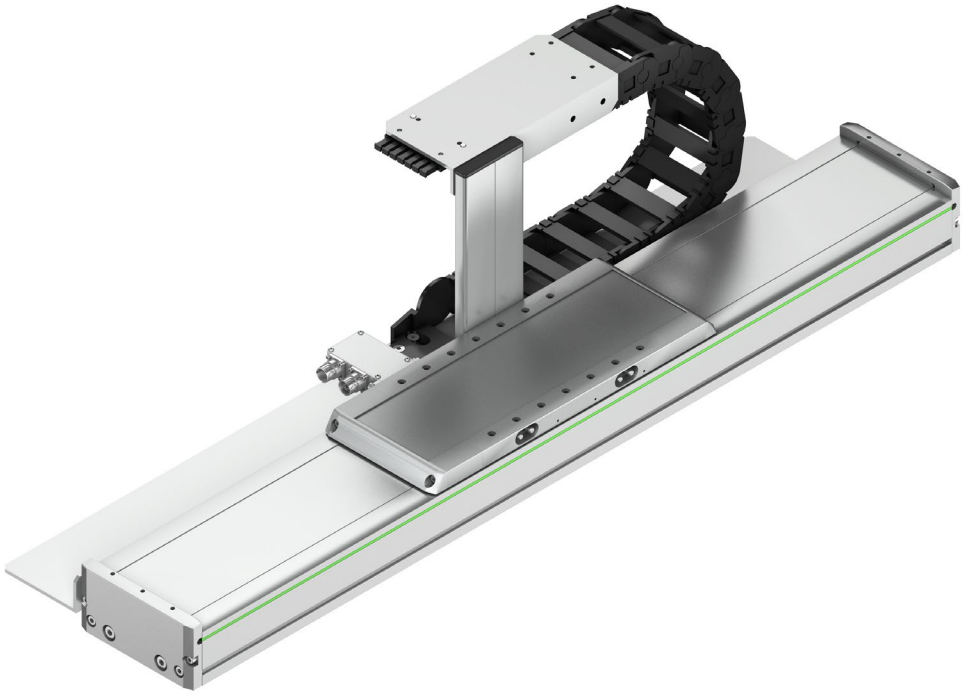
HIWIN®



Valid from serial no. HSN 000 000 000 1

Assembly instructions

Linear axes HT-L

HTL-01-7-EN-2306-MA

www.hiwin.de

Legal information

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Contents

1 General

1.1 About these assembly instructions

These assembly instructions are intended for planners, developers and operators of systems who plan and install the named products as machine elements. It is also addressed to the persons who carry out the following work in connection with the named axes:

- Transport
- Assembly
- Electrical connection including connection to the higher-level control system
- Integration into a safety system
- Retrofitting or upgrading
- Setup
- Commissioning
- Operation
- Cleaning
- Maintenance
- Troubleshooting
- Decommissioning, disassembly and disposal

1.1.1 Requirements

We assume that

- The operating personnel have been instructed in the safe operation of the named products and have read and understood these assembly instructions in full
- Maintenance personnel maintain and repair the products in such a way that they present no danger to persons, the environment or property

1.1.2 Availability

The assembly instructions must always be available to all persons working with or on the named products. The assembly instructions are also available at www.hiwin.de.

1.2 Presentation and layout conventions used in these assembly instructions

1.2.1 Instructions for actions

Instructions for actions are provided in sequential order and identified with a triangle symbol. The results of the actions are accompanied by a tick symbol.

Example:

- Instruction 1
- Instruction 2

✓ Result

1.2.2 Lists

Lists are identified through the use of bullet points.

Example:

The products must not be operated:

- Outdoors
- In areas where there is a risk of explosion
- …

1.2.3 Presentation of safety notices

Safety notices are always indicated by a signal word and sometimes with a hazard-specific symbol (see section 1.2.4 Symbols used).

The following signal words/hazard levels are used:

⚠ **Danger!** Immediate danger!

Failure to follow this safety notice will result in severe or fatal injury!

⚠ **Warning**! Potentially dangerous situation!

Failure to follow this safety notice could result in severe or fatal injury!

⚠ **Attention!** Potentially dangerous situation!

Failure to follow this safety notice could result in moderately severe or minor injury!

Caution! Potentially dangerous situation!

Failure to follow this safety notice could result in damage to property or the environment!

1.2.4 Symbols used

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

Warning and prohibition signs			
	Warning of dangerous electrical voltage!		Warning of risk of hearing damage!
	Warning of cutting injuries!		Warning of crushing risk!
	Warning of magnetic fields!		Warning of danger from suspended loads!
	Warning of hot surfaces!		Environmentally hazardous substance!

Mandatory signs			
	Wear safety gloves!		Wear hearing protection!
	Wear protective goggles!		Release prior to work!

1.2.5 Information

Note:
Notes describe general advice and recommendations.

1.3 Warranty and liability

The manufacturer's “General Terms and Conditions of Sale and Delivery” apply.

1.4 Manufacturer information

Address	HIWIN GmbH Brücklesbünd 1 77654 Offenburg, Germany
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Technical customer service team	+49 (0) 781 / 9 32 78 - 77
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Technical customer service team fax	+49 (0) 781 / 9 32 78 - 97
E-mail	support@hiwin.de
Internet	www.hiwin.de

1.5 Product monitoring

Please inform HIWIN GmbH, as manufacturer of the named products, about:

- Accidents
- Possible sources of danger on the products
- Any unclear information in these assembly instructions

2 Basic safety notices

⚠ **Warning**!

This chapter is for the safety of everyone who works with, assembles, installs, operates, maintains or disassembles the named products. Failure to comply with the following information could be dangerous!

⚠ **Warning**! Danger due to strong magnetic fields!

Due to strong magnetic fields in the surroundings of the named product, there is a health hazard for persons with implants that can be influenced by magnetic fields (e.g. e.g. pacemakers).

- Persons with implants that can be influenced by magnetic fields must keep a safety distance of at least 1 m from the products!

Caution! Danger of property damage!

Strong magnetic forces can destroy watches and magnetisable data carriers in the vicinity of the products.

- Do not bring watches and magnetisable data carriers within close range (< 300 mm) of the products!

2.1 Proper use

Linear axes HM-L combine guide and drive into one compact unit. They are used for the exact positioning in time and place of fixed loads within an automated system. They are ideal in particular for applications requiring high dynamic responses and high precision. In addition, large travel distances can be realised with these linear axes.

Linear axes HT-L may only be installed horizontally and may only be used for the purpose stated:

- Performance limits are given for each size of the named products (see “Linear axes and axis systems HX” catalogue). These performance limits must not be exceeded during operation.
- The products must not be used in potentially explosive atmospheres.
- The products may only be used and operated indoors.
- The products are used as part of an overall system, therefore personal safety must be ensured via the concept of the overall system.
- The assembly instructions and the maintenance and servicing instructions must be complied to ensure the intended use of the products.
- Any other use of the products is considered improper use.

The named products are delivered as a system (guide, drive). That is why the entire documentation of the system must be observed. Depending on the linear axis type, the accompanying documentation may vary.

Requirements for ambient conditions

Ambient conditions during operation:	+5 to +40 °C
Relative humidity during operation:	according to IEC 60721-3-3, class 3K22, non-condensing
Climatic ambient conditions for transport and storage:	Ambient temperature: -20 to +50 °C, non-condensing
Vacuum:	Operation in a vacuum is not permitted

Note:

Prevent condensation from forming to avoid corrosion of the axis.

2.2 Reasonably foreseeable misuse

The named products must not be operated:

- Outdoors
- In areas where there is a risk of explosion

2.3 Conversions or modifications

Conversions or modifications to the named products are not permitted!

2.4 Residual risks

No residual hazards emanate from the named products during normal operation, as they are used as part of the overall system and personal safety is to be ensured by the operator via the overall system. Dangers that may arise during maintenance and servicing are specified in the respective chapters.

2.5 Requirements for personnel

Only authorised and competent persons may carry out work on the products! They must be familiar with the safety equipment and regulations before they start work (see following table).

Activity	Qualifications
Normal operation	Instructed personnel
Cleaning	Instructed personnel
Maintenance	Qualified personnel of the operator or manufacturer
Servicing	Qualified personnel of the operator or manufacturer
Transport	Instructed personnel
Assembly	Instructed qualified personnel
Disassembly	Instructed qualified personnel

2.6 Safety equipment

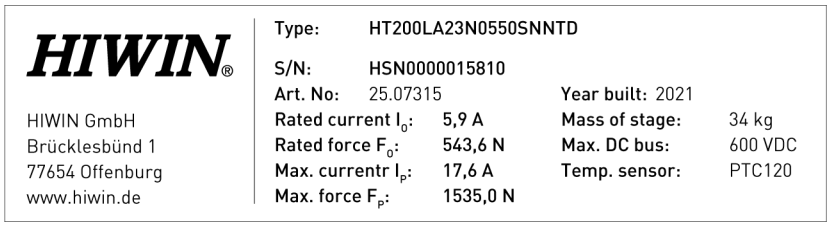
Table 2.1: Personal protective equipment

Operating phase	Personal protective equipment
Normal operation	Staying around the named products is not permitted during normal operation. When staying in the vicinity of the products, the following personal protective equipment is necessary, depending on the travel speed: ○ Safety shoes ○ Hearing protection if necessary
All other operating phases (Cleaning, maintenance, servicing, retrofitting, troubleshooting, repair)	The following personal protective equipment is required for all other phases of operation of the named products: ○ Safety shoes ○ If necessary, protective gloves and goggles ○ Hearing protection if necessary ○ Hair net if necessary

2.7 Labelling on the product

The labels shown below can be found on the products.

Fig. 2.1: Example of a type plate



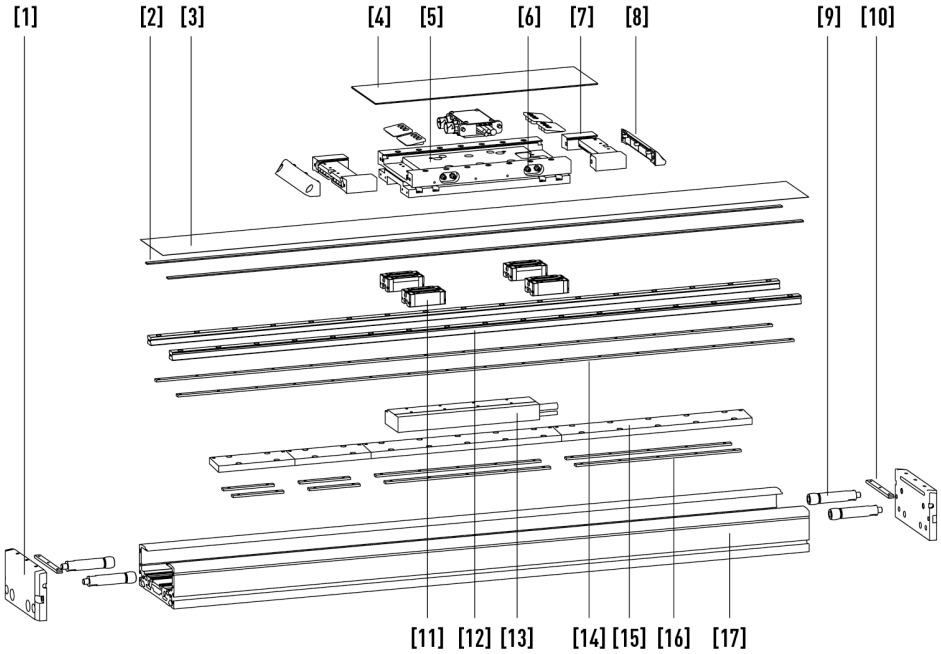
3 Description of linear axes HT-L

3.1 Application

HIWIN linear axes HT-L with linear motor drive are ideal for applications with the highest demands on dynamics, accuracy and synchronism while at the same time minimizing maintenance and sustaining large stroke lengths. Two motor sizes are available for each size in order to optimally meet the requirements for feed force. The distance measuring system is integrated inside the axis to save space and ensures maximum precision. Optionally, generously dimensioned energy chains provide space for the reliable carrying of supply cables.

3.2 Main components

Fig. 3.1: Main components of linear axes HT-L

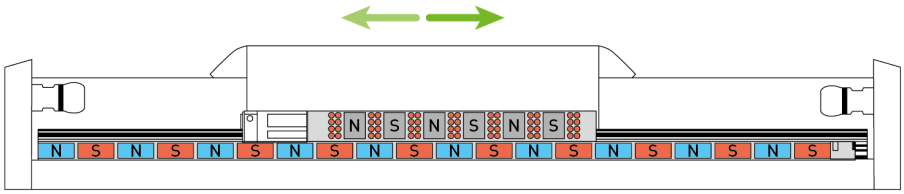


1	End plate	10	Clamping plate for cover strip
2	Magnetic strips	11	Block
3	Steel cover strip	12	Profile rails
4	Carriage cover	13	Linear motor (forcer)
5	Carriage	14	Threaded strips
6	Grease nipple	15	Linear motor (stator)
7	Cover strip deflection	16	Threaded strips
8	Carriage end piece	17	Aluminium axis beam
9	Stop buffer		

3.3 Application function

Linear motor axes HT-L are based on an aluminium base profile in which the linear guideways are integrated. On the one hand, these absorb the weight forces, acceleration and process forces, and on the other hand they ensure the exact guidance of 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 through which alternating current flows generate a magnetic field that varies with time and interacts with the constant magnetic field of the stator. The resulting force is used to generate a linear movement.
Via a servo drive, the motor is powered in such a way that the traversing carriage of the linear motor axis executes exactly the movement that is specified, for example, by a higher-level control system.

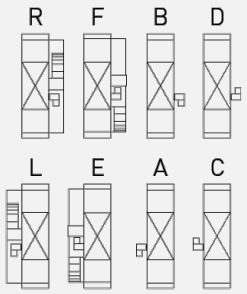
Fig. 3.2: Functional principle of linear axis HT-L



3.4 Order code for linear axes HT-L

Number		1	2	3	4	5	6	7
Order code		HT	150	L	A12	C	1234	S
1	HT	HIWIN linear table						
2	150	Size (profile width): 100: 100 mm 150: 150 mm 200: 200 mm 250: 250 mm						
3	L	Drive type: L: Linear motor						
4	A12	Motor size: A01/A02: HT100L A12/A13: HT150L A22/A23: HT200L A32/A33: HT250L						
5	C	Cover strip: C: With steel cover strip N: Without cover strip						
6	1234	Stroke length [mm]						
7	S	Carriage length: S: Short						

Order code for linear axes HT-L (continued)

Number		8	9	10	11
Continuation order code		A	N	A	R
8	A	Axis limit switch[3]: N: Without limit switch A: 2 × NC contact, 100 mm cable, plug B: 2 × NO contact, 100 mm cable, plug C: 2 × NC contact, 4 m open cable end D: 2 × NO contact, 5 m open cable end			
9	N	Stator: N: Standard			
10	A	Distance measuring system option[1]: A: HIWIN MAGIC, analogue 1 V_{SS} sin/cos B: HIWIN MAGIC, analogue 1 V_{SS} sin/cos and Hall sensor digital[8] D: HIWIN MAGIC, digital TTL 5 V E: HIWIN MAGIC, digital TTL 5 V and Hall sensor digital[8] H: LIC 211, absolute, EnDat 2.2[4] [7] R: BML-S1G0, absolute, BiSS-C, 1 V_{SS} sin/cos[5] S: BML-S1G0, absolute, SSI[5] T: TTK70, absolute, HIPERFACE, 1 V_{SS} sin/cos[4] [8]			
11	R	Connection interface[2] R: With energy chain, plug right/front[6] F: With energy chain, plug right/rear[6] B: Without energy chain, connector right/front D: Without energy chain, connector right/rear L: With energy chain, plug left/front[6] E: With energy chain, plug left/rear[6] A: Without energy chain, connector left/front C: Without energy chain, connector left/rear			

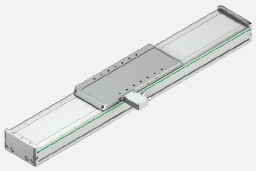
[1] Detailed information in section 4.5
[2] Details on plug orientation and position of the energy chain in section 4.7 from page 22
[3] Additional reference switches on request.
[4] Limitations of the maximum stroke possible, see section 4.5
[5] The distance measuring system has a safety-related, analogue, incremental real-time signal
[6] Max. possible stroke: 5.000 mm
[7] In a horizontal installation position, the axis must be arranged so that the distance measuring system is at the top
8) Option not available for HT100L

4 Options of linear axes HT-L

4.1 Stroke length

The stroke lengths of the linear axes can be selected in millimetre increments.
The maximum stroke length depending on the series and size is listed in Table 4.1.

