[m/s²]	[mm]	[mm]
LMX1E-CB5-1-xxxx-A100	LMC B5	90	270	2.0	178	5	100	178	80
LMX1E-CB6-1-xxxx-A100	LMC B6	110	330	3.0	208	5	100	178	80
LMX1E-CB8-1-xxxx-A100	LMC B8	145	435	4.2	272	5	100	178	80
LMX1E-CB5-1-xxxx-A1A0	LMC B5	90	270	2.3	178	5	100	178	92/101
LMX1E-CB6-1-xxxx-A1A0	LMC B6	110	330	3.3	208	5	100	178	92/101
LMX1E-CB8-1-xxxx-A1A0	LMC B8	145	435	4.5	272	5	100	178	92/101

Notes: F_C = continuous force, 100% duty cycle (DC) at 80 °C coil temperature, F_p = peak force (1 s)

8.2.2 Dimensions and weight of the LMX1E-CB5 axis without cover

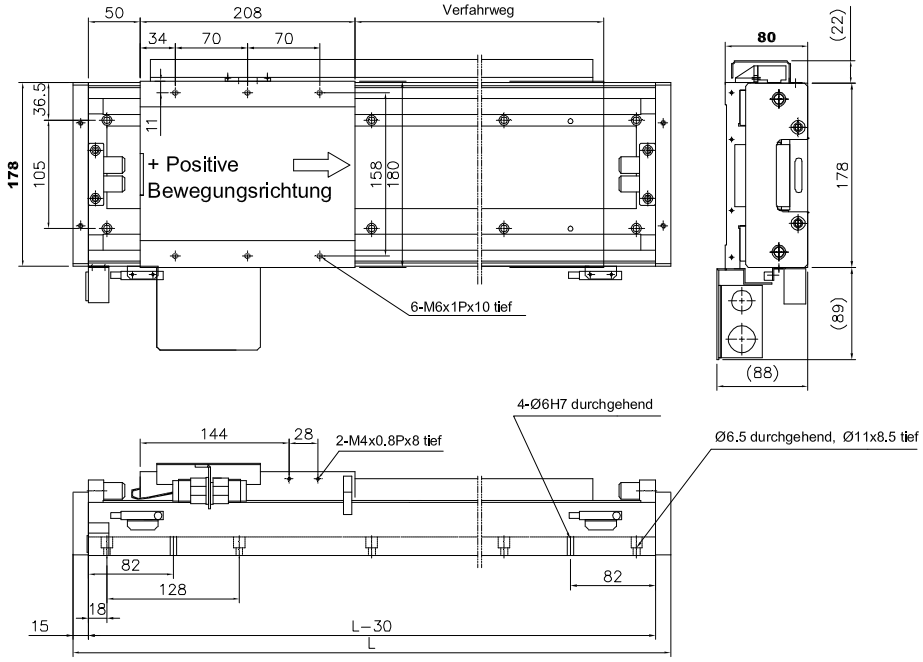
Stroke [mm]	Overall length L [mm]	Weight [kg]
144	450	19.0
272	578	22.5
400	706	26.0
528	834	30.0
656	962	33.0
784	1090	36.5
912	1218	40.5
1040	1346	44.0
1296	1602	51.0
1552	1858	58.5
1808	2114	66.0



All values in mm

8.2.3 Dimensions and weight of the LMX1E-CB6 axis without cover

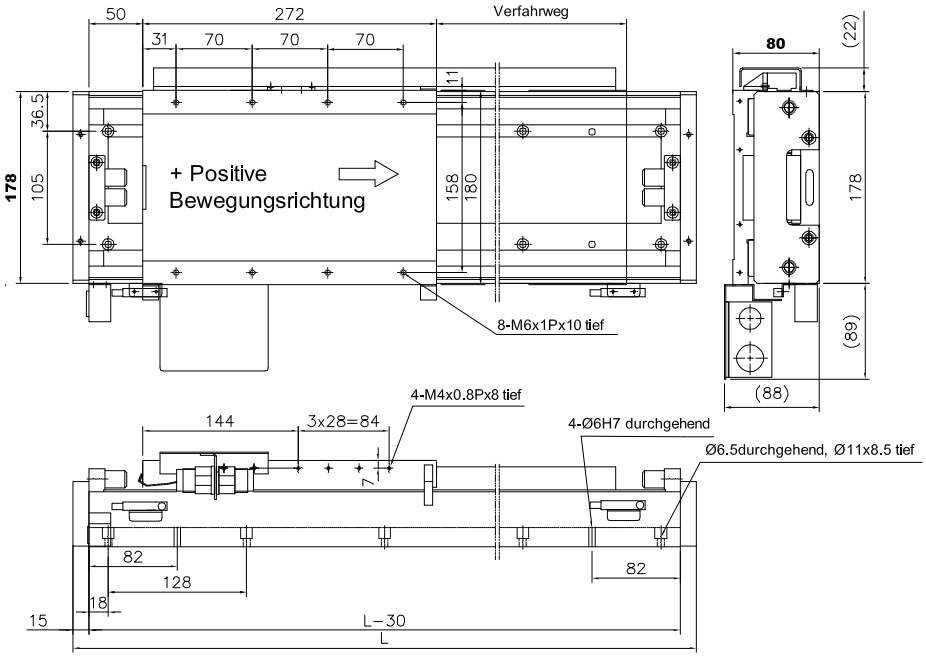
Stroke [mm]	Overall length L [mm]	Weight [kg]
112	450	19.3
240	578	23.0
368	706	26.6
496	834	30.2
624	962	33.9
752	1090	37.5
880	1218	41.2
1008	1346	44.8
1264	1602	52.1
1520	1858	59.4
1776	2114	66.6



All values in mm

8.2.4 Dimensions and weight of the LMX1E-CB8 axis without cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
176	578	24.5
304	706	28.1
432	834	31.7
560	962	35.4
688	1090	39.0
816	1218	42.7
944	1346	46.3
1200	1602	53.6
1456	1858	60.8
1712	2114	68.1

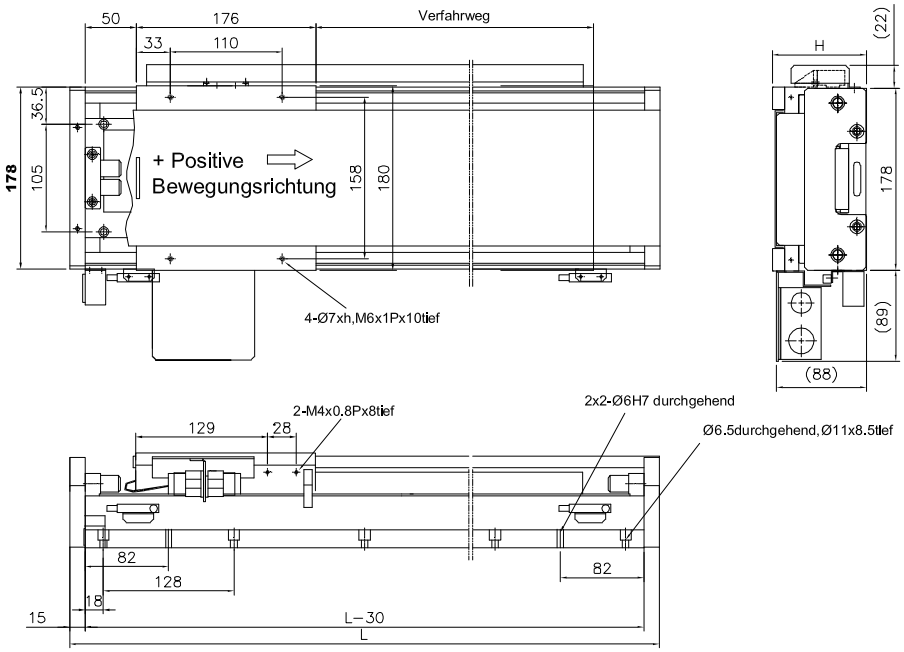


All values in mm

8.2.5 Dimensions and weight of the LMX1E-CB5 axis with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
144	450	658	92	20.3
272	578	660	92	24.3
400	706	860	92	28.0
528	834	1060	92	32.0
656	962	1259	92	36.0
784	1090	1460	92	40.0
912	1218	1660	92	44.0
1040	1346	1859	92	48.0
1296	1602	2260	101	56.0
1552	1858	2659	101	64.0
1808	2114	3060	101	71.7

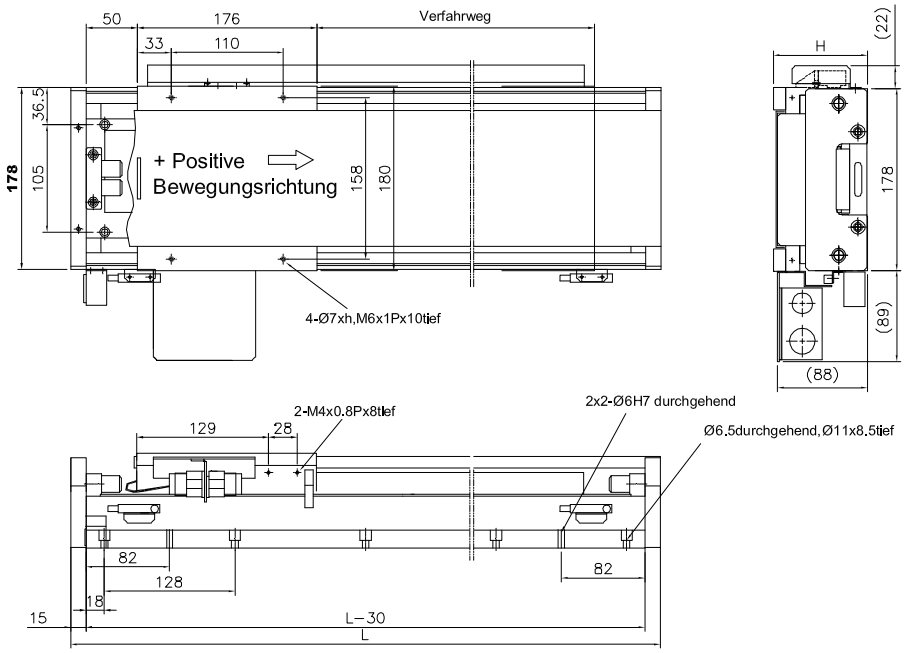
L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H – 80
All values in mm



8.2.6 Dimensions and weight of the LMX1E-CB6 axis with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
112	450	442	92	21.0
240	578	642	92	25.0
368	706	841	92	28.9
496	834	1041	92	32.8
624	962	1242	92	36.8
752	1090	1442	92	40.7
880	1218	1641	92	44.7
1008	1346	1842	92	48.7
1264	1602	2241	101	56.6
1520	1858	2642	101	64.5
1776	2114	3041	101	72.4

L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H – 80
All values in mm

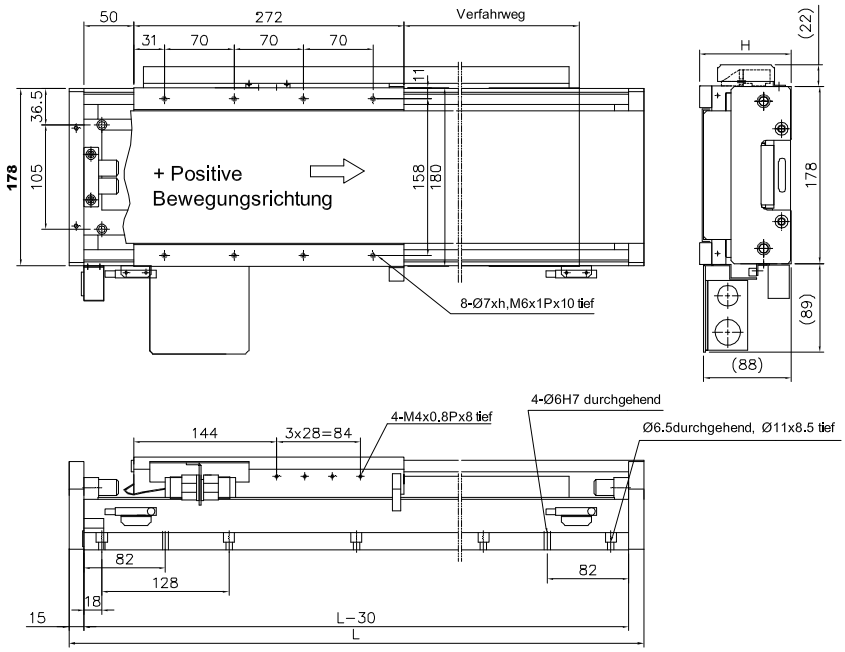


8.2.7 Dimensions and weight of the LMX1E-CB8 axis with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
176	578	606	92	26.4
304	706	806	92	30.4
432	834	1005	92	34.3
560	962	1205	92	38.3
688	1090	1406	92	42.2
816	1218	1605	92	46.2
944	1346	1805	92	50.2
1200	1602	2206	101	58.0
1456	1858	2606	101	66.0
1712	2114	3005	101	74.0

L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H – 80

All values in mm



8.2.8 Parameters for the coreless LMC motor type

	Sym-bol	Unit	LMC												
			A2	A3	A4	A5	A6	B4	B5	B6	B7	B8	BA	C7	C8
Peak force (1 s)	Fp	N	75	105	135	150	180	210	270	330	390	435	540	510	585
Continuous force (at 80 °C)	Fc	N	25	35	45	50	60	70	90	110	130	145	180	170	195
Peak current (1 s)	Ip	A (rms)	6.9	6.3	6.3	5.4	5.4	6	6	6	6	6	6	6	6
Continuous current (at 80 °C)	Ic	A (rms)	2.3	2.1	2.1	1.8	1.8	2	2	2	2	2	2	2	2
Force constant	Kf	N/A (rms)	10.6	15.8	21.2	28.2	33.8	32.5	45.4	54.5	63.5	72.5	90.6	85.4	97.5
Max. coil temp.	Tmax	°C	100	100	100	100	100	100	100	100	100	100	100	100	100
Electrical time constant	Ke	ms	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.8	1.0	1.0
Resistance (per phase at 25 °C)	R25	V	1.7	2.4	3.0	3.5	4.0	4.1	5.2	6.7	7.3	8.3	10.4	8.4	9.6
Inductivity (per phase)	L	mH	0.6	0.8	1.1	1.2	1.4	1.3	1.9	2.2	2.7	3.1	3.9	4.2	4.8
Pin spacing	2	mm	32	32	32	32	32	32	32	32	32	32	32	32	32
Bending radius of the motor cable	Rbend	mm	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
Counter-EMF constant	Kv	Vrms (m/s)	5.9	8.8	11.9	14.5	17.4	19.0	24.8	29.3	34.7	40.0	50.0	45.4	51.9
Motor constant (at 25 °C)	Km	Nm/ Ï W	4.8	6.0	6.9	8.7	9.8	9.3	11.4	12.5	13.7	14.5	16.2	17.0	18.1
Thermal resistance	Rth	°C/W	2.25	1.77	1.32	1.48	1.51	1.18	0.92	0.80	0.65	0.57	0.45	0.56	0.49
Thermo switch			100 °C, bimetal (opener), DC 12 V/6 A, DC 24 V/3 A or PTC SNM100												
Max. intermediate circuit voltage		V	325												
Forcer weight	Mf	kg	0.15	0.23	0.31	0.38	0.45	0.38	0.48	0.58	0.68	0.72	0.88	0.74	0.76
Dead weight of the stator	Ms	kg/m	7	7	7	7	7	12	12	12	12	12	12	21	21
Forcer length/ dimension n	Lf	mm	66/2	98/3	130/ 4	162/5	194/6	130/4	162/5	194/6	226/7	258/8	290/ 10	226/7	258/8
Forcer height	H	mm	59	59	59	59	59	79	79	79	79	79	79	99	99
Stator height	Hs	mm	60	60	60	60	60	80	80	80	80	80	80	103	103
Stator width	Ws	mm	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	35.2	35.2
Stator length/ dimension N	Ls	mm	192/2 256/3 320/4 384/5 448/6 512/7												
Overall height of system	H	mm	74.5	74.5	74.5	74.5	74.5	94.5	94.5	94.5	94.5	94.5	94.5	117.5	117.5

