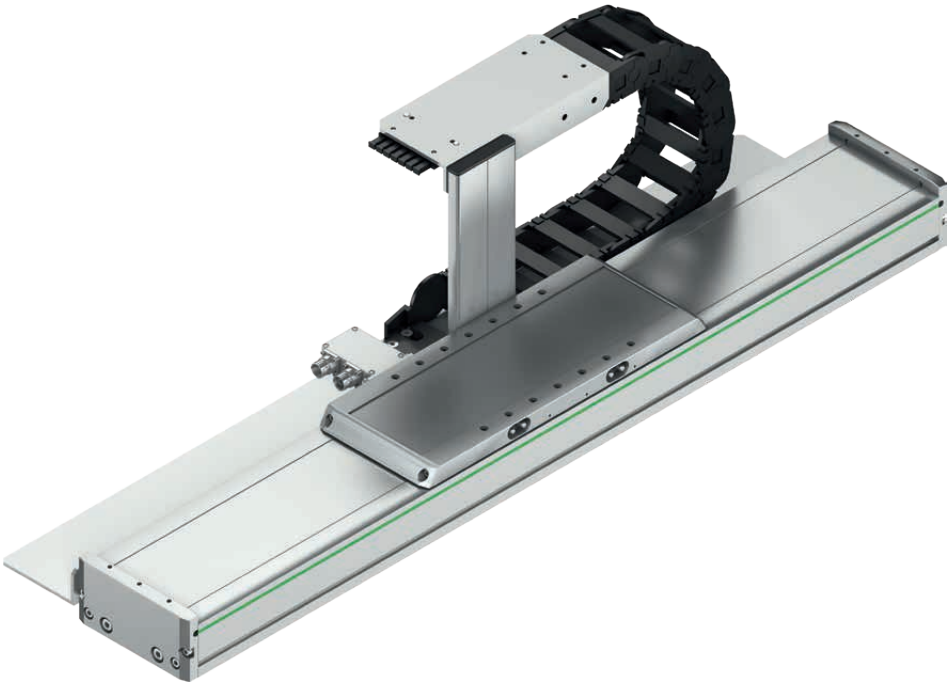
HIWIN®

Motion Control & Systems



Valid from serial no. HSN 000 000 000 1

Assembly Instructions

Linear Axes HT-L

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Contents

1. General information

1.1 About these assembly instructions

These assembly instructions are intended for planners, developers and operators of systems who plan for and install linear axes HT-L (with linear motor) as machine elements. They are also intended for persons who perform the following tasks in connection with the above mentioned axes:

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

1.1.1 Version management

Table 1.1 **Version management**

Version	Date	Notes
01-1	November 2020	Addition of options and accessories
01-0	May 2019	Initial creation of this document

1.1.2 Requirements

We assume that

- ➔ operating personnel are trained in the safe operation practices for linear axes HT-L and have read and understood these assembly instructions in full;
- ➔ maintenance personnel maintain and repair the linear axes HT-L in such a way that they pose no danger to people, property or the environment.

1.1.3 Availability

These assembly instructions must remain constantly available to all persons who work with or on the linear axes HT-L.

1.2 Depictions used in these assembly instructions

1.2.1 Instructions

Instructions are indicated by triangular bullet points in the order in which they are to be carried out.
Results of the actions carried out are indicated by ticks.

Example:

- ▶ Produce appropriate mounting holes on the mounting surface if not already present.
- ▶ Clean mounting surface and position linear axis on it.
- ▶ With the help of T nuts and clamping profiles fix the linear axis.

✓ Linear axis is mounted.

1.2.2 Lists

Lists are indicated by bullet points.

Example:
Linear axes must not be operated:

- ○ Outdoors
- ○ In potentially explosive atmospheres
- ○ ...

1.2.3 Depiction of safety notices

Safety notices are always indicated using a signal word and sometimes also a symbol for the specific risk (see Section 1.2.4, "Symbols used").
The following signal words and risk levels are used:

⚠ DANGER!

Imminent danger!
Noncompliance with the safety notices will result in serious injury or death!

⚠ WARNING!

Potentially dangerous situation!
Noncompliance with the safety notices runs the risk of serious injury or death!

⚠ CAUTION!

Potentially dangerous situation!
Noncompliance with the safety notices runs the risk of slight to moderate injury!

ATTENTION!

Potentially dangerous situation!
Noncompliance with the safety notices runs the risk of damage to property or environmental pollution!

1.2.4 Symbols used

The following symbols are used in these assembly instructions and on the linear axes:

Table 1.2 **Warning signs**

	Warning of dangerous electrical voltage!		Warning of risk of hearing damage!
	Warning of cutting injuries!		Warning of crushing!
	Warning of magnetic fields!		Warning of danger from suspended loads!
	Warning of hot surfaces!		Substance hazardous to the environment!

Table 1.3 **Mandatory signs**

	Wear protective gloves!		Wear hearing protection!
	Wear safety goggles!		Isolate before work!

1.2.5 Information

NOTE Describes general information and recommendations.

1.3 Warranty and liability

The manufacturer's "General conditions of sale and delivery" apply.

1.4 Manufacturer's details

Table 1.4 **Manufacturer's details**

Address	HIWIN GmbH Brücklesbünd 1 D-77654 Offenburg
Phone	+49 (0) 781 / 9 32 78 - 0
Technical customer service	+49 (0) 781 / 9 32 78 - 77
Fax	+49 (0) 781 / 9 32 78 - 90
Technical customer service fax	+49 (0) 781 / 9 32 78 - 97
E-mail	support@hiwin.de
Website	www.hiwin.de

1.5 Copyright

1.6 Product monitoring

Please inform HIWIN, the manufacturer of the linear axes HT-L, of:

- Accidents
- Potential sources of danger in the linear axes
- Anything in these assembly instructions which is difficult to understand

2. Basic safety notices

⚠ WARNING!

This chapter serves to ensure the safety of everyone working with the linear axes HT-L and those who assemble, install, operate, maintain or disassemble them. Non-compliance with the following information results in dangerous working conditions.

⚠ WARNING!

Danger from strong magnetic fields!
Strong magnetic fields around linear axes HT-L pose a health risk to persons with implants (e.g. cardiac pacemakers) that are affected by magnetic fields.

- Persons with implants that are affected by magnetic fields must maintain a safe distance of at least 1 m from linear axes HT-L!

ATTENTION!

Risk of material damage!
Strong magnetic forces may destroy watches and magnetisable data storage media near to the linear axes HT-L.

- Do not bring watches or magnetisable data storage media into the vicinity (<300 mm) of the linear axes HT-L components!

2.1 Intended use

The linear axes HT-L combine guiding and drive functions in the one compact unit. They are designed for the precise positioning in terms of time and location of fixed mounted loads within an automated system. They are specifically ideal for applications requiring high dynamic responses and precision. Also, with these linear axes large travel distances can be realised. Linear axes HT-L may only be installed horizontally and may only be used for the intended purpose as described:

- All linear axis HT-L sizes are subject to performance limits (see catalogue „Linear Axes and Axis Systems HX"). These performance limits may not be exceeded during operations.
- The linear axes HT-L must not be operated in potentially explosive atmospheres.
- The linear axes HT-L may only be used and operated indoors.
- The linear axes HT-L form part of a complete system. Personal safety must therefore be safeguarded beyond the concept for this complete system.
- Proper use of the linear axes HT-L includes observing the assembly instructions and following the maintenance and repair specifications.
- Use of the linear axes HT-L for any other purpose shall be considered improper use.

The linear axes HT-L are delivered as a system (guiding/drive). Therefore observe the whole documentation for this system. The provided documentation may vary depending on the linear axis type.

2.2 Reasonably foreseeable misuse

Linear axes HT-L must not be operated:

- outdoors
- in potentially explosive atmospheres

2.3 Conversions and modifications

Conversions or modifications to the linear axes HT-L are not permitted!

2.4 Residual risks

During normal operation, there are no residual risks associated with the linear axes HT-L because they form part of the complete system and the operator must safeguard personal safety beyond the concept for this complete system. Warnings about risks that may arise during maintenance and repair work are provided in the relevant chapters.

2.5 Personnel requirements

Only authorised and competent persons may carry out work on the linear axes HT-L! hey must be familiar with the safety equipment and regulations before starting work (see Table 2.1).

Table 2.1 **Personnel requirements**

Activity	Qualification
Normal operation	Trained personnel
Cleaning	Trained personnel
Maintenance	Trained specialist personnel of the operator or manufacturer
Repair	Trained specialist personnel of the operator or manufacturer
Transportation	Trained personnel
Assembly	Trained specialist personnel
Disassembly	Trained specialist personnel

2.6 Protective equipment

2.6.1 Personal protective equipment

Table 2.2 **Personal protective equipment**

Operating phase	Personal protective equipment
Normal operation	No persons may remain at the linear axes HT-L during normal operations. Persons near the linear axes HT-L must wear the following personal protective equipment depending on the travel speed: – Safety shoes – If necessary, hearing protection
All other operating phases (cleaning, maintenance, resetting, troubleshooting, repair)	The following personal protective equipment is needed for all other operating phases of the linear axes HT-L: – Safety shoes – If necessary, safety gloves and safety goggles – If necessary, hearing protection – If necessary, hair net

2.7 Labels on the linear axis

The linear axes HT-L bear the labels depicted in the following.

2.7.1 Type plate

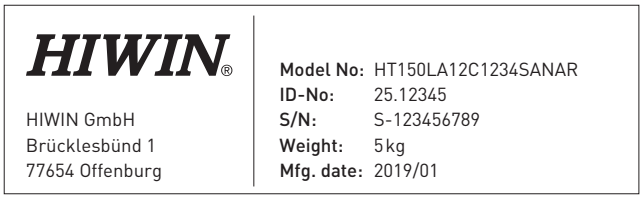


Fig. 2.1 **Type plate (example only)**

3. Description of the linear axes HT-L

3.1 Field of application

HIWIN linear axes HT-L with linear motor drive are ideal for applications with the highest demands on dynamic response, accuracy, and synchronism with the minimum of maintenance and long stroke lengths. Two motor sizes are available for each size, in order to optimally meet the requirements for the required feed force. The distance measuring system is integrated into the interior of the axis in order to save space and ensures maximum precision. Optionally, generously dimensioned energy chains provide space for the reliable carrying of supply cables.

3.2 Ambient conditions

Ambient conditions during operation:	+5 to +40 °C
Relative air humidity during operation:	complying with IEC60721-3-3, Class 3K3, non-condensing
Climatic environmental conditions for transport and storage:	ambient temperature: –20 to +50 °C, non-condensing
Vacuum:	it may not be operated in vacuum

NOTE

Prevent forming of condensation to prevent corrosion of the axis.

3.3 Main components

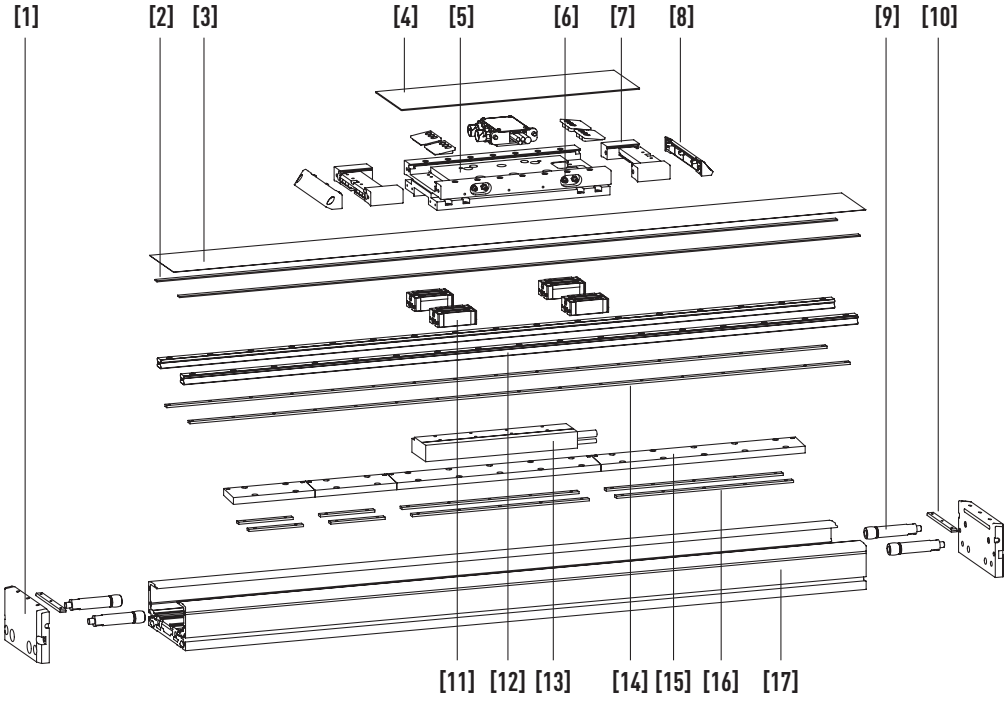


Fig. 3.1 **Main components of the linear axes HT-L**

Table 3.1 **Description of the main components of the linear axes HT-L**

Pos.	Description	Pos.	Description
1	End plate	10	Clamping plate for cover strip
2	Magnetic strip	11	block
3	Steel cover strip	12	Profile rails
4	Carriage cover	13	Linear motor (forcer)
5	Carriage	14	Threaded bars
6	Grease nipple	15	Linear motor (stator)
7	Cover strip deflection	16	Threaded bars
8	Carriage end piece	17	Axis body of aluminium
9	Stopping buffer		

3.4 Functional description

The linear motor axes HT-L are based on an aluminium basic profile with integrated linear guideways. These both absorb the forces exerted by the weights, accelerations, and processes and provide precise guiding for the carriage. The axis is driven by a linear motor.

The linear motor consists of two components, the forcer (primary part) with coils and the stator (secondary part) with permanent magnets. The coils carrying alternating current generate a magnetic field that changes over time and interacts with the steady magnetic field of the stator. The resulting force is used to generate linear motion.

The motor is energized via a drive amplifier in such a way that the carriage of the linear motor axis executes precisely the movement that is predetermined, for example, by a higher-level control system.

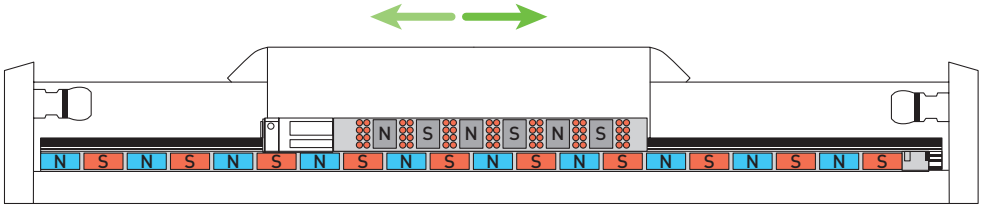


Fig. 3.2 **Functional principle of the linear axes HT-L**

3.5 Order code for linear axes HT-L

HT	150	L	A12	C	1234	S

HIWIN linear table

Size (profile width):
150: 150 mm
200: 200 mm
250: 250 mm

Drive type:
L: Linear motor

Carriage length:
S: Short

Stroke length [mm]

Cover strip:
C: With steel cover strip
N: Without cover strip

Motor size:
A12/A13: HT150L
A22/A23: HT200L
A32/A33: HT250L

Order code for linear axes HT-L (continuation)

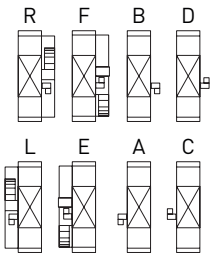
A	N	A	R

Axis limit switches [3]:
N: Without limit switches
A: 2 × NC, 100 mm cable, plug
C: 2 × NC, 4 m open cable end
D: 2 × NO, 5 m open cable end

Stator:
N: Standard

Optional distance measuring system [1]:
A: HIWIN MAGIC, analogue signal, 1 V_{PP} sin/cos
B: HIWIN MAGIC, analogue signal, 1 V_{PP} sin/cos and digital Hall sensor
D: HIWIN MAGIC, digital signal, TTL 5 V
E: HIWIN MAGIC, digital signal, TTL 5 V and digital Hall sensor
H: LIC 211, absolute, EnDat 2.2 [4] [7]
R: BML-S1G0, absolute, BiSS-C, 1 V_{PP} sin/cos [5]
S: BML-S1G0, absolute, SSI [5]
T: TTK70, absolute, HIPERFACE, 1 V_{PP} sin/cos [4]

Connection interface [2]
R: With energy chain, connector right/front [6]
F: With energy chain, connector right/rear [6]
B: Without energy chain, connector right/front
D: Without energy chain, connector right/rear
L: With energy chain, connector left/front [6]
E: With energy chain, connector left/rear [6]
A: Without energy chain, connector left/front
C: Without energy chain, connector left/rear



[1] Detailed information in Section 4.5
[2] For details of the connector configuration and the position of the energy chain, refer to Section 4.7, Page 20 ff.
[3] Further reference switches on request
[4] Maximum stroke may be restricted; see Section 4.5
[5] The distance measuring system has a safety-related, analogue, incremental real-time signal
[6] Maximum possible stroke: 5,000 mm
[7] In horizontal mounting position, the axis must be installed so that the distance measuring system is at the top

4. Options of the linear axes HT-L

4.1 Stroke length

The stroke lengths for the linear axes can be set to the millimetre.
The maximum stroke length depending on the series and size is listed in Table 4.1.