Table 4.1: Maximum stroke length

Drive element	Axis	Maximum stroke [1] [mm]
Linear motor 	HT100L	5.500
	HT150L	5.450
	HT200L	5.400
	HT250L	5.450

[1] Restriction due to energy chain and/or distance measuring system, if applicable. Larger strokes on request.

Please note that the maximum possible stroke can be reduced with the following options:

- Design with cover strip (due to the required cover strip deflections)
- Energy chain
- Distance measuring system

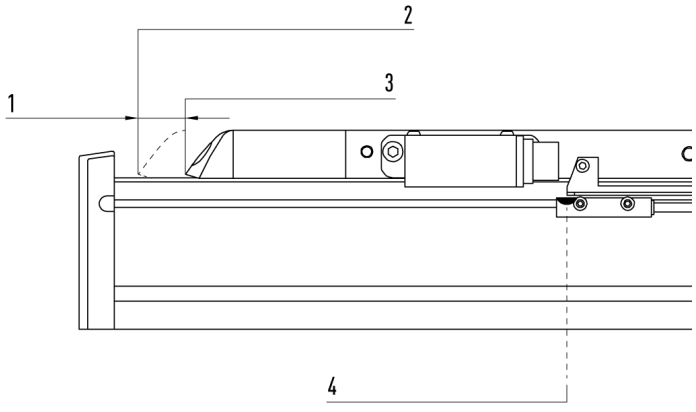
4.1.1 Reserve stroke

Caution! Possible damage to linear axis HT-L!

▶ The mechanical end position must not be approached during operation!

Reserve stroke L_r corresponds to 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 built-in stop buffers. The reserve stroke for each axis size can be found in the “Linear axes and axis systems HX” catalogue.

Fig. 4.1: Illustration of reserve stroke



1	Reserve stroke L_r	3	Carriage position at electrical 0 (sensor switching point)
2	Carriage position at mechanical 0 (rubber buffer stop)	4	Switching point sensor at electrical 0

4.2 Cover

A steel cover strip is optionally available for all sizes of linear axis HT-L. The cover strip is held down with magnetic strips to protect the inside of the axis from dirt. Note that the carriage length increases for axes with cover strip due to the required cover strip deflection.

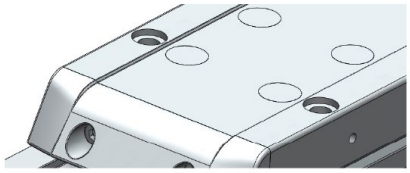
Note

The “cover strip” option cannot be retrofitted.

4.3 Carriage

The carriage has fastening threads for mounting the payload. These have additional counter bores to allow for insertion of centring sleeves.

Fig. 4.2: Carriage with fastening threads

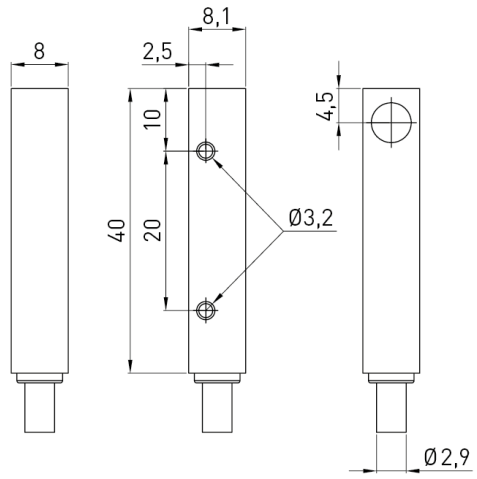


4.4 Limit switch

On the linear axes, two inductive PNP switches, also called proximity switches, indicate the end positions of the travel distance. The limit switch cables can either be routed directly to the interface or laid laterally in the mounting groove. The limit switches are available as NC or NO contacts and optionally with open cable end or with 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

Features	NC contact (25-000786)	NO contact (25-002766)	NC contact (25-000787)	NO contact (25-000788)
Type	Cuboid			
Dimensions (W × H × D)	8 × 8 × 40 mm			
Max. switching distance	2 mm			
Secured switching distance	1,62 mm			
Switching distance to be set	1 mm			
Switching sequence	2.000 Hz			
Secured switching distance	1,62 mm			
Switching distance to be set	1 mm			
Connection type	Cable with plug M8 M8, 3-pin, 100 mm	Cable with plug M8 M8, 3-pin, 100 mm	Cable, 3-wire, 4 m[2)]	Cable, 3-wire, 5 m[2)]
Switching output	PNP			
Electrical type	DC 3-wire			
Protection class	IP67, IP68 [1)]			

[1)] According to EN 60529

[2)] Not suitable for energy chains

Table 4.3: Mechanics/Electrics of the limit switches

Mechanics/Electrics	NC contact (25-000786)	NO contact (25-002766)	NC contact (25-000787)	NO contact (25-000788)
Power supply	10 to 30 VDC			
Residual ripple	≤ 10% [1)]			
Voltage drop	≤ 2 V [2)]			
Current consumption	≤ 10 mA [3)]			
Ready delay	≤ 100 ms			
Hysteresis	5 to 15%			
Reproducibility	≤ 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			
Switch-on pulse suppression	Yes			
Shock and vibration resistance	30 g, 11 ms/10 to 55 Hz, 1 mm			
Ambient temperature during operation	-25 °C to +75 °C			
Housing material	Plastic, VISTAL®			
Material, active surface	Plastic, VISTAL®			
UL file no. (certificate)	NRKH.E348498			

1) From U_v
2) At I_a max.
3) Without load
4) At constant voltage and temperature

Note

For information on connection and pin assignment, see section 6.6.1.

4.5 Distance measuring system

Linear axes HT-L are supplied with distance measuring system as standard. The distance measuring system is integrated inside the axis to save space. Depending on the requirements for measuring principle, interface and signal period, various measuring systems are available, see Table 4.4. For motionless commutation of linear motor axes HT-L, the HIWIN MAGIC distance measuring system can also be combined with the HIWIN digital Hall sensor.

Table 4.4: Distance measuring system selection

Order code	Description	Repeatability accuracy [mm]	Signal period [mm]	Resolution [µm]	Interface		Measuring principle	Max. stroke [mm]
A	MAGIC	±0,005	1	1	Incremental	1 V_{SS} (analogue) [1]	Magnetic	–
B [2]	MAGIC	±0,005	1	1	Incremental	1 V_{SS} (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]	BML-S1G0	±0,005	2	1	Absolute, 32-bit	BiSS-C, 1 V_{SS}	Magnetic	–
S [4]	BML-S1G0	±0,005	2	1	Absolute, 26-bit	SSI	Magnetic	–
T [6]	TTK70	±0,005	1	31,25	Absolute, 17-bit	HIPERFACE	Magnetic	3.600 [5]

Other distance measuring systems on request

[1] Compatible with all common servo drives and the HIWIN servo drive ED1. For more information on HIWIN servo drives, see the “Servo drives and servo motors” catalogue or visit www.hiwin.de.

[2] With digital Hall sensor for motionless commutation

[3] Depending on size and option up to 5.469 mm possible on request

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

[5] Depending on size and option up to max. 3.800 mm possible on request

[6] Is not available for HT100L

4.5.1 HIWIN MAGIC

The HIWIN MAGIC distance measuring system is used in linear axes HT-L for incremental distance measurement. The output is either an analogue or digital signal. The HIWIN MAGIC distance measuring system consists of the encoder (Fig. 4.4) and the magnetic tape (Fig. 4.5) as the measuring standard. Assembly is done at the factory.

Fig. 4.4: MAGIC encoder

Fig. 4.5: MAGIC magnetic tape

Note

The measuring tape of the magnetic distance measuring systems must not be exposed to strong magnetic fields (keep a distance to permanent magnets!). Strong vibrations (e.g. a blow with a hammer) can also damage the magnetisation of the measuring tape. The system is not suitable for environments with magnetic dust (e.g. graphite dust). These can falsify the measuring signal or damage the distance measuring system.

4.5.1.1 Technical data of MAGIC distance measuring system

Table 4.5: Electrical and mechanical properties of the MAGIC encoder

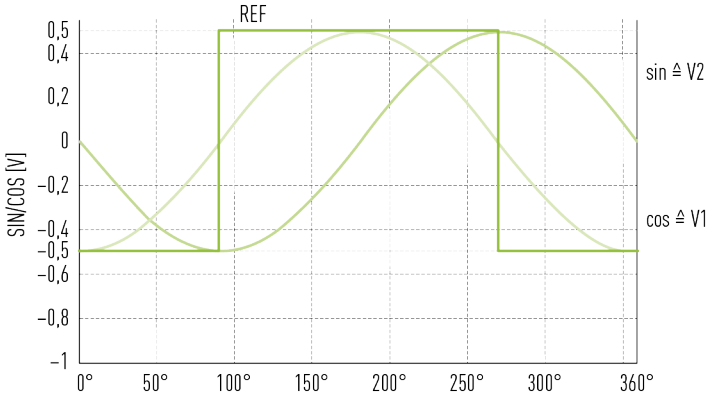
Model	1 V_{SS} (analogue)	TTL (digital)
Electrical properties		
Output signal specification	sin/cos, 1 V_{SS} (0,85 V_{SS} – 1,2 V_{SS})	Quadrature signals acc. to RS422
Resolution	Infinite, signal period 1 mm	1 µm
Repeatability bidirectional	0,003 mm	0,002 mm
Absolute precision	±20 µm/m	
Reference signal [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, according to IEC 801	
Mechanical properties		
Housing material	Aluminium alloy, stainless steel sensor base	
Dimensions of MAGIC encoder	L × W × H: 45 mm × 12 mm × 14 mm	
Standard cable length	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 for MAGIC measuring system (analogue)

Signal format sine/cosine 1 V_{SS} output: the electrical signals after the differential input of the subsequent electronics. The HIWIN MAGIC interface sine/cosine 1 V_{SS} is strictly based on the Siemens specification. The period length of the sine output signal is 1 mm. The period length of the reference signal is 1 mm.

Fig. 4.6: Electrical signals after the difference input of the subsequent electronics (analogue version)

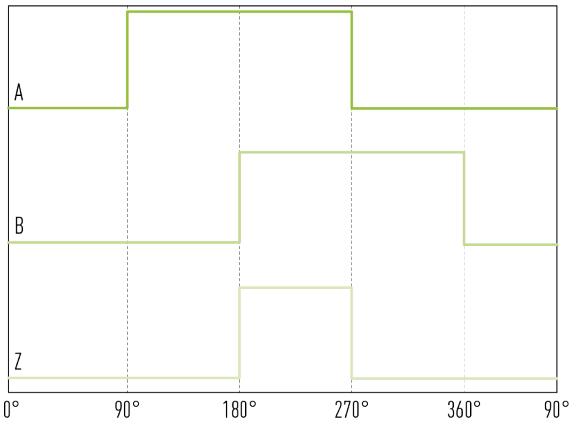


Output signals within one scale period (1.000 µm) in degrees (360° = 1.000 µm)

4.5.1.3 Formats and outputs for MAGIC measuring system (digital)

Digital TTL output: The signals to the A and B channels are phase-shifted by 90° (according to the RS-422 specifications conforming to DIN 66259). Output signals: A, $\bar{A}$, B, $\bar{B}$ and Z, $\bar{Z}$.

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



A A signal
B B signal
Z Z signal (reference switch)

For more information, see the “HIWIN MAGIC distance measuring system” assembly instructions.

Note

For information on connection and pin assignment, see section 6.6.2.2.

4.5.2 TTK70 [1)]

Distance measuring system TTK70 is used in linear axes HT-L for absolute positioning without reference runs. The position is detected magnetically with very high resolution. The sensor board aligned to the measuring plane is equipped with Hall sensors on two parallel tracks. Their arrangement corresponds to the division of the magnetic tape into an incremental and an absolute component. To calculate the absolute position values during operation, the encoder first detects the absolute initial position via the Manchester coding when the linear motor is started. Then all other 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 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

For information on connection and pin assignment, see section 6.6.2.2.

4.5.3 BML-S1G0 [2)]

Distance measuring system BML-S1G0 is used in linear axes HT-L 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

Note

For information on connection and pin assignment, see section 6.6.2.2.

For proper 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.

[3)] Manufacturer: Dr Johannes Heidenhain GmbH

Note

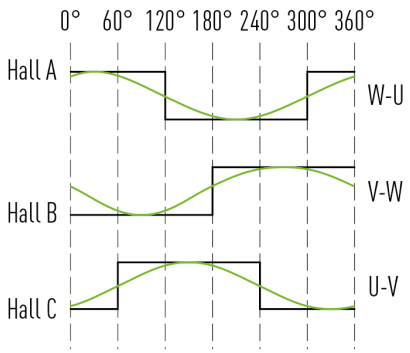
For information on connection and pin assignment, see section 6.6.2.2.

For proper 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-wave signals, each 120° out of phase (see Fig. 4.8).

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



Legend:

W-U: Motor W-U

V-W: Motor V-W

U-V: Motor U-V

- Sensor signal either 0 or 1.
- A combined evaluation of motor voltage and Hall sensor makes it possible to determine the direction of motor rotation without any doubt.
- Evaluation via offset of the pole wheel angle between 0° and 90° (ideally 0° and 45°).

Note

For information on connection and pin assignment, see section 6.6.2.2.

4.7 Connection interface and energy supply

⚠ **Danger!** Danger due to electrical voltage!

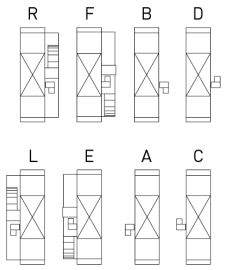
Dangerous currents may flow before and during assembly, disassembly and repair work.

- Make sure that the linear axis is properly earthed via the PE rail in the switch cabinet before connecting the electrical power supply!
- Never disconnect electrical connections while they are live. In unfavourable cases, electric arcs can occur and injure persons and damage contacts!
- Work on electrical installations only by qualified electricians!
- Observe the assembly instructions of the other system components (e.g. linear motor, servo drive)!

Linear axes HT-L have an interface for motor and encoder cables. These are located on the side of the carriage and can be connected quickly and easily without tools thanks to the quick-release fasteners. Depending on the installation situation and the desired cable routing, four different orientations of the plug are available as options, see Fig. 4.9.

For safe carrying of the supply cables, linear axes HT-L are optionally supplied with generously dimensioned energy chains. They are extremely compact and save space when attached to the axis. The alignment of the energy chain depends on the selected plug orientation, see Fig. 4.9.

Fig. 4.9: Possible connection interfaces HT-L



R: With energy chain, plug right/front
F: With energy chain, plug right/rear
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

4.8 Energy chain

Energy chains are optionally available for linear axes HT-L. The mounting is optionally on the right or left and is oriented to the selected plug 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.
The energy chain type and specification can be found in Table 4.6.

Table 4.6: Specification of energy chain

Axis type	Manufacturer reference [1)]	Cross-section interior W × H [mm]	Bending radius [mm]	Max. stroke [mm]
HT100L	2400.05.075.0	57 × 25	75	4.000
HT150L	2400.07.100.0	77 × 25	100	5.000
HT200L/HT250L	2600.07.100.0	75 × 35	100	5.000

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 information:

- 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 – 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 according to Fig. 4.11.

Fig. 4.10: Maximum permissible additional load F_{Add} depending on stroke L_T, series 2400 (source: igus)

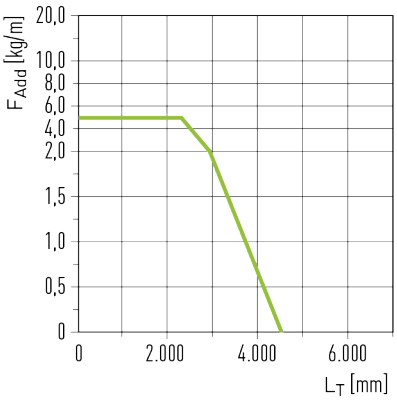
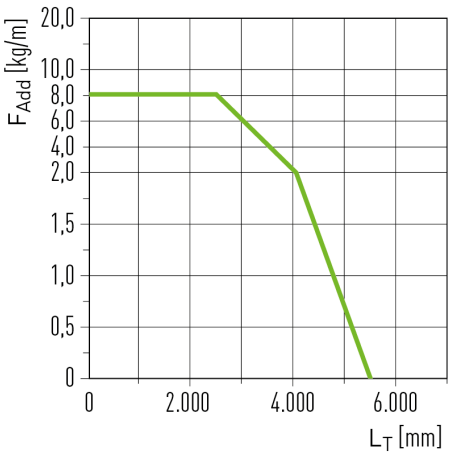


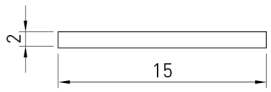
Fig. 4.11: Maximum permissible additional load as a function of the stroke, series 2600 (source: igus)



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

Cellular rubber tape for the reduction of noise emissions from energy chains. The noise reduction tapes, which are self-adhesive on one side, are attached to the energy chain support in such a way that the links of the energy chain are deposited on the tapes when the carriage moves, significantly reducing noise emissions.
The noise reduction tape is available in rolls of 10 m (article number: 25-002485).