8.2.9 Parameters for the iron-core LMS motor

	Symbol	Unit	LMS										
			13	23	27	37	37L	47	47L	57	57L	67	67L
Peak force (1 sec)	Fp	N	470	600	900	1250	1250	1700	1700	2000	2000	2500	2500
Continuous force (at 80 °C)	Fc	N	180	220	340	475	475	650	650	780	780	950	950
Peak current (1 sec)	Ip	A (rms)	12.3	10.5	10.5	10.5	21.0	10.5	21.0	10.5	21.0	10.5	21.0
Continuous current (at 80 °C)	Ic	A (rms)	4.1	3.5	3.5	3.5	7.0	3.5	7.0	3.5	7.0	3.5	7.0
Force constant	Kf	N/A (rms)	44	61	97	136	68	186	96	223	112	271	136
Magnetic force of attraction	Fa	N	805	1350	2036	2850	2850	4071	4071	4885	4885	5700	5700
Max. coil temp.	Tmax	°C	100	100	100	100	100	100	100	100	100	100	100
Electrical time constant	Ke	ms	9.8	11.4	10.8	10.8	10.8	11.1	11.1	11.2	11.2	11.3	11.3
Resistance (per phase at 25 °C)	R25	V	1.7	2.3	3.1	4.3	1.0	5.6	1.3	6.5	1.6	7.4	1.9
Inductivity (per phase)	L	mH	17	27	32	45	10	62	15	73	18	84	21
Pin spacing	2	mm	32	32	32	32	32	32	32	32	32	32	32
Bending radius of the motor cable	Rbend	mm	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
Counter-EMF constant	Kv	Vrms/ (m/s)	26	43	51	71	41	101	59	121	61	141	71
Motor constant (at 25 °C)	Km	Nm/ Ï W	19.4	23.1	31.8	38.0	38.0	45.4	45.5	50.7	50.7	57.6	57.6
Thermal resistance	Rth	°C/W	0.33	0.33	0.46	0.40	0.40	0.30	0.30	0.26	0.26	0.23	0.23
Thermo switch			100 °C, bimetal (opener), DC 12 V/6 A, DC 24 V/3 A or PTC SNM120										
Max. intermediate circuit voltage		V	750										
Forcer weight	Mf	kg	1.8	2.7	4.1	5.9	5.9	8.0	8.0	9.4	9.4	10.8	10.8
Dead weight of the stator	Ms	kg	4.2	6.2	6.2	8.2	8.2	11.5	11.5	13.7	13.7	15.9	15.9
Stator width	Ws	mm	60	80	80	100	100	130	130	150	150	170	170
Spacing of the installation holes	As	mm	45	65	65	85	85	115	115	135	135	155	155
Stator length / dimension N	Ls	mm	192 mm/N=2, 256/N=3, 320 mm/N=4, 384 mm/N=5, 448 mm/N=6, 512 mm/N=7										
Overall height of system	H	mm	55.2	55.2	57.4	57.4	57.4	57.4	57.4	57.4	57.4	57.4	57.4

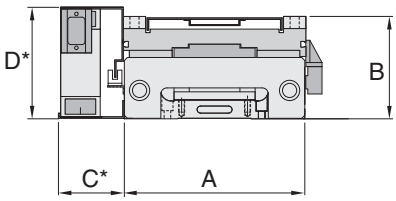
Note: Values in the table relate to operation without forced cooling

8.2.10 Parameters for the iron-core LMT motor

	Symbol	Unit	LMT37	LMT37 (WC) [2]	LMT37L	LMT37L (WC) [2]
Peak force (1 s)	Fp	N	2500	2500	2500	2500
Continuous force (at 80 °C)	Fc	N	950	1600	950	1600
Peak current (1 s)	Ip	A (rms)	10.5	21.0	21.0	21.0
Continuous current (at 80 °C)	Ic	A (rms)	3.5	6.0	7.0	12.0
Force constant	Kf	N/A(rms)	271	271	136	136
Force of attraction	Fa	N	0[1]	0[1]	0[1]	0[1]
Max. coil temperature	Tmax	°C	100	100	100	100
Electrical time constant	Ke	ms	9.6	9.6	9.6	9.6
Resistance (per phase at 25 °C)	R25	•	9.0	9	2.3	2.3
Inductivity (per phase)	L	mH	86	86	22	22
Pin spacing	2	mm	32	32	32	32
Bending radius of the motor cable	Rbend	mm	37.5	37.5	37.5	37.5
Counter-EMF constant	Kv	Vrms(m/s)	141	141	71	71
Motor constant (at 25 °C)	Km	Nm/• W	54.1	54.1	54.1	54.1
Thermal resistance	Rth	°C/W	0.23	0.23	0.23	0.23
Thermo switch			100 °C, bimetal (opener), DC 12 V/6 A, DC 24 V/3 A			
Max. intermediate circuit voltage		V	750			
No. of phases			3	3	3	3
Forcer weight	Mf	kg	14.0	14.0	14.0	14.0
Dead weight of the stator	Ms	kg/m	16.4	16.4	16.4	16.4
Stator width	Ws	mm	100	100	100	100
Stator length/ dimension N	Ls	mm	192 mm/N=2, 256 mm/N=3, 320 mm/N=4, 384 mm/N=5, 448 mm/N=6, 512 mm/N=7			
Spacing of the stator installation holes	As	mm	85	85	85	85
Height of overall system	H	mm	131.5	131.5	131.5	131.5

Notes: 1) 0 = canceled out due to equal attraction forces
2) WC = with water cooling
Values in the table relate to operation without forced cooling; Exception with linear motors marked (WC)

8.3 Technical data for LMX1L-S



*Dimensions C and D are customer-specific

8.3.1 Parameters for LMX1L-S

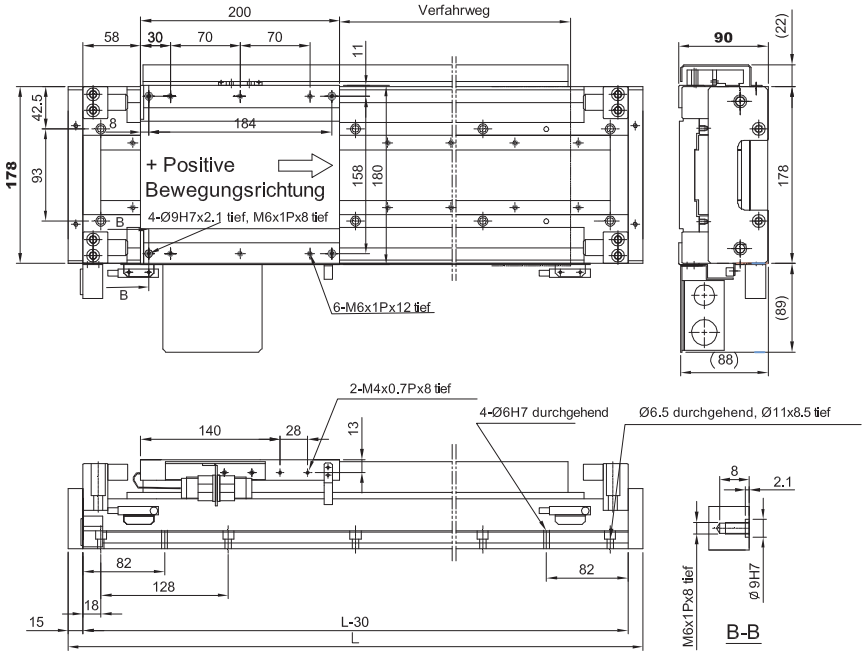
Designation (Order code) xxxx = stroke [mm]	Motor type	F_C [N]	F_p [N]	Travel block		v_{max} [m/s]	a_{max} [m/s²]	Dimension A [mm]	Dimension B [mm]
				Mass [kg]	Length [mm]				
LMX1L-S23-1-xxxx-A100	LMS 23	220	600	7.5	200	4	50	178	90
LMX1L-S27-1-xxxx-A100	LMS 27	340	900	9.5	280	4	50	178	90
LMX1L-S37-1-xxxx-A100	LMS 37	475	1250	12.0	280	3.5*	50	202	95
LMX1L-S37L-1-xxxx-A100	LMS 37L	475	1250	12.0	280	4	50	202	95
LMX1L-S47-1-xxxx-A100	LMS 47	650	1700	18.0	280	2.5*	50	232	95
LMX1L-S47L-1-xxxx-A100	LMS 47L	650	1700	18.0	280	4	50	232	95
LMX1L-S57-1-xxxx-A100	LMS 57	780	2000	22.0	280	2	50	252	100
LMX1L-S57L-1-xxxx-A100	LMS 57L	780	2000	22.0	280	4	50	252	100
LMX1L-S67-1-xxxx-A100	LMS 67	950	2500	26.0	280	2	50	272	100
LMX1L-S67L-1-xxxx-A100	LMS 67L	950	2500	26.0	280	4	50	272	100
LMX1L-S23-1-xxxx-A1A0	LMS 23	220	600	7.8	200	4	50	178	102/111
LMX1L-S27-1-xxxx-A1A0	LMS 27	340	900	9.9	280	4	50	178	102/111
LMX1L-S37-1-xxxx-A1A0	LMS 37	475	1250	12.5	280	3.5*	50	202	107/116
LMX1L-S37L-1-xxxx-A1A0	LMS 37L	475	1250	12.5	280	4	50	202	107/116
LMX1L-S47-1-xxxx-A1A0	LMS 47	650	1700	18.8	280	2.5*	50	232	107/116
LMX1L-S47L-1-xxxx-A1A0	LMS 47L	650	1700	18.8	280	4	50	232	107/116
LMX1L-S57-1-xxxx-A1A0	LMS 57	780	2000	23.0	280	2*	50	252	112/121
LMX1L-S57L-1-xxxx-A1A0	LMS 57L	780	2000	23.0	280	4	50	252	112/121
LMX1L-S67-1-xxxx-A1A0	LMS 67	950	2500	27.0	280	2*	50	272	112/121
LMX1L-S67L-1-xxxx-A1A0	LMS 67L	950	2500	27.0	280	4	50	272	112/121

Notes: F_C = continuous force, 100% duty cycle (DD) at 80 °C coil temperature, F_p = peak force (1 s)
* Limited by counter-EMF of the motor coil

8.3.2 Dimensions and weight of the LMX1L-S23 linear motor axis without cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
104	450	21.0
232	578	23.5
360	706	27.0
488	834	31.0
616	962	34.0
744	1090	37.0
872	1218	40.0
1000	1346	43.0
1256	1602	50.0
1512	1858	56.0
1768	2114	62.0
2024	2370	68.0

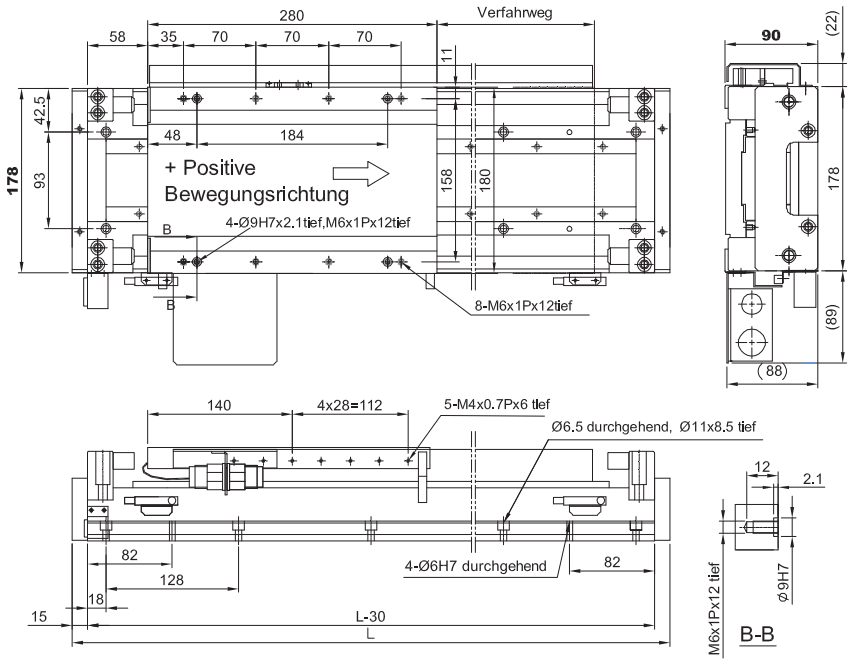
All values in mm



8.3.3 Dimensions and weight of the LMX1L-S27 linear motor axis without cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
152	578	27.0
280	706	30.0
408	834	33.5
536	962	37.0
664	1090	40.0
792	1218	43.5
920	1346	46.5
1176	1602	52.0
1432	1858	58.0
1688	2114	64.0
1944	2370	70.0
2200	2626	76.0