Table 4.1 **Maximum stroke**

Drive element	Axis	Maximum stroke [2] [mm]
Linear motor 	**HT150L**	5,300
	HT200L	5,300
	HT250L	5,300 [1]

[1] HT250LA33C: 5,200 mm
[2] Larger strokes on request

Please bear in mind that the maximum possible stroke may be shorter with the following options:
- Type with cover strip (owing to required cover strip deflections)
- Energy chain
- Distance measuring system

4.1.1 Reserve stroke

ATTENTION!

Damage to the linear axis HT-L!
▶ The mechanical end position must not be accessed during operation!

The reserve stroke L_r equals the distance that can be travelled in addition to the stroke on both sides of the end positions (stroke 0, stroke max) before the carriage reaches the mechanical end position (mechanical 0) at the installed buffer stops. The reserve stroke for each axis size can be found in the catalogue "Linear Axes and Axis Systems HX".

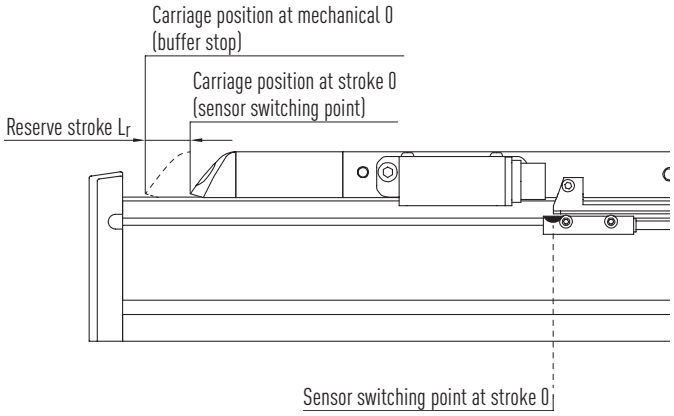


Fig. 4.1 **Illustration of the reserve stroke**

4.2 Cover

An optional steel cover strip is available for all linear axes HT-L. This cover strip is held in place with magnetic strips to prevent contaminants from entering the axis' interior. Bear in mind that the carriage is longer on axes with cover strip because of the required cover strip deflection.

NOTE

The optional cover strip cannot be retrofitted.

4.3 Carriage

The carriage has threads for mounting the imposed load. These feature additional counterbores that can take centring sleeves.

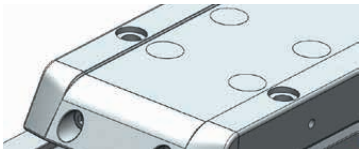


Fig. 4.2 **Carriage with mounting threads**

4.4 Limit switches

The linear axes HT-L feature two inductive PNP or proximity switches that signal the end positions of the travel distance. The limit switch cables can be routed either directly to the interface or into the mounting groove. limit switches are available as N/C or N/O contacts, with or without plug.

4.4.1 Limit switch dimensions

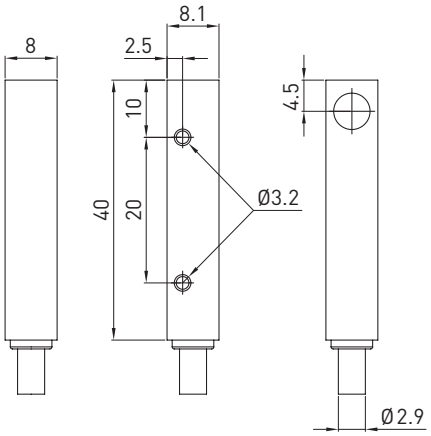


Fig. 4.3 **Limit switch dimensions**

4.4.2 Limit switch specifications

Table 4.2 **General features of the limit switches**

Properties	N/C contact (25-000786)	N/C contact (25-000787)	N/O contact (25-000788)
Housing	Rectangular		
Dimensions (W × H × D)	8 × 8 × 40 mm		
Max. sensing range	2 mm		
Switching frequency	2,000 Hz		
Connection type	Cable with M8, 3-pin plug, 100 mm	Cable, 3-wire, 4 m	Cable, 3-wire, 5 m
Output type	PNP		
Electrical wiring	DC 3-wire		
Protection class	IP67, IP68 [1]		

[1] According to EN 60529

Table 4.3 **Mechanics/electronics of the limit switches**

Mechanics/electronics	N/C contact (25-000786)	N/C contact (25-000787)	N/O contact (25-000788)
Supply voltage	10 to 30 VDC		
Ripple	≤ 10 % [1]		
Voltage drop	≤ 2 V [2]		
Current consumption	≤ 10 mA [3]		
Time delay before availability	≤ 100 ms		
Hysteresis	5 to 15 %		
Repeatability	≤ 2 % [4]		
Temperature drift	±10 %		
EMC	According to EN 60947-5-2		
Continuous current I_a	≤ 200 mA		
Cable material	PVC		
Short-circuit protection	Yes		
Reverse polarity protection	Yes		
Power-up pulse protection	Yes		
Shock and vibration resistance	30 g, 11 ms/10 to 55 Hz, 1 mm		
Ambient operating temperature	–25 °C to +75 °C		
Housing material	Plastic, VISTAL®		
Sensing face material	Plastic, VISTAL®		
UL-file-no. (certificate))	NRKH.E348498		

[1] Of U_v
[2] At I_a max.
[3] Without load
[4] At constant voltage and temperature

Information on connection and pin assignment can be found in Section 6.6.1

NOTE

4.5 Distance measuring system

Linear axes HT-L are supplied with the distance measuring system as standard; it is integrated inside the axis in order to save space. A range of measuring systems are available to suit various measuring principle, interface and signal period requirements, see Table 4.4. To enable motionless commutation of the linear motor axes HT-L, it is also possible to combine the distance measuring system HIWIN MAGIC with the digital Hall sensor available from HIWIN.

Table 4.4 **Distance measuring system selection**

Order code	Name	Repeatability [mm]	Signal period [mm]	Resolution [µm]	Interface		Measuring principle	Max stroke [mm]
A	MAGIC	±0.005	1	1	Incremental	1 V_{PP} (analogue) [1]	Magnetic	–
B [2]	MAGIC	±0.005	1	1	Incremental	1 V_{PP} (analogue) [1]	Magnetic	–
D	MAGIC	±0.005	–	1	Incremental	TTL (digital) [1]	Magnetic	–
E [2]	MAGIC	±0.005	–	1	Incremental	TTL (digital) [1]	Magnetic	–
H	LIC 211	±0.005	–	0.1	Absolute, EnDat 2.2	EnDat 22	Optical	5,200 [3]
R [4]	ML-S1G0	±0.005	2	1	Absolute, 32-bit	BiSS-C, 1 V_{PP}	Magnetic	–
S [4]	ML-S1G0	±0.005	2	1	Absolute, 26-bit	SSI	Magnetic	–
T	TTK70	±0.005	1	31.25	Absolute, 17-bit	HIPERFACE	Magnetic	3,600 [5]

Other distance measuring systems available on request

[1] Compatible with all standard drive amplifiers and with HIWIN drive amplifier D1-N. For more information about HIWIN drive amplifiers, consult the "Drives and Servo Motors" catalogue or visit www.hiwin.de

[2] With digital Hall sensor for motionless commutation

[3] Depending on size and options up to 5,550 mm available on request

[4] The distance measuring system has a safety-related, analogue, incremental real-time signal

[5] Depending on size and options up to 3,841 mm available on request

4.5.1 HIWIN-MAGIC

The HIWIN-MAGIC distance measuring system is used in the linear axes HT-L for incremental distance measurement. The output signals can be either analogue or digital. The HIWIN-MAGIC distance measuring system consists of the encoder (Fig. 4.4) and the magnetic scale (Fig. 4.5) as the measurement standard. It is assembled prior to delivery.

Fig. 4.4 **MAGIC encoder**

Fig. 4.5 **MAGIC magnetic scale**

NOTE

The measuring scale of the magnetic measuring systems may not be subjected to any strong magnetic fields (keep it well away from permanent magnets!). 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). These things can falsify the encoder signal or damage the distance measuring system.

4.5.1.1 Technical data of the MAGIC distance measuring system

Table 4.5 **Electrical and mechanical properties of the MAGIC encoder**

Type	1 V_{PP} (analogue)	TTL (digital)
Electrical properties		
Output signal	sin/cos, 1 V_{PP} (0.85 V_{PP} – 1.2 V_{PP})	Quadrature signal, RS422
Resolution	Infinite, signal period 1 mm	1 µm
Repeatability bidirectional	0.003 mm	0.002 mm
Absolute accuracy	±20 µm/m	
Reference signal [1)]	Periodic index impulse at a distance of 1 mm	
Phase angle	90° ±0.1° el	90°
DC component	2.5 V ±0.3 V	–
Distortion factor	Typ. < 0.1 %	–
Operating voltage	5 V ±5 %	
Power consumption	Typ. 35 mA, max. 70 mA	Typ. 70 mA, max. 120 mA
Max. measurement speed	10 m/s	5 m/s
EMC class	3, acc. to IEC 801	
Mechanical properties		
Housing material	High-quality aluminium alloy, encoder bottom made of stainless steel	
MAGIC encoder dimensions	L × W × B: 45 mm × 12 mm × 14 mm	
Standard cable length [2)]	5,000 mm	
Min. bending radius cable	40 mm	
Protection class	IP67	
Operating temperature	0 °C to +50 °C	
Weight of MAGIC encoder	80 g	

[1)] Can be used e.g. with reference switch

4.5.1.2 Formats and outputs of the MAGIC measuring system (analogue)

Signal format sinus/cosinus 1 V_{PP} output: electrical signals after the differential input of the downstream electronic components. The sinus/cosinus 1 V_{PP} interface of HIWIN MAGIC is strictly based on the Siemens specifications. The period length of the sinus output signal is 1 mm. The period length of the reference signal is 1 mm.

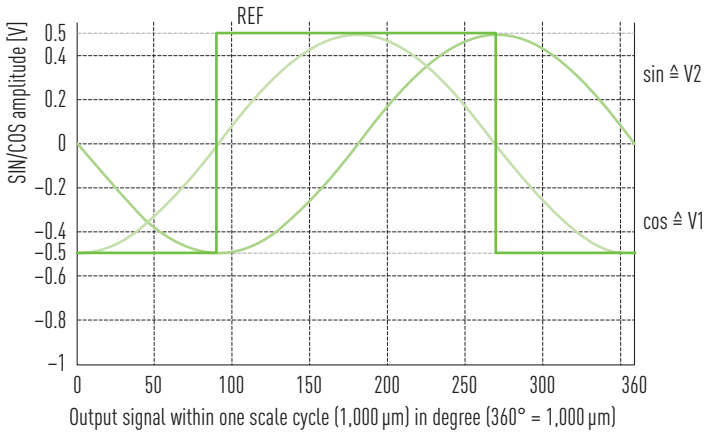


Fig. 4.6 **Electrical signals after the differential input of the downstream electronic components (analogue version)**

4.5.1.3 Formats and outputs of the MAGIC measuring system (digital)

Digital TTL output: The signals on A and B channels have a 90° phase shift (according to RS422 specification in DIN 66259).
Output signal: A, Ā, B, B̄ and Z, Z̄.

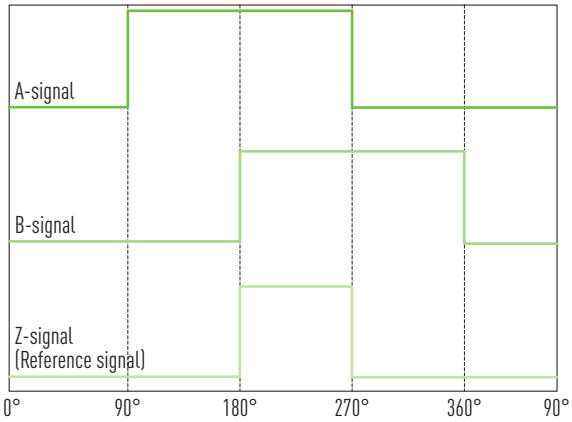


Fig. 4.7 **Signals of the MAGIC encoder (TTL version)**

For more information, please refer to the assembly instructions "HIWIN MAGIC Distance Measuring Systems".

NOTE

Please see Section 6.6.2.2 for information about connection and pin assignment

4.5.2 TTK70 [1)]

The TTK70 distance measuring system is used in the linear axes HT-L for absolute position determination, without reference run. The position determination is magnetic with very high resolution. The sensor board which is aligned with the measuring level is equipped with Hall sensors on two parallel tracks. Their arrangement corresponds to the division of the magnetic scale into an incremental and an absolute component. To calculate the absolute position values during operation, the encoder first detects the absolute starting position when the linear motor is started via the Manchester encoding. Then all further actual positions of the drive are determined via the incremental position on the magnetic track or via sine/cosine signals. The measuring system is integrated inside the axis in order to save space. The interface for the electrical connection is located on the side of the carriage. The system is integrated via the HIPERFACE® interface.

[1)] Manufacturer: SICK AG

NOTE

Information on connection and pin assignment can be found in Section 6.6.2.2

For professional commissioning and integration into the system with the HIPERFACE® interface, please refer to the manufacturer's documentation.

4.5.3 BML-S1G0 [2)]

The BML-S1G0 distance measuring system is used in the HT-L linear tables for absolute positioning without reference runs. The BML is a magnetically-encoded, non-contact absolute distance measuring system consisting of a sensor head and a measurement body. There are two magnetic tracks on the measurement body: One track with alternating magnetic north and south poles and one track with coding of the absolute position. The sensors in the sensor head measure the alternating magnetic field. When the measurement body is passed over without contact, the sensors scan the magnetic poles and transmit the path information to the control system. It can thus determine the absolute position and the distance travelled.
The measuring system is integrated inside the axis to save space. The interface for the electrical connection is located on the side of the carriage. The system is integrated either via an SSI or a BiSS-C interface. The sensor has a safety-oriented, analogue, incremental real-time signal and can be used in safety-oriented applications up to Safety Integrity Level 2 (SIL 2) according to EN 61800-5-2/EN 62061/IEC 61508 and Performance Level d (PL d) according to EN ISO 13849-1.

[2)] Manufacturer: Balluff GmbH

Information on connection and pin assignment can be found in Section 6.6.2.2 **NOTE**

For professional commissioning and integration into the system with the BiSS-C or SSI interface, please refer to the manufacturer's documentation.

4.5.4 LIC 211 [3)]

The LIC 211 distance measuring system is used in the HT-L linear motor axes for absolute positioning without reference runs. The LIC is an open, non-contact distance measuring system suitable for use with high travel speeds and simultaneously large strokes.
The measuring system is integrated inside the axis to save space. It consists of a scanning head on the carriage of the axis and a steel measurement body, which is glued into the axis profile. The LIC works with the principle of photoelectric (optical) scanning.
The measurement body is designed with two tracks. One has the absolute information as a serial code structure. The position value is therefore already available when the electronics are switched on. When the measurement body is passed over without contact, the second track is scanned with an incremental signal and interpolated for the current position value.
The connector for the electrical connection is situated on the side of the carriage. The system is integrated via EnDat 2.2. This interface basically supports the use of measurement devices in safety-related applications based on DIN EN ISO 13 849-1 (successor of EN 954-1) as well as EN 61 508 and EN 61800-5-2.