Fig. 4.12: Dimensions of tape for reduction of noise emissions from the energy chain



[1)] Suitable for all linear motor axes HT-S with energy chain (exception: HT150L with connection interface E or F)

5 Transport and setup

5.1 Delivery

5.1.1 Delivery condition

Linear axes HT-L are delivered fully assembled and functionally tested.

5.1.2 Scope of delivery

The scope of delivery varies depending on the model, accessories and options ordered.

5.2 Transport to the installation location

⚠ **Warning**! Danger from suspended loads or falling parts!

Lifting heavy loads can cause damage to health!

- Assembly and maintenance of the linear axes only by qualified personnel!
- Take the mass of the parts into account during transport. Use suitable lifting gear!
- Comply with the applicable industrial safety regulations for handling suspended loads.
- Lift linear axes only at specified support points!
- Secure machines and machine parts against tipping over!

⚠ **Warning**! Danger due to strong magnetic fields!

Due to strong magnetic fields of linear axes HT-L, there is a health hazard for persons with implants that can be influenced by magnetic fields (e.g. e.g. pacemakers).

- Persons with implants that can be influenced by magnetic fields must keep a safety distance of at least 1 m from linear axes HT!

⚠ **Attention!** Risk of impact 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 applicable industrial safety regulations!
- Transport to the installation site only by qualified personnel!

Caution! Danger of property damage!

Strong magnetic forces can destroy watches and magnetisable data carriers in the vicinity of linear axes HT.

- Do not bring watches and magnetisable data carriers within close range (< 300 mm) of linear axes HT!

Caution! Possible damage to the linear axes!

The linear axes can be damaged by mechanical stress.

- Lift linear axes only at specified support points (see section 5.5)!
- For longer linear axes, ensure the centre sections have additional protection!
- Ensure that the linear axes do not bend, as this will permanently affect the precision!
- Do not transport any additional loads on the linear axes during transport!
- Provide additional support for heavy attachments!

Caution! Possible influence of magnetic fields on aircraft avionics!

- Observe packaging and transport regulations (IATA 953)!

The linear axes are precision products and must be handled with care. Shocks and impacts can damage the axes. Reduced running accuracy and a reduced service life could be the result. Transport the product packed as close as possible to the installation site. Only remove the packaging once there.

5.3 Installation location requirements

5.3.1 Environmental conditions

Ambient conditions during operation:	+5 to +40 °C
Relative humidity during operation:	according to IEC 60721-3-3, class 3K22, non-condensing
Climatic ambient conditions for transport and storage:	Ambient temperature: -20 to +50 °C, non-condensing
Vacuum:	Operation in a vacuum is not permitted

5.3.2 Safety equipment to be provided by the operator

Possible safety equipment/measures:

- Personal protective equipment according to UVV (accident prevention regulation)
- Electrosensitive protective equipment
- Mechanical safety equipment

5.4 Storage

- Store the linear axes in the transport packaging.
- Alternative: Select packaging in which the linear axes are secured against slipping, damage and vibration.
- Store the linear axes only in dry, frost-free rooms.
- Clean and protect used linear axes before storage.

5.5 Unpacking and setup

⚠ **Warning**! Danger due to strong magnetic fields!

Due to strong magnetic fields of linear axes HT-L, there is a health hazard for persons with implants that can be influenced by magnetic fields (e.g. e.g. pacemakers).

- Persons with implants that can be influenced by magnetic fields must keep a safety distance of at least 1 m from linear axes HT!

Caution! Danger of property damage!

Strong magnetic forces can destroy watches and magnetisable data carriers in the vicinity of linear axes HT.

- Do not bring watches and magnetisable data carriers within close range (< 300 mm) of linear axes HT!

Caution! Danger to health and the environment!

Contact with lubricants can cause irritation, poisoning and allergic reactions as well as damage to the environment.

- Only use suitable media that are not dangerous for humans. Observe the manufacturer's safety data sheets.
- Dispose of substances appropriately.

Note

Linear axes HT-L may only be set up and operated indoors.

- Remove the packaging.
- Lift the linear axis for transport at specified support points A and B (see Fig. 5.1). The distance of points A and B from the end of the axis should be one quarter of the total length of the axis.
- Do not lift the linear axis by attachments. During transport, provide additional support for heavy attachments such as the drive.
- Dispose of the packaging in an environmentally friendly manner.

Fig. 5.1: Support points A and B for lifting and transporting

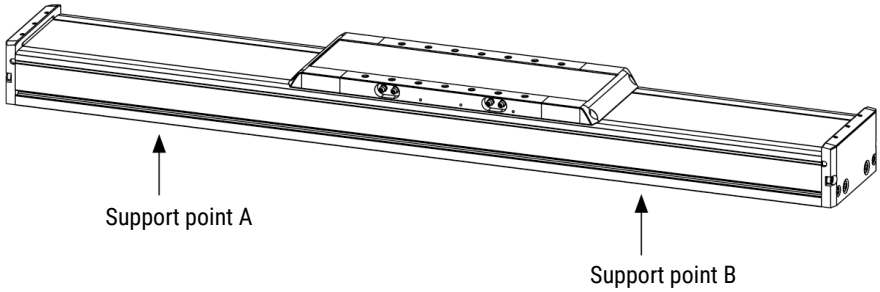


Fig. 5.2: Correct position of the support points

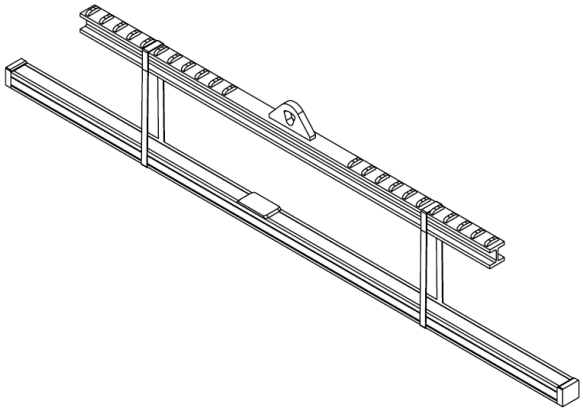
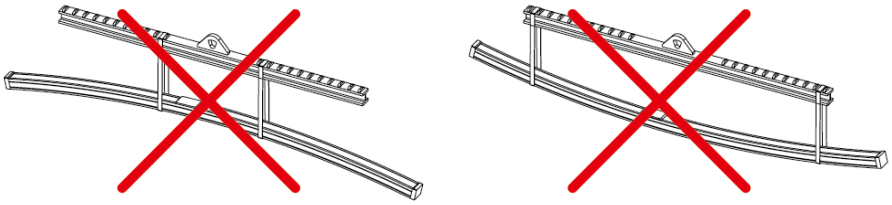


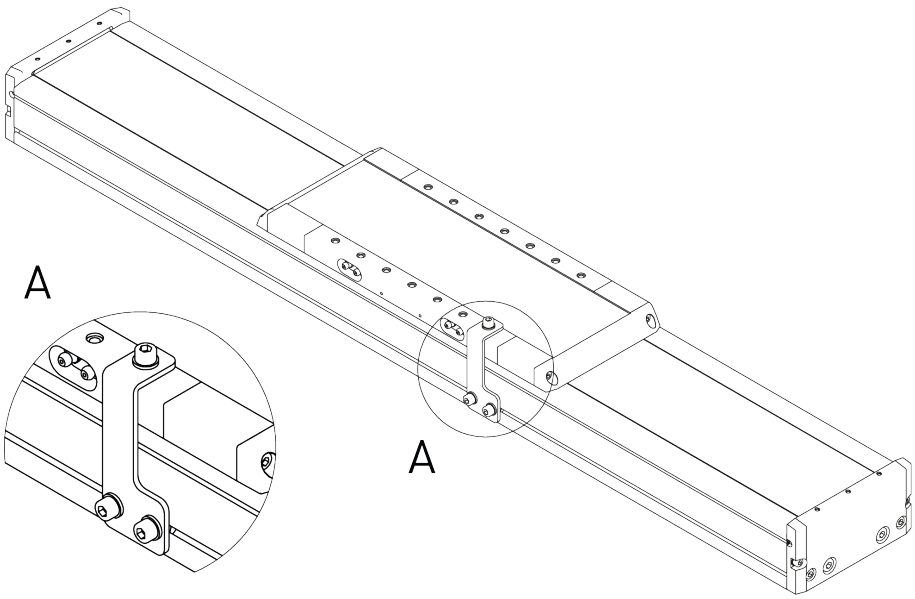
Fig. 5.3: Incorrect position of the support points



5.6 Removing the transport lock

Linear motor axes HT-L are supplied with a transport lock as standard to prevent uncontrolled movements of the carriage during transport. The transport lock (see Fig. 5.4) can be removed as soon as the linear motor axis is placed at the installation site, but at the latest before commissioning.

Fig. 5.4: Transport lock



6 Assembly and connection

⚠ **Danger!** Danger due to electrical voltage!

Dangerous currents may flow before and during assembly, disassembly and repair work.

- Work may only be carried out by qualified electricians when the device is de-energised!
- Before working, disconnect linear axes HT-L from the power supply and secure them against being switched on again!

⚠ **Warning**! Danger due to strong magnetic fields!

Due to strong magnetic fields of linear axes HT-L, there is a health hazard for persons with implants that can be influenced by magnetic fields (e.g. e.g. pacemakers).

- Persons with implants that can be influenced by magnetic fields must keep a safety distance of at least 1 m from linear axes HT!

⚠ **Warning**! Risk of impact and crushing!

Injuries may occur due to automatic or manual movement of the carriage.

- A safety guard must be provided for the operation of the linear axes!
- Commissioning, set-up and troubleshooting only by qualified personnel!

⚠ **Warning**! Danger of cutting!

The cover strip can cause cuts during assembly or disassembly.

- Commissioning and set-up only by qualified personnel with appropriate protective equipment (gloves, goggles)!

⚠ **Warning**! Risk of impact and crushing!

Unintentional movements of the driven elements of the linear axes can cause injuries.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!

⚠ **Attention!** Danger of hearing damage!

The linear axes can generate noise above 70 dB(A) at high speeds.

- For fast running linear axes with a noise level above 70 dB(A), ear protection must be worn!
- Linear axes with energy chain and chain support can generate noise up to 94 db(A) depending on load and speed. Noise reduction tape is available as an accessory.

⚠ **Attention!** Danger from suspended loads or falling parts!

- Assembly and maintenance of the linear axes only by qualified personnel!
- Take the mass of the parts into account during transport. Use suitable lifting gear!
- Comply with the applicable industrial safety regulations for handling suspended loads.
- Lift linear axes only at specified support points!
- Secure machines and machine parts against tipping over!
- Attach the linear axes according to the assembly instructions!

⚠ **Attention!** Risk of impact 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).

- A safety guard must be provided for the operation of the linear axes!

⚠ **Attention!** 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.

- Carry out assembly in such a way that parts do not come loose even in the event of strong acceleration or continuous vibrations!
- Attach the payload in accordance with the assembly instructions!

⚠ **Attention!** Danger of electric shock or burns from contact with live parts!

Contact with live parts can cause injuries.

If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!
- Only qualified personnel may install cabling!
- Work on electrical installations only by qualified personnel!

Caution! Danger of property damage!

Strong magnetic forces can destroy watches and magnetisable data carriers in the vicinity of linear axes HT.

- Do not bring watches and magnetisable data carriers within close range (< 300 mm) of linear axes HT!

Caution! Risk of damage to health and the environment!

Contact with lubricants can cause irritation, poisoning and allergic reactions as well as damage to the environment.

- Only use suitable media that are not dangerous for humans. Observe the manufacturer's safety data sheets.
- Dispose of substances appropriately.

6.1 Mounting linear axes HT-L

Linear axes HT-L may only be mounted in a horizontal installation position (see Fig. 6.1and Fig. 6.2). Use in a vertical installation position (see Fig. 6.3) is not intended. Linear axes HT-L with energy chain can only be installed in horizontal mounting position (see Fig. 6.1). For linear axes HT-L with distance measuring system H (LIC 211), the axis must be aligned so that the reference edge is at the top when installed horizontally.
The attachment is to be made to the aluminium profile of the axis. The linear axes can be fastened to the mounting surface with clamping profiles (lateral grooves) or with T nuts (bottom grooves). Please note that depending on the installation position, the weight of the linear axis acts as an additional load and that the actually acting forces and torques must be below the permissible values (see “Linear axes and axis systems HX” catalogue).

Fig. 6.1: Horizontal lying installation position

Fig. 6.2: Horizontal standing installation position

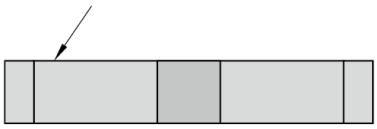
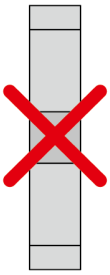


Fig. 6.3: Vertical installation position



Note

The aluminium profile of the axis is manufactured using the extrusion process in accordance with EN 12020-2.

Note

If increased running accuracy is required, the axis must be aligned and fastened to an accurate reference edge.

Note

Please observe the support distance of the respective axis sizes (see section 6.1.1 “Maximum support distance of linear axes HT-L for self-supporting application"). Not only the end blocks must rest on the mounting surface!

Note

The screws must be secured against unintentional loosening.

6.1.1 Maximum support distance of linear axes HT-L with self-supporting application

In the case of linear axes with long stroke lengths and high payloads, an impermissibly high deflection of the axis beam can occur depending on the mounting. To avoid this, the axis beam should be supported several times and mounted stably on a flat surface. At least one support point must be provided on each side, in each case at the end of the profile. The max. permissible support distance L_{SUP} as a function of load F_y and F_z according to the following diagrams must not be exceeded. Additional support points may have to be provided to ensure this. For multi-axis systems, the masses of the moving axes must also be taken into account.

Fig. 6.4: Horizontal lying axis position

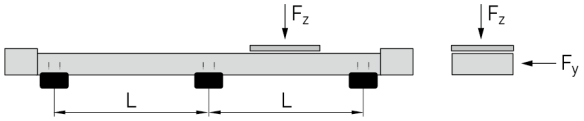


Fig. 6.5: Horizontal standing axis position

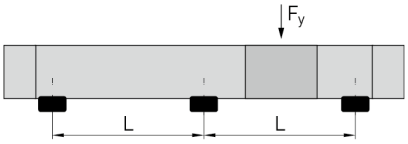


Fig. 6.6: Maximum support distance as a function of force F_z

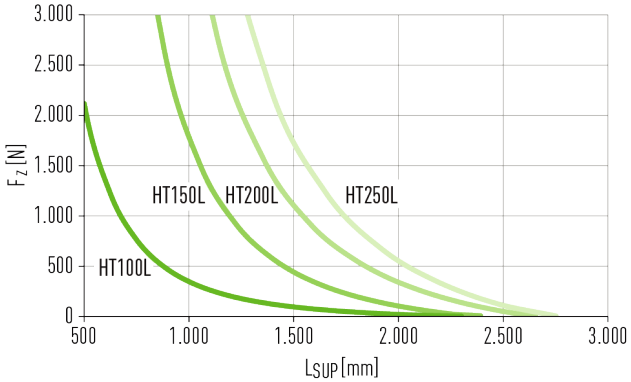
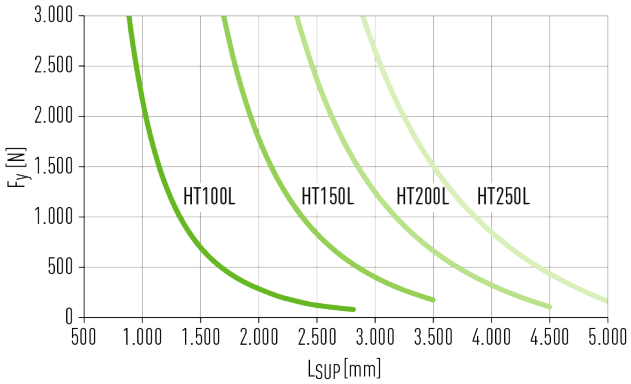


Fig. 6.7: Maximum support distance as a function of force F_y



6.1.2 Reference surface accuracy requirements

When securing linear axes 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.

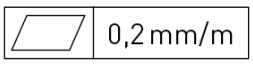
6.1.3 Mounting with T nuts

The T nut to be used for each axis size can be found in Table 6.1. The sliding blocks are to be arranged according to 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 tensile direction per T nut) must be taken into account. The minimum number of T nuts specified in Table 6.1 must not be undercut. The T nuts are to be positioned grouped into mounting points as shown in Fig. 6.11, Fig. 6.12 and Fig. 6.13. It is important to ensure that there is at least one mounting point at each end of the axis and each mounting point is capable of safely transmitting the external load. The number and spacing of the additional mounting points should be chosen according to the load situation. Distances L_{NX} listed in Table 6.1 are only reference values.