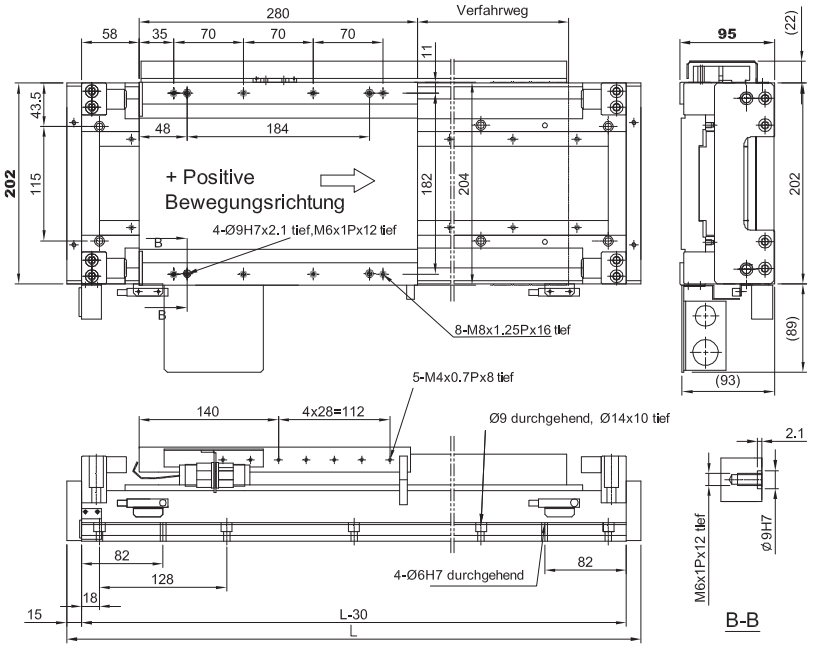
All values in mm



8.3.4 Dimensions and weight of the LMX1L-S37 and LMX1L-S37L linear motor axes without cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
152	578	33.0
280	706	36.0
408	834	40.0
536	962	43.0
664	1090	47.0
792	1218	50.0
920	1346	54.0
1176	1602	62.0
1432	1858	70.0
1688	2114	78.0
1944	2370	86.0
2200	2626	94.0

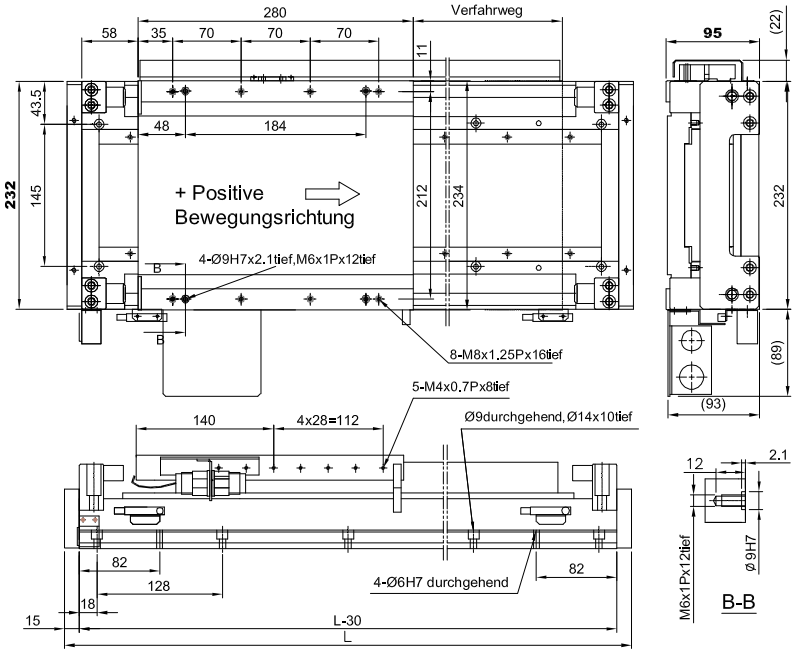
All values in mm



8.3.5 Dimensions and weight of the LMX1L-S47 and LMX1L-S47L linear motor axes without cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
152	578	38.0
280	706	41.0
408	834	46.0
536	962	50.0
664	1090	55.0
792	1218	58.0
920	1346	63.0
1176	1602	71.0
1432	1858	80.0
1688	2114	88.0
1944	2370	96.0
2200	2626	105.0

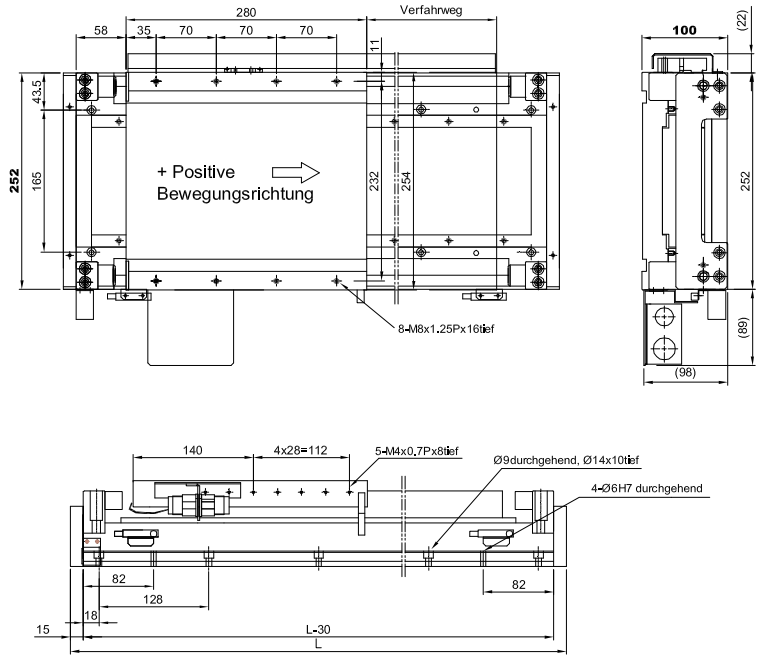
All values in mm



8.3.6 Dimensions and weight of the LMX1L-S57 and LMX1L-S57L linear motor axes without cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
152	578	47.0
280	706	51.0
408	834	57.0
536	962	63.0
664	1090	69.0
792	1218	73.0
920	1346	80.0
1176	1602	90.0
1432	1858	100.0
1688	2114	110.0
1944	2370	120.0
2200	2626	130.0

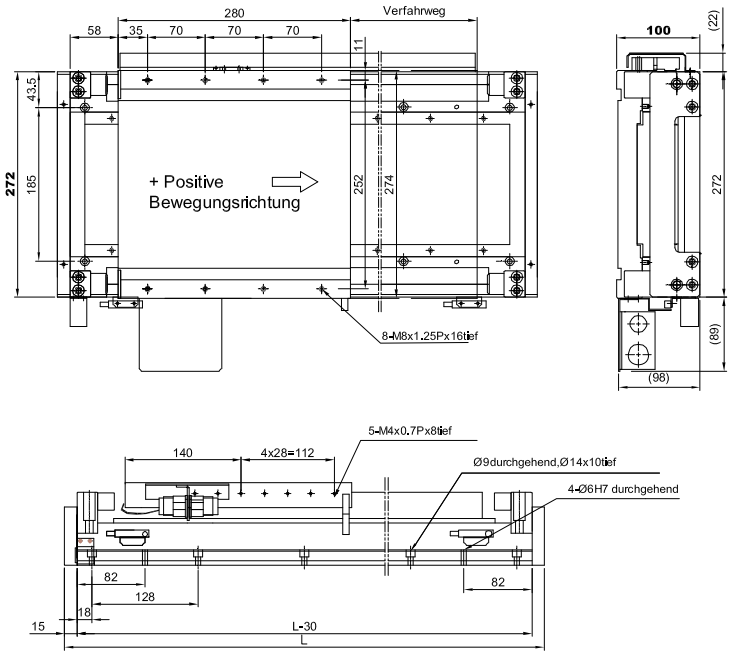
All values in mm



8.3.7 Dimensions and weight of the LMX1L-S67 and LMX1L-S67L linear motor axes without cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
152	578	46.0
280	706	51.0
408	834	57.0
536	962	62.0
664	1090	67.0
792	1218	73.0
920	1346	78.0
1176	1602	89.0
1432	1858	100.0
1688	2114	111.0
1944	2370	129.0
2200	2626	140.0

All values in mm

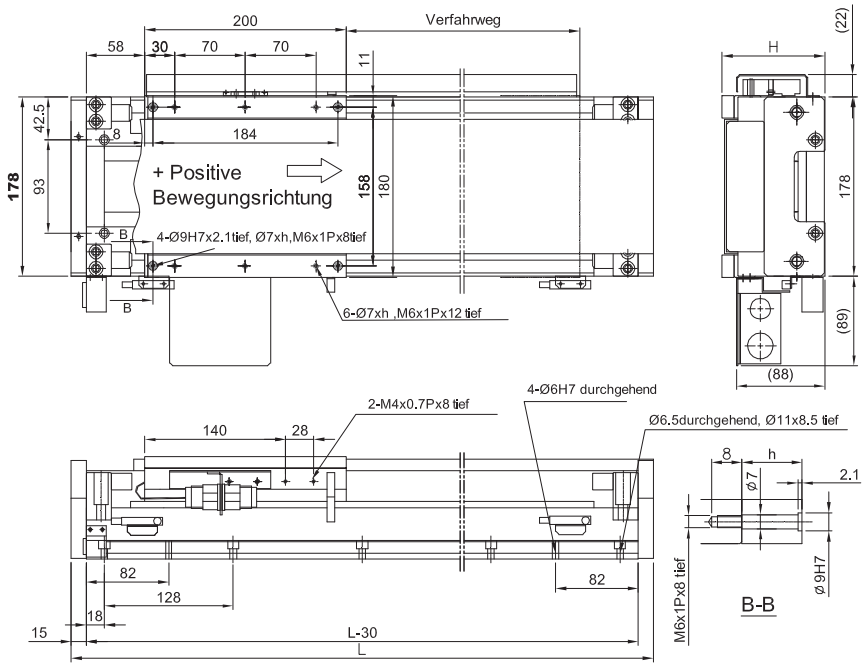


8.3.8 Dimensions and weight of the LMX1L-S23 linear motor axis with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
104	450	421	102	23.0
232	578	621	102	26.0
360	706	821	102	29.5
488	834	1021	102	34.0
616	962	1222	102	37.0
744	1090	1421	102	40.0
872	1218	1621	102	43.5
1000	1346	1821	102	46.5
1256	1602	2221	111	54.0
1512	1858	2622	111	60.5
1768	2114	3021	111	67.0
2024	2370	3421	111	74.0

L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H - 90

All values in mm

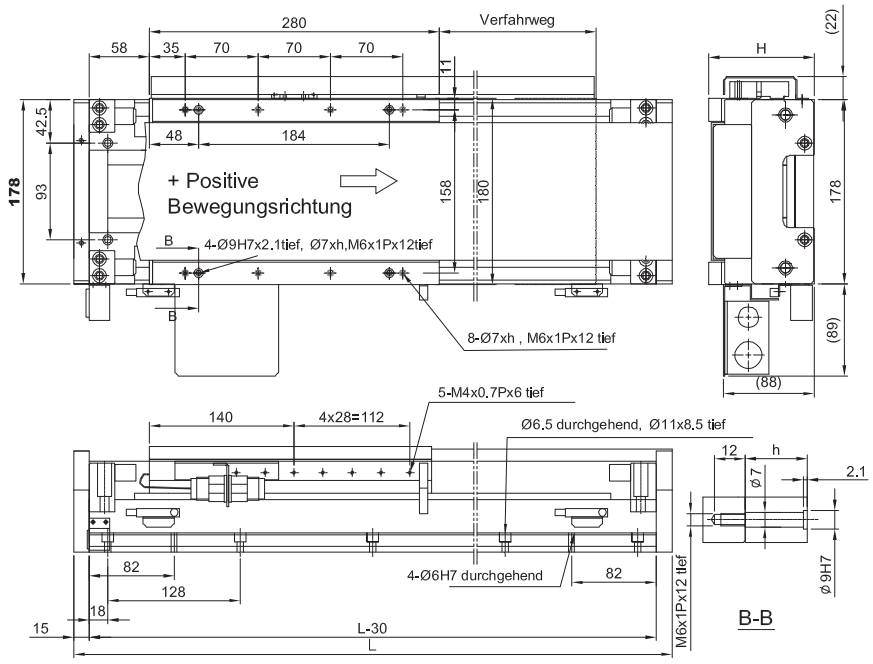


8.3.9 Dimensions and weight of the LMX1L-S27 linear motor axis with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
152	578	576	102	29.5
280	706	775	102	32.5
408	834	976	102	36.0
536	962	1176	102	40.0
664	1090	1376	102	43.0
792	1218	1576	102	47.0
920	1346	1776	102	50.0
1176	1602	2177	111	56.0
1432	1858	2576	111	62.5
1688	2114	2976	111	69.0
1944	2370	3376	111	75.5
2200	2626	3776	111	82.0

L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H - 90

All values in mm

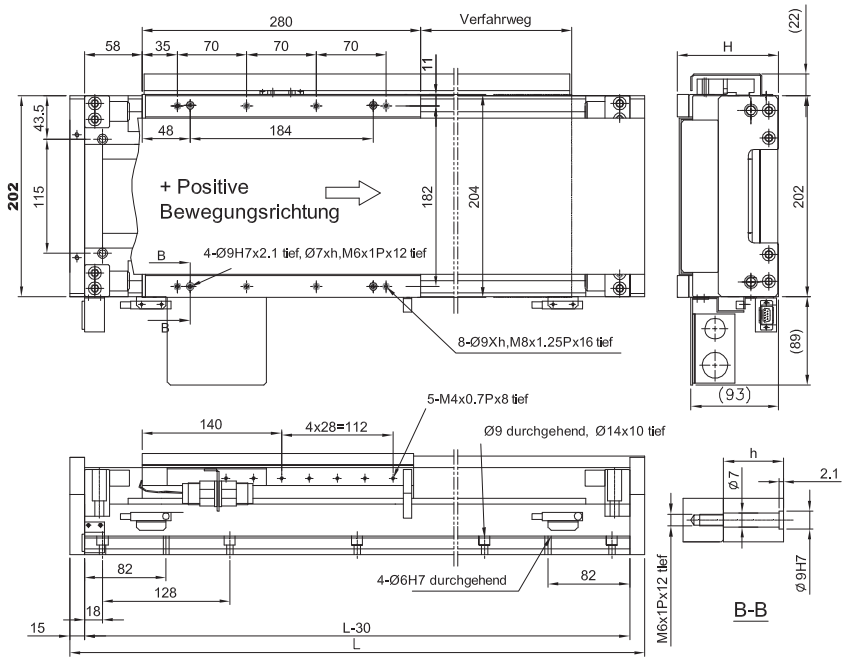


8.3.10 Dimensions and weight of the LMX1L-S37 and LMX1L-S37L linear motor axes with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
152	578	576	107	36.0
280	706	775	107	40.0
408	834	976	107	44.0
536	962	1176	107	47.0
664	1090	1376	107	51.0
792	1218	1576	107	55.0
920	1346	1776	107	59.0
1176	1602	2177	116	68.0
1432	1858	2576	116	76.0
1688	2114	2976	116	85.0
1944	2370	3376	116	94.0
2200	2626	3776	116	103.0