[2)] Manufacturer: Dr. Johannes Heidenhain GmbH

Information on connection and pin assignment can be found in Section 6.6.2.2 **NOTE**

For professional commissioning and integration into the system with the EnDat22 interface, please refer to the manufacturer's documentation.

4.6 Hall sensor

For motionless commutation, a Hall sensor with digital output signal is available for linear axes HT-L. The digital Hall sensors have three square signals offset through 120° (see Fig. 4.8).

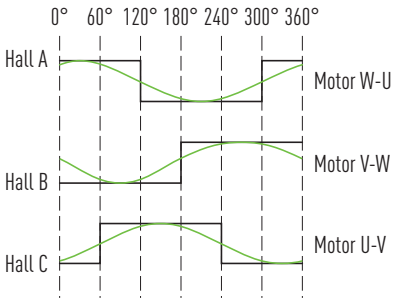


Fig. 4.8 **Output signal from digital Hall sensor with single ended output**

- Sensor signal either 0 or 1
- A combined analysis of the motor voltage supply and Hall sensor determines reliably the motor's sense of direction.
- Analysis based on the rotor displacement angle between 0° and 90° (ideally 0° and 45°)

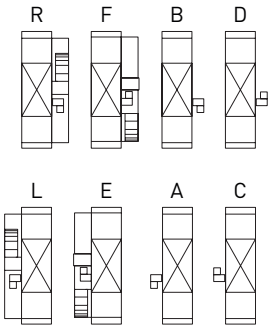
For more information about connection and pin assignment, please refer to Section 6.6.2.2 **NOTE**

4.7 Connection interface and energy supply

⚠ DANGER!

Danger from electrical voltage!
Before and during assembly, disassembly and repair work, dangerous currents may flow.
- Before connecting the electrical power supply, ensure that the linear axis is correctly earthed via the PE rail in the switch cabinet!
- Never loosen electrical connections when energized. In unfavourable cases, electric arcs can form, causing injury and damage to contacts!
- Only qualified personnel may work on electrical installations!
- Heed the assembly instructions for the other system components (e.g. linear motor, drive)!

Linear axes HT-L are equipped with an interface for motor and encoder cables. This is located on the side of the carriage. The self-locking quick fasteners it features provide a fast and easy way of connecting the cables – without the need for tools. There are four different options for the connector configuration to suit the installation conditions and how the cables need to be routed, see Fig. 4.9.
To ensure that the supply cables are carried safely, linear axes HT-L with a stroke of up to 4,000 mm are available with the option of generously dimensioned energy chains. They are extremely compact and save space when used with the axis. The configuration of the energy chain depends on the chosen connector orientation, see Fig. 4.9.



R: With energy chain, connector right/front
F: With energy chain, connector right/r
B: Without energy chain, connector right/front
D: Without energy chain, connector right/rear
L: With energy chain, connector left/front
E: With energy chain, connector left/rear
A: Without energy chain, connector left/front
C: Without energy chain, connector left/rear

Fig. 4.9 **Possible connection interfaces for linear axes HT-L**

4.8 Energy chain

Optional energy chains are available for the linear axes HT-L. The chains can be installed on either the right or the left and is based on the selected connector position. The generously dimensioned energy chains provide enough space for the supply cables to be carried safely. They are extremely compact and achieve space savings when integrated into the system as a whole.
For details of the energy chain type and size, please see Table 4.6.

Table 4.6 **Energy chain specifications**

Manufacturer ID [1)]	Inside cross-section W × H [mm]	Bending radius [mm]
2600.07.100.0	75 × 35	100

[1)] Manufacturer: igus GmbH

The upper run is self-supporting but there is a surface for the lower run that supports the energy chain as it unrolls. To prevent the cables and hoses from riding over each other, there is a partition in every second link. The connecting pieces are of a rigid design. Strain relief combs are fitted at both ends so that the cables and hoses can be secured with cable ties. To ensure that the energy chains are handled correctly, and that the cables and hoses are installed and secured properly, please observe the assembly instructions from the energy chain manufacturer.

General notes:

- For details of suitable motor and signal cables, please refer to the operating manual from the motor manufacturer.
- Observe the minimum bending radii (industrial standard 8 × D) specified for the cables and hoses, and the associated service life that is to be anticipated.
- In the case of shielded cables, make sure the shields are resistant to bending.
- Low-friction and abrasion-resistant cable/hose sheaths should be used.
- To prevent cables and hoses with different outer sheaths from bonding, separate them with partitions.
- Ensure twist-free installation of cables and hoses.
- Leave enough spare room (10 to 20 %, at least 1 mm) all the way around the cables and hoses, and allow for the lateral expansion that occurs when hoses are pressurised.
- Make sure that the weight is distributed evenly/symmetrically. Ideally, heavy cables and hoses should be positioned at the outer edges.
- Provide strain relief for cables and hoses at both ends so that they are located in the neutral zone when the energy chain is in the extended position and can move freely within its radius.
- In the case of high acceleration values or if the cables have a wide variety of diameters, use additional partitions where applicable.
- Observe the maximum additional load from cables and hoses that is permitted based on the stroke (see Fig. 4.10).

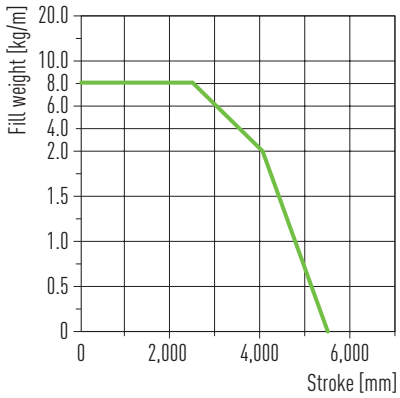


Fig. 4.10 **Maximum permissible additional load as a function of the stroke, Series 2600 (source: igus)**

4.8.1 Tape for noise reduction of the energy chain [1)]

Cellular rubber tape to reduce the noise of energy chains. The single-sided self-adhesive noise reduction tapes are glued to the energy chain's contact surface in such a way that the energy chain links are resting on the tapes when the carriage moves, which significantly reduces noise emissions.
The noise reduction tape is available in rolls of 10 m (article number: 25-002485).

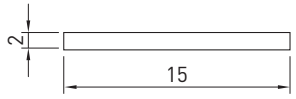


Fig. 4.11 **Dimensions of tape for noise reduction of the energy chain**

[1)] Suitable for all linear axes HT-L with energy chain (except HT150L with connection interface E or F).

5. Transport and installation

5.1 Delivery

5.1.1 Delivery state

The linear axes HT-L are supplied fully assembled and function tested.

5.1.2 Scope of delivery

The contents of delivery vary depending on the ordered model, accessories, and options.

5.2 Transport to the installation site

⚠ WARNING!

Danger from suspended loads or falling parts!

Lifting heavy loads may damage your health!

- Only qualified personnel may assemble, install, and service the linear axes!
- Note the mass when transporting the parts. Use suitable hoisting gear!
- Observe the applicable occupational health and safety regulations when handling suspended loads!
- Hoist the linear axes only at the designated points!
- Secure machinery and machine parts against tilting!

⚠ WARNING!

Danger from strong magnetic fields!

Strong magnetic fields around linear axes HT-L pose a health risk to persons with implants (e.g. cardiac pacemakers) that are affected by magnetic fields.

- Persons with implants that are affected by magnetic fields must maintain a safe distance of at least 1 m from linear axes HT-L!

⚠ CAUTION!

Danger of impacts and crushing!

If the axes are moved/driven manually, injuries can be caused by moving axes and attachments (energy chains, attachments installed by customer).

- Observe the applicable occupational health and safety regulations!
- Transport to the installation site only by qualified personnel!

ATTENTION!

Risk of material damage!

Strong magnetic forces may destroy watches and magnetisable data storage media near to the linear axes HT-L.

- Do not bring watches or magnetisable data storage media into the vicinity (<300 mm) of the linear axes HT-L components!

ATTENTION!

Damage to the linear axes!

The linear axes may be damaged by mechanical loading.

- Hoist the linear axes only at the designated points (see Section 5.5)!
- For longer linear axes, provide additional protection of the centre section!
- Ensure that the linear axes do not bend as this could permanently damage accuracy!
- During transport, do not transport any additional loads on the linear axes!
- Provide heavy attachments with additional supports!

ATTENTION!

Possible influence of magnetic fields on aircraft electronics!

- Observe packaging and transport instructions (IATA 953)!

The linear axes are precision products and must be treated with care. Impacts of any kind may damage the axis. The result may be compromised running precision and service life. Transport the packaged product as close as possible to its installation site. Remove the packaging at this site only.

5.3 Requirements at the installation site

5.3.1 Ambient conditions

Ambient conditions during operation:	+5 to +40 °C
Relative air humidity during operation:	complying with IEC60721-3-3, Class 3K3, non-condensing
Climatic environmental conditions for transport and storage:	ambient temperature: –20 to +50 °C, non-condensing
Vacuum:	it may not be operated in vacuum

5.3.2 Safety equipment to be provided by the operator

Possible safety equipment/measures:

- Personal protective equipment in accordance with UVV (German accident prevention regulations)
- Zero-contact protective equipment
- Mechanical protective equipment

5.4 Storage

- Store the linear axes HT-L in their transport packaging.
- Alternatively: Use packaging that secures the linear axes against slipping, damage, and vibrations.
- Store the linear axes in dry, frost free rooms only
- Clean and protect used linear axes before storage

5.5 Unpacking and installing

⚠ WARNING!

Danger from strong magnetic fields!
Strong magnetic fields around linear axes HT-L pose a health risk to persons with implants (e.g. cardiac pacemakers) that are affected by magnetic fields.

- Persons with implants that are affected by magnetic fields must maintain a safe distance of at least 1 m from linear axes HT-L!

ATTENTION!

Risk of material damage!
Strong magnetic forces may destroy watches and magnetisable data storage media near to the linear axes HT-L.

- Do not bring watches or magnetisable data storage media into the vicinity (<300 mm) of the linear axes HT-L components!

ATTENTION!

Warning! Health and environmental hazards!
Contact with lubricants may cause irritation, poisoning, allergic reactions, and damage to the environment.

- Use only suitable, non-hazardous agents. Note the manufacturer's safety data sheets!
- Ensure proper disposal!

NOTE

The linear axes HT-L may only be installed and operated indoors.

- Remove packaging.
- To transport the linear axis, hoist it at the points designated A and B (see Fig. 5.1). The points A and B should be a quarter of the axis' overall length from each of its ends.
- Do not hoist the linear axis by its attachments. During transport, provide additional support for heavy attachments such as the drive.
- Dispose of packaging in an environmentally friendly way.

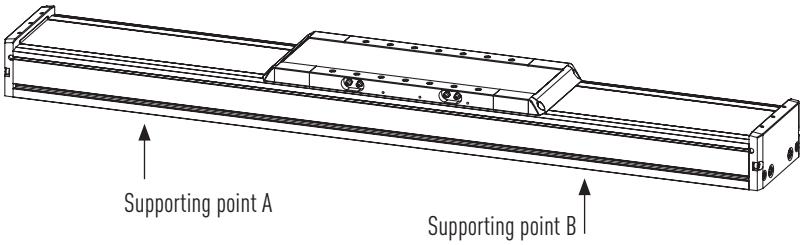


Fig. 5.1 **Supporting points A and B for hoisting and transporting**

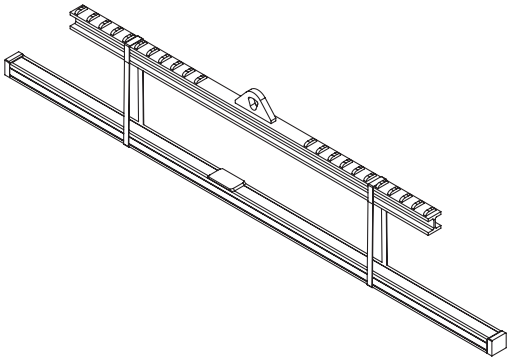


Fig. 5.2 **Correct position of the supporting points**

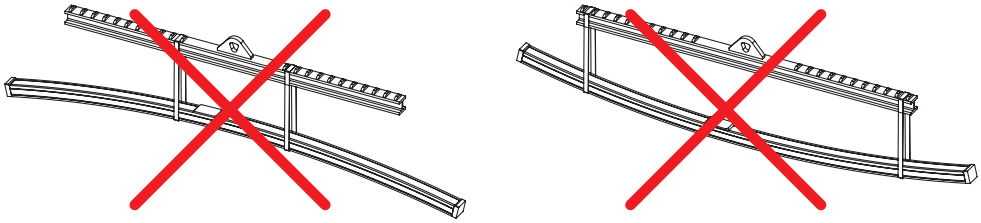


Fig. 5.3 **Correct position of the supporting points**

6. Assembly and connection

⚠ DANGER!

Danger from electrical voltage!
Before and during assembly, disassembly and repair work, dangerous currents may flow.
- Work may only be carried out by a qualified electrician and with the power supply disconnected!
- Before carrying out work on the linear axis HT-L, disconnect the power supply and protect it from being switched back on!

⚠ WARNING!

Danger from strong magnetic fields!
Strong magnetic fields around linear axes HT-L pose a health risk to persons with implants (e.g. cardiac pacemakers) that are affected by magnetic fields.
- Persons with implants that are affected by magnetic fields must maintain a safe distance of at least 1 m from linear axes HT-L!

⚠ WARNING!

Danger of impacts and crushing!
Uncontrolled or manual carriage movements may cause injury.
- Isolating protective equipment must be provided for linear axis operations!
- Only qualified personnel may be assigned to commissioning, setup, and troubleshooting!

⚠ WARNING!

Danger of cutting injuries!
Installing or removing the cover strip may cause cutting injuries.
- Only qualified personnel wearing appropriate protective equipment (gloves, goggles) may be assigned to commissioning and setup!

⚠ WARNING!

Danger of impacts and crushing!
Uncontrolled movements by the powered elements of the linear axes may cause injury.
- Controller design complying with DIN EN 12100. No start after
  - power connected, reinstated!
  - troubleshooting!
  - machine stop!

⚠ CAUTION!

Warning! Damage to hearing!
The linear axes can generate noise in excess of 70 dB(A) at high speeds.
- Hearing protection must be worn when high speed linear axes generate noise greater than 70 dB(A)!

⚠ CAUTION!

Danger from suspended loads or falling parts!
- Only qualified personnel may assemble, install, and service the linear axes!
- Note the mass when transporting the parts. Use suitable hoisting gear!
- Observe the applicable occupational health and safety regulations when handling suspended loads!
- Hoist the linear axes only at the designated points!
- Secure machinery and machine parts against tilting!
- Secure the linear axes as described in the assembly instructions!

⚠ CAUTION!

Danger of impacts and crushing
If the axes are moved by the motor, injuries can be caused by moving axes and attachments (energy chains, attachments installed by customer).
- Isolating protective equipment must be provided for linear axis operations!

⚠ CAUTION!

Danger of impacts and crushing due to imposed load becoming detached!
If the fastener is fastened incorrectly or fails, injuries can be caused by falling or flying parts.
- Your assembly must ensure that parts cannot detach even under high accelerations or constant vibrations!
- Secure the imposed load as described in the assembly instructions!

⚠ CAUTION!

Warning! Electric shock or burns by contact with live parts!
Contact with live parts can result in injuries.
If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.
- Controller design complying with DIN EN 12100. No start after
  – power connected, reinstated!
  – troubleshooting!
  – machine stop!
- Only qualified personnel may install cabling!
- Only qualified personnel may work on electrical installations!

ATTENTION!

Risk of material damage!
Strong magnetic forces may destroy watches and magnetisable data storage media near to the linear axes HT-L.
- Do not bring watches or magnetisable data storage media into the vicinity (<300 mm) of the linear axes HT-L components!

