

Assembly instructions

HIWIN MAGIC Distance Measuring Systems

MAGIC-01-15-EN-2304-MA

Imprint

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1 General

1.1 About these assembly instructions

These assembly instructions are intended for planners, developers and operators of systems into which the described distance measuring systems are to be integrated. It is also addressed to persons who carry out the following work:

- 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 Scope of these assembly instructions

These assembly instructions apply to HIWIN distance measuring systems with the following product designations:

- HIWIN MAGIC
- HIWIN MAGIC-PG

1.1.2 Requirements

We assume that

- Operating personnel are trained in the safe operation of the HIWIN MAGIC and MAGIC-PG distance measuring systems and have read these assembly instructions and understood their contents in full
- Maintenance personnel maintain and repair the HIWIN MAGIC distance measuring systems and MAGIC-PG in such a way that they present no danger to persons, the environment or property

1.1.3 Availability

The assembly instructions must always be available to all persons working with or on the HIWIN MAGIC and MAGIC-PG distance measuring systems.

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:

- ▶ Fix the encoder by tightening the screws [7] with 1 Nm.
- ▶ Fasten the wiper [14] to the MAGIC-PG encoder using screws [11], nuts [10] and lock washers [9] in such a way that the sealing lip rests lightly against the rail contour on all sides.
- ✓ The new encoder is mounted.

1.2.2 Lists

Lists are identified through the use of bullet points.

Example:

It is available in two versions:


- HIWIN MAGIC: type with separate encoder
- HIWIN MAGIC-PG: distance measuring system integrated in a linear guideway
- ...


1.2.3 Presentation of safety information


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 instruction will result in severe or fatal injury!


 **Warning!** Potentially dangerous situation!

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

 **Attention!** Potentially dangerous situation!

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



 **Caution!** Potentially dangerous situation!

 Failure to follow this safety instruction 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 linear axes:

Warning symbols

	Warning of dangerous electrical voltage!		Environmentally hazardous substance!
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1.2.5 Information

Note:

Provides general information 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
Telephone	+49 (0) 781 / 9 32 78 - 0
Technical customer service team	+49 (0) 781 / 9 32 78 - 77
Fax	+49 (0) 781 / 9 32 78 - 90
Technical customer service team fax	+49 (0) 781 / 9 32 78 - 97
E-mail	info@hiwin.de
Internet	www.hiwin.de

1.5 Product monitoring

Please inform HIWIN, as the manufacturer of the HIWIN MAGIC and MAGIC-PG distance measuring systems, about:

- Accidents
- Possible sources of danger on the MAGIC and MAGIC-PG distance measuring systems
- Any unclear information in these assembly instructions

2 Basic safety information

⚠ Warning! Danger due to strong magnetic fields!

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

2.1 Proper use

HIWIN MAGIC is a magnetic distance measuring system for positioning tasks with linear movement within an automated system. It is mainly used in linear motors. The named distance measuring systems must not be used outdoors or in hazardous areas where there is a risk of explosions.

The distance measuring systems may only be used as described for the intended purpose.

2.2 Exclusion of liability in the event of alteration and improper handling

No changes whatsoever may be made to the distance measuring systems that are not described in these assembly instructions. If a modified design is necessary, please contact the manufacturer.

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

Only original HIWIN parts are permitted as spare parts and accessories. Spare parts and accessories not supplied by HIWIN have not been tested for operation with HIWIN MAGIC distance measuring systems and may impair operational safety. The manufacturer accepts no liability for damage caused by the use of non-approved spare parts and accessories.

2.3 Qualified personnel

The distance measuring system may only be installed, integrated into higher-level systems, commissioned, operated and maintained by competent personnel. A qualified person is one who

- Has suitable technical training and
- Has been instructed by the machine operator in operation and the valid safety guidelines and can assess the dangers to be expected and
- Has read through these assembly instructions in full and understood them and has access to the assembly instructions at all times

2.4 General safety instructions

⚠ Warning! Danger of serious or fatal injuries!

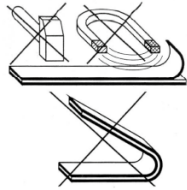
- ▶ Before and during all assembly, disassembly or repair work, the distance measuring system or the higher-level system must be de-energised and it must be ensured that the mains connection cannot be re-established by other persons!
- ▶ The distance measuring systems must not be used in potentially explosive atmospheres.
- ▶ The distance measuring systems may only be used and operated indoors.

2.5 Safety instructions for storage and transport

The distance measuring systems are delivered in suitable packaging. The systems must be left in these until they are installed.

The distance measuring systems must be stored in dry areas protected from impacts.

No heavy objects may be placed on the products during storage and transport.