L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H - 95

All values in mm

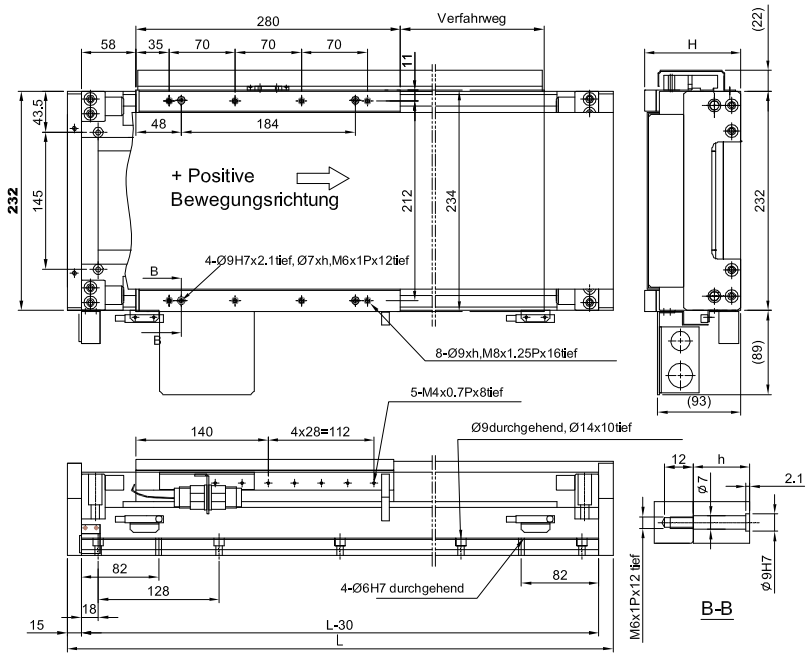


8.3.11 Dimensions and weight of the LMX1L-S47 and LMX1L-S47L linear motor axes with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
152	578	576	107	42.0
280	706	775	107	45.0
408	834	976	107	50.0
536	962	1176	107	55.0
664	1090	1376	107	60.0
792	1218	1576	108	63.0
920	1346	1776	107	69.0
1176	1602	2177	116	78.0
1432	1858	2576	116	87.0
1688	2114	2976	116	96.0
1944	2370	3376	116	105.0
2200	2626	3776	116	114.0

L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H - 95

All values in mm

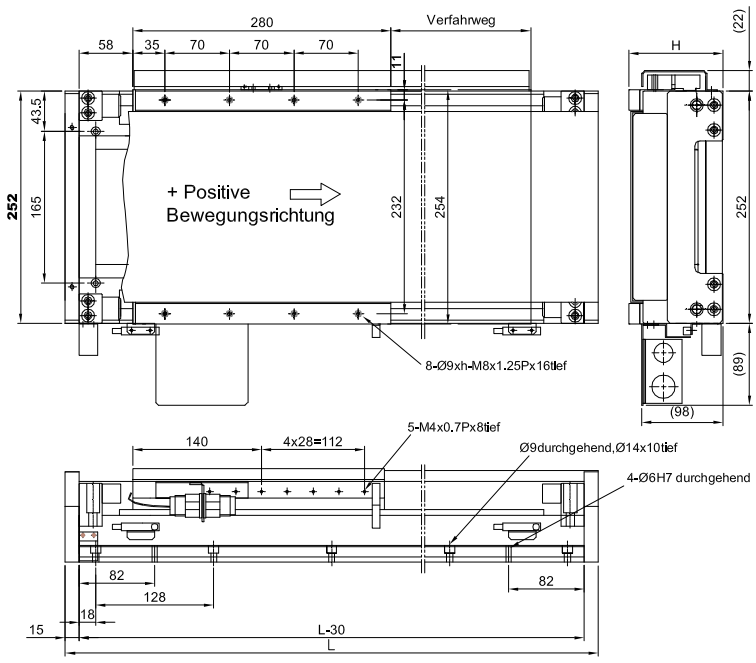


8.3.12 Dimensions and weight of the LMX1L-S57 and LMX1L-S57L linear motor axes with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
152	578	576	112	48.5
280	706	775	112	53.0
408	834	976	112	59.0
536	962	1176	112	65.5
664	1090	1376	112	72.0
792	1218	1576	112	76.0
920	1346	1776	112	83.5
1176	1602	2177	121	94.0
1432	1858	2576	121	104.0
1688	2114	2976	121	114.0
1944	2370	3376	121	125.0
2200	2626	3776	121	135.5

L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H - 100

All values in mm

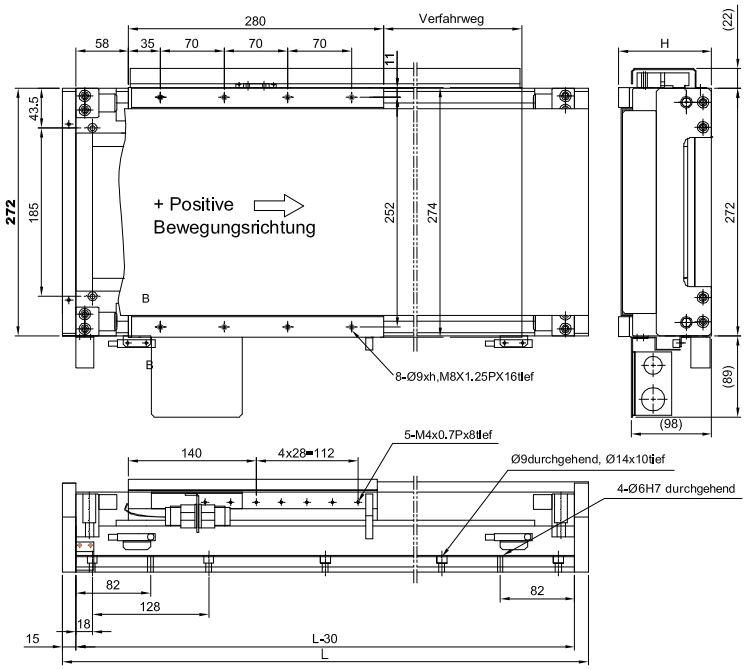


8.3.13 Dimensions and weight of the LMX1L-S67 and LMX1L-S67L linear motor axes with cover

Stroke [mm]	Overall length L_1 [mm]	Overall length L_2 [mm]	H [mm]	Weight [kg]
152	578	576	112	50.0
280	706	775	112	55.0
408	834	976	112	62.0
536	962	1176	112	67.0
664	1090	1376	112	73.0
792	1218	1576	112	79.0
920	1346	1776	112	85.0
1176	1602	2177	121	96.0
1432	1858	2576	121	108.0
1688	2114	2976	121	119.0
1944	2370	3376	121	130.0
2200	2626	3776	121	141.0

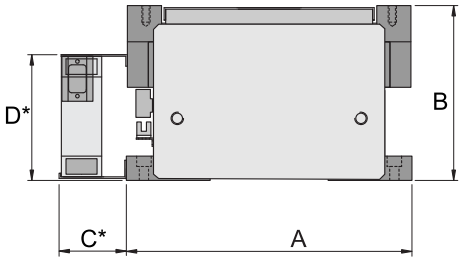
L_1 = overall length with metal cover
L_2 = overall length with bellows cover
h = H - 100

All values in mm



8.4 Technical data for LMX1L-T

8.4.1 Parameters for LMX1L-T



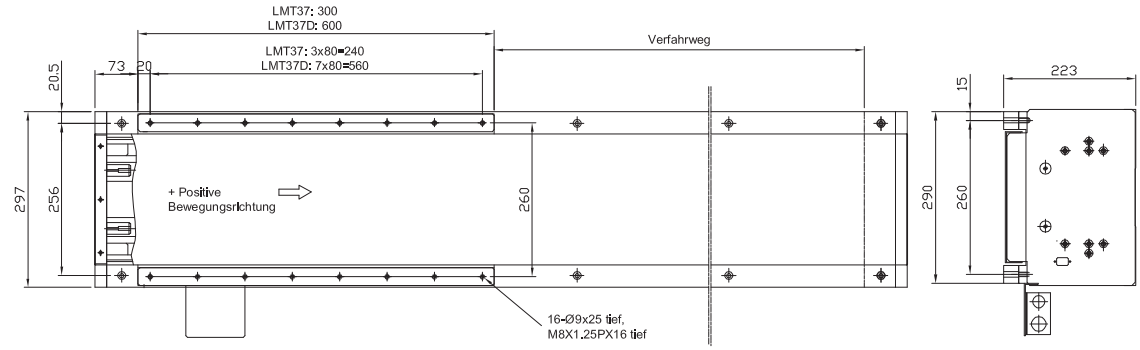
*Dimensions C and D are customer-specific

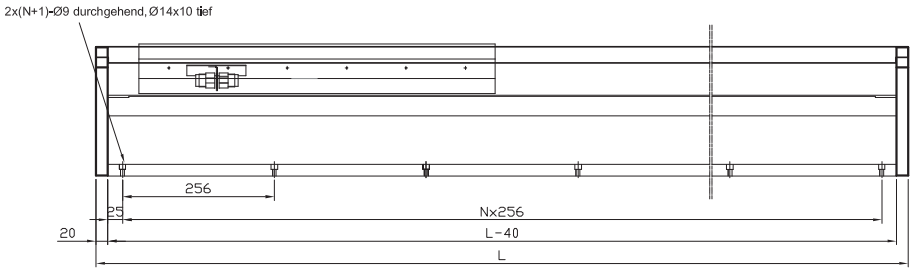
Designation (Order code) xxxx = stroke	Motor type	F_C [N]	F_P [N]	Travel block		v_{max} [m/s]	a_{max} [m/s²]	Dimension A [mm]	Dimension B [mm]
				Mass [kg]	Length [mm]				
LMX1L-T37-1-xxxx-A1A0	LMT 37	950	2500	25	300	2*	50	297	223
LMX1L-T37L-1-xxxx-A1A0	LMT 37L	950	2500	25	300	4	50	297	223
LMX1L-T37D-1-xxxx-A1A0	LMT 37D	1900	5000	50	600	2*	50	297	223
LMX1L-T37LD-1-xxxx-A1A0	LMT 37LD	1900	5000	50	600	4	50	297	223

Notes: F_C = continuous force, 100% duty cycle (DD) at 80 °C coil temperature, F_P = peak force (1 s)
* Limited by counter-EMF of the motor coil

8.4.2 Dimensions and weight of the LMX1L-T37 and LMX1L-T37L linear motor axes with cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
388	858	120
644	1124	150
900	1370	179
1156	1626	208
1412	1882	237
1668	2138	267
1924	2394	297
2180	2650	327
3160	3674	565



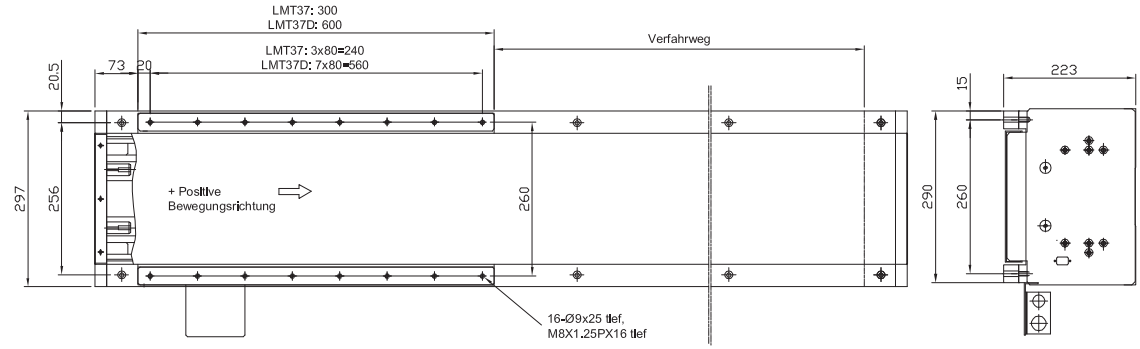


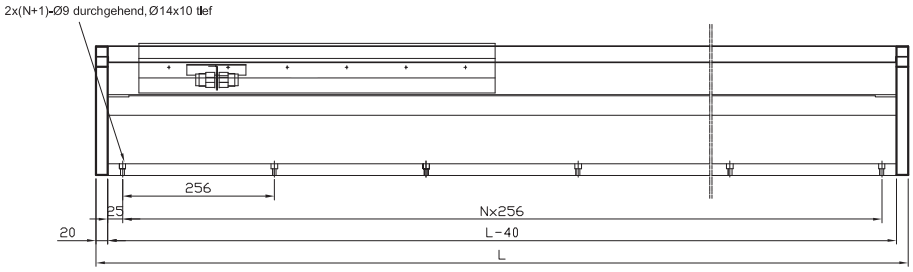
All values in mm

8.4.3 Dimensions and weight of the LMX1L-T37D and LMX1L-T37LD linear motor axes with cover

Stroke [mm]	Overall length L [mm]	Weight [kg]
388	1114	175
644	1370	205
900	1626	234
1156	1882	263
1412	2138	292
1668	2394	322
1924	2650	352
2180	2906	382
3160	3930	620

All values in mm





8.5 Technical data for LMV1L

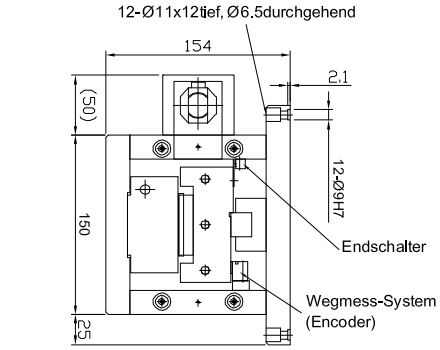
8.5.1 Parameters for LMV1L

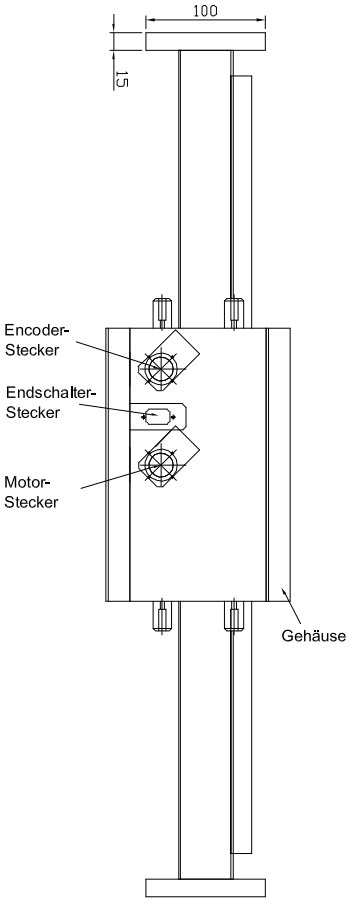
Designation (Order code)	Motor type	F_c [N]	F_p [N]	Mass of the travel block [kg]	v_{max} [m/s]	a_{max} [m/s2]	Stroke [mm]
LMV1L-S13-1-120-A100	LMS 13	180	470	6	1.8	30	120
LMV1L-S13-1-250-A100	LMS 13	180	470	8	1.8	30	250
LMV1L-S23-1-250-A100	LMS 23	220	600	10	1.8	30	250
LMV1L-S23-1-400-A100	LMS 23	220	600	12	1.8	30	400