ATTENTION!

Warning! Health and environmental hazards!
Contact with lubricants may cause irritation, poisoning, allergic reactions, and damage to the environment.
- Use only suitable, non-hazardous agents. Note the manufacturer's safety data sheets!
- Ensure proper disposal!

6.1 Assembling the linear axes HT-L

Linear axes HT-L may only be mounted in a horizontal mounting position (see Fig. 6.1 and Fig. 6.2). Use in a vertical mounting position (see Fig. 6.3) is not intended. Linear axes HT-L with energy chain can only be installed in a lying horizontal mounting position (see Fig. 6.1). In standing horizontal installation position, linear axes HT-L with distance measuring system option H (LIC 211) must be aligned so that the reference edge is at the top.
Fasteners must be applied to the axis' aluminium profile. The linear axes can be secured to the mounting surface by means of clamping profiles (side grooves) or T nuts (grooves at bottom). Bear in mind that, depending on the installation position, the linear axis' weight acts as an additional load and that the actually induced forces and torques must remain within the permitted range (see catalogue "Linear Axes and Axis Systems HX").

Fig. 6.1 **Lying horizontal installation position**

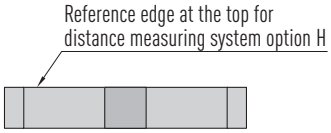


Fig. 6.2 **Standing horizontal installation position**

Fig. 6.3 **Vertical installation position**

The axis' aluminium profile has been extruded in compliance with EN 12020-2. NOTE

If higher running precision is required, the axis must be aligned and secured to a precision reference edge. NOTE

Please note the support spacing for each of the axis sizes (see Section 6.1.1, "Maximum support spacing for linear axes HT-L in self-supporting applications"). Not only the end blocks may lie on the mounting surface! NOTE

The bolts must be secured to prevent them coming loose. NOTE

6.1.1 Maximum support spacing for linear axes HT-L in self-supporting applications

Depending on how the linear axis is fixed, the axis body may undergo excessive bending, especially with large stroke lengths and high load capacities. This can be prevented when the axis body is mounted on multiple supports on a stable sub construction. The maximum support spacing L is a function of the acting force and can be determined from the following diagrams. In the case of multi-axis systems, the masses of the moving axes must also be taken into account.

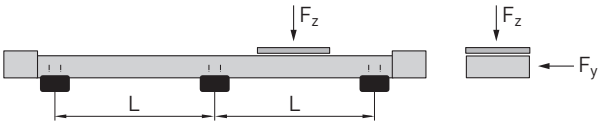


Fig. 6.4 **Horizontal axis position**

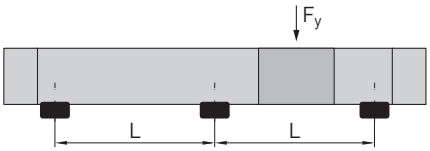


Fig. 6.5 **Vertical axis position**

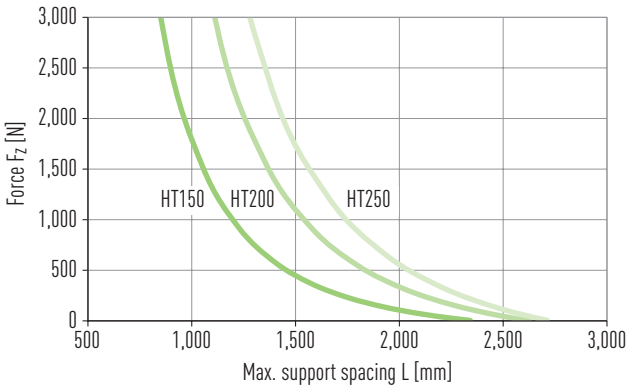


Fig. 6.6 **Maximum support spacing as a function of the force F_z**

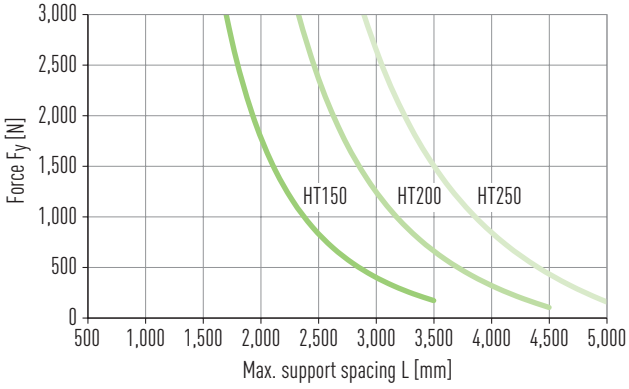


Fig. 6.7 **Maximum support spacing as a function of the force F_y**

6.1.2 Reference surface accuracy requirements

When securing the linear axis HT-L, mount the axis on a flat surface and make sure that the mounting points are aligned with each other so that the necessary flatness of 0.2 mm/m is achieved.

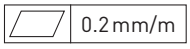
6.1.3 Assembly with T nuts

The T nuts to be used for each axis size are given in Table 6.1. The T nuts must be arranged as per Fig. 6.8, Fig. 6.9, Fig. 6.11, Fig. 6.12 or Fig. 6.13. The required number of T nuts depends on the external load. To calculate the required number, the load values listed in Table 6.1 (clamping force per T nut; permissible axial operating force in tension direction per T nut) must be taken into account. Don't drop below the minimum number of T nuts specified in Table 6.1. The T nuts are to be positioned grouped in the form of mounting points as shown in Fig. 6.11, Fig. 6.12 and Fig. 6.13. Make sure that each mounting point for itself transmits the external load safely. The distances between the mounting points are to be selected depending on the load situation. The recommended distances L_{NX} listed in Table 6.1 are only reference values.

- Drill mounting holes in the mounting surface (hole spacing listed in Table 6.1).
- Clean mounting surface and position linear axis on it.
- Swivel the T nut into the bottom groove.
- Secure the T nut with a small tightening torque on the bolts.
- Now tighten the bolts with the full tightening torques, proceeding in a crosswise manner.

✓ The linear axis has now been installed.

Note the hole spacing L_{NY} when securing the linear axes.



Precision requirements for all reference surfaces for securing the axis profile.

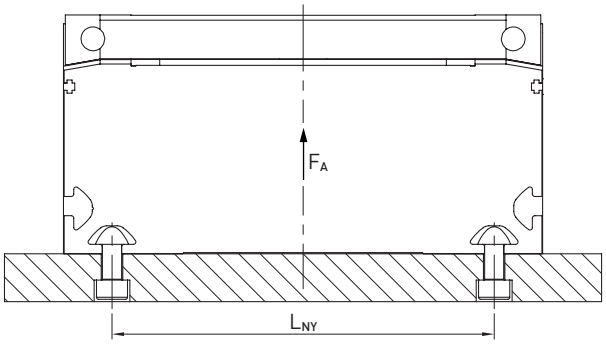


Fig. 6.8 **Hole spacing for securing the linear axes HT150, HT200 with a T nut from below**

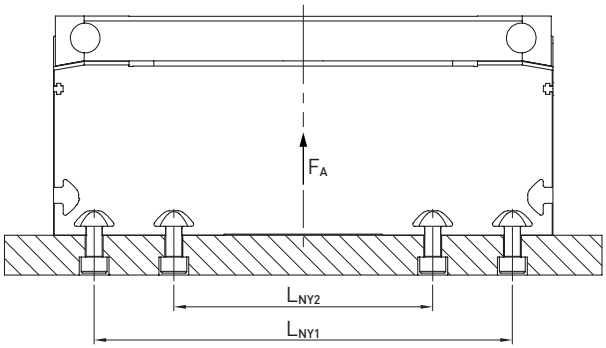


Fig. 6.9 **Hole spacing for securing the linear axes HT250 with a T nut from below**

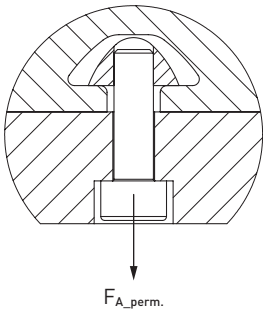


Fig. 6.10 **Permissible axial operating force in tension direction per slot nut (F_A_perm.)**

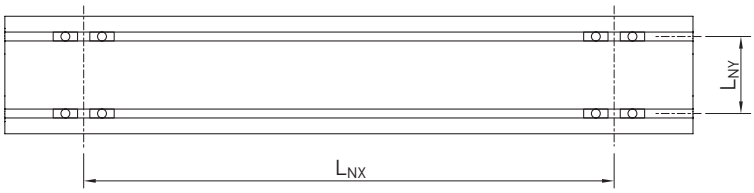


Fig. 6.11 **Securing with T nuts – HT150L**

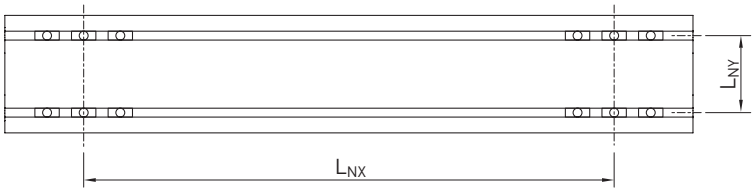


Fig. 6.12 **Securing with T nuts – HT200L**

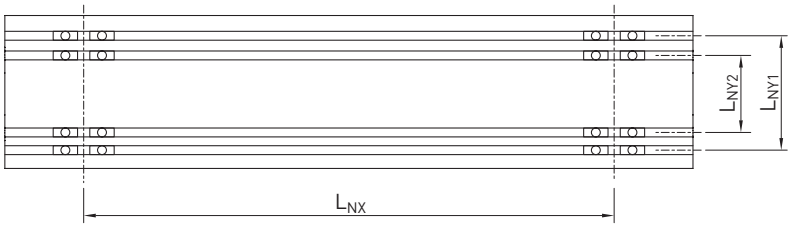


Fig. 6.13 **Securing with T nuts – HT250L**

Table 6.1 **Minimum number of T nuts for securing the axis, and recommended spacing of mounting points on long axes**

Size	Minimum number of T nuts	L_{NY}/L_{NY1} [mm]	L_{NY2} [mm]	Recommended distance L_{NX} [mm]	Thread size	Screw tightening torque [Nm]	Clamping force per T nut [N]	$F_{A\_perm.}$ [1] [N]	Art. no. T nuts (10 pcs)
HT150	8	120	–	600	M6	10.1	10,200	1,750	20-000531
HT200	12	160	–	800	M8	24.6	18,600	5,000	20-000534
HT250	16	210	130	1,000	M8	24.6	18,600	5,000	20-000534

[1] Permissible axial operating force in tension direction per T nut

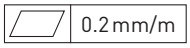
6.1.4 Mounting with clamping profiles

The clamping profiles must always be attached in pairs to the left and right of the axis body (see Fig. 6.15 and Fig. 6.16). The required number of clamping profiles depends on the external load. To calculate the required number, the load values listed in Table 6.2 (clamping force per clamping profile; permissible axial operating force in tension direction per clamping profile) must be taken into account. Don't drop below the minimum number of clamping profiles specified in Table 6.2. The distances between the mounting points are to be selected depending on the load situation. The recommended distances L_{SX} listed in Table 6.2 are only reference values.

- Drill mounting holes in the mounting surface (hole spacing listed in Table 6.2).
- Clean mounting surface and position linear axis on it.
- Swivel the clamping profile into the side groove.
- Secure the clamping profile with a small tightening torque on the bolts.
- Now tighten the bolts with the full tightening torques, proceeding in a crosswise manner.

✓ The linear axis has now been installed.

Observe the L_{SY} hole spacing (Fig. 6.14) when securing the linear axes.



Precision requirements for all reference surfaces for securing the axis profile.

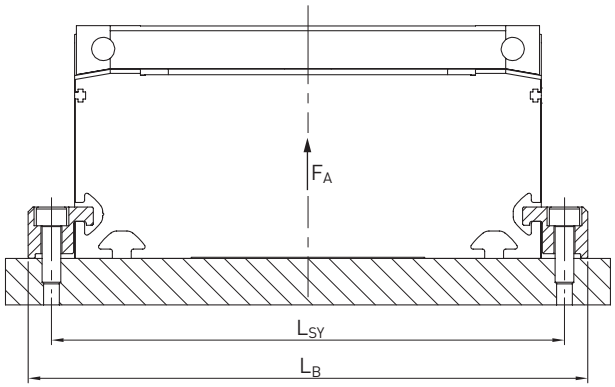


Fig. 6.14 **Hole spacing for the lateral securing of linear axes with clamping profiles**

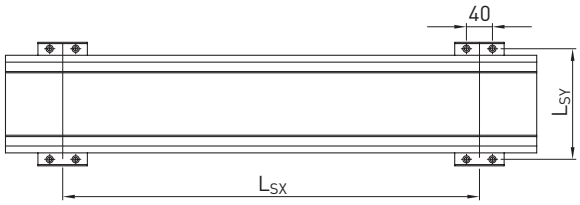


Fig. 6.15 **Securing with clamping profiles – HT150L**

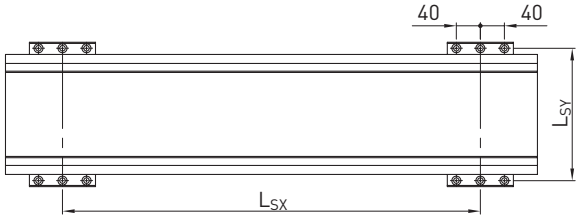


Fig. 6.16 **Securing with clamping profiles – HT200L, HT250L**

Table 6.2 **Minimum number of clamping profiles for securing the axis, and recommended spacing of mounting points on long axes**

Size	Min. number of clamping profiles	L_{SY} [mm]	L_B [mm]	Recommended distance L_{SX} [mm]	Thread size	Screw tightening torque [Nm]	Clamping force per clamping profile [N]	$F_{A\_perm.}$ [1] [N]	Art. no. clamping profiles (4 pcs)
HT150	4	170	190	600	M6	10.1	8,600	1,600	25-001023
HT200	4	220	240	800	M8	18.5	17,000	3,000	25-000520
HT250	6	270	290	1,000	M8	18.5	17,000	5,000	25-000520

[1] Permissible axial operating force in tension direction per pair of clamping profiles

6.2 Mounting the imposed load

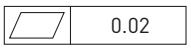
The spacings of the threaded holes for mounting the imposed load are identical for all drive options available to a size. They can be found in the catalogue Linear Axes and Axis Systems HX". Additional counterbores can take centring rings.

Table 6.3 **Threaded holes for securing the imposed load**

Size	Thread size × depth	Counterbore depth for centring sleeve [mm]	Counterbore diameter for centring sleeve [mm]
HT150	M6 × 14	1.5	Ø8 H7
HT200	M8 × 14	2.0	Ø12 H7
HT250	M10 × 20	2.0	Ø15 H7

- ▶ Clean mounting surfaces at the carriage.
- ▶ Clean the mounting surface of the load.
- ▶ Position the load on the carriage of the linear axis.
- ▶ Tighten the mounting bolts crosswise.
- ▶ If necessary, use centring sleeves.
- ▶ Check the free movement of the load over the entire stroke.
- ▶ Lock the bolts.

✓ The imposed load has now been installed.



Precision requirements for the imposed load's mounting surface.

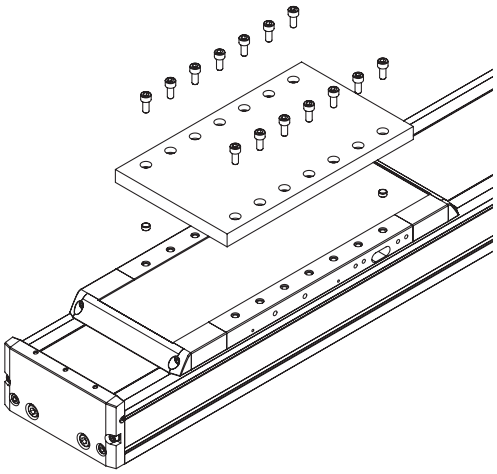


Fig. 6.17 **Securing the load with centring sleeves**

6.3 Mounting the limit switches

The limit switches are available as an N/C or N/O contact. The limit switch can be secured directly in the limit switch groove (T groove) with the provided M3 bolts and square nuts. The limit switches can be mounted on the left or right.