- Drill the mounting holes in the mounting surface (hole spacing according to Table 6.1).
- Clean the mounting surface and position the linear axis on the mounting surface.
- Swing the T nut into the lower groove.
- Pre-assemble the T nut with the screws with low screw tightening torque.
- Tighten the screws crosswise, taking into account the screw tightening torques.

✓ The linear axis is mounted.

When mounting the linear axes, observe hole spacing L_{NY}.



Level of accuracy required for all reference surfaces in order to secure the axis profile.

Fig. 6.8: Hole spacing for fastening linear axes HT100L, HT150L, HT200L from below with T nuts

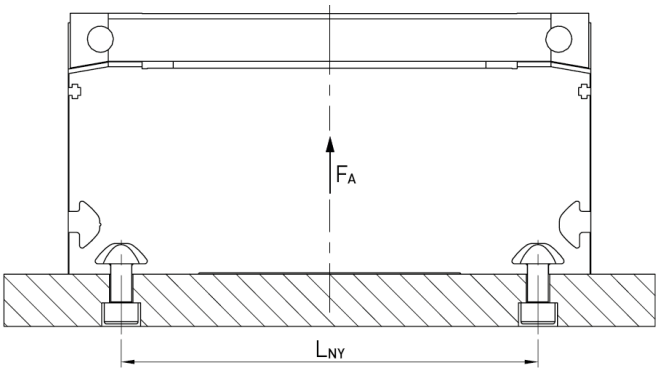


Fig. 6.9: Hole spacing for fastening linear axes HT250L from below with T nuts

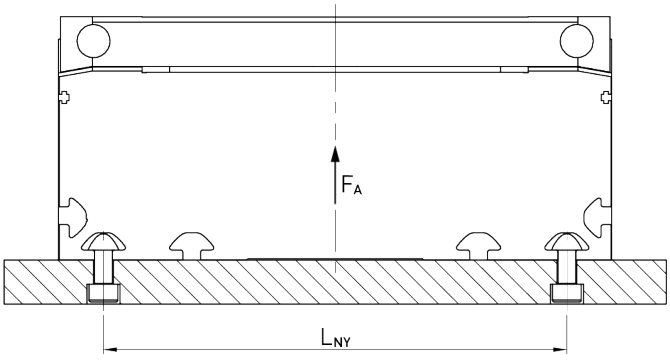


Fig. 6.10: Permissible axial operating force in tensile direction per T nut ($F_{A\_per.}$)

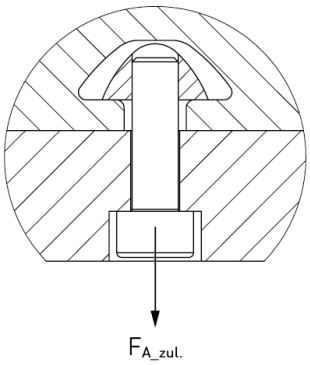


Fig. 6.11: Mounting with T nuts – HT100L, HT150L

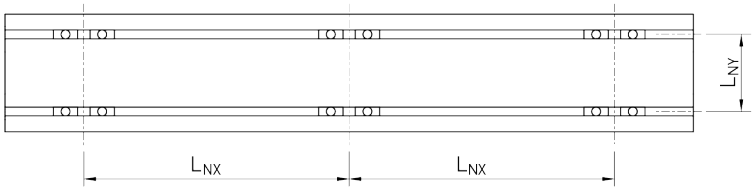


Fig. 6.12: Mounting with T nuts – HT200L

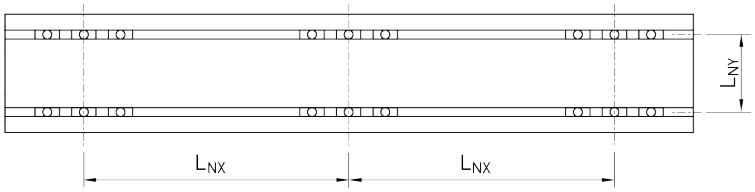


Fig. 6.13: Mounting with T nuts – HT250L

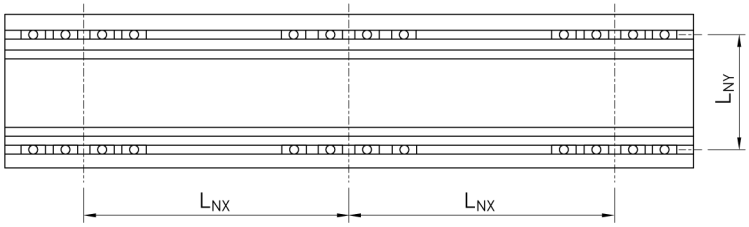


Table 6.1: Minimum number of T nuts for fastening the axis and recommended spacing of the mounting points for longer axes

Size	Minimum number of T blocks	L_{NY} [mm]	Rec. distance L_{NX} [mm]	Thread size	Screw tightening torque [Nm]	Clamping force per T nut [N]	$F_{A\_per.}$ [1] [N]	Art. no.
HT100	8	80	500	M5	4,5	5.400	500	20-000529
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	1.000	M8	24,6	18.600	5.000	20-000534

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

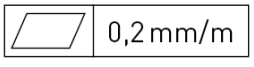
6.1.4 Mounting with clamping profiles

The clamping profiles must always be mounted in pairs (left and right of the axis beam) (see fig. 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 load in tensile direction per pair of clamping profiles) must be taken into account. The minimum number of clamping profiles specified in Table 6.2 must not be undercut. It is important to ensure that there is at least one mounting point at each end of the axis and each mounting point is capable of safely transmitting the external load. The number and spacing of the additional mounting points should be chosen according to the load situation. Distances L_{SX} listed in Table 6.2 are only reference values.

- Drill the mounting holes in the mounting surface (hole spacing according to Table 6.2).
- Clean the mounting surface and position the linear axis on the mounting surface.
- Swivel the clamping profile into the lateral groove.
- Pre-assemble the clamping profile with the screws with low screw tightening torque.
- Tighten the screws crosswise, taking into account the screw tightening torques.

✓ The linear axis is mounted.

When mounting the linear axes, observe hole spacing L_{SY} (Fig. 6.14).



Level of accuracy required for all reference surfaces in order to secure the axis profile.

Fig. 6.14: Hole spacing for lateral mounting of linear axes with clamping profiles

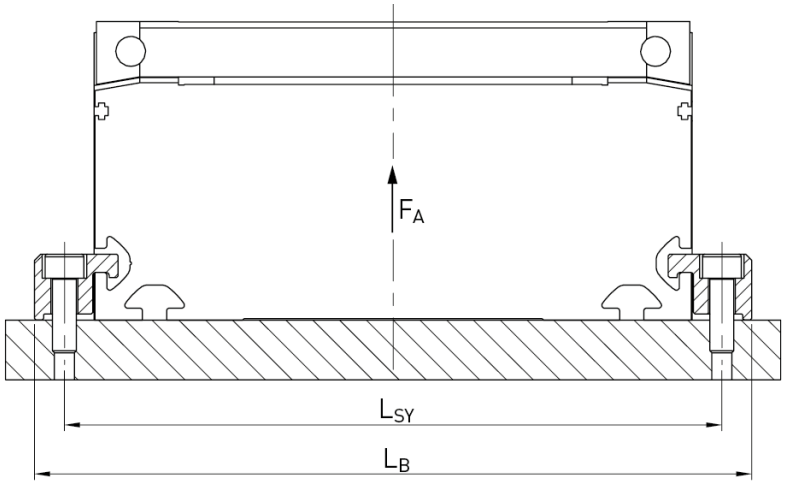


Fig. 6.15: Mounting with clamping profiles – HT100L, HT150L

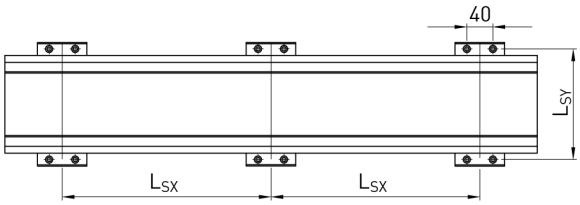


Fig. 6.16: Mounting with clamping profiles – HT200L, HT250L

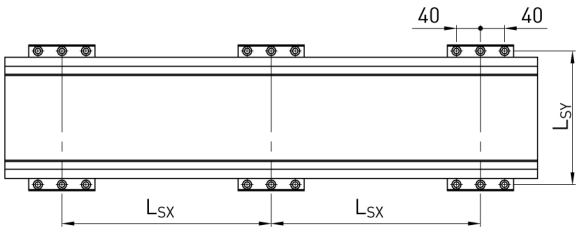


Table 6.2: Minimum number of clamping profiles for fastening the axis and recommended spacing of the mounting points for longer axes

Size	Minimum 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]	$F_{A\_per.}$ [1] [N]	Article no. clamping profiles (4 pcs.)
HT100	4	115	130	500	M5	4,9	4.700	800	25-000517
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 tensile direction per pair of clamping profiles

6.2 Mounting the payload

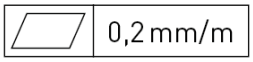
The distances of the threaded holes for mounting the payload are identical for all drive options within the size and can be found in the “Linear axes and axis systems HX” catalogue. Additional counter bores allow for insertion of centring rings.

Table 6.3: Threaded holes for fastening the payload

Size	Thread size × depth	Counter bore depth for centring sleeve [mm]	Counter bore diameter for centring sleeve [mm]
HT100	M5 × 10	1,5	Ø8 H7
HT150	M6 × 14	1,5	Ø8 H7
HT200	M8 × 14	2,0	Ø12 H7
HT250	M10 × 20	2,0	Ø15 H7

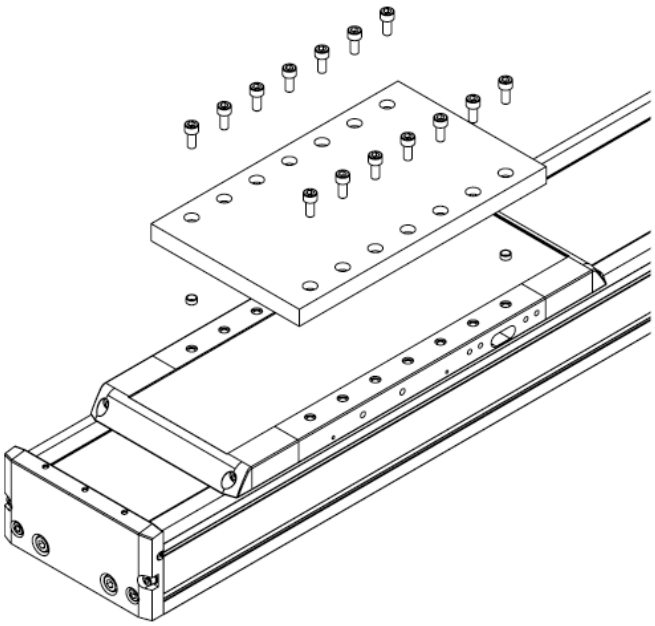
- Clean the mounting surfaces on the carriage.
- Clean the mounting surface of the load.
- Position the load on the carriage of the linear axis.
- Tighten the mounting bolts crosswise.
- Use centring sleeves if necessary.
- Check if the load moves freely throughout the entire stroke.
- Secure the screws.

✓ The payload is mounted.



Accuracy requirement for the mounting surface of the payload.

Fig. 6.17: Mounting the load with centring sleeves



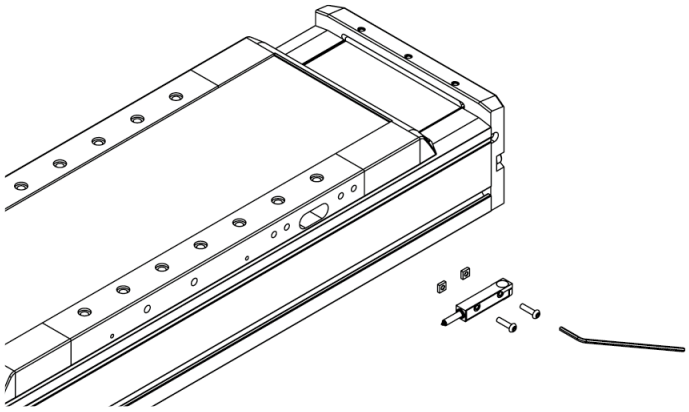
6.3 Mounting the limit switches

The limit switches are optionally available as NC or NO contacts. The limit switch can be fixed directly in the limit switch groove (T groove) with the enclosed M3 screws and square nuts. The limit switches can be mounted either on the right or on the left.

- Where applicable, remove the green trim from the upper T groove.
- Slide two square nuts into the upper T groove through each recess on the drive block.
- Position the limit switch with both screws. Leave the two screws unfastened for the time being.
- Slide the limit switch to the desired position and push it slightly upwards.
- Tighten the screws. The screw tightening torque is 0,5 Nm.

✓ The limit switches have been mounted.

Fig. 6.18: Mounting of limit switch



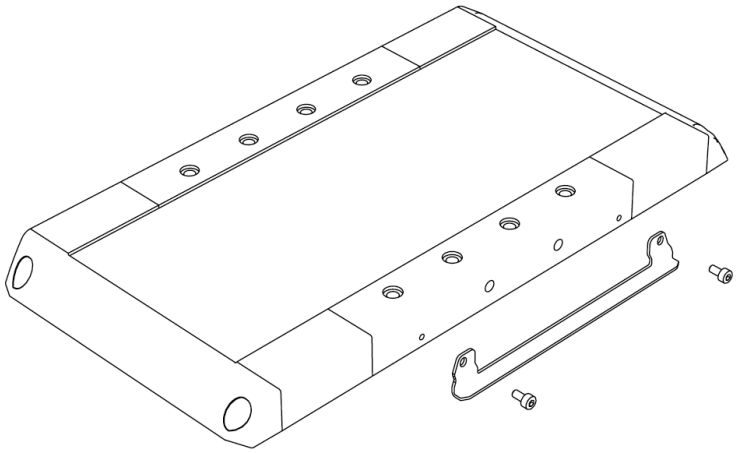
6.4 Mounting the damping element

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

- Place the damping element on the carriage.
- Screw the damping element lightly to the carriage with the enclosed M3 screws.
- Align the damping element parallel to the lower edge of the carriage.

✓ The damping element is pre-assembled.

Fig. 6.19: Mounting damping element



6.5 Setting the switching distance

The limit switches are inductive units and require a defined switching distance between limit switch and damping element of 1 mm.

- Move the carriage until the damping element is above a limit switch. Align the damping element using a feeler gauge so that the switching distance of 1 mm is maintained. Make sure that the damping element remains aligned parallel to the lower edge of the carriage.
- Tighten the bolts of the damping element. The screw tightening torque is 1 Nm.
- If a second limit switch is installed: Move the carriage until the damping element is above the second limit switch and check with a feeler gauge whether the switching distance of 1 mm is maintained. Correct if necessary until the switching distance is maintained for both limit switches.
- Lay the limit switch cable in the lower groove. The cable can be protected by the groove cover there. The groove cover is available separately, see section 11.4.
- ✓ The switching distance has been set.

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

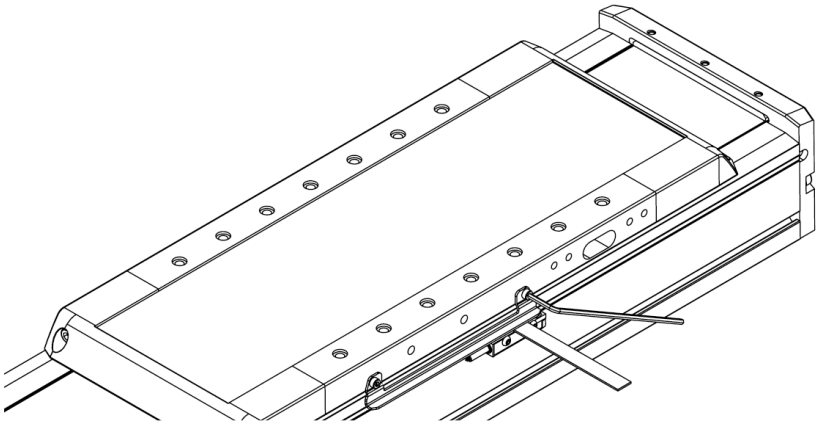
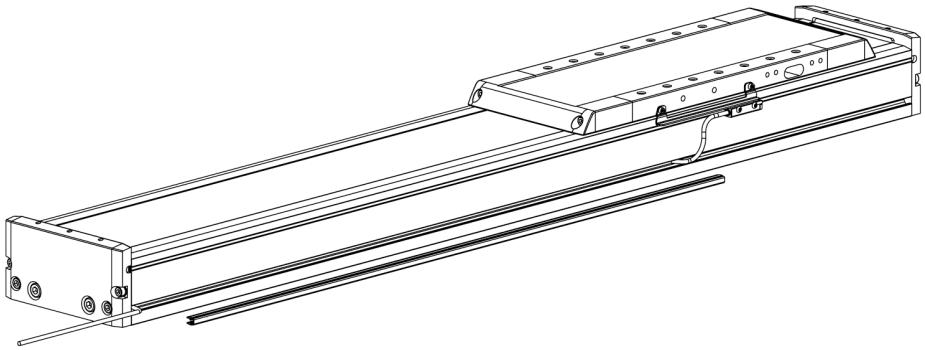


Fig. 6.21: Mounting of limit switch: Laying the cables



- Check that the limit switch is functioning correctly before commissioning with a limit switch test box or by controlled travel to the end positions.