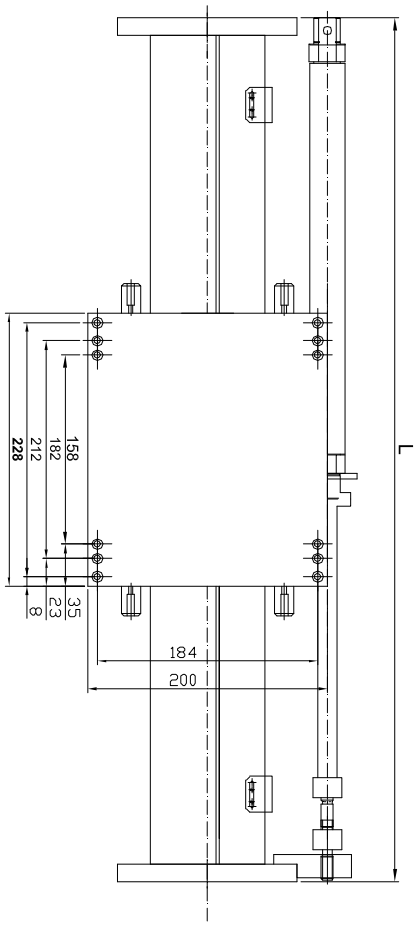
Notes: F_c = continuous force, 100% duty cycle (DC) at 80 °C coil temperature F_p = peak force (1 s)

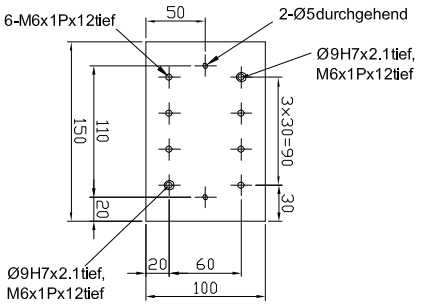
8.5.2 Dimensions and weight of the LMV1L linear motor axes

Order code	Stroke [mm]	Overall length L [mm]	Weight [kg]
LMV1L-S13-1-120-A100	120	444	15
LMV1L-S13-1-250-A100	250	572	19
LMV1L-S23-1-250-A100	250	572	26
LMV1L-S23-1-400-A100	400	722	29









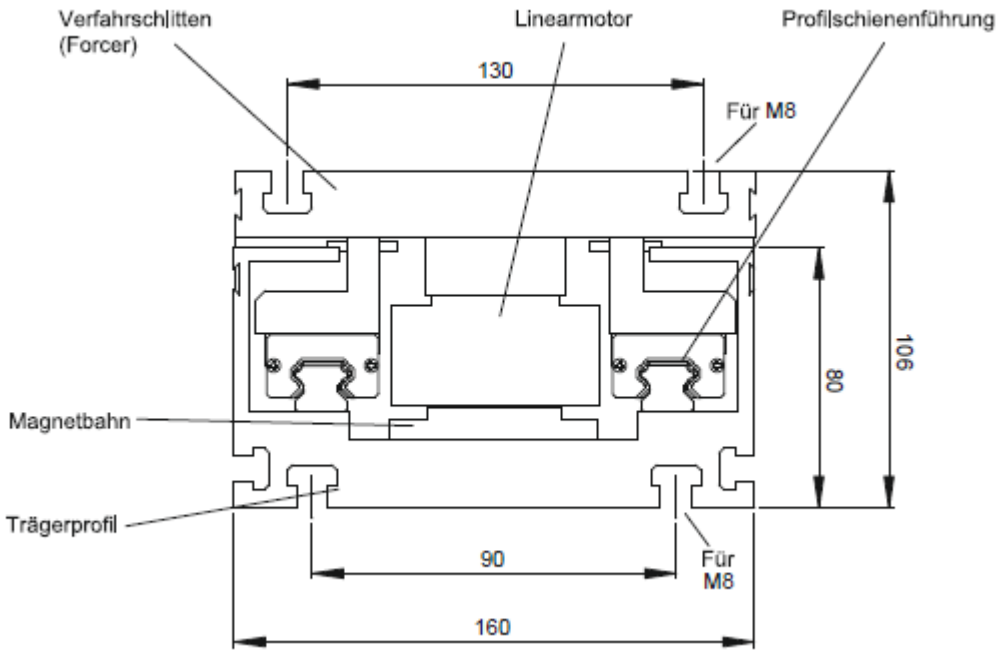
All values in mm

8.6 Parameters for LMH1L-S1 - S2

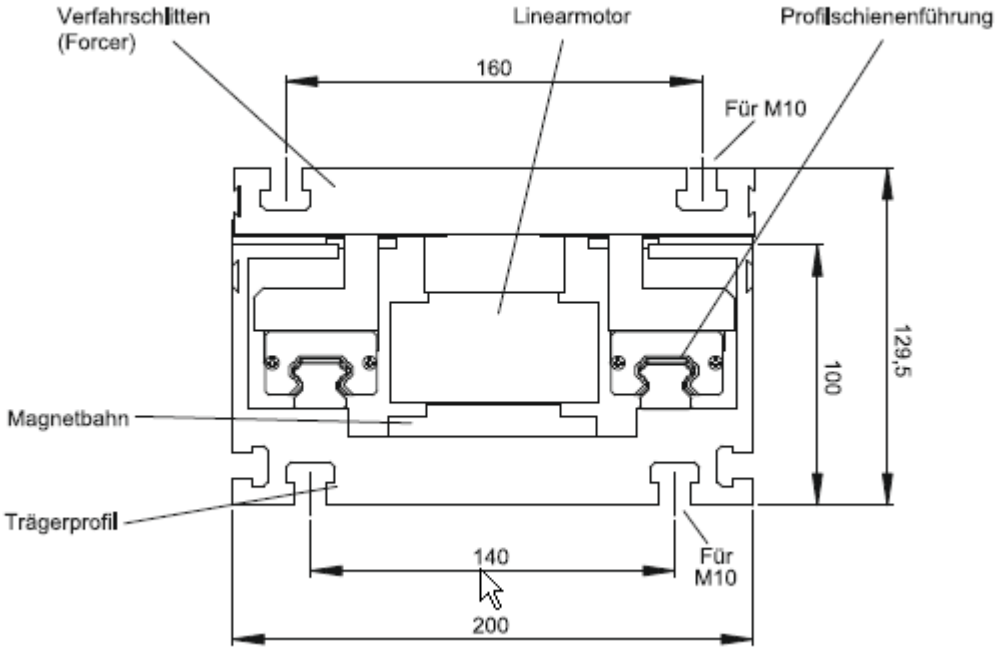
Designation (Order code) xxxx = stroke [mm]	Motor type	F_c [N]	F_p [N]	Travel block		v_{max} [m/s]	a_{max} [m/s²]
				Mass [kg]	Length [mm]		
LMH1L-S13-1-xxxx-D000	LMS13	180	540	7	256	4	50
LMH1L-S17-1-xxxx-D000	LMS17	210	630	10	365	4	50
LMH1L-S17D-1-xxxx-D000	LMS17D	420	1260	20	611	4	50
LMH1L-S23-1-xxxx-D000	LMS 23	220	600	8	250	4	50
LMH1L-S27-1-xxxx-D000	LMS 27	340	900	11	343	4	50
LMH1L-S27D-1-xxxx-D000	LMS 27D	680	1800	22	600	4	50

Notes: F_c = continuous force, 100% duty cycle (DC) at 80 °C coil temperature, F_p = peak force (1 s)

8.6.1 Dimensions of the LMH1L-S1 linear motor axes



8.6.2 Dimensions of the LMH1L-S2 linear motor axes



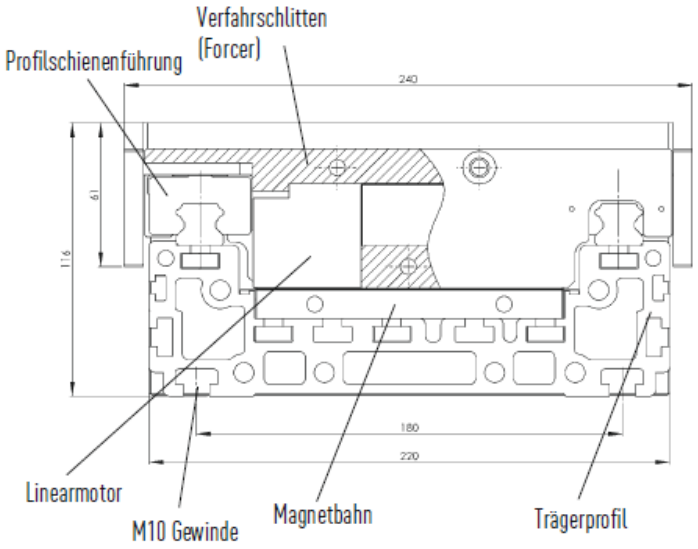
All values in mm

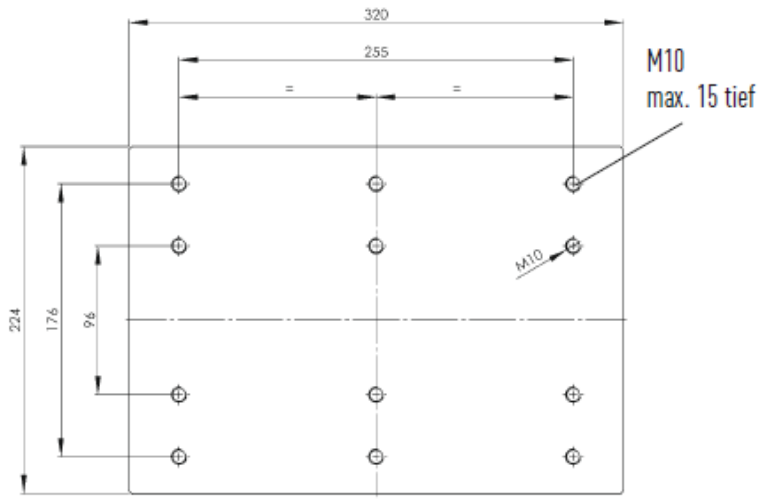
8.7 Technical data for LMH1L-S4

8.7.1 Parameters for LMH1L-S4

Designation (Order code) xxxx = stroke [mm]	Motor type	F_c [N]	F_p [N]	Travel block		v max [m/s]	a_{max} [m/s²]
				Mass [kg]	Length [mm]		
LMH1L-S47L-1-xxxx-D000	LMS 47L	650	1700	14	353	4	50
LMH1L-S47LD-1-xxxx-D000	LMS 47LD	1300	3400	27	673	4	50

8.7.2 Dimensions of the LMH1L-S4 linear motor axes





All values in mm

8.8 Technical data for the HIWIN-MAGIC and HIWIN-MAGIC-PG distance measuring systems

8.8.1 Technical data

8.8.2 Dimensions of the HIWIN MAGIC

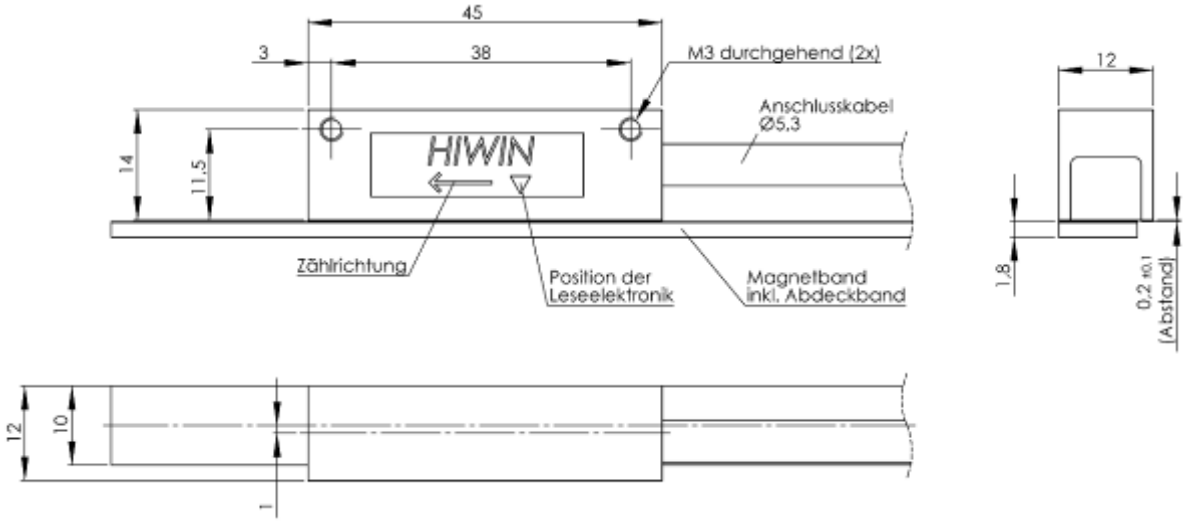


Figure 8.1 Scale drawing of the HIWIN MAGIC

8.8.3 Dimensions of the HIWIN-MAGIC-PG

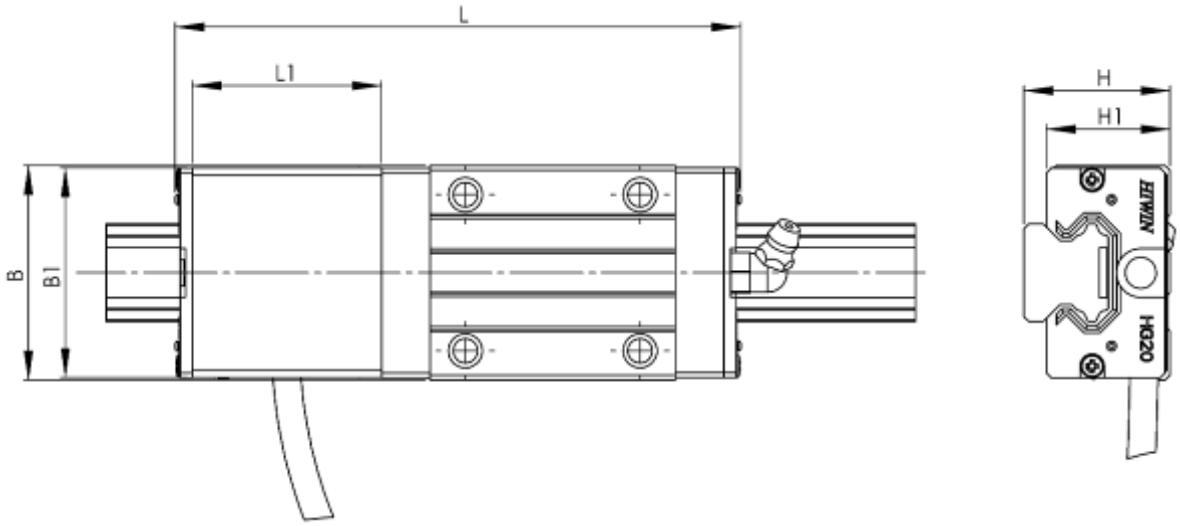


Figure 8.2 Scale drawing of the HGH20CA block including the MAGIC-PG housing

Figure 8.2 shows a block of the HGH20CA size. HIWIN MAGIC-PG modules are also available for the HGH25CA block size. The dimensions are listed in the table below. It is also possible to fit the encoder to HG20 and HG25 block sizes (long type and flange type, see the "Linear Guideways" catalog). The overall dimensions then change accordingly.