- If necessary, remove the green decorative strip from the upper T groove.
- Push two square nuts into the upper T groove through the notch at the drive block.
- Attach the limit switch with two bolts. First leave the two bolts untightened.
- Push the limit switch to the required position, and press it up slightly
- Tighten the bolts. The tightening torque is 0.5 Nm.

✓ The limit switches have now been installed.

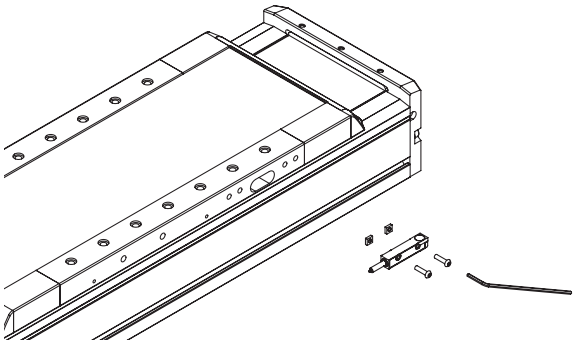


Fig. 6.18 **Mounting the limit switch**

6.4 Mounting the damping element

The damping element actuates the limit switches at the carriage's two end positions (at stroke 0 and stroke max) and must be mounted on the same side as the limit switches.

- Place the damping element at the carriage.
- Using the enclosed M3 bolts, secure the damping element loosely on the carriage.
- Align the damping element parallel to the carriage's lower edge.

✓ The damping element has now been pre-installed.

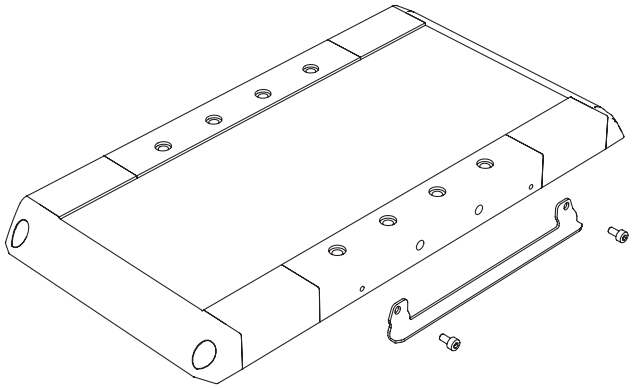


Fig. 6.19 **Mounting the damping element**

6.5 Setting the switching distance

The limit switches are inductive units and need a defined switching distance of 0.8 mm (±0.2 mm) to the damping element.

- Move the carriage until the damping element is above a limit switch. Using a feeler gauge, align the damping element for a switching distance of 0.8 mm (±0.2 mm). Make sure in doing so that the damping element remains parallel to the carriage's lower edge.
- Tighten the bolts for the damping element. The tightening torque is 1 Nm.
- If a second limit switch has been installed: Move the carriage until the damping element is above the second limit switch, and check with a feeler gauge that the switching distance is 0.8 mm (±0.2 mm). Correct where necessary until the switching distance is reached for both limit switches.
- Route the limit switch cable into the lower groove. There the cable is protected under the groove cover. The groove cover is available separately, see Section 11.4.

✓ The switching distance has now been set.

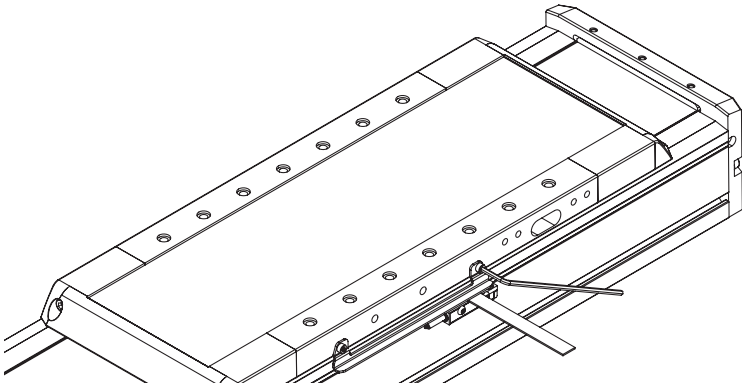


Fig. 6.20 **Setting the switching distance with a feeler gauge, and tightening the bolts**

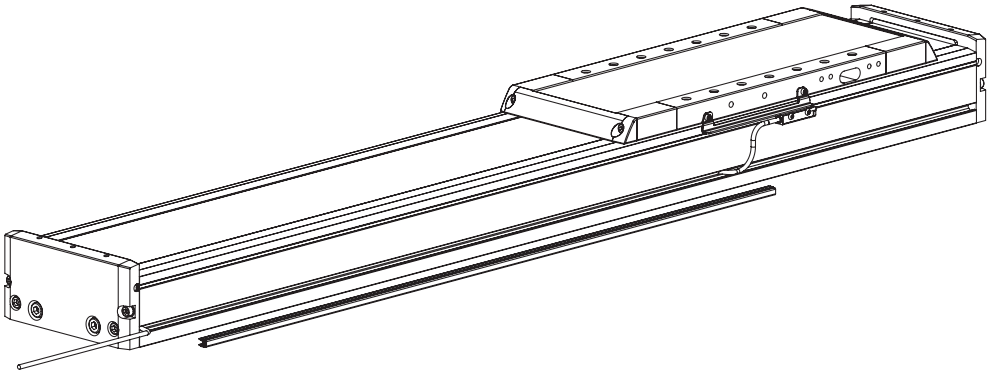


Fig. 6.21 **Mounting the limit switch: Routing the cables**

6.6 Electrical connection

⚠ DANGER!

Danger from electrical voltage!
If motors are incorrectly earthed, there is a danger of electric shock.
- Before connecting the electrical power supply, ensure that the linear axis is correctly earthed via the PE rail in the switch cabinet!

⚠ DANGER!

Danger from electrical voltage!
Electrical currents may flow even if the motor is not moving.
- Ensure that the linear axis is disconnected from the power supply before the electrical connections are detached from the motors!
- After disconnecting the drive amplifier from the power supply, wait at least 5 minutes before touching live parts or breaking connections!
- For safety reasons, measure the voltage in the intermediate circuit and wait until it has fallen below 40 V!
- Only qualified personnel may work on electrical installations!

⚠ WARNING!

Risk of injury and material damage!
If the motor is overloaded, it may overheat and catch fire.
- Provide a safety device on the control and hardware side to protect the motor against overload!
- Connection of PTC temperature sensors for warning and switch-off purposes in case of overload!
- Connection of PT1000 or KTY84 sensors for temperature monitoring purposes!
- Use of an I^2t model in the drive amplifier or the higher-level controller for time limitation of currents above I_N!

6.6.1 Connecting the limit switches

The pin assignment of the limit switch connector for variant A is shown in Fig. 6.23. For variants C and D (see order code on Page 12) with open cable ends, the wires must be connected according to Fig. 6.22.

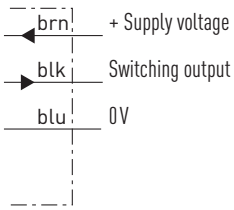
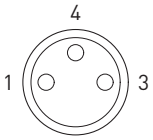


Fig. 6.22 **Connection diagram**



Pin assignment:
1: Brown (+ supply voltage)
3: Blue (0 V)
4: Black (switching output)

Fig. 6.23 **Pin assignment of limit switch plug**

The sensor is operated at a low voltage, so there is not normally any risk of injuries or fatalities from this alone. **NOTE**

Do not operate the sensor with a voltage other than the one specified. This can destroy it. **NOTE**

6.6.2 Connection of motor and internal distance measuring system for linear axes HT-L

The linear motor axes HT-L have an interface for motor and encoder cables. These are located on the side of the carriage (see Fig. 6.24) and can be quickly and easily connected without tools by the self-locking quick-release fasteners.

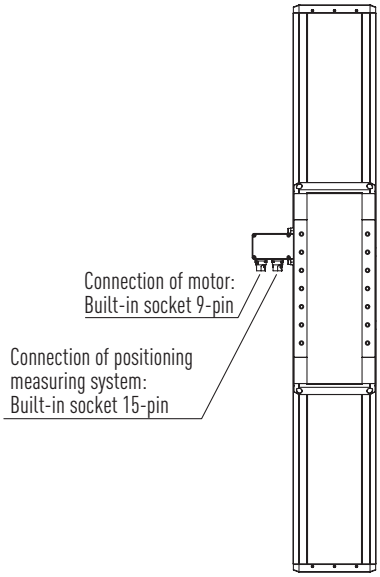


Fig. 6.24 **Electrical connection interface of linear motor axis HT-L**

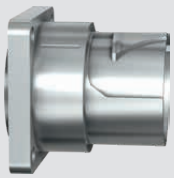
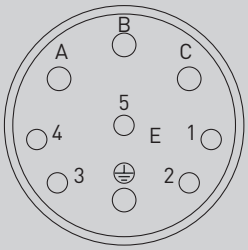
6.6.2.1 Connecting the motor

ATTENTION!

Danger of injury!
An incorrectly connected motor may cause uncontrolled carriage movements which can lead to injuries or might damage the linear axis.

▶ Only qualified personnel may connect the motor!

Table 6.4 **Built-in socket 9-pin**

Type	Specification	Designation [1]	Pole configuration
Built-in socket 	915, E, 9-pin, flange	EEGA201NN00000500000	
Matching plug	915, 9-pin, P, D = 10.5 – 12	ESTA202NN00340500000	

[1] Manufacturer: TE Connectivity Industrial GmbH

Table 6.5 **Pin assignment of built-in socket 9-pin**

Pin no.	Signal
A	U
B	V
C	W
GND	GND
1	T1+/PTC SNM 120
2	T1–/PTC SNM 120
3	T2+/PT1000
4	T2–/PT1000

6.6.2.2 Connecting the distance measuring system and the Hall sensor

ATTENTION!

Danger of injury!
An incorrectly connected distance measuring system may cause uncontrolled carriage movements which can lead to injuries or might damage the linear axis.
▶ Only qualified personnel may connect the distance measuring system!

If the incremental distance measuring system is connected according to Table 6.7, the counting direction results as shown in Fig. 6.25.

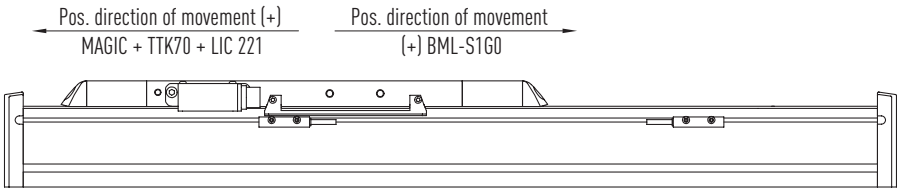
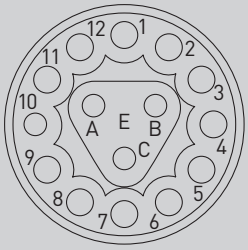


Fig. 6.25 **Positive direction of movement for linear axis HT-L (connection interface shown: option "D")**

Table 6.6 **Built-in socket 15-pin**

Type	Specification	Designation [1]	Pole configuration
Built-in socket 	915, E, 15-pin, flange	EEGA204NN00000001000	
Matching plug	915, 15-pin, P, D = 8.5 – 10.5	ESTA205NN00330003000	

[1] Manufacturer: TE Connectivity Industrial GmbH

Table 6.7 **Pin assignment of built-in socket 15-pin**

Pin no.	Signal of distance measuring system MAGIC							
	MAGIC				LIC 211	BML		TTK70
	A	B	D	E	H	R	S	T
1	V1–	V1–	A–	A–		A–	A–	cos–
2	V2–	V2–	B–	B–		B–	B–	sin–
3	Ref+	Ref+	Ref+	Ref+	Data–	Data–	Data–	Data–
4	5 V	5 V	5 V	5 V	5 V	5 V	5 V	7 – 12 V
5	5 V	5 V	5 V	5 V	5 V	5 V	5 V	7 – 12 V
6	–	Hall B	–	Hall B	Clock–	Clock–	Clock–	–
7	–	Hall C	–	Hall C	Clock+	Clock+	Clock+	–
8	–	–	–	–		–	–	–
9	V1+	V1+	A+	A+		A+	A+	cos+
10	V2+	V2+	B+	B+		B+	B+	sin+
11	Ref–	Ref–	Ref–	Ref–	Data+	Data+	Data+	Data+
12	0 V	0 V	0 V	0 V	0 V	0 V	0 V	–
A	0 V	0 V	0 V	0 V	0 V	0 V	0 V	0 V
B	–	Hall A	–	Hall A		–	–	–
C	–		–	–		–	–	–
Plug housing	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding

A: analogue signal, 1 V_{PP} sin/cos
B: analogue signal, 1 V_{PP} sin/cos and digital Hall sensor
D: digital TTL 5 V
E: digital TTL 5 V and digital Hall sensor
H: absolute, EnDat 2.2
R: absolute, BiSS-C, 1 V_{PP} sin/cos
S: absolute, SSI, 1 V_{PP} sin/cos
T: absolute, HIPERFACE 1 V_{PP} sin/cos

6.6.3 Cables and connectors

For HIWIN linear motor axes, and in general for all highly dynamic applications we recommend our pre-assembled extension cables that are specifically designed for dynamic use in energy chains. The high-quality extension cables are shipped with a round connector (coupling, female) on one side (see Sections 11.13, 11.14 and 11.15).

NOTE

In order to prevent EMC interference in the encoder signal, the encoder extension cable must be shielded and the shielding must be in full contact across the connectors. High-quality, fully-shielded connectors must be used.

6.6.4 Connecting the drive amplifier

NOTE

Details on the drive amplifier's connections can be found in its operating instructions.

7. Maintenance and cleaning

⚠ WARNING!

Danger from strong magnetic fields!
Strong magnetic fields around linear axes HT-L pose a health risk to persons with implants (e.g. cardiac pacemakers) that are affected by magnetic fields.
- ▶ Persons with implants that are affected by magnetic fields must maintain a safe distance of at least 1 m from linear axes HT-L!

⚠ WARNING!

Danger of impacts and crushing!
If the carriage is moved or started unintentionally, injuries may result!
- ▶ Controller design complying with DIN EN 12100. No start after:
  - – power connected, reinstated!
  - – troubleshooting!
  - – machine stop!

⚠ WARNING!

Risk of injury and material damage!
Unauthorised work on the system creates the risk of injuries and may invalidate the warranty.
- ▶ Only qualified personnel may assemble, install, and service the system!

⚠ CAUTION!

Tilting axes can cause crushing injuries!
- ▶ Secure machinery and machine parts against tilting!

⚠ CAUTION!

Falling axis or detached imposed load can cause impact and crushing injuries!
Danger from high loads!
- ▶ Use suitable hoisting gear!
- ▶ Secure the linear axis as described in the assembly instructions (see Section 6.1)!
- ▶ Secure the imposed load as described in the assembly instructions (see Section 6.2)!

⚠ CAUTION!

Danger of impacts and crushing!
If the axes are moved/driven manually, injuries can be caused by moving axes and attachments (energy chains, attachments installed by customer).
- ▶ Observe the applicable occupational health and safety regulations!
- ▶ Transport to the installation site only by qualified personnel!

⚠ CAUTION!

Warning! Electric shock or burns by contact with live parts!
Contact with live parts can result in injuries.
If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.
- ▶ Controller design complying with DIN EN 12100. No start after:
  - – power connected, reinstated!
  - – troubleshooting!
  - – machine stop!
- ▶ Only qualified personnel may install cabling!
- ▶ Only qualified personnel may work on electrical installations!

ATTENTION!

Risk of material damage!
Strong magnetic forces may destroy watches and magnetisable data storage media near to the linear axes HT-L.
- Do not bring watches or magnetisable data storage media into the vicinity (<300 mm) of the linear axes HT-L components!

ATTENTION!

Warning! Health and environmental hazards!
Contact with lubricants may cause irritation, poisoning, allergic reactions, and damage to the environment.
- Use only suitable, non-hazardous agents. Note the manufacturer's safety data sheets!
- Ensure proper disposal!