6.6 Electrical connection

⚠ **Danger!** Danger due to electrical voltage!

If the motor is not properly earthed, there is a risk of electric shock.

- Make sure that the linear axis is properly earthed via the PE rail in the switch cabinet before connecting the electrical power supply!

⚠ **Danger!** Danger due to electrical voltage!

Electrical currents can also flow when the motor is not moving.

- Make sure that the linear axis is disconnected from the power supply before disconnecting the electrical connections of the motors!
- After disconnecting the servo drive from the power supply, wait at least 5 minutes before touching live parts or loosening connections!
- To be on the safe side, measure the voltage in the intermediate circuit of the servo drive. Wait until it has dropped below 40 V!
- Work on electrical installations only by qualified personnel!

⚠ **Warning**! Danger of injury and damage to property!

If the motor is overloaded, it can overheat and catch fire.

- Provide a safety device on the control system and hardware side to protect the motor against overload!
- Connect PTC temperature sensors which issue warnings and switch off the system in case of overload!
- Connect PT1000 or KTY84 sensors to monitor temperature!
- Use of an I^2t model in the servo drive or the higher-level control system for time limitation of currents above I_N!

6.6.1 Limit switch connection

The pin assignment of the limit switch plug for variant A and B can be found in Fig 6.23: For variant C and D (see order code page 12) with open cable end, connect the wires according to fig. Fig 6.22.

Fig 6.22: Wiring diagram

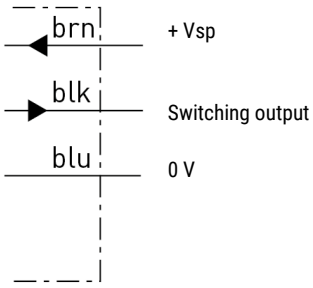
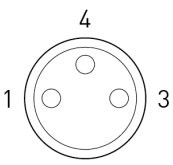


Fig 6.23: Pin assignment: Limit switch plug



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

Note

Since the sensor is operated with a low voltage, it alone does not normally pose a risk of injury or death.

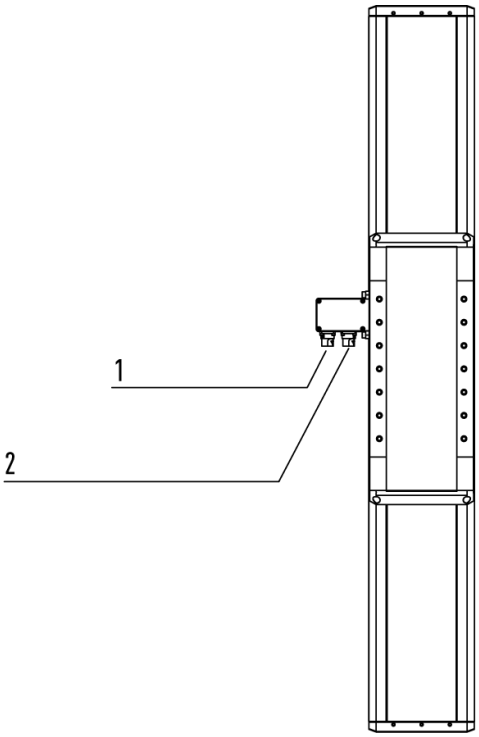
Note

Do not operate the sensor with a voltage other than the specified voltage, otherwise it may be destroyed!

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

Linear motor axes HT-L have an interface for cables for motor and distance measuring system. These are located on the side of the carriage (see Fig. 6.24) and can be connected quickly and easily without tools thanks to the quick-release fasteners.

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



Pos	Connection	HT100L [1)]	HT150L, HT200L, HT250L
1	Motor	Receptacle 915, E, 9-pin, flange (see section 11.14 for matching cables)	Receptacle M23, 8-pin, PRO, flange (see section 11.13 for matching cables)
2	Distance measuring system	Receptacle 915, E, 15-pin, flange (see section 11.17 and 11.18 for matching cables)	Receptacle M17, N, 17-pin, PRO, flange (see section 11.15 and 11.16 for matching cables)

[1)] Up to 4/2022 standard for HT150L, HT200L, HT250L

6.6.2.1 Motor connection

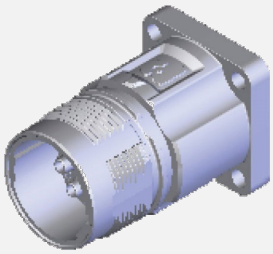
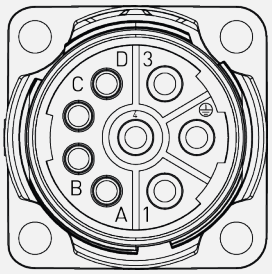
Caution! Risk of injury!

Incorrect connection of the motor can lead to uncontrolled travel movements of the carriage and possibly damage to the axis.

- Connection of the motor only by qualified personnel!

Connection of motor receptacle M23, 8-pin

Table 6.4: Receptacle 8-pin

Model	Specification	Description [1]	Pin image
Receptacle 	M23, 8-pin, PRO, flange	M23-7EP198AW500S	
Matching plug	M23, 8-pin, PRO, D = 5,5 – 15	M23-7EP198A9LDNS	

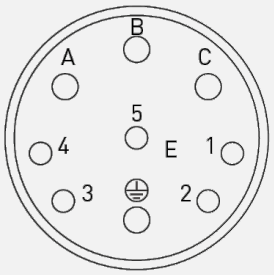
[1] Manufacturer: Phoenix Contact GmbH & Co. KG

Table 6.5: Pin assignment receptacle, 8-pin

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

Connection of motor receptacle 915, 9-pin

Table 6.6: Receptacle 9-pin

Model	Specification	Description [1]	Pin image
Receptacle 	915, E, 9-pin, flange	EEGA201NN00000500000	
Matching plug	915, 9-pin, P, D = 10,5 – 12	ESTA202NN00340500000	

[1] Manufacturer: TE Connectivity Industrial GmbH

Table 6.7: Pin assignment receptacle, 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 Connection of distance measuring system and Hall sensor

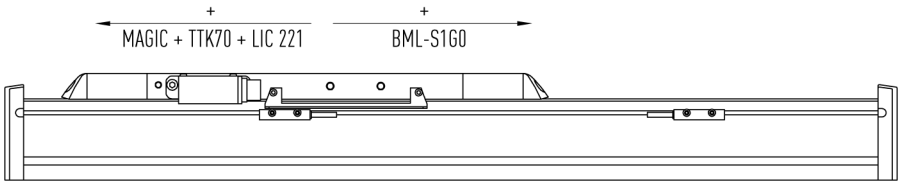
Caution! Risk of injury!

Incorrect connection of the distance measuring system can lead to uncontrolled travel movements of the carriage and possibly damage to the axis.

- Connection of the distance measuring system only by qualified personnel!

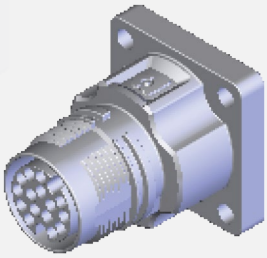
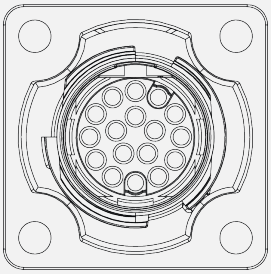
If the distance measuring system is connected according to Table 6.9 or Table 6.11, the counting direction is as shown in Fig. 6.25.

Fig. 6.25: Positive direction of travel of linear axis HT-L (connection interface shown: Option "D")



Connection of distance measuring system receptacle M17, 17-pin

Table 6.8: Receptacle 17-pin

Model	Specification	Description [1]	Pin image
Receptacle 	M17, N, 17-pin, PRO, flange	M17-17P1N8AW500S	
Matching plug	M17, N, 17-pin, PRO, D = 8,5 – 12	M17-17S1N8A8004	

[1] Manufacturer: Phoenix Contact GmbH & Co. KG

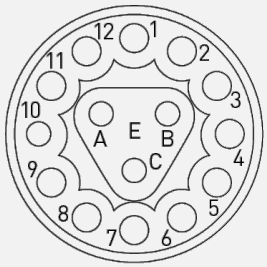
Table 6.9: Pin assignment receptacle, 17-pin

Pin no.	MAGIC signal distance measuring system							
	MAGIC				LIC 211	BML		TTK70
	A	B	D	E	H	R	S	T
1	Sin-	Sin-	B-	B-	–	Cos-	Cos-	Cos-
2	Cos-	Cos-	A-	A-	–	Sin-	Sin-	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	–	–	–	–	Clock–	Clock–	Clock–	–
7	–	–	–	–	Clock+	Clock+	Clock+	–
8	–	Hall A-	–	–	–	–	–	–
9	Sin+	Sin+	B+	B+	–	Cos+	Cos+	Cos+
10	Cos+	Cos+	A+	A+	–	Sin+	Sin+	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	0 V
13	0 V	0 V	0 V	0 V	0 V	0 V	0 V	0 V
14	–	B+	–	Hall B	–	–	–	–
15	–	–	–	–	–	–	–	–
16	–	B-	–	Hall A	–	–	–	–
17	–	A+	–	Hall C	–	–	–	–
Plug connector housing	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding

A: Analogue 1 V_{SS} sin/cos
B: Analogue 1 V_{SS} sin/cos + Hall sensor digital
D: Digital TTL 5 V
E: Digital TTL 5 V + Hall sensor digital
H: Absolute, EnDat 2.2
R: Absolute, BiSS-C, 1 V_{SS} sin/cos
S: Absolute, SSI, 1 V_{SS} sin/cos
T: Absolute, HIPERFACE 1 V_{SS} sin/cos

Connection of distance measuring system receptacle 915, 15-pin

Table 6.10: Receptacle 15-pin

Model	Specification	Description [1]	Pin image
Receptacle 	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 6.11: Pin assignment receptacle, 15-pin

Pin no.	MAGIC signal distance measuring system							
	MAGIC				LIC 211	BML		TTK70
	A	B	D	E	H	R	S	T
1	Sin-	Sin-	B-	B-		A-	A-	cos-
2	Cos-	Cos-	A-	A-		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	–	A+	–	Hall B	Clock–	Clock–	Clock–	–
7	–	B-	–	Hall C	Clock+	Clock+	Clock+	–
8	–	A-	–	–	–	–	–	–
9	Sin+	Sin+	B+	B+		A+	A+	cos+
10	Cos+	Cos+	A+	A+		B+	B+	sin+
11	Ref-	Ref-	Z'	Z'	Data+	Data+	Data+	Data+
12	0 V	0 V	0 V	0 V	Ground	Ground	Ground	0 V
A	0 V	0 V	0 V	0 V	Ground	Ground	Ground	0 V
B	–	B+	–	Hall A	–	–	–	–
C	–	–	–	–	–	–	–	–
Plug connector housing	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding	Shielding

A: Analogue 1 V_{SS} sin/cos
B: Analogue 1 V_{SS} sin/cos + Hall sensor digital
D: Digital TTL 5 V
E: Digital TTL 5 V + Hall sensor digital
H: Absolute, EnDat 2.2
R: Absolute, BiSS-C, 1 V_{SS} sin/cos
S: Absolute, SSI, 1 V_{SS} sin/cos
T: Absolute, HIPERFACE 1 V_{SS} sin/cos

6.6.3 Cables and plugs

For HIWIN linear motor axes and generally for all highly dynamic applications, we recommend our pre-assembled extension cables, which are specially designed for dynamic use in energy chains. The high-quality extension cables are supplied with a round connector (coupling, female) on one side (see sections 11.13, 11.4, 11.18, 11.16, 11.17 and 11.18).

Note

To avoid EMC interference in the encoder signal, the encoder cable extension must be shielded and the shielding must be contacted over a wide area via the plugs. High-quality, fully shielded plugs must be used!

6.6.4 Servo drive connection

Note

Information on the connection options of the servo drive can be found in the operating manual of the servo drive used!

7 Maintenance and cleaning

⚠ **Warning**! Danger due to strong magnetic fields!

Due to strong magnetic fields of linear axes HT-L, there is a health hazard for persons with implants that can be influenced by magnetic fields (e.g. e.g. pacemakers).

- Persons with implants that can be influenced by magnetic fields must keep a safety distance of at least 1 m from linear axes HT!

⚠ **Warning**! Risk of impact and crushing!

Injuries can occur if the carriage is moved or accidentally started up.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!

⚠ **Warning**! Danger of injury and damage to property!

Unauthorised work on the unit may cause injury and invalidate the warranty.

- Assembly and maintenance of the system only by qualified personnel!

⚠ **Attention!** Danger of crushing due to tilting of the axes!

- Secure machine and machine parts against tipping over!

⚠ **Attention!** Danger of impacts and crushing due to the axis falling down or the payload coming loose!

Danger due to high loads!

- Use suitable lifting gear!
- Attach the linear axis according to the assembly instructions (see section 6.1)!
- Attach the payload according to the assembly instructions (see section 6.2)!

⚠ **Attention!** Risk of impact 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 applicable industrial safety regulations!
- Transport to the installation site only by qualified personnel!

⚠ **Attention!** Danger of electric shock or burns from contact with live parts!

Contact with live parts can cause injuries.

If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!
- Only qualified personnel may install cabling!
- Work on electrical installations only by qualified personnel!

⚠ **Caution!** Danger of property damage!

Strong magnetic forces can destroy watches and magnetisable data carriers in the vicinity of linear axes HT.

- Do not bring watches and magnetisable data carriers within close range (< 300 mm) of linear axes HT!

⚠ **Caution!** Danger to health and the environment!

Contact with lubricants can cause irritation, poisoning and allergic reactions as well as damage to the environment.

- Only use suitable media that are not dangerous for humans. Observe the manufacturer's safety data sheets.
- Dispose of substances appropriately.

Caution! Damage due to incorrect lubricant!

Using the wrong lubricant can cause damage to property or environmental pollution.

- Use the correct type of lubricant (grease, oil) according to the specifications in these assembly instructions!

For maintenance work:

- Secure the linear axis against unauthorised switching on.
- Disconnect the linear axis from the power supply.
- Secure the linear axis against unauthorised restart.

Note

Compliance with the maintenance intervals for cleaning and lubrication is essential.

Include the maintenance intervals in your maintenance schedule.

7.1 Lubrication

Operation of the linear axes continuously consumes lubricant. The product must be relubricated regularly. Note that the lubricant may leak out of the lubrication system in small quantities.

The following factors influence the lubrication intervals:

- Dust and dirt
- Operating temperatures
- Loads
- Vibration stress
- Permanently short positioning paths
- Speeds

Note

Insufficient lubrication or the wrong lubricant increase wear and reduce the service life.

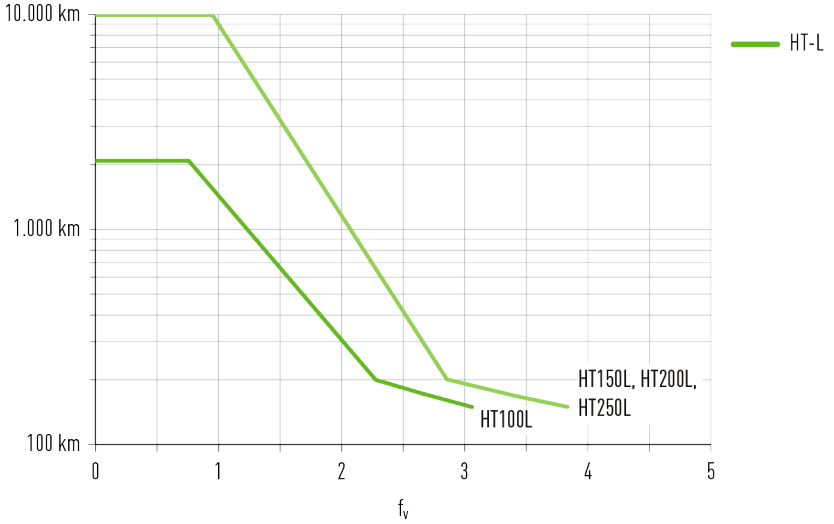
Part of linear axes HT-L are two linear guideways with two blocks each, which are provided with initial lubrication at the factory. For relubrication, there are four grease nipples (one for each block) on the side of the block.