Dimensions of the HGH20CA and HGH25CA blocks including the MAGIC-PG housing

Rail type	HGH20CA	HG25HCA
Length L	116.5	121
Length L1	39	37
Width B	44	48
Width B1	43	46.4
Height H	30	40
Height H1	24.4	29.5

Electrical and mechanical properties of the HIWIN MAGIC and HIWIN MAGIC-PG

Type	1 V_{pp} (analog)	TTL (digital)
Electrical properties		
Specifications for output signal	sin/cos, 1V_{pp}	Quadrature signals to RS 422
Resolution	Infinite, signal period 1 mm	1µm
Bidirectional repeatability accuracy	0.01 mm	0.01 mm
Reference signal	Periodic index impulse at a distance of 1 mm	
Operating voltage	5 V ±5%	5 V ±5%
Power consumption	Typ. 35 mA, max. 70 mA	Typ. 70 mA, max. 120 mA
Max. measurement speed	10 m/s	1 m/s
EMC class	3, to IEC 801	
Mechanical properties		
Housing material	High-quality aluminum alloy, encoder bottom made of stainless steel	
MAGIC sensor head dimensions	L x W x H: 51 mm x 27 mm x 18.5 mm	
MAGIC-PG sensor head dimensions	L x W x H: 39 mm x 43 mm x 24.4 mm (in addition to block)	
Cable length	5 m	
Min. bending radius of cable	40 mm	40 mm
Protection class	IP67	IP67
Operating temperatures	0°C to +50°C	
Weight of MAGIC encoder	80 g	80 g
Weight of MAGIC-PG encoder	80 g	80 g
MAGIC-PG suitable for block	Types HG20 and HG25	

Item numbers of the MAGIC-PG encoders:

Output signal	Index	Cable length	Item no.
1 Vpp (HG20)	Multi-index	5 m	8-08-0120
TTL (HG20)	Multi-index	5 m	8-08-0122
1 Vpp (HG25)	Multi-index	5 m	8-08-0118
TTL 1 Vpp (HG25)	Multi-index	5 m	8-08-0119

NOTE

8.8.4 "Analog sin/cos 1 V_{pp}" output signal

8.8.4.1 Signal format for sine/cosine 1V_{pp} output

The MAGIC(-IG-20) sine/cosine 1 Vpp interface is based heavily on the Siemens specification. The period length of the sine output signal is 1 mm. The period length of the reference signal is also 1 mm.

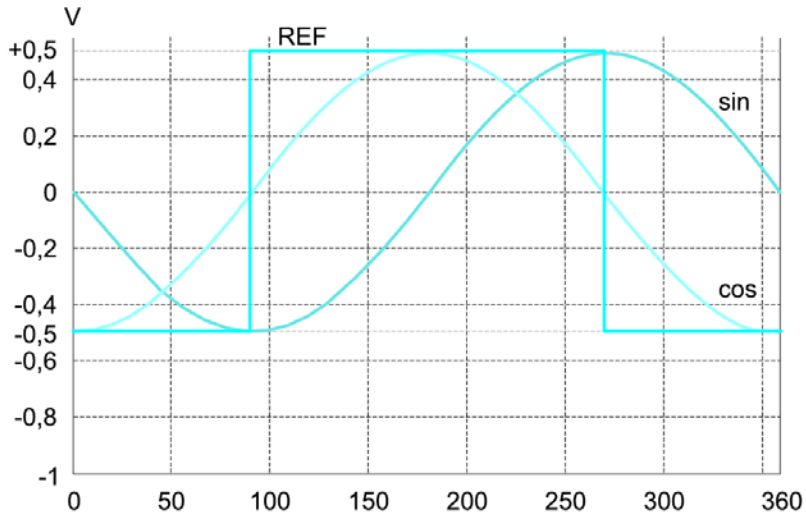


Figure 8.4: The electrical signals after the differential input of the downstream electronic components

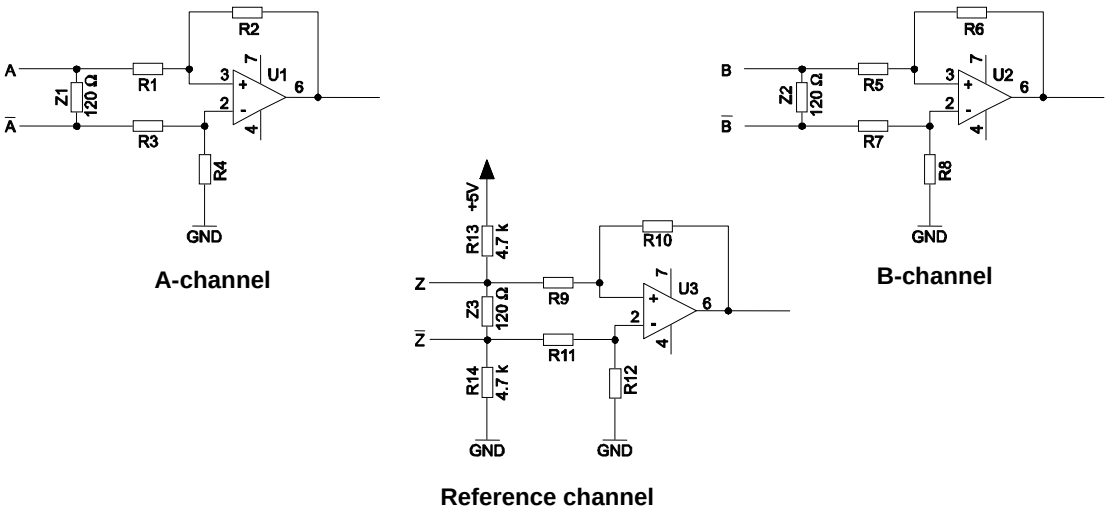


Figure 8.5: Recommended switching of the downstream electronic components with sine/cosine 1V_{pp} output

8.8.5 "Digital TTL" output signal

8.8.5.1 Digital TTL output

- Signals to the A and B channels phase-shifted by 90° (according to the RS422 specification conforming to DIN 66259)
- Recommended terminating resistance Z = 120 Ohm
- Output signals: A, A– and B, B– and Z, Z–
- Single reference pulse (optional)
- Definition of a minimum pulse duration (optional)

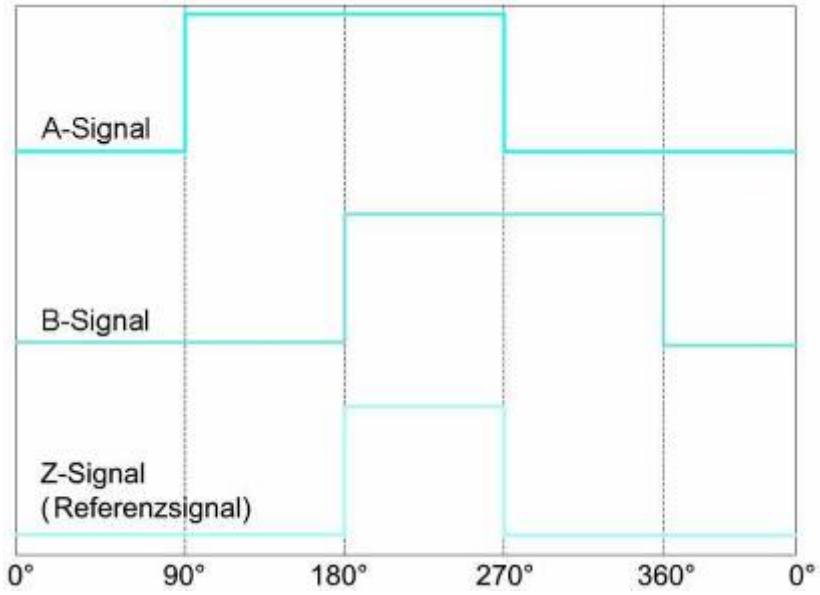


Figure 8.6: Output signal of digital TTL output

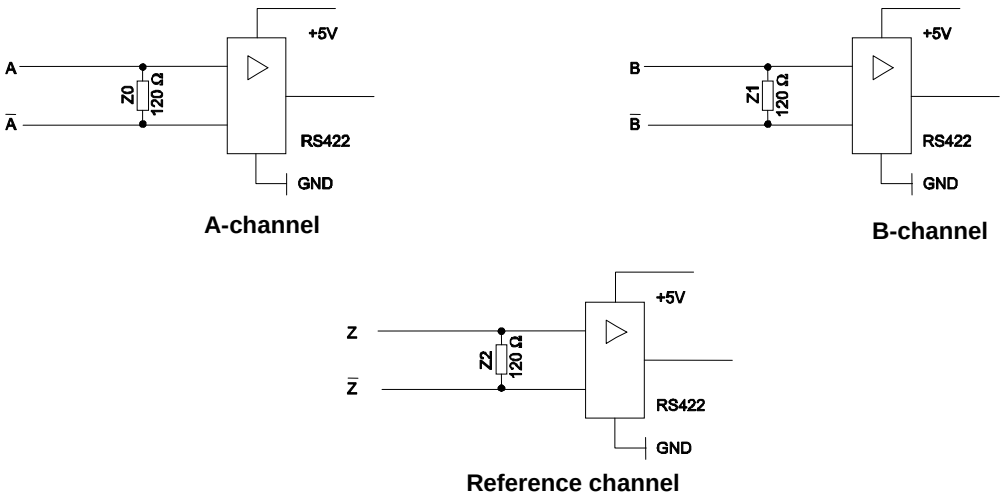


Figure 8.7: Recommended switching of the downstream electronic components with digital TTL output

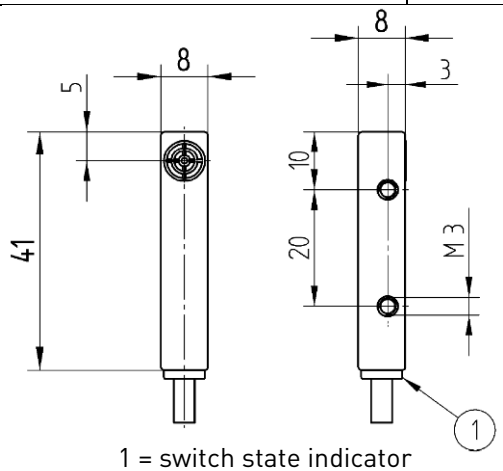
8.9 Technical data for the magnetic scale

Accuracy class	± 20 µm per meter
Period	1 mm
Thickness (including double-sided adhesive tape)	1.70 ± 0.10 mm
Thickness with stainless steel cover strip (including double-sided adhesive tape)	1.85 ± 0.15 mm
Width	10.05 ± 0.10 mm
Maximum length	40 m
Magnetic remanence	> 240 mT
Pole pitch (distance north-south pole)	1 mm
Material (ROHS-compliant)	Elastomer, nitrile and EPDM
Temperature range	0°C...+50°C
Weight	70 g/m

8.10 Reference and limit switches

An inductive proximity switch is used as the reference switch.
Technical data:

Inductive	
Switching distance	2 mm
Correction factor V2A/brass/Al	0.73/0.49/0.39
Installation type	Flush
Switch hysteresis	< 15%
Electrical	
Power supply	10...30 VDC
Power input (Ub = 24 V)	< 6 mA
Switching frequency	1500 Hz
Temperature drift	< 10%
Temperature range	-25 to 80 °C
Switch output voltage drop	100 mA
Residual current voltage drop	< 100 A
Short circuit protection	Yes
Reverse polarity protection	Yes
Overload protection	Yes
Mechanical	
Housing material	Plastic
Full encapsulation	Yes
Protection mode	IP 67
Connection type	Cable
Cable length	2 m, 4 m
Protective insulation, rated voltage	50 V



1 = switch state indicator

Figure 8.8 Scale drawing of the reference or limit switch

9 Spare parts, order codes

9.1 MAGIC/MAGIC-PG spare parts list

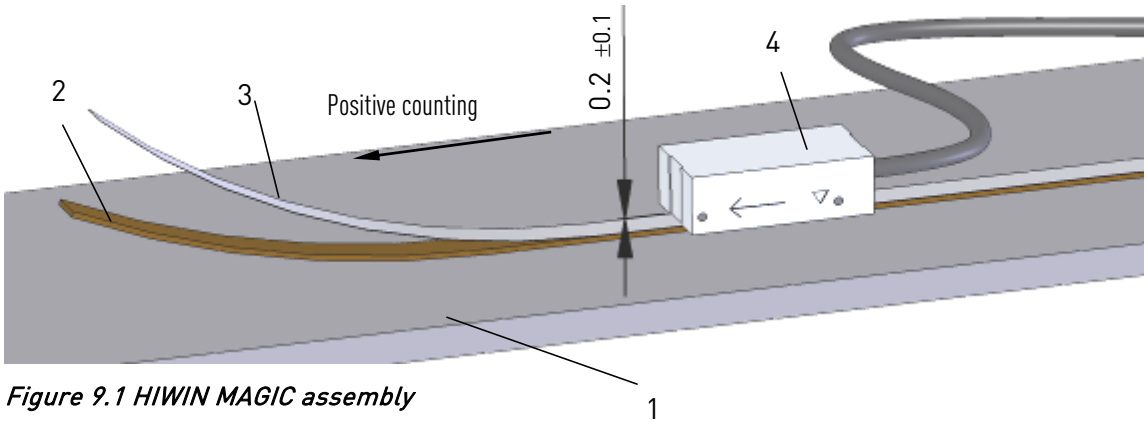


Figure 9.1 HIWIN MAGIC assembly

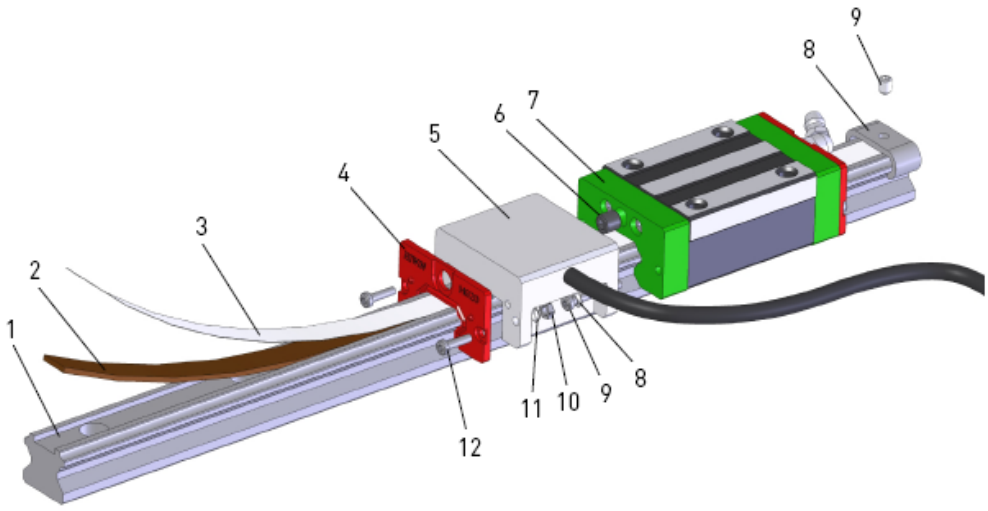


Figure 9.2 HIWIN MAGIC-PG assembly

HIWIN MAGIC encoder (1 V_{pp})

8-08-0203	Cable length 5 m, open ends	[4]

HIWIN MAGIC (TTL) encoder

8-08-0207	Cable length 5 m, open ends	[4]

HIWIN MAGIC-PG encoder (1 V_{pp}); including 8-12-0093 screw set

8-08-0211	Cable length 5 m, open ends	[7]

HIWIN MAGIC-PG encoder (TTL); including 8-12-0093 screw set

8-08-0215	Cable length 5 m, open ends	[7]

Magnetic scale

8-08-0028	Including stainless steel protective cover tape, material sold by the meter	[2+3]

Profile rail with groove

HGR20RxxxxH-G1	Bored holes from above	[1]
HGR20TxxxxH-G1	Threaded holes from above	[1]

9.2 Spare parts list for linear motor axes

The assembly of all linear motor axes is essentially the same; the spare parts are shown schematically in the diagram below.