ATTENTION!

Damage from wrong lubricant!
Using a wrong lubricant can cause damage to property and pollute the environment.
- Use the correct lubricant type (grease, oil) as specified in these assembly instructions!

During maintenance:
- Secure the linear axis against being switched on without authorisation.
- Disconnect the power supply of the linear axis.
- Secure the linear axis against being switched back on without authorisation.

NOTE

The cleaning and lubrication intervals must be observed without fail.
Include these maintenance intervals in your maintenance schedule.

7.1 Lubrication

Linear axis operations consume lubricant on a continuous basis. The product must be relubricated at regular intervals. Bear in mind that small quantities of lubricant can exit the lubrication system.

The following factors affect the lubrication intervals:
- Dust and dirt
- Operating temperatures
- Loads
- Vibration stress
- Permanently short positioning distances
- Rotary speeds

NOTE

Inadequate lubrication or the wrong lubricant increases wear and reduces the service life.

The linear axes HT-L include two linear guideways with two blocks each that are initially lubricated prior to delivery. Relubrication is introduced through four grease nipples (one for each block) on the side of the carriage.

The lubrication interval depends on the loading, speed, cycle time, and ambient conditions. Recommended lubrication intervals are listed in Table 7.1.

Table 7.1 **Lubricant quantities for the linear guideway of the linear axes HT-L**

Size	Block	Lubricant	Relubrication quantity [cm³]
HT150L	QE15	G04	0.55
HT200L	QH20	G04	0.70
HT250L	QH25	G04	0.75

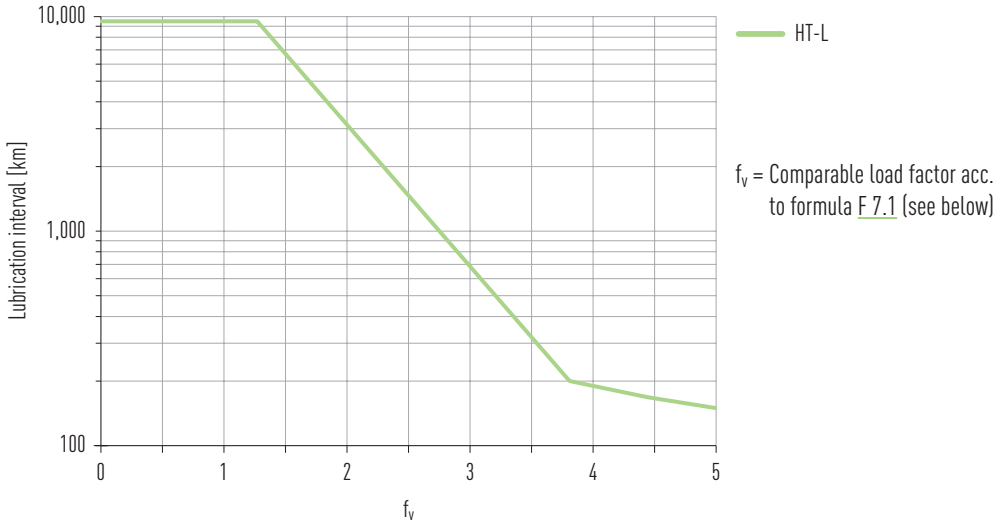


Fig. 7.1 **Load-dependent relubrication intervals for linear guideways of the linear axes HT-L**

7.1.1 Calculating the comparable load factor f_v

In the case of combined loads from multiple forces and torques, the comparable load factor f_v is calculated with the Formula F 7.1.

F 7.1

$$f_v = \frac{|F_y|}{F_{ydynmax}} + \frac{|F_z|}{F_{zdynmax}} + \frac{|M_x|}{M_{xdynmax}} + \frac{|M_y|}{M_{ydynmax}} + \frac{|M_z|}{M_{zdynmax}}$$

f_v	Comparable load factor
F_y	Force acting along the Y axis [N]
F_z	Force acting along the Z axis [N]
M_x	Torque acting around the X axis [Nm]
M_y	Torque acting around the Y axis [Nm]
M_z	Torque acting around the Z axis [Nm]
$F_{ydynmax}$	Maximum dynamic force along the Y axis [N]
$F_{zdynmax}$	Maximum dynamic force along the Z axis [N]
$M_{xdynmax}$	Maximum dynamic torque acting around the X axis [Nm]
$M_{ydynmax}$	Maximum dynamic torque acting around the Y axis [Nm]
$M_{zdynmax}$	Maximum dynamic torque acting around the Z axis [Nm]

7.1.2 Lubrication procedure

NOTE **Use only lubricants that are in accordance with DIN 51825, KP2K of the consistency class NGLI2!**

NOTE **Ensure that only lubricants without solid lubricant particles (e.g. graphite or MoS_2) are used!**

NOTE **For vertical installation, the relubricant quantity is increased by approx. 50 %.**

NOTE **Under special operating conditions (soiling, short stroke, installation type), the lubrication intervals must be adjusted from case to case.**

Example lubrication of the linear guideway:

- Move the carriage to an arbitrary position.
- Apply the nozzle at right angles to a lube point on the side.
- Press the nozzle manually against the grease nipple.
- Discharge the required quantity of lubricant from the grease gun (see Table 7.1).
- Repeat the process for all lube points on this carriage side.

✓ The linear guideway has been lubricated.

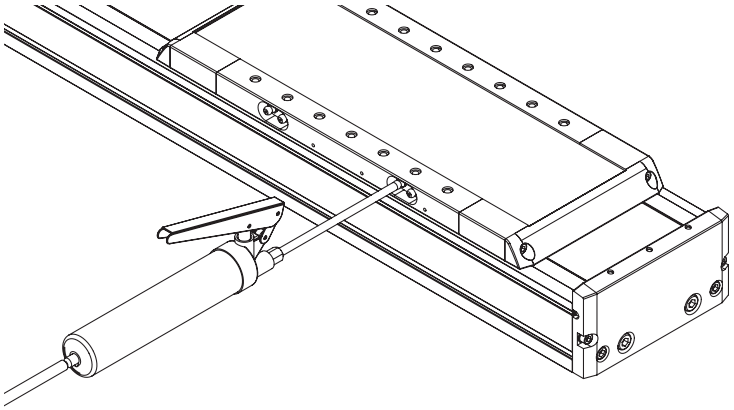


Fig. 7.2 **Lubrication procedure**

7.1.3 HIWIN lubricants

The grease type HIWIN G04 is recommended for the linear axes. HIWIN can also offer you a suitable grease gun with matching adapter (see Section 11.18).

7.2 Cleaning the linear axis

⚠ WARNING!

Danger of cutting injuries!
Installing or removing the cover strip may cause cutting injuries.
- Only qualified personnel wearing appropriate protective equipment (gloves, goggles) may be assigned to commissioning and setup!

ATTENTION!

Warning! Health and environmental hazards!
Contact with lubricants may cause irritation, poisoning, allergic reactions, and damage to the environment.
- Use only suitable, non-hazardous agents. Note the manufacturer's safety data sheets!
- Ensure proper disposal!

Thanks to their layout and optional cover strips, linear axes HT-L are insensitive to penetration by contaminants and foreign particles. Nevertheless, the linear axes must be examined and its outside cleaned at regular intervals.

Note the following points when cleaning:
- Do not use compressed air.
- The surface is anodised and therefore only partially resistant to alkaline cleaning agents. Only neutral cleaning agents may be used for cleaning.
- Regularly remove coarse particles from the surface. Ideal is a moistened, soft, and lint free cleaning cloth.
- The cover strip is exposed to friction and therefore abrasion. Remove the abrasion particles regularly.

7.3 Replacing the cover strip

The cover strip must be changed as soon as there are any signs of rippling and it can no longer be held in position by the magnetic strips. In this case, a sufficient sealing is no longer guaranteed.
- Undo the clamping screw of the cover strip clamp at both ends of the axis as shown in Fig. 7.9.
- Undo the carriage end piece screws. Remove the end pieces from both ends of all carriages (see Fig. 7.7).
- Remove the carriage cover by pushing it out of the carriage profile (see Fig. 7.3).
- Undo the cover strip deflection mounting screws. Remove the cover strip deflection from both ends of all carriages (see Fig. 7.4).
- Now remove the cover strip by lifting it off the carriage profile.
- Use a soft, damp, lint-free cloth to remove any dirt from the cover strip clamp, carriage end piece, cover strip deflection, cover strip guide and carriage cover (e.g. with ethanol).
- If necessary, replace the cover strip guides on the top of the carriage profile and the bottom of the cover strip deflection (see Fig. 7.5).
- Cut the new cover strip to the same length as the one that you have removed.
- Lay the cover strip on the magnetic strip of the axis base profile and guide it over the carriage profile (see Fig. 7.6).
- Center the cover strip.
- Mount the cover strip deflection on both sides of the carriage as shown in Fig. 7.4.
- Center the cover strip deflection.
- Hand-tighten the cover strip deflection screws.
- Mount the carriage cover by inserting it into the groove of the carriage profile and the cover strip deflection (see Fig. 7.3)
- Place the carriage end pieces on the cover strip deflection as shown in Fig. 7.7 and hand-tighten the mounting screws.
- Push the ends of the cover strip under the cover strip clamp on both sides. Make sure that the cover strip is aligned centrally with the axis profile and that it is in contact with the magnetic strips across the entire length. Hand-tighten the clamping screws of the cover strip clamp (see Fig. 7.8 and Fig. 7.9).
- Move the carriages to both end positions and check that the cover strip is seated correctly. If necessary, loosen the cover strip clamp screws again, realign the cover strip and then retighten the screws.

✓ The new cover strip has been mounted.

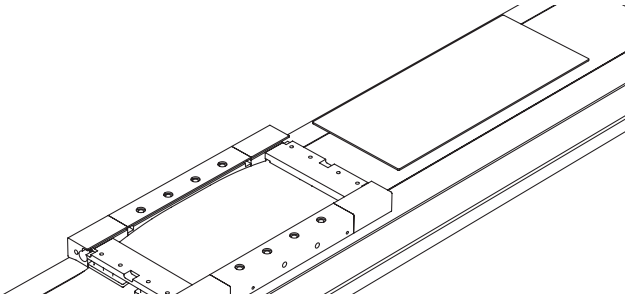


Fig. 7.3 **Removing/mounting the carriage cover**

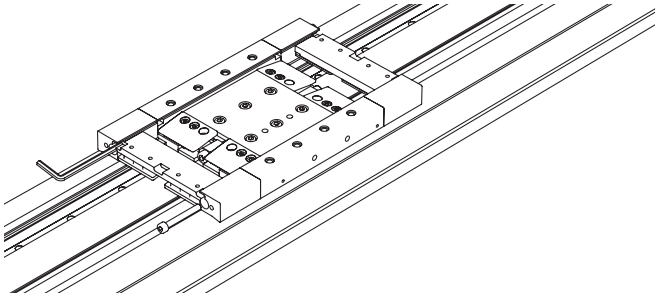


Fig. 7.4 **Removing/mounting the cover strip deflection**

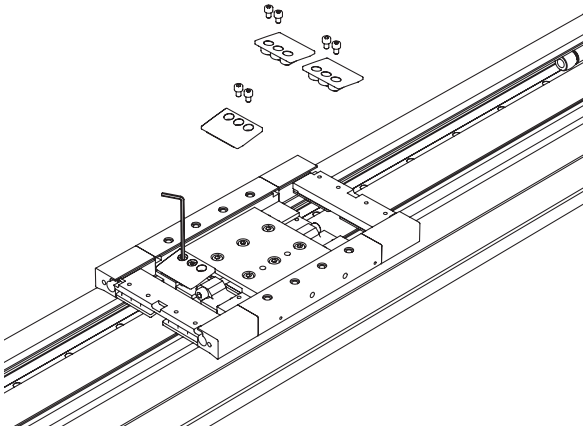


Fig. 7.5 **Removing/mounting the cover strip guide**

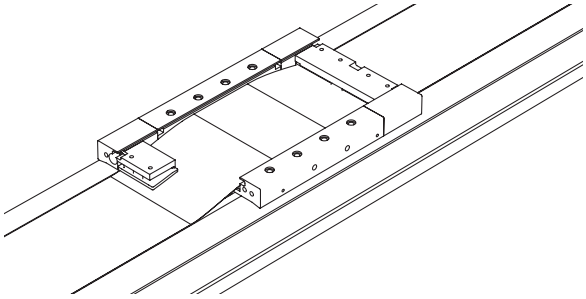


Fig. 7.6 **Guiding the cover strip**

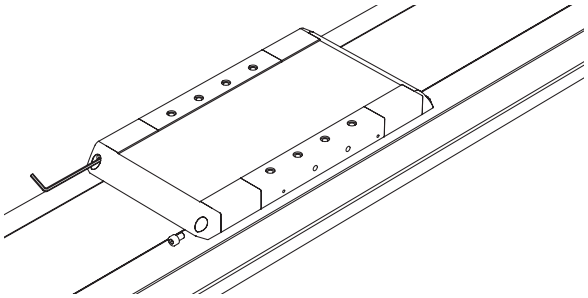


Fig. 7.7 **Removing/mounting the carriage end piece**

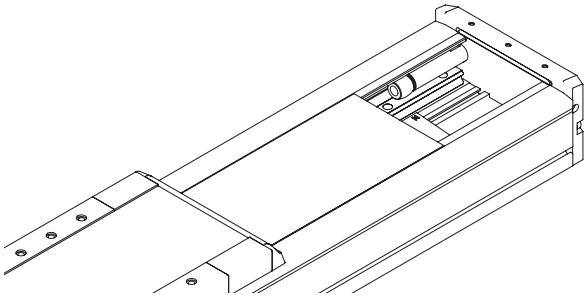


Fig. 7.8 **Mounting the cover strip under the cover strip clamp**

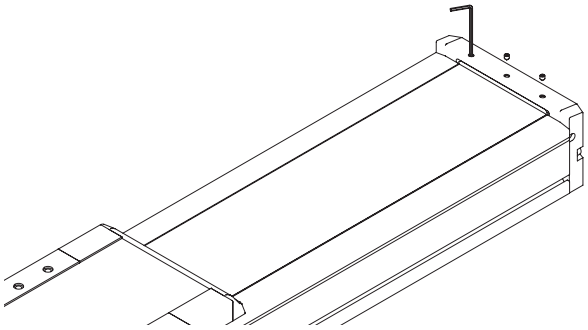


Fig. 7.9 **Removing/mounting the cover strip clamp**

7.5 Changing the HT-L cover strip guide

For longer linear tables HT-L, the cover strip is guided by an additional cover strip guide to ensure that the cover strip is centred in the axis. The cover strip guide is integrated in the carriage and consists of a roller holder and a ball bearing on which the cover strip rolls off laterally.
The ball bearings of the cover strip guides must be checked for their running properties at regular intervals (running performance approx. 20,000 km). If necessary, the complete cover strip guide must be replaced on both sides.

- Loosen the fixing screws of the cover strip guide on both sides.
- Pull the cover strip guides sideways out of the carriage (see Fig. 7.10).
- Remove any dirt from the seats of the cover strip guides in the carriage.
- Insert the new cover strip guides into the carriage on both sides.
- Tighten the fixing screws with 3.0 Nm
- Check whether the cover strip is centred in the axis profile when the carriage moves and, if necessary, align the cover strip centrally by loosening the cover strip clamp (Fig. 7.9).

✓ The new cover strip guide has been mounted.

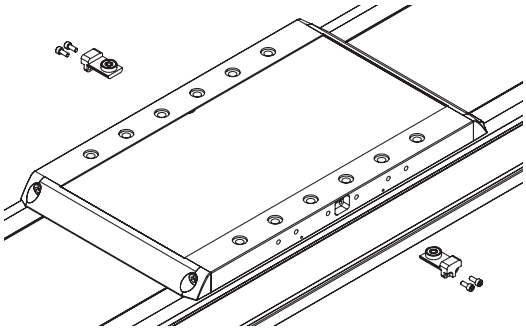


Fig. 7.10 **Cover strip guide**

7.4 Visual examination of electrical componentry

⚠ CAUTION!