**Note:**

The measuring tape of the magnetic distance measuring systems must not be exposed to strong magnetic fields (keep a distance to permanent magnets of linear motor axes!). Strong vibrations (e.g. a blow with a hammer) can also damage the magnetisation of the measuring tape.

2.6 Safety instructions for handling products carrying current and voltage

Note:

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

2.7 Further information

If you have any questions, please contact our sales organisation:

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

Fax: +49 (0) 781 / 9 32 78-90

For questions regarding the documentation, suggestions and corrections, please send a fax to the following fax address:

Tel.: +49 (0) 781 / 9 32 78-90

3 Product descriptions

The magnetic distance measuring systems of the MAGIC series are optimised for measuring the distances travelled in linear movements and particularly on linear motor axes. They are particularly well-suited for use in harsh environments and are insensitive to oil, dirt, vibration and shock.

The rugged housing is electrically shielded, the signal output is in real time (for details see chapter 5 [Electrical connection](#) and “Linear motors and distance measuring systems” catalogue).

It is available in two versions:

- HIWIN MAGIC: type with separate encoder
- HIWIN MAGIC-PG: distance measuring system integrated in a linear guideway

3.1 HIWIN MAGIC

This distance measuring system consists of a separate encoder ([fig. 3.1](#)) and a magnetic tape ([fig. 3.2](#)). Both can be mounted by the customer in suitable positions of their choice.

Fig. 3.1: MAGIC encoder



Fig. 3.2: MAGIC magnetic tape



3.2 HIWIN MAGIC-PG

In this version, the distance measuring system is integrated into a linear guideway. The total unit is then called the positioning guideway (PG).

The scanning unit is attached to a standard guide carriage, it is suitable for blocks of sizes HG_20, HG_25, QH_20, QH_25, CG_20, CG_25, CG_30, CG_35 und CG_45. The measuring standard is integrated directly into a profile rail in the form of a magnetic tape (see [Fig. 3.3](#)).

Fig. 3.3: MAGIC-PG system for HG and QH series

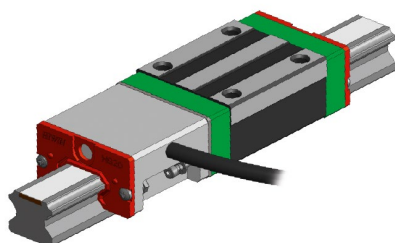
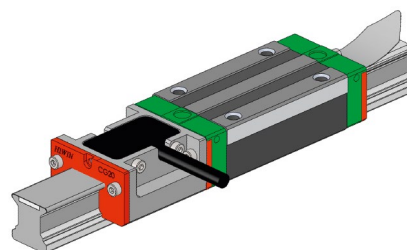


Fig. 3.4: MAGIC-PG system for CG series



3.3 Connections

The distance measuring system is connected to a higher-level control system (e.g. servo drive) with the cable permanently mounted on the encoder. It is supplied with a low voltage of 5 V.

The cable can be supplied with open ends (see Fig. 3.5) or optionally pre-assembled with a round plug coupling (see Fig. 3.6).

Fig. 3.5: Cable with open ends

Fig. 3.6: Cable with coupling (optional)



! Caution! Observe handling instructions for electrostatic sensitive components!

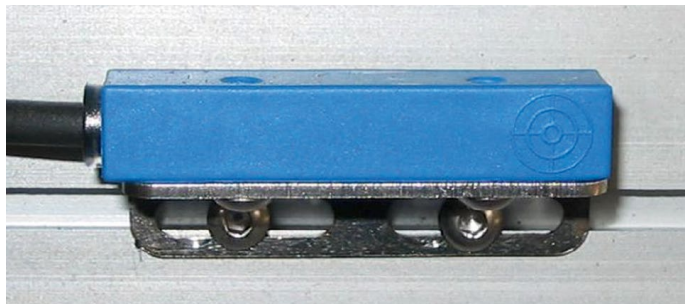
- ▶ Wear a wrist strap or ESD gloves during installation to protect the component.
- ▶ Do not touch the pins in the connector or bare wires without antistatic protection.

3.4 Reference switch

The MAGIC encoder provides index signals at intervals of 1 mm. A reference switch ("cam switch") is required to define a zero point.

HIWIN offers an inductive proximity switch for this purpose (see Fig. 3.7).

Fig. 3.7: Reference switch on bracket



3.5 Scope of delivery

Depending on customer requirements, the MAGIC and MAGIC-PG distance measuring systems are offered in different forms and scopes.

Individual components can be supplied for retrofitting existing linear guide systems. HIWIN also offers the distance measuring systems installed in linear guides as a complete system.

The standard scope of delivery and the optional accessories are shown in Table 3.1. You will find the order code for systems in section 9 Spare parts and accessories.