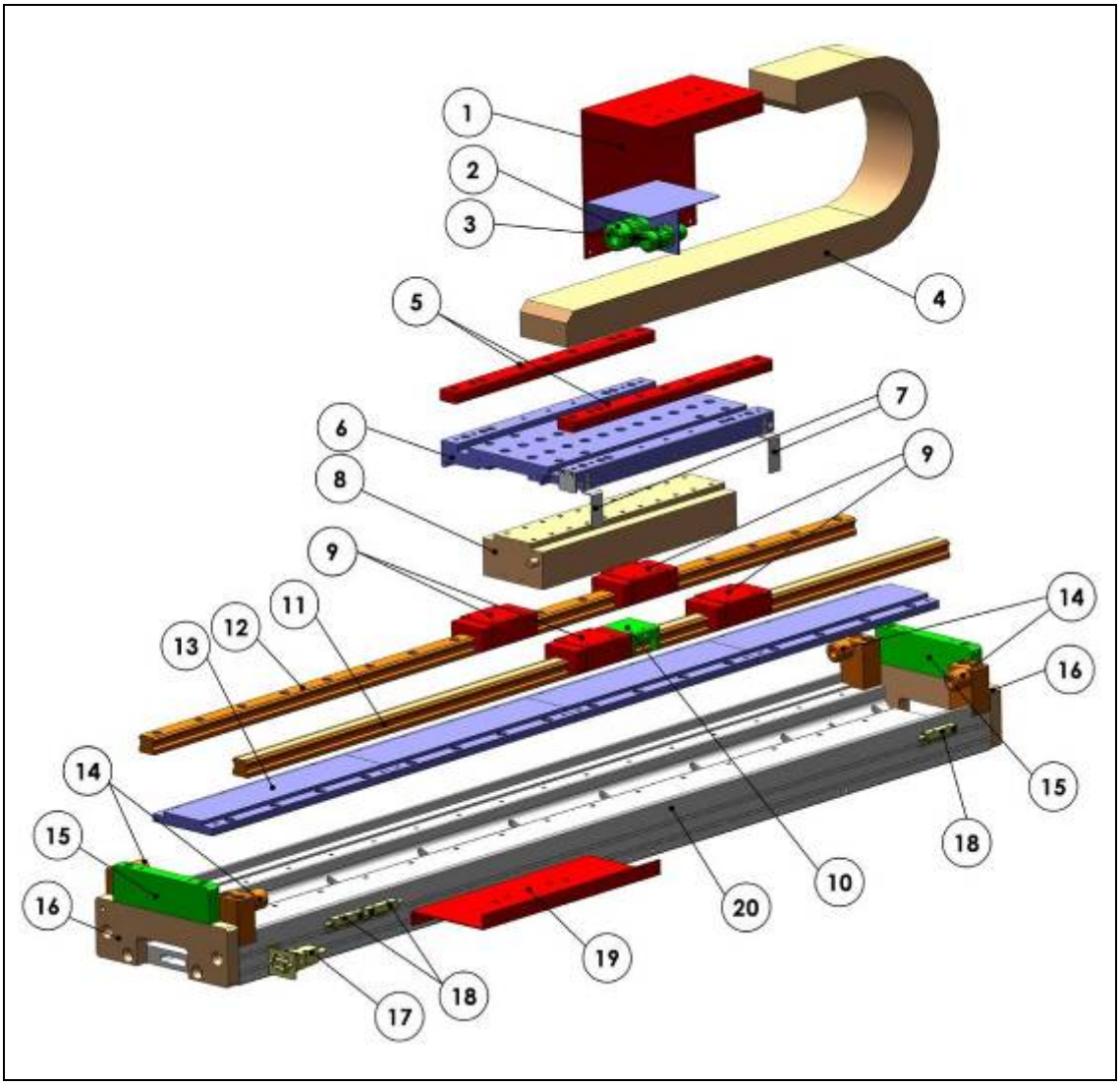


Figure 9.4: Schematic depiction of the spare parts

1 Mounting for towing chain
2 Motor connector coupler
3 Encoder connector coupler
4 Energy chain, towing chain, cable guide
5 Optional: Mounting plates for plate cover
6 Travel block (forcer carrier plate)
7 Cam switches for limit switches and reference switches
8 Forcer (primary part of the linear motor)
9 Profile rail block
10 MAGIC-PG distance measuring system
11 Profile rail with magnetic scale of the MAGIC-PG
12 Standard profile rail
13 Stator (secondary part of the linear motor)
14 Stop buffer
15 Optional: Spacer for plate cover
16 Profile end plates
17 Limit and reference switch connectors
18 Reference switch and limit switch with erecting angle
19 Locking plate for towing chain
20 Basic profile

Our products are subject to continuous technical modification and improvement. To avoid incorrect deliveries or to order parts without item numbers, please always give the details on the name plate, the serial number of the linear motor axis and the enclosed parts list.

Item no.	Designation	Axis type	Order number
6	Travel block	LMX1L-S23	8-11-0144
		LMX1L-S27	8-11-0145
		LMX1L-S37	8-11-0146
		LMX1L-S47	8-11-0147
		LMX1L-S57	8-11-0148
		LMX1L-S67	8-11-0149
		LMX1L-T37	8-11-0150
		LMX1L-T37D	8-11-0151
		LMX1E-CB5	8-11-0152
		LMX1E-CB6	8-11-0153
		LMX1E-CB8	8-11-0154
		LMX1F-CB5	8-11-0155
		LMX1F-CB6	8-11-0156
		LMX1F-CB8	8-11-0157
7	Cam switch	LMX1L-S23	8-11-0158
		LMX1L-S27	
		LMX1L-S37	
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
1	Mounting for towing chain	LMX1L-S23	8-11-0159
		LMX1L-S27	
		LMX1L-S37	
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	8-11-0160
		LMX1E-CB6	
		LMX1E-CB	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
20	Basic profile	LMX1L-S23	8-11-0161
		LMX1L-S27	
		LMX1L-S37	8-11-0191

Item no.	Designation	Axis type	Order number
		LMX1L-S47	8-11-0266
		LMX1L-S57	8-11-0267
		LMX1L-S67	8-11-0268
		LMX1L-T37	8-11-0269
		LMX1L-T37D	
		LMX1E-CB5	8-11-0162
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
14	Stop (required with stop buffer)	LMX1L-S23	8-11-0139
		LMX1L-S27	8-11-0139
		LMX1L-S37	8-11-0139
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	8-11-164
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
16	Profile end plate	LMX1L-S23	8-11-0140
		LMX1L-S27	8-11-0140
		LMX1L-S37	8-11-0192
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-S37	
		LMX1L-S37D	
		LMX1E-CB5	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
18	Holder for limit switch connector	LMX1L-S23	8-11-0073
		LMX1L-S27	
		LMX1L-S37	
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	

Item no.	Designation	Axis type	Order number
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
-	Fixing bracket for distance measuring system sensor (not MAGIC-PG)	LMX1L-S23	8-11-0167 for Renishaw RGHxx
		LMX1L-S27	
		LMX1L-S37	
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	8-11-0168 for Renishaw RGHxx
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
18	Limit switch mounting bracket (without limit switches)	LMX1L-S23	8-12-0011
		LMX1L-S27	
		LMX1L-S37	
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
14	Stop buffer	all types	8-13-0008
15	Spacer for panel cover	LMX1L-S23	8-11-0136
		LMX1L-S27	8-11-0137
		LMX1L-S37	8-11-0190
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-T37	

Item no.	Designation	Axis type	Order number
		LMX1L-T37D	
		LMX1E-CB5	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1E-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
5	Mounting plate for panel cover	LMX1L-S23	8-11-0138
		LMX1L-S27	8-11-0138
		LMX1L-S37	8-11-0312
		LMX1L-S47	
		LMX1L-S57	
		LMX1L-S67	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	8-11-0165
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
8	Forcer	LMX1L-S23	LMS23
		LMX1L-S27	LMS27
		LMX1L-S37	LMS37
		LMX1L-S37L	LMS37L
		LMX1L-S47	LMS47
		LMX1L-S47L	LMS47L
		LMX1L-S57	LMS57
		LMX1L-S57L	LMS57L
		LMX1L-S67	LMS67
		LMX1L-S67L	LMS67L
		LMX1L-T37	LMT37
		LMX1L-T37D	2 x LMT37
		LMX1E-CB5	LMCB5
		LMX1E-CB6	LMCB6

Item no.	Designation	Axis type	Order number
		LMX1E-CB8	LMCB8
		LMX1F-CB5	LMCB5
		LMX1F-CB6	LMCB6
		LMX1F-CB8	LMCB8
9	Block (linear guideway)	LMX1L-S23	HGH20CAZ0P
		LMX1L-S27	
		LMX1L-S37	HGH20HAZ0P
		LMX1L-S37L	
		LMX1L-S47	
		LMX1L-S47L	
		LMX1L-S57	
		LMX1L-S57L	
		LMX1L-S67	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	HGH15CAZ0P
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	MG series
		LMX1F-CB6	
		LMX1F-CB8	
12	Standard profile rail	LMX1L-S23	HGR20RxxxP
		LMX1L-S27	
		LMX1L-S37	
		LMX1L-S37L	
		LMX1L-S47	
		LMX1L-S57L	
		LMX1L-S67	
		LMX1L-S67L	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	HGR15RxxxP
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	MG series
		LMX1F-CB6	
		LMX1F-CB8	
2	Motor coupler (with central fastening)	LMX1L-S23	8-10-0087 M23 8-pin 8-10-0091 T-coupler M23 8-pin (for "D" types)
		LMX1L-S27	
		LMX1L-S37	

Item no.	Designation	Axis type	Order number
		LMX1L-S37L	
		LMX1L-S47	
		LMX1L-S57L	
		LMX1L-S67	
		LMX1L-S67L	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
3	Encoder coupler (with central fastening)	LMX1L-S23	8-10-0089 M17 17-pin
		LMX1L-S27	
		LMX1L-S37	
		LMX1L-S37L	
		LMX1L-S47	
		LMX1L-S57L	
		LMX1L-S67	
		LMX1L-S67L	
		LMX1L-T37	
		LMX1L-T37D	
		LMX1E-CB5	
		LMX1E-CB6	
		LMX1E-CB8	
		LMX1F-CB5	
		LMX1F-CB6	
		LMX1F-CB8	
1	Mounting for energy chain	Customer-specific	See parts list
18	Reference switch	For all axes	8-14-0003 (cable length 4 m)
13	Stators	LMX1L-S23 LMX1L-S27	LMS2S1 192 mm LMS2S2 256 mm LMS2S3 320 mm LMS2S4 387 mm LMS2S5 448 mm LMS2S6 512 mm
	Stators	LMX1L-S37 LMX1L-S37L	LMS3S1 192 mm LMS3S2 256 mm LMS3S3 320 mm LMS3S4 387 mm LMS3S5 448 mm LMS3S6 512 mm

Item no.	Designation	Axis type	Order number
13	Stators	LMX1L-S47 LMX1L-S47L	LMS4S1 192 mm LMS4S2 256 mm LMS4S3 320 mm LMS4S4 387 mm LMS4S5 448 mm LMS4S6 512 mm
	Stators	LMX1L-S57 LMX1L-S57L	LMS5S1 192 mm LMS5S2 256 mm LMS5S3 320 mm LMS5S4 387 mm LMS5S5 448 mm LMS5S6 512 mm
	Stators	LMX1L-S67 LMX1L-S67L	LMS6S1 192 mm LMS6S2 256 mm LMS6S3 320 mm LMS6S4 387 mm LMS6S5 448 mm LMS6S6 512 mm
	Stators	LMX1L-T37 LMX1L-T37D	LMS3S1C 192 mm screwed from the back LMS6S3C 320 mm screwed from the back
4	Energy chain	All axes	See parts list

9.3 Order codes for pneumatic packages

Pneumatic package LMV1L-S13 stroke 120 mm – LMX1E-CBX stroke 112 to 144 mm

Item	Description	Quantity
8-16-0006	Standard cylinder DSNU-25-150-PPV-KP	1
8-16-0009	Self-aligning rod coupler FK-M10x1.25	1
8-16-0032	Quick-action vent valve SEU-1/8	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0039	Mounting plate for pneumatic valve B=53	1
8-16-0044	Clip ∅25 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0394/5	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	2
8-11-0398	Mounting for self-aligning rod coupler	1

Pneumatic package LMV1L-S13/S23 stroke 250 mm – LMX1E-CBX stroke 240 to 272 mm

Item	Description	Quantity
8-16-0007	Standard cylinder DSNU-25-300-PPV-KP	1
8-16-0009	Self-aligning rod coupler FK-M10x1.25	1
8-16-0032	Quick-action vent valve SEU-1/8	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0039	Mounting plate for pneumatic valve B=53	1
8-16-0044	Clip ∅25 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0394/5	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	2
8-11-0398	Mounting for self-aligning rod coupler	1