Warning! Electric shock or burns by contact with live parts!
Contact with live parts can result in injuries.
If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.

- Controller design complying with DIN EN 12100. No start after:
  - power connected, reinstated!
  - troubleshooting!
  - machine stop!
- Only qualified personnel may install cabling!
- Only qualified personnel may work on electrical installations!

8. Faults

8.1 Linear axis HT-L system malfunctions

⚠ CAUTION!

Danger of impacts and crushing
If the axes are moved by the motor, injuries can be caused by moving axes and attachments (energy chains, attachments installed by customer).
- Isolating protective equipment must be provided for linear axis operations!

⚠ CAUTION!

Warning! Electric shock or burns by contact with live parts!
Contact with live parts can result in injuries.
If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.
- Controller design complying with DIN EN 12100. No start after:
  – power connected, reinstated!
  – troubleshooting!
  – machine stop!
- Only qualified personnel may install cabling!
- Only qualified personnel may work on electrical installations!

Table 8.1 **Table of linear axis HT-L malfunctions**

Fault	Possible cause	Remedy
Carriage not moving	Load too high	Reduce load or drive acceleration
Carriage backlash and inaccurate positioning	Guiding or drive element backlash after a collision or from extreme effects (impacts, peak loads, etc.) from outside	Send axis to HIWIN for repair
Limit switch not working	Switching distance too large	Adjust switching distance to correct value
	Limit switch defect or cable break	Replace limit switch
	Signal not arriving at controller	Check input line to controller
Noise and vibrations at high speeds	Tensions in the system	Install axis free of tension; check flatness of bearing surface and attached load
	Wrong drive controller settings	Retune, and adjust controller settings to the application conditions
Noise generated by guiding mechanisms	Lack of lubricant	Relubricate
	Damage to guiding mechanisms, e.g. as a result of extreme impact on the carriage or extreme contamination	Send axis to HIWIN for repair
Motor load rising, controller shutting down owing to overload	Tensions in the system or lack of lubrication	Install axis free of tension; check flatness of bearing surface and attached load. Relubricate axis
	Heavy contamination on the axis and internal guiding mechanisms	Clean axis, reinstate free movement of guiding and drive elements
Motor does not start	Supply cables disconnected	Check connections, plug contacts may be compressed, repair if necessary
	Fuse has tripped via motor protection	Check motor protection for the right settings, remedy defects if necessary

Table 8.1 **Table of linear axis HT-L malfunctions (continuation)**

Fault	Possible cause	Remedy
Upon restart, the drive reports a fault during commutation	Motor phases connected incorrectly	Check rotational direction
	Encoder counting direction incorrect	Change the sin and cos pair of wires in the encoder plug
	Carriage is too close to the limit switch/ limit stop	Disconnect power supply to axis and move carriage manually into the centre of the axis
	Carriage blocked	Check carriage manually for free movement
	No symmetrical force ratios	
	Additional drive resistance	Change parameters in the drive amplifier
Axis overspeeds upon restart	Commutation incorrect	See fault during commutation
		Check commutation parameters in the drive, activate speed monitoring
	EMC interference with the encoder signal	Check the shielding of the connectors and cables
Axis overspeeds in positioning mode	Programming error in the position transfer, invalid acceleration ordered	Activate security settings in the drive amplifier, such as speed monitoring, permissible position errors etc.
	Rated power exceeded as duty cycle is too long	Adapt load cycle to the rated power of the motor
Motor heats up too much (measure temperature)	Cooling insufficient	Rectify cooling air supply or open cooling air passages, retrofit external fan if necessary
	Carriage is difficult to move	Check lubrication of the guidings, check for foreign bodies in the traversing range
	Ambient temperature too high	Observe permissible temperature range
	Load cycle has been modified	Calculate load cycle and adapt accordingly
	Drive amplifier motor commutation does not function properly	Adapt commutation parameters of the drive amplifier
Operating noise from the carriage	Relubrication required or bearing damage	Lubrication or consultation with HIWIN GmbH
After homing, there is an offset of 1 mm	The position of the cam switch is exactly between two index pulses of the MAGIC-PG	Shift of the cam switch by approx. 0.5 mm
The axis generates cracking noises when it is subject to control	EMC interference in the encoder signal	Encoder cables must be used with separately shielded sin and cos signal pairs
	Commutation incorrect	Optimise commutation parameters
The carriage jerks while moving and generates operating noise that is not caused by the profile rail	EMC interference in the encoder signal, encoder cable plug connection defective, pin bent in plug	Place motor cable and/or encoder cable shield in full contact with the earthing terminal of the amplifier, check pin in plug
	Wrong controller parameters	Check controller parameters, check tuning
Position discrepancies after several hours of operation	Wrong settings for duty cycle Overload Heat transfers	Check operating range; check if axis is operating within the specifications

8.2 Faults during operation with drive amplifier

For interpretation of faults and information on how to remedy them, see the drive's operating instructions.

9. Disassembly

⚠ DANGER!

Danger from electrical voltage!
Before and during assembly, disassembly and repair work, dangerous currents may flow.
- Work may only be carried out by a qualified electrician and with the power supply disconnected!
- Before carrying out work on the linear axes, disconnect the power supply and protect it from being switched back on!

⚠ WARNING!

Danger of impacts and crushing!
If the carriage is moved or started unintentionally, injuries may result!
- Controller design complying with DIN EN 12100. No start after:
  – power connected, reinstated!
  – troubleshooting!
  – machine stop!

⚠ WARNING!

Risk of crushing from carriages!
Danger of injury from crushing and damage to the linear axes caused by movement of the carriage due to gravity, as the axes do not feature brakes in their standard version.
- Make sure that the carriage is secured against uncontrolled movement during downtimes!

⚠ WARNING!

Danger of cutting injuries!
Installing or removing the cover strip may cause cutting injuries.
- Only qualified personnel wearing appropriate protective equipment (gloves, goggles) may be assigned to commissioning and setup!

⚠ WARNING!

Danger from suspended loads or falling parts!
Lifting heavy loads may damage your health!
- Only qualified personnel may assemble, install, and service the linear axes!
- Note the mass when transporting the parts. Use suitable hoisting gear!
- Observe the applicable occupational health and safety regulations when handling suspended loads!
- Hoist the linear axes only at the designated points!
- Secure machinery and machine parts against tilting!

⚠ CAUTION!

Danger of impacts and crushing!
If the axes are moved/driven manually, injuries can be caused by moving axes and attachments (energy chains, attachments installed by customer).
- Observe the applicable occupational health and safety regulations!
- Transport to the installation site only by qualified personnel!

⚠ CAUTION!

Warning! Electric shock or burns by contact with live parts!
Contact with live parts can result in injuries.
If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.
- Controller design complying with DIN EN 12100. No start after:
  – power connected, reinstated!
  – troubleshooting!
  – machine stop!
- Only qualified personnel may install cabling!
- Only qualified personnel may work on electrical installations!

⚠ CAUTION!

Tilting axes can cause crushing injuries!

- Secure machinery and machine parts against tilting!

ATTENTION!

Warning! Health and environmental hazards!

Contact with lubricants may cause irritation, poisoning, allergic reactions, and damage to the environment.

- Use only suitable, non-hazardous agents. Note the manufacturer's safety data sheets!
- Ensure proper disposal!

Disassembly steps:

- Disconnect the linear axis from its power supply.
- Unscrew and remove the moved loads.
- Secure moving parts (e.g. carriage) against uncontrolled movements.
- Unscrew and remove the linear axis.

✓ The linear axis has now been disassembled.

10. Disposal

ATTENTION!

Warning! Health and environmental hazards!
Contact with lubricants may cause irritation, poisoning, allergic reactions, and damage to the environment.
- Use only suitable, non-hazardous agents. Note the manufacturer's safety data sheets!
- Ensure proper disposal!

Table 10.1 **Disposal**

Fluids	
Lubricants	Dispose of as hazardous waste in an environmentally friendly way
Soiled cleaning cloths	Dispose of as hazardous waste in an environmentally friendly way
Linear axis	
Cabling, electrical components	Dispose of as electrical waste
PP components (e.g. energy chain)	Dispose of separately
Steel components (e.g. profile rail)	Dispose of separately
Aluminium components (e.g. profile)	Dispose of separately

11. Appendix 1: Accessories and spare parts

Our products are constantly subjected to technical changes and improvements. Please always quote the serial number of your linear axis when ordering replacement parts, accessories, and parts without article numbers. This will ensure that you receive the correct parts. The serial number can be found on the axis' type plate.

11.1 Clamping profiles

Clamping profiles are convenient devices for installing the linear axis to the machine frame from above. The clamping profiles can be swivelled into the sides of the axis' profile groove. Sets are available with four clamping profiles.

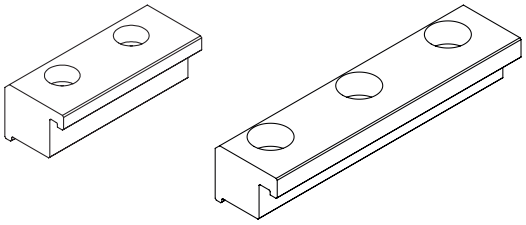


Fig. 11.1 **Short and long clamping profiles**

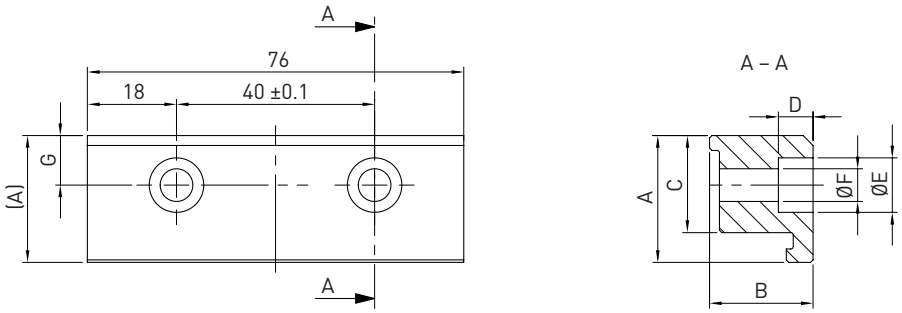


Fig. 11.2 **Dimensional drawing of short clamping profile**

Table 11.1 **Article numbers and dimensions for short clamping profiles**

Suitable for linear axis	Type	A	B	C	D	Ø E	Ø F	G	Suitable screw	Article number, 4 pcs
HT150	Size 6	26.1	15.9	19.6	8.5	11	6.6	10.00	DIN 912 M6	25-001023
HT200, HT250	Size 8	28.0	22.0	19.5	8.0	15	9.0	10.00	DIN 912 M8	25-000519

Unit: mm

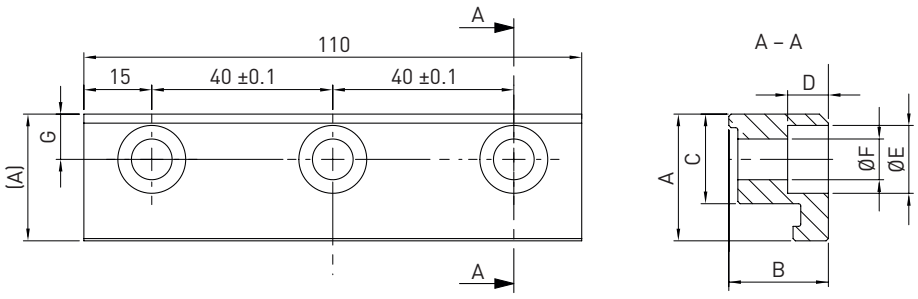


Fig. 11.3 **Dimensional drawing of long clamping profile**

Table 11.2 **Article numbers and dimensions for long clamping profiles**

Suitable for linear axis	Type	A	B	C	D	Ø E	Ø F	G	Suitable screw	Article number, 4 pcs
HT200 [1], HT250 [1]	Size 8	28.0	22.0	19.5	8.0	15.0	9.0	10.0	DIN 912 M8	25-000520

[1] Preferred type for axis mounting
Unit: mm

11.2 T nut

T nut for the frictional connection of the linear axes. Flexible fastening options through the grooves on the side and on the bottom of the axis profile. Sets are available with ten T nuts.

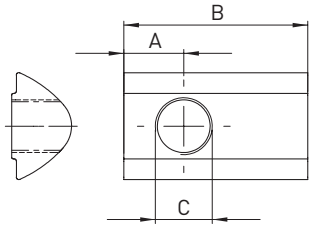


Fig. 11.4 **Dimensional drawing of T nut**

Table 11.3 **Article numbers and dimensions for T nuts**

Suitable for linear axis	Type	A	B	C	Article number, 10 pcs.
HT150	Size 6 M5	4.5	17.0	M5	20-000530
HT150 [1]	Size 6 M6	5.5	17.0	M6	20-000531
HT200, HT250	Size 8 M5	7.5	23.0	M5	20-000532
HT200, HT250	Size 8 M6	6.5	23.0	M6	20-000533
HT200, HT250 [1]	Size 8 M8	7.5	23.0	M8	20-000534

[1] Preferred type for axis mounting
Unit: mm

11.3 Centring sleeve

Centring sleeves that are inserted in the carriage's mounting holes for precise, repeatable load bearing. Sets are available with ten centring sleeves.

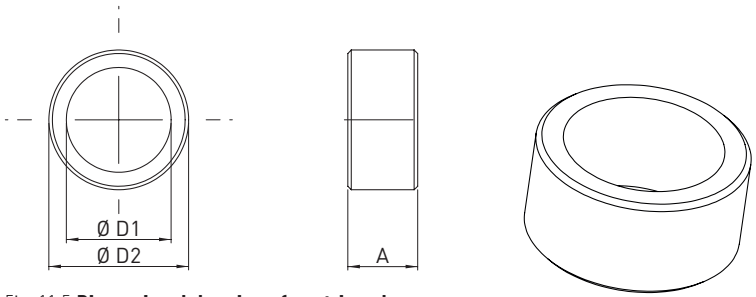


Fig. 11.5 **Dimensional drawing of centring sleeve**

Table 11.4 **Article numbers and dimensions for centring sleeves**

Suitable for linear axis	A	Ø D1	Ø D2	Article number, 10 pcs.
HT150	4	6.5	8 h6	25-000511
HT200	4	9.0	12 h6	25-000512
HT250	4	11.0	15 h6	25-000513

Unit: mm

11.4 Groove cover

Cover for the fastening groove. Length: 2 m. Sets are available with five groove covers.

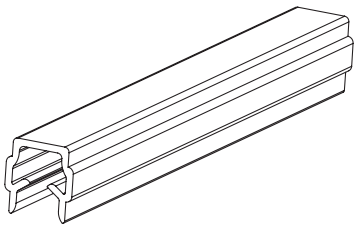


Fig. 11.6 **Groove cover for linear axes HT-L**

Table 11.5 **Article numbers for groove covers**

Suitable for linear axis	Article number, 5 pcs.
HT150	25-000515
HT200, HT250	25-000516

11.5 Limit switch

The inductive proximity switch is available in either a normally closed or a normally open version. The switch can be secured directly inside the switch profile groove using the fasteners supplied. The limit switch is supplied as standard with plug or open cable end.

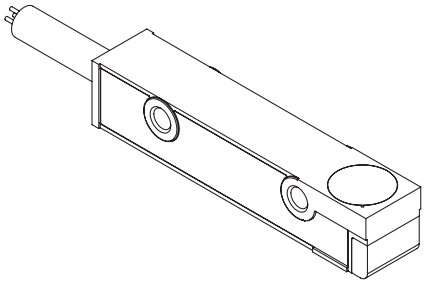


Fig. 11.7 **Limit switch for linear axes**

Table 11.6 **Limit switch options**

Option	Article number
Limit switch with 100 mm cable, plug (NC)	25-000786
Limit switch with 4 m cable (NC)	25-000787
Limit switch with 5 m cable (NO)	25-000788

NOTE

For more information see Section 4.4.

11.6 Extension cable for limit switch

Cable with 3-pin M8 round connector on the limit switch side and exposed wires on the other cable end.