Table 3.1: Overview of standard scope of delivery and optional accessories

Distance measuring system	MAGIC	MAGIC-PG
Encoder	Select cable length	Select cable length
Magnetic tape (including cover strip)	Select length	Select length
Type of encoder with coupling	Optional	Optional
Reference switch	Optional	Optional
Screw set for MAGIC-PG	Not suitable	Standard scope of delivery

4 Assembly

⚠ Warning! Danger due to electrical voltage!

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

- ▶ Before and during all assembly, disassembly or repair work, the distance measuring system or the higher-level system must be de-energised and it must be ensured that the mains connection cannot be re-established by other persons!
- ▶ Observe the assembly instructions of the other system components (e.g. linear motor, servo drive)!

! Caution! Possible damage to the HIWIN MAGIC distance measuring system!

The measuring tape of the magnetic distance measuring systems must not be exposed to strong magnetic fields. Magnetic dust can falsify the measuring signal or damage the distance measuring system.

- ▶ Keep the distance between the distance measuring systems and the permanent magnets of linear motor axes!
- ▶ Caution when using magnetic feet (dial gauge holders), e.g. to align the profile rails!
- ▶ Avoid strong shocks (e.g. use of a hammer)!
- ▶ Do not use the system in environments with magnetic dust (e.g. graphite dust)!

! Caution! Possible damage to the HIWIN MAGIC distance measuring system!

Magnetic chips or other foreign objects may stick to the magnetic tape. This can destroy the mechanics of the encoder.

- ▶ Check the air gap between the scanning unit and the measuring standard (magnetic tape) regularly and keep it free!

Note:

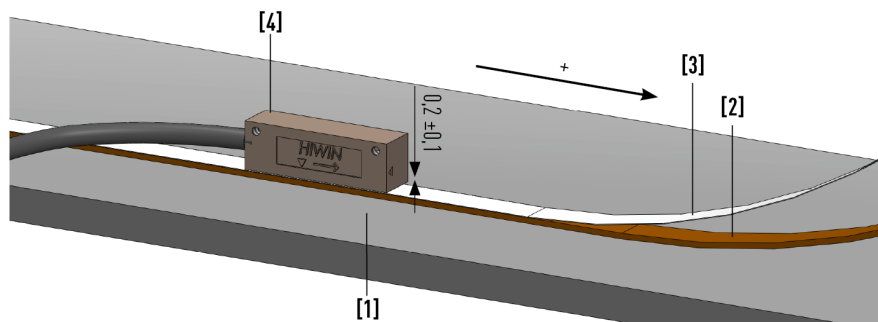
The magnetic tape is fixed to the rail with a high-performance adhesive (exclusively for sizes HG_20, HG_25, QH_20 and QH_25). The adhesive can be dissolved by certain solvents. If the adhesive loosens, the magnetic tape may bulge. This must be prevented with specific measures (e.g. additional clamping of the magnetic tape at the ends).

HIWIN GmbH accepts no liability should a tape come loose from the rail that has not been secured with the appropriate measures.

4.1 Mounting the HIWIN MAGIC

Fig. 4.1 Illustrates the assembly steps for the HIWIN MAGIC described below.

Fig. 4.1: Structure of the HIWIN MAGIC



4.1.1 Mounting the magnetic and cover strip

The magnetic tape can be mounted on a suitable flat surface chosen by the customer parallel to the direction of movement on the fixed part of the system. The following criteria must be met:

- Average roughness value $R_a \leq 3.2 \mu\text{m}$
- Height deviation (parallelism) to the direction of travel of the encoder: $\leq 0.1 \text{ mm}$
- Lateral parallelism deviation to the direction of travel of the encoder: $\leq 0.2 \text{ mm}$ (ideally use a reference edge)

The magnetic tape and the cover strip are provided with an adhesive film covered by a protective tape.

Note:

Only remove the protective tape shortly before or during assembly!

Assembly steps:

- ▶ Thoroughly clean the surface [1] on which the tape is to be mounted with alcohol or isopropanol.

Note:

The mounting surface for the magnetic tape must be absolutely clean, dry and free of grease! This is the only way to ensure a reliable adhesive bond!

- ▶ Stick on the magnetic tape [2] and press it on using a mounting roller with a force of approx. 250 N/cm^2 . Make sure that the tape is neither compressed nor overstretched.
- ▶ Clean the surface of the magnetic tape as described above.
- ▶ Stick the cover strip [3] onto the magnetic tape. Make sure that there are no bubbles under the tape when gluing. Press on the cover strip with a mounting roller with a force of approx. 250 N/cm^2 .
- ✓ The magnetic tape and the cover strip are mounted.

Note:

The adhesive strength is created under pressure. The final strength is achieved after approx. 48 hours at room temperature.

4.1.2 Mounting the encoder

Attach the encoder [4] to the moving part of the system so that the reference edge of the encoder is flush with the edge of the magnetic tape. The reference edge of the encoder is identified by a mark on the front.