The lubrication interval depends on the load, speed, cycle time and ambient conditions. For the lubrication interval, the reference values from Table 7.1 apply.

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

Size	Guide carriage	Lubricant	Relubrication quantity [cm³]
HT100L	MGN09	G04	0,06
HT150L	QE15	G04	0,30
HT200L	QH20	G04	0,50
HT250L	QH25	G04	0,80

Fig. 7.1: Load-dependent relubrication intervals of the linear guideway of linear axes HT-L



f_v = Load comparison factor according to formula F 7.1 (see below)

7.1.1 Determination of load comparison factor f_v

In case of combined load from several forces and torques, load comparison factor f_v is calculated according to 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	Load comparison factor
F_y	Effective force in Y-direction [N]
F_z	Effective force in Z-direction [N]
M_x	Effective torque around the X-axis [Nm]
M_y	Effective torque around the Y-axis [Nm]
M_z	Effective torque around the Z-axis [Nm]
$F_{ydynmax}$	Maximum dynamic force in Y direction [N]
$F_{zdynmax}$	Maximum dynamic force in Z direction [N]
$M_{xdynmax}$	Maximum dynamic moment around the X-axis [Nm]
$M_{ydynmax}$	Maximum dynamic moment around the Y-axis [Nm]
$M_{zdynmax}$	Maximum dynamic moment around the Z-axis [Nm]

7.1.2 Lubrication process

Note

Only use lubricants according to DIN 51825, KP2K, consistency class NGLI2!

Note

Make sure that only lubricants without solid lubricant content (e.g. graphite or MoS_2) are used!

Note

With vertical installation, the relubrication quantity increases by approx. 50%.

Note

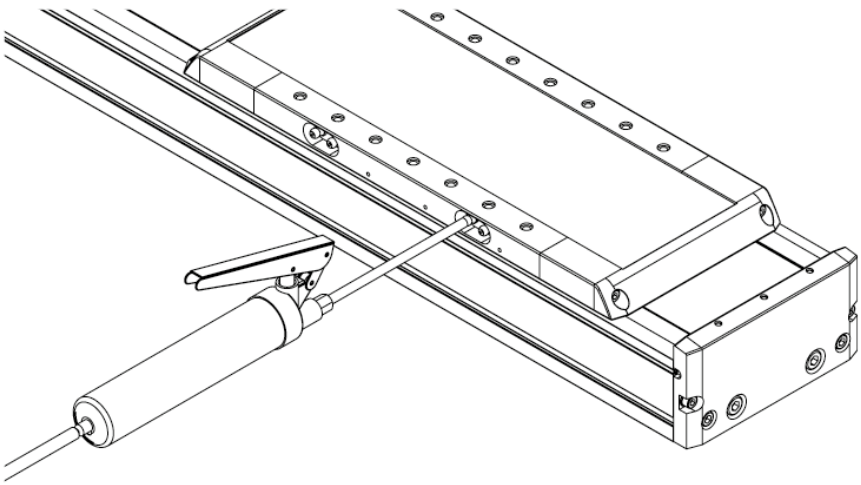
In case of special operating conditions (contamination, short stroke, type of installation), the lubrication intervals must be adapted to the application.

Lubrication using the example of the linear guideway:

- Move the carriage to any position.
- Place the nozzle at a right angle to a lubrication point.
- Press the nozzle against the grease nipple with manual force.
- Operate the lubricant gun until the required relubrication quantity (see Table 7.1) is reached.
- Repeat the procedure for all lubrication points on the selected carriage side.

✓ The linear guideway is lubricated.

Fig. 7.2: Lubrication process



7.1.3 HIWIN lubricants

HIWIN grease type G04 is recommended for lubricating the linear axes. HIWIN also offers you a grease gun with a suitable mouthpiece (see section 11.21).

7.2 Cleaning the linear axis

⚠ **Warning**! Danger of cutting!

The cover strip can cause cuts during assembly or disassembly.

- Commissioning and set-up only by qualified personnel with appropriate protective equipment (gloves, goggles)!

⚠ **Caution!** Risk of damage to health and the environment!

Contact with lubricants can cause irritation, poisoning and allergic reactions as well as damage to the environment.

- Only use suitable media that are not dangerous for humans. Observe the manufacturer's safety data sheets.
- Dispose of substances appropriately.

Linear axes HT-L are insensitive to the penetration of dirt and foreign bodies due to their constructive design and the optionally selectable cover strips. Nevertheless, the linear axes must be checked regularly and cleaned from the outside.

Observe the following points when cleaning:

- Do not use compressed air.
- The surface is anodised and only resistant to alkaline cleaning agents under certain conditions. Only neutral cleaning agents may be used for cleaning.
- Remove coarse particles from the surface regularly. A moistened, soft and lint-free cleaning cloth is ideal for this purpose.
- The cover strip is subject to abrasion due to friction caused by its function. Remove the abrasion regularly.

7.3 Changing 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 seal is no longer guaranteed.

- Undo the clamping bolt 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 piece from both ends of all carriages (see Fig. 7.7).
- Remove the carriage cover by sliding it out of the carriage profile (see Fig. 7.3).
- If present, please remove the cover strip guide according to chapter 7.4
- Undo the mounting bolts. 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 (with ethanol if necessary) to remove any dirt from the cover strip clamp, carriage end piece, cover strip deflection, strip guide and carriage cover.
- If necessary, replace the strip guides on the top of the carriage profile and the underside 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.
- Place the cover strip on the magnetic strip of the axis base profile and guide it over the carriage profile (see Fig. 7.6).
- Centre the cover strip.
- Mount the cover strip deflection on both sides of the carriage according to Fig. 7.4.
- Align the cover strip deflection centrally.

- Hand-tighten the cover strip deflection screws.
- Fit the carriage cover by sliding 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 bolts.
- 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 cover strip clamping bolts (see Fig. 7.8 and Fig. 7.9).
- Move the carriages to both end positions and check that the cover strip is aligned correctly. If necessary, loosen the cover strip clamp screws again, realign the cover strip and then retighten the screws.

✓ The new cover strip is mounted

Fig. 7.3: Disassembly/Assembly of carriage cover

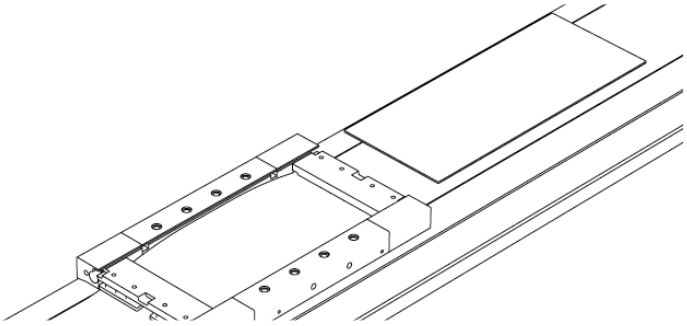


Fig. 7.4: Disassembly/Assembly of cover strip deflection

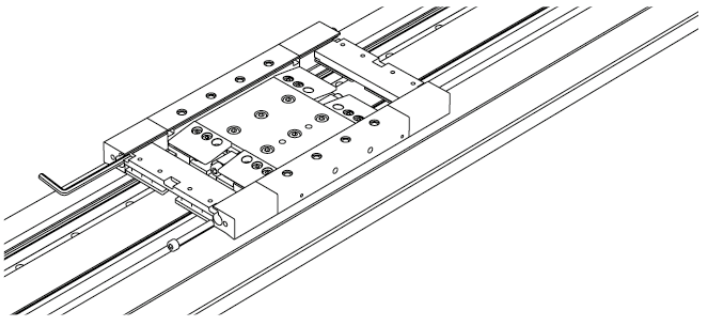


Fig. 7.5: Disassembly/Assembly of strip guide

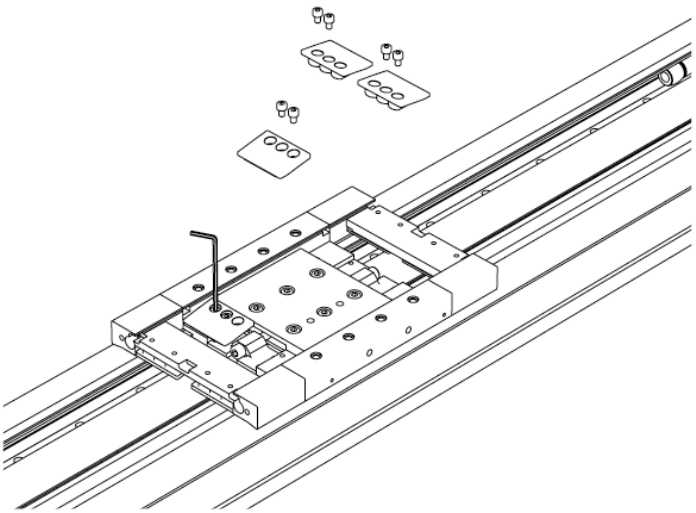


Fig. 7.6: Cover strip guide

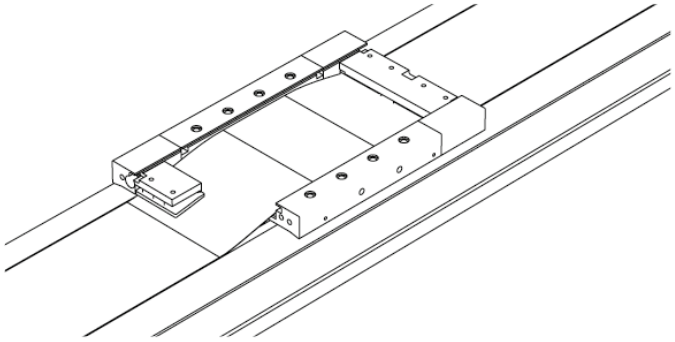


Fig. 7.7: Disassembly/Assembly of carriage end piece

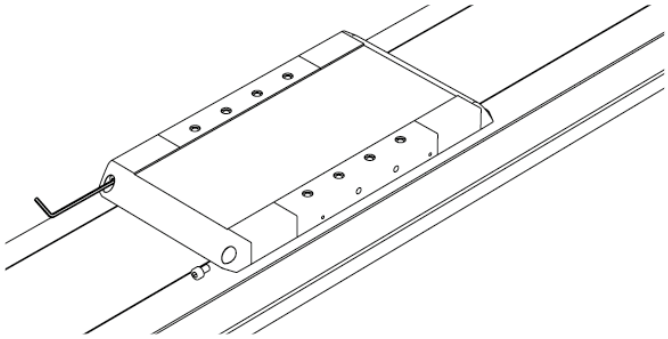


Fig. 7.8: Mounting of cover strip in the cover strip clamp

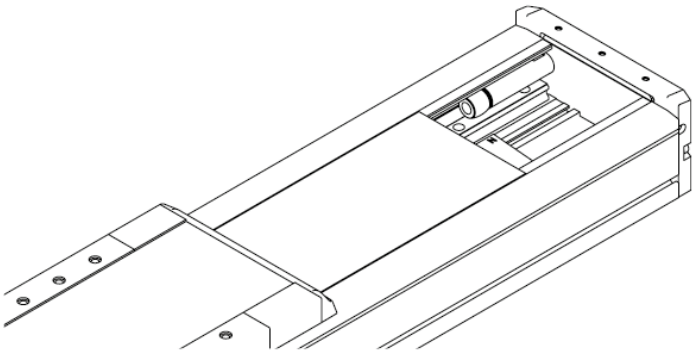
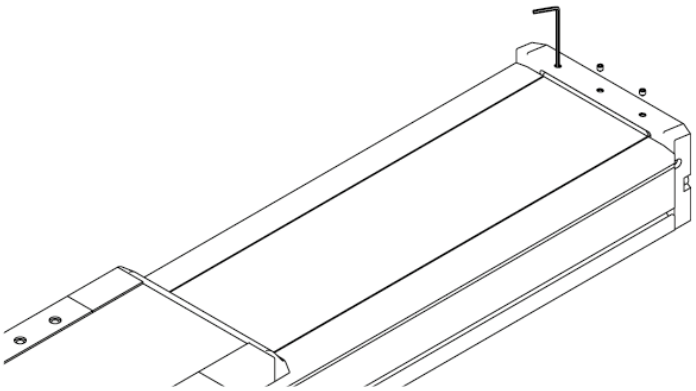


Fig. 7.9: Disassembly/Assembly of the cover strip clamp



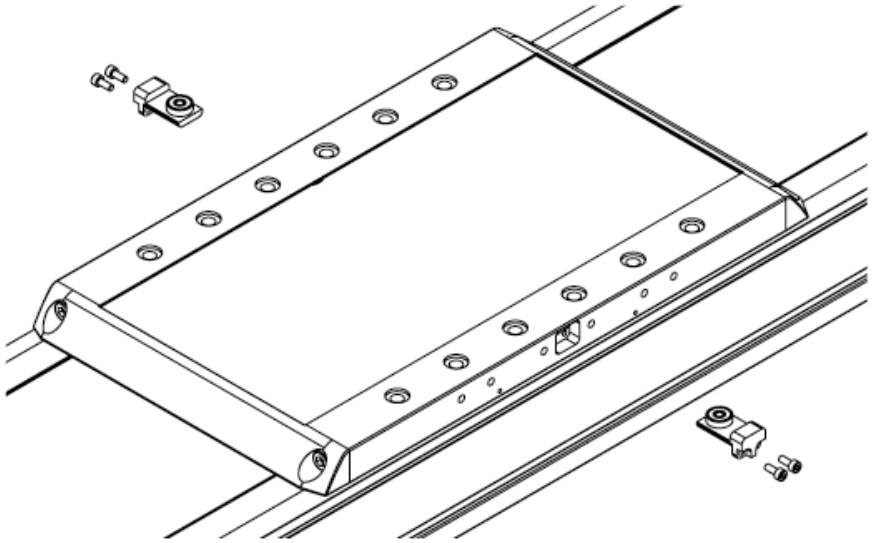
7.4 Changing the cover strip guide

For longer linear axes 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 mounting bolts 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 seat of the cover strip guides in the carriage.
- Insert the new cover strip guides into the carriage on both sides.
- Tighten the mounting bolts 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 is mounted.

Fig. 7.10: Cover strip guides



7.5 Visual inspection of electrical components

⚠ **Attention!** Danger of electric shock or burns from contact with live parts!

Contact with live parts can cause injuries.

If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!
- Only qualified personnel may install cabling!
- Work on electrical installations only by qualified personnel!

8 Faults

8.1 Faults on linear axes HT-L

⚠ **Attention!** Risk of impact 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).

- A safety guard must be provided for the operation of the linear axes!

⚠ **Attention!** Danger of electric shock or burns from contact with live parts!

Contact with live parts can cause injuries.

If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!
- Only qualified personnel may install cabling!
- Work on electrical installations only by qualified personnel!

Table 8.1: Fault table of linear axes HT-L

Fault	Possible cause	Remedy
Carriage does not move	Load too high	Reduce load or acceleration of the drive if necessary
No limit switch function	Switching distance too large	Readjust the switching distance and set correctly
	Limit switch defective or cable break	Replace limit switch
	Signal does not arrive at the control system	Check the supply line to the control system
Noise and vibrations at high speed	Tension in the system	Install the axis so it is free of tension, check the evenness of the supporting surface and the attached load
	Incorrect settings on the drive controller	Re-tune and adapt controller settings to the application conditions
Noise generation of the guides	Lack of lubricant	Relubrication
	Damage to the guides, for example due to extreme impact loads on the carriage or extreme contamination	Send axis to HIWIN GmbH for repair
Motor load increases, control system switches off due to overload	Tension in the system or lack of lubricant	Install the axis so it is free of tension, check the evenness of the supporting surface and the attached load. Relubricate axis
	Heavy contamination of the axis and the internal guides	Clean axis, ensure free movement of guide and drive elements
Motor will not start	Supply lines interrupted	Check connections, plug connector contacts may be pressed in. Correct if necessary.
	Fuse has been triggered by the motor protection equipment	Check motor protection equipment for the correct setting, or correct the fault
When restarting, the servo drive reports a commutation fault	Motor phases incorrectly connected	Check direction of rotation
	Encoder counting direction wrong	Replace SIN and COS wire pair in encoder plug
	Traversing carriage is too close to limit switch/end stop	De-energise the axis and move the traversing carriage to the centre of the axis by hand.
	Carriage blocked	Manually check the carriage for free movement
	No symmetrical force ratios	
	Additional travel resistance	Change parameterisation in the servo drive

Fault	Possible cause	Remedy
Axis "goes through" on restart	Commutation faulty	See commutation malfunction
		Check commutation parameterisation in the drive, activate speed monitoring
	EMC interference on encoder signal	Check the shielding of the plugs and cables
Axis "goes through" in positioning mode	Programming error during position transfer, impermissible accelerations requested	Activate safety settings in servo drive, such as e.g. speed monitoring, permissible tracking error, etc.
	Rated power exceeded due to excessively long duty cycle	Adapt the load cycle to the nominal engine power
Motor is heating up too much (measure temperature)	Insufficient cooling	Adjust cooling air supply or clear cooling air paths. If necessary, retrofit fans
	Traversing carriage is sluggish	Check the lubrication of the guides, check for foreign bodies in the travel area
	Ambient temperature too high	Note permissible temperature range
	Load cycle was changed	Calculate load cycle (have it calculated) and adjust accordingly
	Motor commutation of the servo drive does not work properly	Adjust the commutation parameters of the servo drive
Running noises on the carriage	Relubrication required or bearing damage	Lubricate or consult with HIWIN GmbH customer service
After the reference run, there is an offset of 1 mm	The position of the cam switch is exactly between two index pulses of the MAGIC-PG	Shifting of cam switch by approx. 0,5 mm
The axis produces cracking noises when it is regulation mode	EMC interference in the encoder signal	It is essential to use encoder cables with separately shielded sin and cos signal pairs
	Commutation faulty	Optimise the parameterisation of the commutation.
Carriage jerks when moving and generally generates running noises that do not come from the profile rail	EMC interference in the encoder signal, encoder cable plug connection faulty, pin in the plug bent	Connect the shield of the motor cable and/or encoder cable to the earth terminal of the amplifier, check the pin in the connector
	Incorrect controller parameters	Check controller parameters, check tuning
Position deviations after several hours of operation	Incorrect duty cycle	Position deviations after several hours of operation

8.2 Operating faults with a servo drive

You will find explanations of the faults that occur and information on how to resolve them in the operating manual for the servo drive.