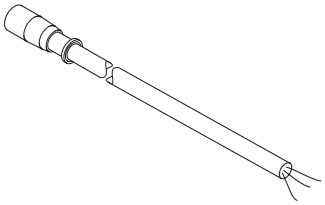


Fig. 11.8 **Extension cable for limit switch**

Table 11.7 **Extension cable for limit switch**

Length [m]	Max. cable diameter [mm]	Min. bending radius static [mm]	Min. bending radius dynamic [mm]	Article number
3	4.5	13.5	18.0	8-10-0275
5	4.5	13.5	18.0	8-10-0276
7	4.5	13.5	18.0	8-10-0277
10	4.5	13.5	18.0	8-10-0278
15	4.5	13.5	18.0	8-10-0279

11.7 Damping element

The damping element is needed to switch the limit switches at both of the carriage's end positions (at stroke 0 and stroke max). Set including mounting material.
Article number: 25-001031

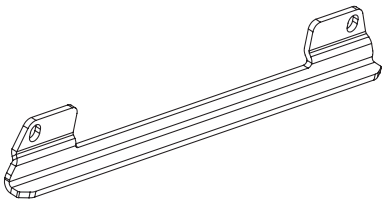


Fig. 11.9 **Damping element for linear axes HT-L**

11.8 Cover strip

The steel cover strip is available in lengths of 3 m and 6 m.

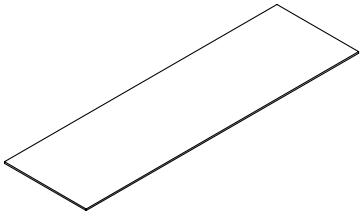


Fig. 11.10 **Cover strip**

Table 11.8 **Article numbers for cover strip**

Suitable for linear axis	Article number (3 m)	Article number (6 m)
HT150	25-001188	25-001192
HT200	25-001189	25-001193
HT250	25-001190	25-001194

11.9 Magnetic strip

The magnetic strip holds down the cover strip and is available in a length of 7.5 m.

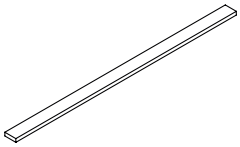


Fig. 11.11 **Magnetic strip**

Table 11.9 **Article numbers for magnetic strip**

Suitable for linear axis	Article number (7.5 m)
HT150	25-001195
HT200	25-001195
HT250	25-001196

11.10 Cover strip deflection

The cover strip deflection set consists of the following parts:

8 × cover strip guide
16 × cylinder-head screw

Each carriage requires one cover strip deflection set.

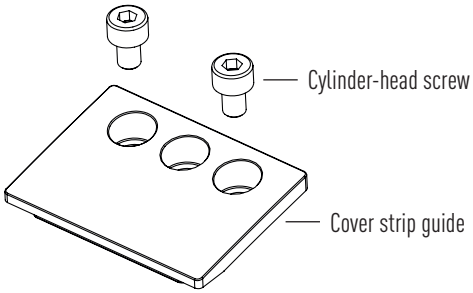


Fig. 11.12 **Cover strip deflection**

Table 11.10 **Cover strip deflection set article numbers**

Suitable for linear axis	Cylinder-head screw	Article number
HT100	DIN 7984 M3 × 5	25-001203
HT150	DIN 912 M4 × 6	25-001204
HT200	DIN 912 M4 × 6	25-001205
HT250	DIN 6912 M5 × 8	25-001206

11.11 Cover strip guide

Cover strip for additional guidance of the cover strip for longer axes. The set consists of two strip guides (enough for one carriage) including fastening material.

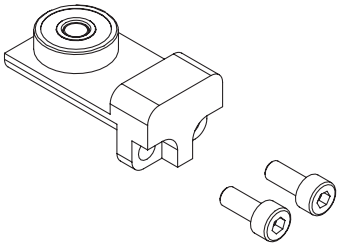


Fig. 11.13 **Cover strip guide**

Table 11.11 **Article numbers for cover strip guide**

Suitable for linear axis	Article number
HT150	25-002579
HT200	25-002631
HT250	25-002632

11.12 Buffer stop

The buffer stop serves as a mechanical limit.

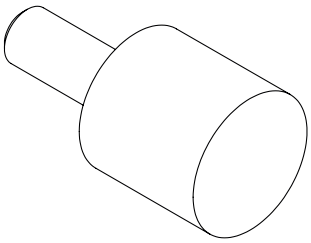


Fig. 11.14 **Buffer stop**

Table 11.12 **Article numbers for buffer stop**

Suitable for linear axis	Article number
HT150	8-13-0007
HT200	8-13-0007
HT250	8-13-0008

11.13 Motor cable

Motor cable suitable for linear axes HT-L. Open cable end.

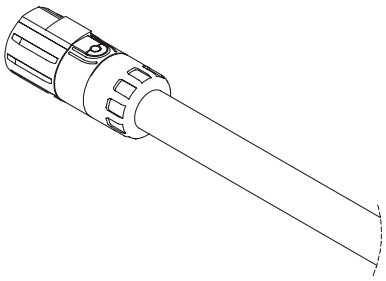
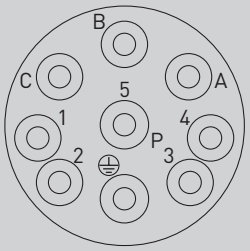


Fig. 11.15 **Motor cable for linear axes HT-L**

Table 11.13 **Motor cable for linear axes HT-L**

Length [m]	Max. cable diameter [mm]	Min. bending radius static [mm]	Min. bending radius dynamic [mm]	Article number
3	11.9	60	90	8-10-1214
5	11.9	60	90	8-10-1215
10	11.9	60	90	8-10-1217

Table 11.14 **Pin assignment in motor cable**

Pin no.	Wire colour	Signal	Pole configuration
A	Black 1	U	
B	Black 2	V	
C	Black 3	W	
GND	GND	GND	
1	Red	T1+	
2	Yellow	T1–	
3	Black	T2+	
4	White	T2–	

11.14 Encoder cable for incremental distance measuring system

Cable for incremental distance measuring system (option A, B, D, E) for linear axes HT-L.

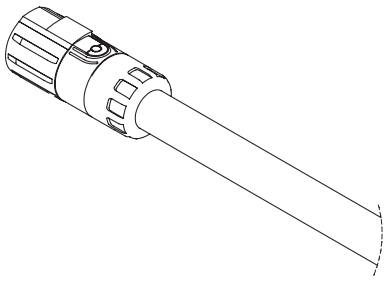
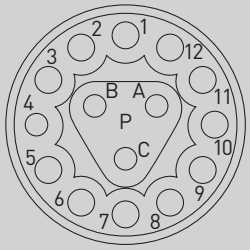


Fig. 11.16 **Encoder cable for incremental distance measuring system**

Table 11.15 **Encoder cable for incremental distance measuring system (option A, B, D, E)**

Length [m]	Suitable for option	Cable end	Max. cable diameter [mm]	Min. bending radius static [mm]	Min. bending radius dynamic [mm]	Article number
3	A, D	Open cable end: MAGIC 1 V_{PP}/ TTL without Hall sensor	9	45	72	8-10-1207
5	A, D	Open cable end: MAGIC 1 V_{PP}/ TTL without Hall sensor	9	45	72	8-10-1208
10	A, D	Open cable end: MAGIC 1 V_{PP}/ TTL without Hall sensor	9	45	72	8-10-1210
3	B, E	Open cable end: MAGIC 1 V_{PP}/ TTL with Hall sensor	9	45	72	8-10-1201
5	B, E	Open cable end: MAGIC 1 V_{PP}/ TTL with Hall sensor	9	45	72	8-10-1202
10	B, E	Open cable end: MAGIC 1 V_{PP}/ TTL with Hall sensor	9	45	72	8-10-1204

Table 11.16 **Pin assignment in encoder cable for incremental distance measuring system**

Pin no.	Open cable end MAGIC 1 V_{PP}/ TTL without Hall		Open cable end MAGIC 1 V_{PP}/ TTL with Hall		Pole configuration
	Wire colour	**Signal**	**Wire colour**	**Signal**	
1	Green	V1–	Green	V1–	
2	Black	V2–	Black	V2–	
3	Orange	V0+/Data–	Orange	V0+/Data–	
4	Brown-red	U+	Brown-red	U+	
5	Grey	Sense+	–	–	
6	White-yellow	Clock–	Blue	Hall B	
7	White-black	Clock+	White-yellow	Hall C	
8	–	–	–	–	
9	Yellow	V1+	Yellow	V1+	
10	Brown	V2+	Brown	V2+	
11	Red	V0–/Data+	Red	V0–	
12	Brown-blue	0 V	Brown-blue	0 V	
A	Blue	Sense–	–		
B	–	–	Grey	Hall A	
C	–	SH1/SH2/SH3	–	SH1/SH2/SH3	

11.15 Encoder cable for absolute distance measuring system

Cable for absolute distance measuring system (option H, R, S, T) for linear axes HT-L.

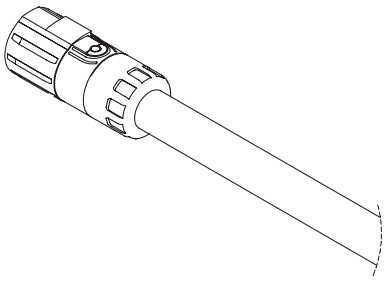
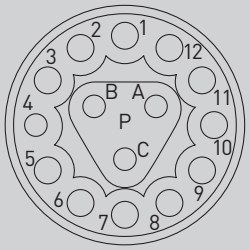


Fig. 11.17 **Encoder cable for absolute distance measuring system**

Table 11.17 **Encoder cable for absolute distance measuring system**

Length [m]	Suitable for option	Cable end	Max. cable diameter [mm]	Min. bending radius static [mm]	Min. bending radius dynamic [mm]	Article number
3	H, R, S, T	Open cable end	9	45	72	8-10-1207
5	H, R, S, T	Open cable end	9	45	72	8-10-1208
10	H, R, S, T	Open cable end	9	45	72	8-10-1210

Table 11.18 **Pin assignment in encoder cable for absolute distance measuring system**

Pin no.	Wire colour	Signal	Pole configuration
1	Green	V1–	
2	Black	V2–	
3	Orange	V0+/Data–	
4	Brown-red	U+	
5	Grey	Sense+	
6	White-yellow	Clock–	
7	White-black	Clock+	
8	–	–	
9	Yellow	V1+	
10	Brown	V2+	
11	Red	V0–/Data+	
12	Brown-blue	0 V	
A	Blue	Sense–	
B	–	–	
C	–	SH1/SH2/SH3	

11.16 Separators for energy chain

Separators for separating the cables within the energy chain. By default, the energy chain is equipped with a separator in each second chain link. Additional separators are available in sets of 20 pieces.
Article number (PU 20 pcs.): 8-05-0337

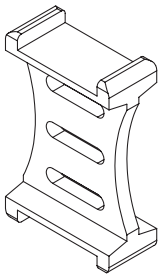


Fig. 11.18 **Separator for energy chain**

11.17 Tape for noise reduction of the energy chain

Single-sided self-adhesive cellular rubber tape to be glued to the contact surface of the energy chain to reduce the noise emissions of energy chains. Suitable for all linear axes HT-L with energy chain (except HT150L with connection interface E or F).
Roll of 10 m
Article number: 05-002485

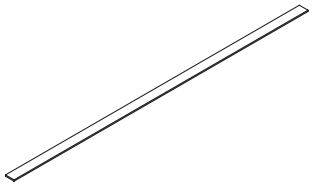


Fig. 11.19 **Tape for noise reduction of the energy chain**

11.18 HIWIN lubricants

Table 11.19 **Recommended HIWIN grease**

Grease type	Application	Quantity unit	
		Cartridge 400 g	**Can 1 kg**
G04	High speed		
		Article number: 20-000345	Article number: 20-000346

Table 11.20 **Recommended HIWIN grease gun**

Article number	Description	Scope of delivery	Comment
20-000333	Grease gun GN-400C incl. set of lubrication adapter and nozzles (see Fig. 11.20)	Grease gun GN-400-C consisting of: – Grease gun – Hydraulic coupling A1 suitable for conical grease nipples acc. to DIN 71412, outer diameter 15 mm – Hollow mouthpiece A2 suitable for conical or ball grease nipples acc. to DIN 71412/DIN 3402, outer diameter 10 mm – Set of lubrication adapter and nozzles	Suitable for 400 g cartridge or direct filling

Fig. 11.20 **Grease gun GN-400C**

11.19 HIWIN grease nipple

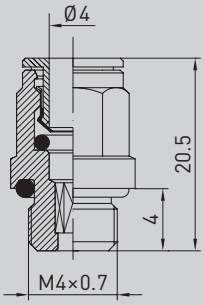
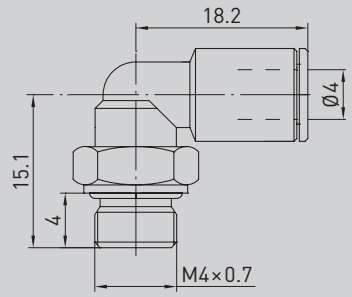
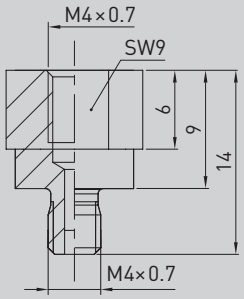
Grease nipples suitable for linear axes HT-L (all sizes).

Table 11.21 **Grease nipples**

Article number	Type	Picture
20-000538	Standard	
20-000325	Option	
20-000272	Option	

11.20 Lubrication fittings and push-in fittings

Table 11.22 **Lubrication fittings and push-in fittings**

Article number	Type	Picture
8-12-0186	Straight push-in fitting Ø 4	
20-002116	90° angled push-in fitting Ø 4	
20-002108	Lubrication adapter M4/M4 for extending the push-in fittings to avoid collisions (e.g. damping element)	

12. Appendix 2: Declaration of Incorporation

in the sense of the EU Machinery Directive 2006/42/EC, Annex II 1. B for partly completed machinery

The manufacturer:	HIWIN GmbH, Brücklesbünd 1, D-77654 Offenburg
Documentation department:	HIWIN GmbH, Brücklesbünd 1, D-77654 Offenburg

Description and identification of the partly completed machine:

Product:	Linear tables HT-L
Type:	HT150L, HT200L, HT250L
Year of manufacture:	from 2017

It is hereby declared that the following essential requirements of the Machinery Directive 2006/42/EC have been fulfilled.
1.1.3, 1.1.5, 1.2.1, 1.3.3, 1.3.4, 1.3.7, 1.3.9, 1.5.1, 1.5.8, 1.5.9, 1.6.2, 1.6.3, 1.5.5, 1.1.2, 1.3.2, 1.5.4

Moreover, it is declared that the relevant technical documentation specified under Annex VII Part B has been compiled.
It is hereby explicitly declared that the partly completed machine complies with all of the pertinent conditions in the following EC Directives.

2006/42/EG	EC Machinery Directive
2014/30/EU	Directive on electromagnetic compatibility (EMC)
2011/65/EU	RoHS Directive on the restriction of hazardous substances

A reference to the harmonised standards used, as referred to in Article 7(2)

EN ISO 13732-1:2008	Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces
EN ISO 12100:201	Safety of machinery – General principles for design – Risk assessment and risk reduction
EN 60204-1:2006/AC:2010	Safety of machinery – Electrical equipment of machines – Part 1: General requirements

The manufacturer or the authorised person undertakes to transmit, in response to a reasoned request by the national authorities, the relevant documentation on the partly completed machinery.

This is without prejudice to the intellectual property rights of the manufacturer!

Important note! The partly completed machinery may not be commissioned until it has been ascertained that the machinery into which this partly completed machinery is to be incorporated is compliant with the provisions of this Directive.

Offenburg, May 2019

Werner Mäurer,
Managing Director

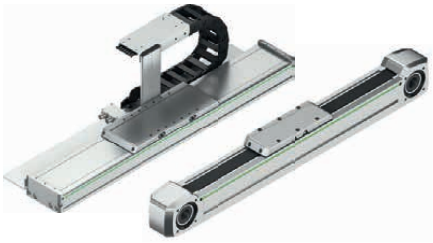
Notes

Notes

We live motion.

Linear Guideways

Ballscrews



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Torque Motors

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Rotary Tables

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