Pneumatic package LMV1L-S23 stroke 400 mm – LMX1E-CBX stroke 304 to 432 mm

Item	Description	Quantity
8-16-0008	Standard cylinder DSNU-25-450-PPV-KP	1
8-16-0009	Self-aligning rod coupler FK-M10x1.25	1
8-16-0032	Quick-action vent valve SEU-1/8	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0039	Mounting plate for pneumatic valve B=53	1
8-16-0044	Clip ∅25 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1

8-11-0394/5	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	2
8-11-0398	Mounting for self-aligning rod coupler	1

Pneumatic package LMX1L-S23 stroke 104 mm

Item	Description	Quantity
8-16-0014	Standard cylinder DSNU-40-150-P-KP	1
8-16-0015	Self-aligning rod coupler FK-M12x1.25	1
8-16-0018	Quick-action vent valve SEU-1/4	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0040	Mounting plate for pneumatic valve B=70	1
8-16-0045	Clip ∅43 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0396	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	1
8-16-0046	Reducer D-1/8 I-1/4 A	1
8-16-0017	Double nipple ESK-1/4-1/4	2
8-11-0397	Mounting for self-aligning rod coupler	1

Pneumatic package LMX1L-S23 stroke 232 mm

Item	Description	Quantity
8-16-0014	Standard cylinder DSNU-40-250-P-KP	1
8-16-0015	Self-aligning rod coupler FK-M12x1.25	1
8-16-0018	Quick-action vent valve SEU-1/4	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0040	Mounting plate for pneumatic valve B=70	1
8-16-0045	Clip ∅43 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0396	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	1
8-16-0046	Reducer D-1/8 I-1/4 A	1
8-16-0017	Double nipple ESK-1/4-1/4	2
8-11-0397	Mounting for self-aligning rod coupler	1

Pneumatic package LMX1L-S23 stroke 360 mm

Item	Description	Quantity
8-16-0014	Standard cylinder DSNU-40-400-P-KP	1
8-16-0015	Self-aligning rod coupler FK-M12x1.25	1
8-16-0018	Quick-action vent valve SEU-1/4	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0040	Mounting plate for pneumatic valve B=70	1
8-16-0045	Clip ∅43 mm	1
8-16-0010	Silencer U-1/8	2

8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0396	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	1
8-16-0046	Reducer D-1/8 I-1/4 A	1
8-16-0017	Double nipple ESK-1/4-1/4	2
8-11-0397	Mounting for self-aligning rod coupler	1

Pneumatic package LMX1L-Sx7 stroke 152 mm

Item	Description	Quantity
8-16-0014	Standard cylinder DSNU-40-180-P-KP	1
8-16-0015	Self-aligning rod coupler FK-M12x1.25	1
8-16-0018	Quick-action vent valve SEU-1/4	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0040	Mounting plate for pneumatic valve B=70	1
8-16-0045	Clip ∅43 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0396	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	1
8-16-0046	Reducer D-1/8 I-1/4 A	1
8-16-0017	Double nipple ESK-1/4-1/4	2
8-11-0397	Mounting for self-aligning rod coupler	1

Pneumatic package LMX1L-Sx7 stroke 280 mm

Item	Description	Quantity
8-16-0014	Standard cylinder DSNU-40-300-P-KP	1
8-16-0015	Self-aligning rod coupler FK-M12x1.25	1
8-16-0018	Quick-action vent valve SEU-1/4	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0040	Mounting plate for pneumatic valve B=70	1
8-16-0045	Clip ∅43 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0396	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	1
8-16-0046	Reducer D-1/8 I-1/4 A	1
8-16-0017	Double nipple ESK-1/4-1/4	2
8-11-0397	Mounting for self-aligning rod coupler	1

Pneumatic package LMX1L-Sx7 stroke 408 mm

Item	Description	Quantity
8-16-0014	Standard cylinder DSNU-40-430-P-KP	1
8-16-0015	Self-aligning rod coupler FK-M12x1.25	1
8-16-0018	Quick-action vent valve SEU-1/4	1
8-16-0019	Pressure regulating valve MS4-LR-1/4-D6-AS	1
8-16-0022	Solenoid valve MHE3-M1H-3/2G-1/8	1
8-16-0023	Socket cable KMYZ-3-24-M8-0.5-LED-PUR	1
8-16-0040	Mounting plate for pneumatic valve B=70	1
8-16-0045	Clip ∅43 mm	1
8-16-0010	Silencer U-1/8	2
8-16-0041	T-piece QST-6	1
8-16-0011	L-screw connection QSL-1/8-6	3
8-16-0042	L-screw connection QSL-1/4-6	1
8-11-0396	L-angle	1
8-16-0043	Double nipple ESK-1/8-1/8	1
8-16-0046	Reducer D-1/8 I-1/4 A	1
8-16-0017	Double nipple ESK-1/4-1/4	2
8-11-0397	Mounting for self-aligning rod coupler	1

9.4 Order numbers for strip lubrication

Strip lubrication for LMH1L linear motor axes

Item	Description	Quantity
8-12-0112	Lubrication connector strip, 4-way	1
8-12-0125	Central lubrication hose, 2.5x4	4
8-12-0127	Plug-in screw connection, straight, 4-M6x0.75	4
8-12-0128	Plug-in screw connection, angled 4-M6x0.75	4
34310003	Lubricating nipple, M6x0.75Px6.5Lx0deg	4

9.5 Cables

Motor cable type 2 - M23 8-pin - LMX1L-S / LMX1L-T / LMV1L

Number	Cable	MAT	Length in m
8-10-0069	CF27.15.10.02.01.D	MAT9048433.B	3
8-10-0070	CF27.15.10.02.01.D	MAT9048433.B	5
8-10-0071	CF27.15.10.02.01.D	MAT9048433.B	8
8-10-0072	CF27.15.10.02.01.D	MAT9048433.B	10
8-10-0073	CF27.15.10.02.01.D	MAT9048433.B	12
8-10-0074	CF27.15.10.02.01.D	MAT9048433.B	15
8-10-0197	CF27.15.10.02.01.D	MAT9048433.B	19
8-10-0252	CF27.15.10.02.01.D	MAT9048433.B	20
8-10-0211	CF27.15.10.02.01.D	MAT9048433.B	30

Motor cable type 5 - M17 - 7-pin - LMX1E

Number	Cable	MAT	Length in m
8-10-0258	CF10.07.07	MAT90416522	3
8-10-0259	CF10.07.07	MAT90416522	5
8-10-0260	CF10.07.07	MAT90416522	8
8-10-0261	CF10.07.07	MAT90416522	10
8-10-0262	CF10.07.07	MAT90416522	12
8-10-0263	CF10.07.07	MAT90416522	15

Encoder cable, Lust, new with UL - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0075	CF211.002	MAT9048434	3
8-10-0076	CF211.002	MAT9048434	5
8-10-0077	CF211.002	MAT9048434	8
8-10-0078	CF211.002	MAT9048434	10
8-10-0079	CF211.002	MAT9048434	12
8-10-0080	CF211.002	MAT9048434	15
8-10-0094	CF211.002	MAT9048434	18

Encoder cable, CT, new with UL - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0081	CF211.002	MAT9048435	3
8-10-0082	CF211.002	MAT9048435	5
8-10-0083	CF211.002	MAT9048435	8
8-10-0084	CF211.002	MAT9048435	10
8-10-0085	CF211.002	MAT9048435	12
8-10-0086	CF211.002	MAT9048435	15
8-10-0095	CF211.002	MAT9048435	18
8-10-0210	CF211.002	MAT9048435	30

Encoder cable, B&R, new with UL - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0153	CF211.002	MAT9049923	3
8-10-0154	CF211.002	MAT9049923	5
8-10-0155	CF211.002	MAT9049923	8
8-10-0156	CF211.002	MAT9049923	10
8-10-0157	CF211.002	MAT9049923	12
8-10-0158	CF211.002	MAT9049923	15
8-10-0159	CF211.002	MAT9049923	18

Encoder cable, Copley, new with UL - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0122	CF211.002	MAT9049166	3
8-10-0123	CF211.002	MAT9049166	5
8-10-0124	CF211.002	MAT9049166	8
8-10-0125	CF211.002	MAT9049166	10
8-10-0126	CF211.002	MAT9049166	12
8-10-0127	CF211.002	MAT9049166	15
8-10-0128	CF211.002	MAT9049166	18

Encoder cable, Servostar CD, new with UL - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0160	CF211.002	MAT90410190	3
8-10-0161	CF211.002	MAT90410190	5
8-10-0162	CF211.002	MAT90410190	8
8-10-0163	CF211.002	MAT90410190	10
8-10-0164	CF211.002	MAT90410190	12
8-10-0165	CF211.002	MAT90410190	15

Encoder cable, Servostar 600 Danaher and AS2000 Beckhoff, new with UL - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0189	CF211.002	MAT90410846	3
8-10-0190	CF211.002	MAT90410846	5
8-10-0191	CF211.002	MAT90410846	8
8-10-0192	CF211.002	MAT90410846	10
8-10-0193	CF211.002	MAT90410846	12
8-10-0194	CF211.002	MAT90410846	15

Encoder cable, new with UL with open ends - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0115	CF211.002	MAT9049165.A	3
8-10-0116	CF211.002	MAT9049165.A	5
8-10-0117	CF211.002	MAT9049165.A	8
8-10-0118	CF211.002	MAT9049165.A	10
8-10-0119	CF211.002	MAT9049165.A	12
8-10-0120	CF211.002	MAT9049165.A	15
8-10-0121	CF211.002	MAT9049165.A	18
8-10-0198	CF211.002	MAT9049165.A	19

Encoder cable, Sinamics S120 (SIEMENS), new with UL - M17 - 17-pin

Number	Cable	MAT	Length in m
8-10-0201	CF211.002	MAT90411719	3
8-10-0202	CF211.002	MAT90411719	5
8-10-0203	CF211.002	MAT90411719	8
8-10-0204	CF211.002	MAT90411719	10
8-10-0205	CF211.002	MAT90411719	12
8-10-0206	CF211.002	MAT90411719	15
8-10-0242	CF211.003	MAT90411719	18
8-10-0243	CF211.003	MAT90411719	20
8-10-0244	CF211.003	MAT90411719	25

Limit switch cable

Number	Cable	MAT	Length in m
8-10-0026	CF240.01.14	MAT9047514.B	3
8-10-0027	CF240.01.14	MAT9047514.B	5
8-10-0028	CF240.01.14	MAT9047514.B	8
8-10-0029	CF240.01.14	MAT9047514.B	10
8-10-0030	CF240.01.14	MAT9047514.B	12
8-10-0042	CF240.01.14	MAT9047514.B	15
8-10-0199	CF240.01.14	MAT9047514.B	19
8-10-0213	CF240.01.14	MAT9047514.B	30

10 What to do in the event of a problem

Problem	Possible cause	Remedy
Motor will not start	Supply lines interrupted	Check connections, connector contacts may be pressed in. Correct if necessary. The connectors have a seal, which means that a certain amount of screw resistance needs to be overcome.
	Fuse has been triggered by the motor protection equipment	Check motor protection equipment for the correct setting. Correct if necessary.
On restart, the drive amplifier reports a commutation problem	Motor phases connected incorrectly	Check the direction of rotation
	Encoder counting direction incorrect	Swap over SIN and COS wire pair in the encoder connector
	Travel block is too close to the limit switch/end stop	Disconnect all power to the axis and move the travel block by hand to the center of the axis.
	Forcer blocked, clamping element blocked	Check forcer manually for free movement, readjust vertical weight balancing, open clamp
	Vertical installation, no symmetrical power relationships	
	Additional travel resistance, e.g. brush curtain, sealing lip, no parameter modification	Change parameterization in the amplifier
Axis "races" on restart	Faulty commutation	See commutation problem above
		Check commutation parameterization in the drive, activate speed monitoring
	EMC fault for encoder signal	Check shielding of the connectors and cables
Axis "races" in positioning mode	Programming error in the position transfer, impermissible acceleration demanded	Activate safety settings in drive amplifier, such as speed monitoring, permitted drag errors, etc.
Motor is humming and has a high power input	Clamping element blocked	Check air pressure supply and/or power supply of the brake
Problem	Possible cause	Remedy

Problem	Possible cause	Remedy
Motor is heating up too much (measure temperature)	Nominal power exceeded due to excessively long duty cycle	Adjust load cycle to suit the motor's nominal power
	Insufficient cooling	Correct cooling air supply or clear cooling air paths, retrofit third-party fans if necessary
	Travel block moves with difficulty	Check lubrication of the guides, foreign materials in the travel range?
	Ambient temperature too high	Note permissible temperature range
	Load cycle has been changed	Calculate load cycle (or outsource this) and adjust accordingly
	Motor commutation of the drive amplifier is not working correctly	Adjust commutation parameters of the drive amplifier
Running noise on the forcer	Relubrication required or bearing damage	Lubricate or consult HIWIN customer service
After the reference run there is an offset of 1 mm	The cam switch is positioned at the exact midpoint between two index pulses of the MAGIC-PG	Move the cam switch by approx. 0.5 mm
The axis generates clicking noises when under control	EMC errors in the encoder signal	It is essential that sensor cables with separately shielded SIN and COS signal pairs are used
	Faulty commutation	Optimize commutation parameterization.
Forcer is running jerkily and there are running noises that are not coming from the profile rails	EMC error in the encoder signal, encoder cable connector connection faulty, pin bent in the connector	Position the motor cable shielding and/or sensor cable flat against the grounding clamp of the amplifier, check pin in the connector
Positional discrepancies after several hours of operation		Use mains filter for voltage stabilization
		Fit ferrous cores to the motor cable
		Ground the forcer and/or stators separately (particularly important with granite carriers)

11 Declaration of incorporation

Manufacturer:	HIWIN GmbH Brücklesbünd 2 D-77654 Offenburg Tel.: +49 (0)781 932 78 0
Responsible for the documentation:	Werner Mäurer Brücklesbünd 2 D-77654 Offenburg
Product designation:	LMX..., LMV..., LMH..., LMG...
Year of manufacture: from 2010	

The manufacturer hereby declares that this machinery, which is incomplete, meets the requirements of the Machinery Directive (2006/42/EC).

In addition, the product is also in conformity with the following European directives:

- Electromagnetic Compatibility Directive (2004/108/EC)
- Low Voltage Directive (2006/95/EC)

The manufacturer undertakes to send (e.g. electronically) the specific documents relating to this incomplete machinery to relevant national authorities on request.

The specific technical documentation for the machinery has been produced in accordance with appendix VII, part B.

This incomplete machinery may not be put into operation until it has been ascertained that the machinery into which this incomplete machinery is to be incorporated is in conformity with the Machinery Directive (2006/42/EC).

Offenburg, December 29, 2009

Management

Werner Mäurer