9 Disassembly

⚠ **Danger!** Danger due to electrical voltage!

Dangerous currents may flow before and during assembly, disassembly and repair work.

- Work may only be carried out by qualified electricians when the device is de-energised!
- Before working, disconnect the linear axes from the power supply and secure them against being switched on again!

⚠ **Warning**! Risk of impact and crushing!

Injuries can occur if the carriage is moved or accidentally started up.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!

⚠ **Warning**! Danger of crushing due to traversing carriage!

Risk of injury due to crushing and damage to the linear axis due to movement of the traversing carriage due to gravity, as the axes do not have a brake by default.

- Ensure that the carriage is secured against unintentional movement when stationary!

⚠ **Warning**! Danger of cutting!

The cover strip can cause cuts during assembly or disassembly.

- Commissioning and set-up only by qualified personnel with appropriate protective equipment (gloves, goggles)!

⚠ **Warning**! Danger from suspended loads or falling parts!

Lifting heavy loads can cause damage to health!

- Assembly and maintenance of the linear axes only by qualified personnel!
- Take the mass of the parts into account during transport. Use suitable lifting gear!
- Comply with the applicable industrial safety regulations for handling suspended loads.
- Lift linear axes only at specified support points!
- Secure machines and machine parts against tipping over!

⚠ **Attention!** Risk of impact 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 applicable industrial safety regulations!
- Transport to the installation site only by qualified personnel!

⚠ **Attention!** Danger of electric shock or burns from contact with live parts!

Contact with live parts can cause injuries.

If the customer installs cables incorrectly, the constant motion inside the energy chain can cause chafing and expose the electrical contact points.

- Construction of the control system according to DIN EN 12100. No start up after:
  - Application, return of energy!
  - Correction of a fault!
  - Machine stop!
- Only qualified personnel may install cabling!
- Work on electrical installations only by qualified personnel!

⚠ **Attention!** Danger of crushing due to tilting of the axes!

- Secure machine and machine parts against tipping over!

Caution! Danger to health and the environment!

Contact with lubricants can cause irritation, poisoning and allergic reactions as well as damage to the environment.

- Only use suitable media that are not dangerous for humans. Observe the manufacturer's safety data sheets.
- Dispose of substances appropriately.

Disassembly steps:

- Disconnect the linear axis from the electric system.
- Unscrew the moving load.
- Protect the moving parts (e.g. carriage) from unintentional movement.
- Unscrew the linear axis.

✓ The linear axis is disassembled.

10 Disposal

Caution! Danger to health and the environment!

Contact with lubricants can cause irritation, poisoning and allergic reactions as well as damage to the environment.

- Only use suitable media that are not dangerous for humans. Observe the manufacturer's safety data sheets.
- Dispose of substances appropriately.

Table 10.1: Disposal

Liquids	
Lubricants	Dispose of as hazardous waste in an environmentally-safe manner
Soiled cleaning cloths	Dispose of as hazardous waste in an environmentally-safe manner
Linear axis	
Cabling, electrical components	Dispose of as electrical waste
Plastic components (e.g. energy chain)	Sort by type before disposal
Components made of steel (e.g. profile rail)	Sort by type before disposal
Aluminium components (e.g. profile)	Sort by type before disposal

11 Appendix 1: Accessories and spare parts

Our products are always subject to technical changes and improvements. To avoid incorrect deliveries of spare parts and accessories or to order parts without part numbers, please always quote the serial number of the linear axis when ordering. You will find this on the type plate of the axis.

11.1 Clamping profiles

With the help of clamping profiles, the linear axis is attached to the machine frame from above. The clamping profiles can be swivelled laterally into the profile groove of the axis. Sets containing 4 clamping profiles are available.

Fig. 11.1: Clamping profiles short and long

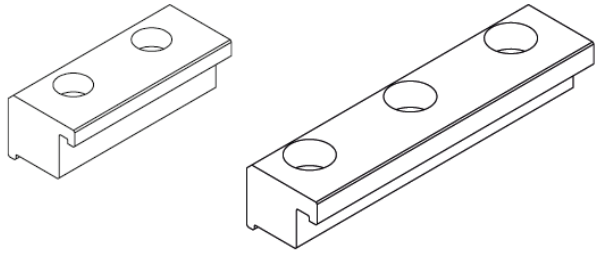


Fig. 11.2: Dimensioned drawing of clamping profile short

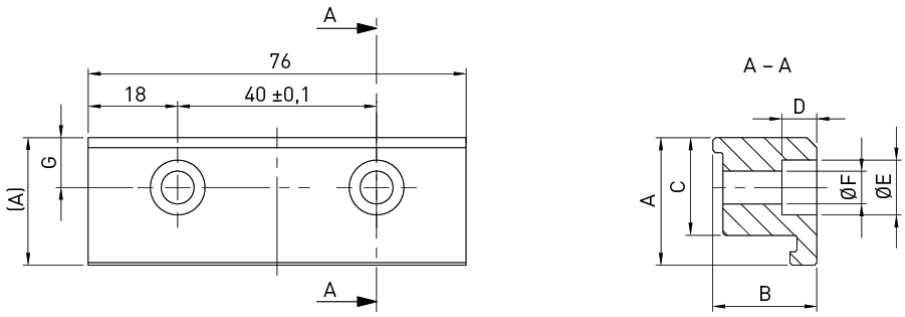


Table 11.1: Article numbers and dimensions of clamping profiles short

Suitable for linear axis	Model	A	B	C	D	Ø E	Ø F	G	Matching screw	Article number, 4 pieces
HT100	Size 5	18,0	10,5	14,1	6,0	10	5,5	6,85	DIN 912 M5	25-000517
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: Dimensioned drawing of clamping profile long

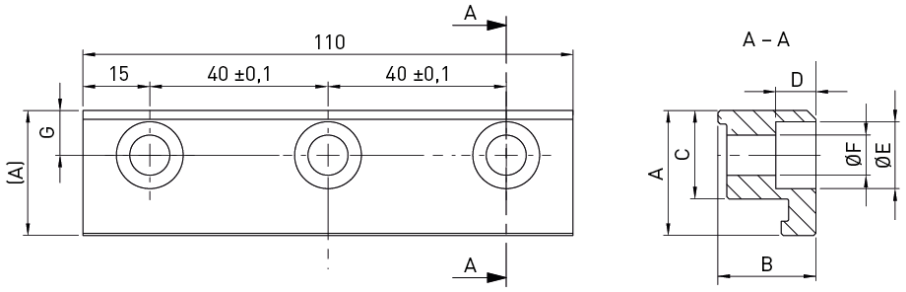


Table 11.2: Article numbers and dimensions of clamping profiles long

Suitable for linear axis	Model	A	B	C	D	Ø E	Ø F	G	Matching screw	Article number, 4 pieces
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 force-fit mounting of the linear axes. Flexible fastening option via the grooves and underside of the axis profile. Sets containing 10 T nuts are available.

Fig. 11.4: Dimensioned drawing of T nut

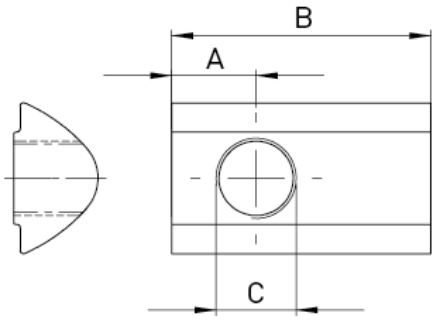


Table 11.3: Article numbers and dimensions of T nut

Suitable for linear axis	Model	A	B	C	Article number, 10 pieces
HT100	Size 5 M4	3,5	12,0	M4	20-000528
HT100 [1]	Size 5 M5	3,5	12,0	M5	20-000529
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 for insertion into the mounting holes of the carriage for exact and reproducible load pick-up. Sets containing 10 centring sleeves are available.

Fig. 11.5: Dimensioned drawing of centring sleeve

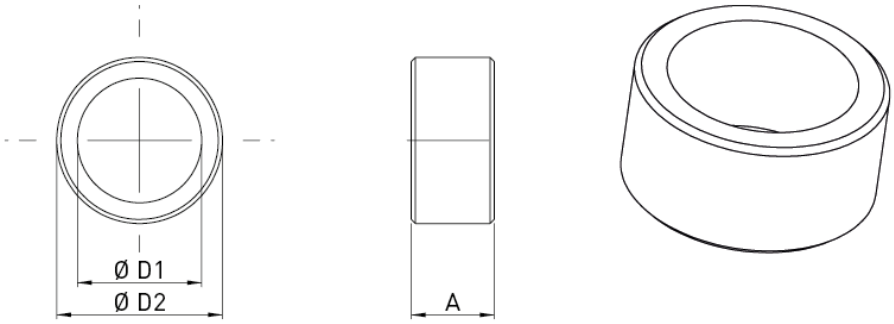


Table 11.4: Article numbers and dimensions of centring sleeve

Suitable for linear axis	A	Ø D1	Ø D2	Article number, 10 pieces
HT100, 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

Groove cover for covering mounting groove. Length: 2 m. Sets of 5 groove covers are available.

Fig. 11.6: Slot cover for linear axes HT-L

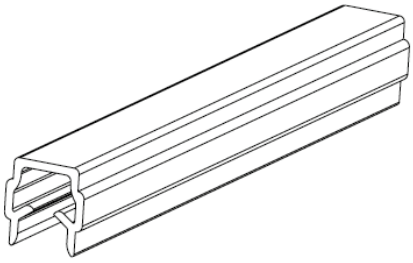


Table 11.5: Article numbers for groove cover

Suitable for linear axis	Article number, 5 pieces
HT100	25-000514
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. By default, the limit switch is available with plug or open cable end.

Fig. 11.7: Limit switch for linear axes HT-L

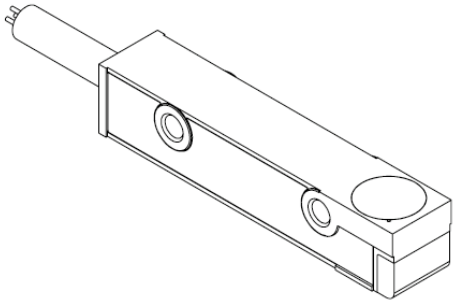


Table 11.6: Options for limit switch

Option	Article number
Limit switch with 100 mm cable, plug (NC contact)	25-000786
Limit switch with 100 mm cable, plug (NO contact)	25-002766
Limit switch with 4 m cable (NC contact)	25-000787
Limit switch with 5 m cable (NO contact)	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 open wires at the other end of the cable.

Fig. 11.8: Extension cable for limit switch

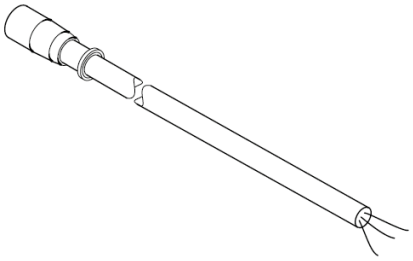


Table 11.7: Extension cable for limit switch

Length [m]	Max. cable diameter [mm]	Min. static bending radius [mm]	Min. dynamic bending radius [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 used to switch the limit switch in the two carriage 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

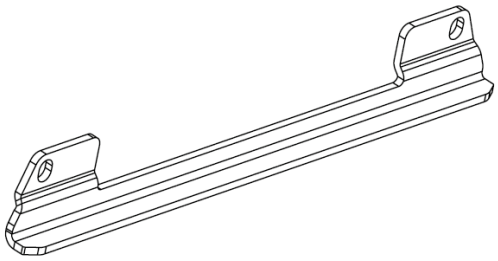


Table 11.8: Article numbers for damping element

Suitable for linear axis	Article number
HT	25-001031

11.8 Cover strip

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

Fig. 11.10: Cover strip

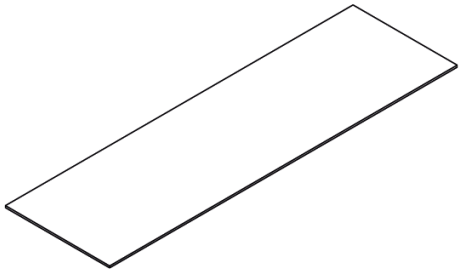


Table 11.9: Cover strip article numbers

Suitable for linear axis	Article number (3 m)	Article number (6 m)
HT100	80077827	80077856
HT150	25-001188	25-001192
HT200	25-001189	25-001193
HT250	25-001190	25-001194

11.9 Magnetic strip

The magnetic strip is used to hold down the cover strip and is available in a length of 7,5 m.

Fig. 11.11: Magnetic strip

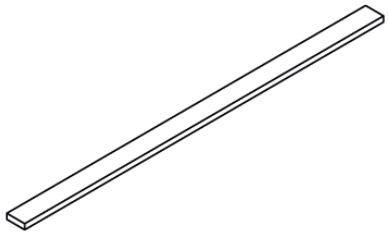


Table 11.10: Magnetic strip article numbers

Suitable for linear axis	Article number (7,5 m)
HT100	25-000543
HT150	25-001195
HT200	25-001195
HT250	25-001196

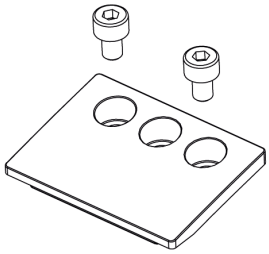
11.10 Cover strip deflection

The cover strip deflection set includes the following parts:

8 × strip guide
16 × cylinder head screw

One cover strip deflection set is required per carriage.

Fig. 11.12: Cover strip deflection



– Cylinder head screw

– Belt guide

Table 11.11: Article numbers cover strip deflection set

Suitable for linear axis	Cylinder head screw	Article number
HT100	DIN7984 M3 × 5	80071958
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

Strip guide 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

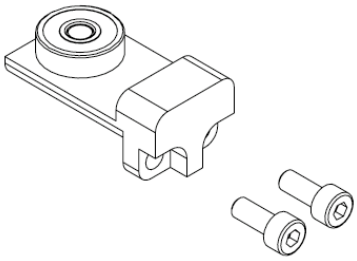


Table 11.12: Article numbers for cover strip guide

Suitable for linear axis	Article number
HT100	80059104
HT150	25-002579
HT200	25-002631
HT250	25-002632

11.12 Stop buffer

The stop buffer serves as a mechanical limit.

Fig. 11.14: Stop buffer

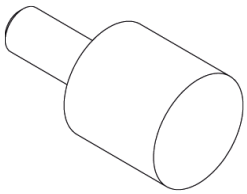


Table 11.13: Article numbers for stop buffers

Suitable for linear axis	Article number
HT100	25-000056
HT150	8-13-0007
HT200	8-13-0007
HT250	8-13-0008

11.13 Motor cable M23, 8-pin

Motor cable suitable for linear axes HT-L, with connection M23, 8-pin (standard). Cable end with open wires.

Fig. 11.15: Motor cable for linear axis HT-L, 8-pin

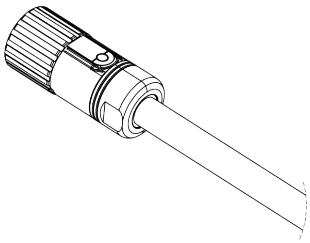
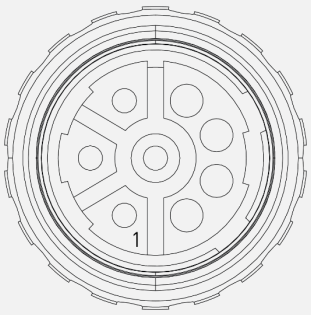


Table 11.14: Motor cable for linear axis HT-L, 8-pin

Length [m]	Max. cable diameter [mm]	Min. static bending radius [mm]	Min. dynamic bending radius [mm]	Article number
3	12,5	50	93,75	8-10-0069
5	12,5	50	93,75	8-10-0070
10	12,5	50	93,75	8-10-0072

Table 11.15: Pin assignment of motor cable, 8-pin

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

11.14 Motor cable 915, 9-pin

Motor cable matching linear axes HT-L, with connection 915, 9-pin (standard until 04/2022).
Cable end with open wires.

Fig. 11.16: Motor cable for linear axis HT-L

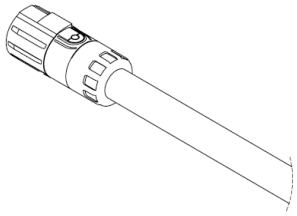
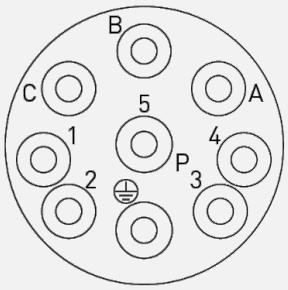


Table 11.16: Motor cable for linear axis HT-L, 9-pin

Length [m]	Max. cable diameter [mm]	Min. static bending radius [mm]	Min. dynamic bending radius [mm]	Article number
3	12,5	50	93	8-10-1214
5	12,5	50	93	8-10-1215
10	12,5	50	93	8-10-1217

Table 11.17: Pin assignment of motor cable, 9-pin

Pin no.	Wire colour	Signal	Pin image
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–	

11.15 Cable for incremental distance measuring system, M17, 17-pin

Cable for incremental distance measuring system (option A, B, D, E) for linear axes HT-L, with connection M17, 17-pin (standard).

Fig. 11.17: Cable for incremental distance measuring system, M17, 17-pin

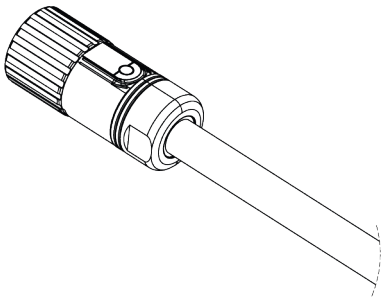
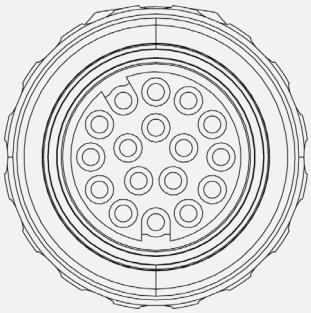


Table 11.18: Cable for incremental distance measuring system (option A, B, D, E), M17, 17-pin

Length [m]	Suitable for option	End of cable	Max. cable diameter [mm]	Min. static bending radius [mm]	Min. dynamic bending radius [mm]	Article no.
3	A, B	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1856
5	A, B	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1857
8	A, B	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1858
10	A, B	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1859
12	A, B	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1860
15	A, B	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1861
3	D, E	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1862
5	D, E	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1863
8	D, E	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1864
10	D, E	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1865
12	D, E	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1866
15	D, E	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1867
3	A, D	Open	9	45	95	8-10-0115
5	A, D	Open	9	45	95	8-10-0116
10	A, D	Open	9	45	95	8-10-0118
3	B, E	Open	9	45	95	80028093
5	B, E	Open	9	45	95	80028203
10	B, E	Open	9	45	95	80028218

Table 11.19: Pin assignment of cable for incremental distance measuring system, M17, 17-pin

Pin no.	Open wires MAGIC 1 V_{SS}/ TTL without Hall		Open wires MAGIC 1 V_{SS}/ TTL with Hall		Pin image
	Wire colour	**Signal**	**Wire colour**	**Signal**	
1	Green	V1–	Green	V1–	
2	Black	V2–	Black	V2–	
3	Orange	V0+	Orange	V0+	
4	Brown-red	U+	Brown-red	U+	
5	Grey	Sense+	–	–	
6	–	–	–	–	
7	–	–	–	–	
8	–	–	–	–	
9	Yellow	V1+	Yellow	V1+	
10	Brown	V2+	Brown	V2+	
11	Red	V0–	Red	V0–	
12	Brown-blue	0 V	Brown-blue	0 V	
13	Blue	Sense–	–		
14	–	–	Grey	Hall A	
15	–	SH1/SH2/SH3	–	SH1/SH2/SH3	
16	–	–	Blue	Hall B	
17	–	–	White-yellow	Hall C	

11.16 Cable for absolute distance measuring system, M17, 17-pin

Cable for absolute distance measuring system (option H, R, S, T) for linear axes HT-L, with connection M17, 17-pin (standard).

Fig. 11.18: Cable for absolute distance measuring system, M17, 17-pin

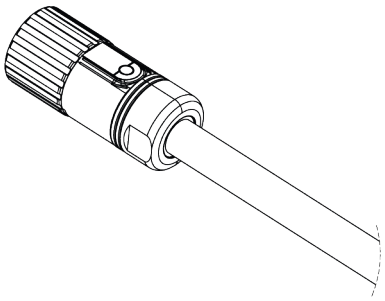
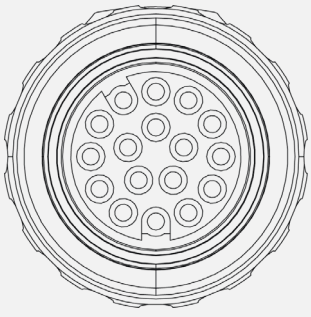


Table 11.20: Cable for absolute distance measuring system, M17, 17-pin

Length [m]	Suitable for option	End of cable	Max. cable diameter [mm]	Min. static bending radius [mm]	Min. dynamic bending radius [mm]	Article number
3	H, R	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1868
5	H, R	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1869
8	H, R	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1870
10	H, R	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1871
12	H, R	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1872
15	H, R	Connector suitable for ESC-SS for ED1	9	45	90	8-10-1873
3	H, R, S, T	Open	9	45	90	8-10-0315
5	H, R, S, T	Open	9	45	90	8-10-0316
10	H, R, S, T	Open	9	45	90	8-10-0318

Table 11.21: Pin assignment cable for absolute distance measuring system, M17, 17-pin

Pin no.	Wire colour	Signal	Pin image
1	Green	V1–	
2	Black	V2–	
3	Orange	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	Data+	
12	Brown-blue	0 V	
13	Blue	Sense–	
14	–	–	
15	–	SH1/SH2/SH3	

11.17 Cable for incremental distance measuring system, 915, 15-pin

Cable for incremental distance measuring system (option A, B, D, E) for linear axes HT-L, with connection 915, 15-pin (standard until 04/2022).

Fig. 11.19: Cable for incremental distance measuring system, 915, 15-pin

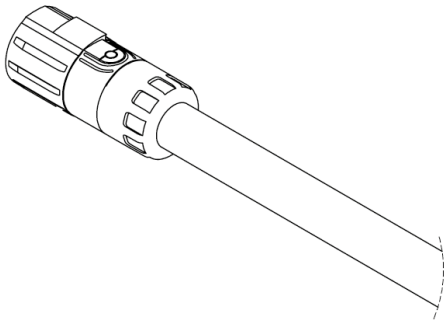
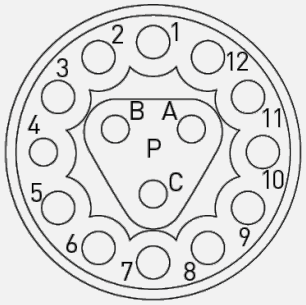


Table 11.22: Cable for incremental distance measuring system (option A, B, D, E), 915, 15-pin

Length [m]	Suitable for option	End of cable	Max. cable diameter [mm]	Min. static bending radius [mm]	Min. dynamic bending radius [mm]	Article no.
3	A, B	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1838
5	A, B	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1839
8	A, B	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1840
10	A, B	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1841
12	A, B	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1842
15	A, B	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1843
3	D, E	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1844
5	D, E	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1845
8	D, E	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1846
10	D, E	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1847
12	D, E	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1848
15	D, E	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1849
3	A, D	Open	9	45	72	8-10-1207
5	A, D	Open	9	45	72	8-10-1208
10	A, D	Open	9	45	72	8-10-1210
3	B, E	Open	9	45	72	8-10-1201
5	B, E	Open	9	45	72	8-10-1202
10	B, E	Open	9	45	72	8-10-1204

Table 11.23: Pin assignment for cable for incremental distance measuring system, 915, 15-pin

Pin no.	Open wires MAGIC 1 V_{SS}/ TTL without Hall		Open wires MAGIC 1 V_{SS}/ TTL with Hall		Pin image
	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	

11.18 Cable for absolute distance measuring system, 915, 15-pin

Cable for absolute distance measuring system (option H, R, S, T) for linear axes HT-L, with connection 915, 15-pin (standard until 04/2022).

Fig. 11.20: Cable for absolute distance measuring system, 915, 15-pin

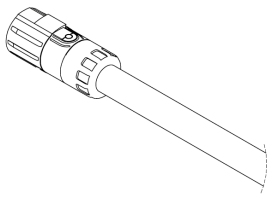
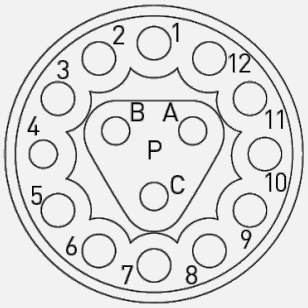


Table 11.24: Cable for absolute distance measuring system, 915, 15-pin

Length [m]	Suitable for option	End of cable	Max. cable diameter [mm]	Min. static bending radius [mm]	Min. dynamic bending radius [mm]	Article number
3	H, R	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1850
5	H, R	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1851
8	H, R	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1852
10	H, R	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1853
12	H, R	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1854
15	H, R	Connector suitable for ESC-SS for ED1	9	45	72	8-10-1855
3	H, R, S, T	Open	9	45	72	8-10-1207
5	H, R, S, T	Open	9	45	72	8-10-1208
10	H, R, S, T	Open	9	45	72	8-10-1210

Table 11.25: Pin assignment cable for absolute distance measuring system, 915, 15-pin

Pin no.	Wire colour	Signal	Pin image
1	Green	V1–	
2	Black	V2–	
3	Orange	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	Data+	
12	Brown-blue	0 V	
A	Blue	Sense–	
B	–	–	
C	–	SH1/SH2/SH3	

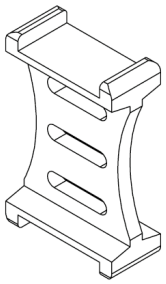
11.19 Partitions for energy chain

Partitions for separating cables in the energy chain By default, the energy chain is equipped with a partition in every second chain link. Additional partitions are available in a set of 20.

Table 11.26: Article numbers for partition

Suitable for linear axis	Article number, 20 pcs.
HT100L, HT150L	8-05-0336
HT200L, HT250L	8-05-0337

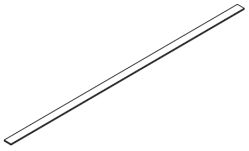
Fig. 11.21: Partition for energy chains



11.20 Tape for reduction of noise emissions from the energy chain

Cellular rubber tape, self-adhesive on one side, for attachment to the contact surface of the energy chain in order to reduce noise emissions. Suitable for all linear motor axes HT-L with energy chain (exception: HT150L with drive interface E or F).
Roll of 10 m
Article number: 25-002485

Fig. 11.22: Tape for reduction of noise emissions from the energy chain



11.21 HIWIN lubricants

Table 11.27: Recommended HIWIN grease

Grease type	Area of application	Unit of measure	Article number
G04	High velocity	Cartridge 400 g	20-000345

Table 11.28: Recommended HIWIN grease gun

Article number	Description	Scope of delivery	Comment
20-000333	Grease gun type GN-400C including set of lubrication adapters and nozzles (see Fig. 11.23)	Grease gun type GN-400-C consisting of: ○ Grease gun ○ Hydraulic gripping coupling A1 suitable for conical grease nipples according to DIN 71412, outer diameter 15 mm ○ Hollow mouthpiece A2 for conical and ball grease nipples to DIN 71412/DIN 3402, outer diameter 10 mm ○ Set of lubrication adapters and nozzles	Suitable for 400 g cartridge or direct filling

Fig. 11.23: Grease gun GN-400C

11.22 HIWIN grease nipple

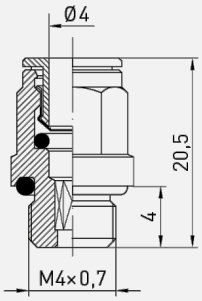
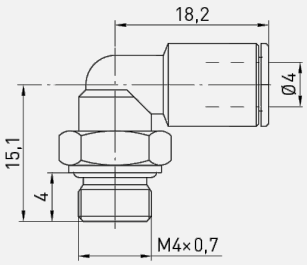
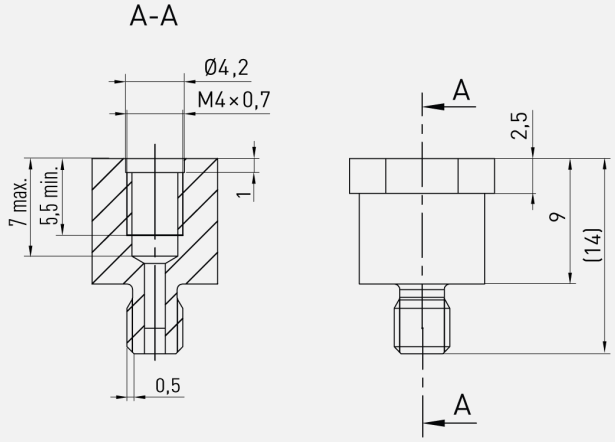
Grease nipple suitable for linear axes HT-L (all sizes).

Table 11.29: Grease nipple

Article number	Model	Figure
20-000538	Standard	
20-000325	Option	
20-000272	Option	

11.23 Lubrication connectors and push-in fittings

Table 11.30: Lubrication connectors and push-in fittings

Article number	Model	Figure
8-12-0186	Push-in fitting, straight Ø 4	
20-002116	Push-in fitting, angled Ø 4	
20-002108	Lubrication adapter M4/M4 for extension of the push-in fittings to prevent collisions (e.g. damping element)	

12 Installation certificate

In terms of EU Machinery Directive 2006/42/EC, Appendix II 1. B for incomplete machines

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

Description and identification of the incomplete machine:

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

We hereby declare that the machine satisfies the following fundamental provisions of the Machinery Directive 2006/42/EC:
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

We also declare that the specialist technical documents have been produced in accordance with appendix VII, part B.
We expressly declare that the incomplete machine satisfies all of the applicable provisions of the following EC directives.

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

Reference of the harmonised standards applied in accordance with Article 7(2)

EN ISO 13732-1:2008	Ergonomics of the thermal environment – Evaluation methods for human responses to contact with surfaces - Part 1: Hot surfaces
EN ISO 12100:2010	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 its agents undertake to provide the specialist documents on the incomplete machine to authorised organisations in the individual member states upon request.

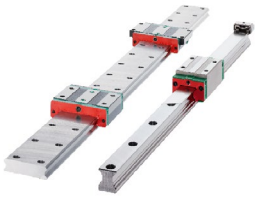
Commercial copyrights remain unaffected.

Important note The incomplete machinery may not be put into operation until it has been ascertained that the machinery into which this incomplete machinery is to be incorporated is in conformity with this Directive.

Offenburg, May 2019

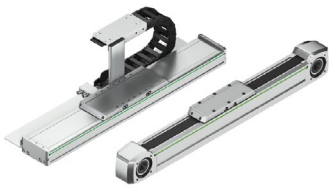
Werner Mäurer, Management

We live motion.

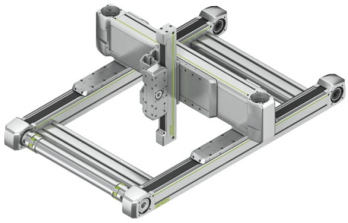


Linear guideways

Ballscrews



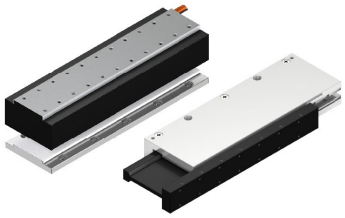
Linear axes



Linear axis systems

Torque motors

Robot



Linear motors

Rotary tables

Servo drives and servo motors

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