- ✓ The encoder is mounted.

Note:

The distance between the cover strip and the encoder must be $0.2 \pm 0.1 \text{ mm}$. The use of a feeler gauge is recommended for setting the correct distance.

Make sure that the minimum cable bending radius of 40 mm is not undercut!

4.2 Mounting the HIWIN MAGIC-PG – HG and QH series

4.2.1 Assembly of the profile rails

Mount the linear guideways according to the “Linear guideways” assembly instructions.

4.2.2 Mounting the magnetic and cover strip

The magnetic and cover strip must be glued in place after the rails have been mounted.

Spare parts required to replace the pressure roller:

1 pc. 8-18-0011 Slide bearing

1 pc. 8-12-0144 Castor

Note:

Check the pressure roller inside the installation aid for any damage before use and replace it if necessary. Uneven surfaces on the roller can deform and damage the magnetic tape during installation.

Assembly steps:

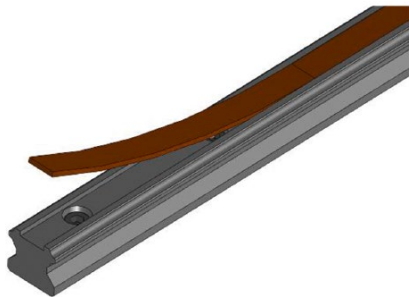
- ▶ Pull the block off the rail.

Note:

For this purpose, use the installation aid supplied to prevent balls from falling out.

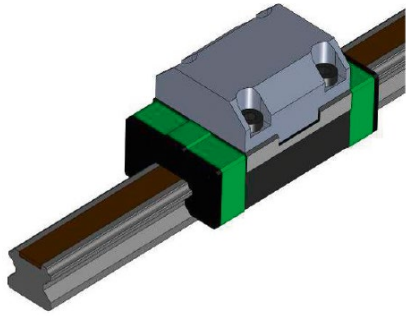
- ▶ Clean the groove thoroughly with alcohol or isopropanol so that it is free of grease and dust.
- ▶ Pull the adhesive foil off the magnetic tape. Insert the magnetic tape evenly into the groove by hand with the adhesive surface facing the profile rail (see [Fig. 4.2](#)).

Fig. 4.2: Inserting the magnetic tape



- ▶ Check in advance that the pressure roller inside the assembly tool is free of grease.
- ▶ Pull the assembly tool onto the linear guideway using the supplied installation aid (see “Linear guideways” assembly instructions).
- ▶ Proceed with the assembly tool a few times along the entire length of the profile rail. Then remove the assembly tool.

Fig. 4.3: Mounting tool for pressing on the magnetic tape



- ▶ Degrease the surface of the magnetic tape with alcohol or isopropanol.
- ▶ Stick the cover strip onto the magnetic tape. Make sure that there are no bubbles under the tape when gluing.
- ▶ Press the cover strip on with the assembly tool as well.
- ▶ Grease the rail and cover strip to prevent corrosion and dry running of the sealing lip (light lubricating film)
- ▶ Pull the block back onto the rail. Make sure that no balls fall out.
- ✓ The magnetic tape and the cover strip are mounted.

Note:

The adhesive strength is created under pressure. The final strength is achieved after approx. 48 hours at room temperature.

4.2.3 Mounting the MAGIC-PG encoder

The encoder is delivered pre-assembled on the block as shown in Fig. 4.4. The standard alignment is shown. The assembly steps apply to all 4 possible orientations of the encoder (see "Linear motors and distance measuring systems" catalogue). To mount the block on the linear guideway, please refer to the "Linear guideways" assembly instructions.

Fig. 4.4: MAGIC-PG encoder pre-mounted on the block

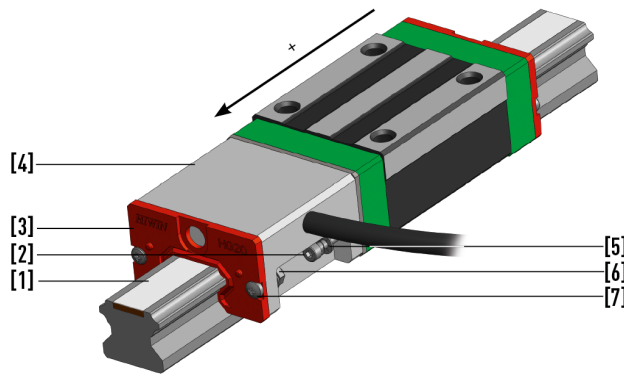


Table 4.1: MAGIC-PG – HG and QH series

Art. no.	Name	Art. no.	Name
1	Cover strip	5	Lock washer
2	Screws	6	Nut
3	Wiper	7	Screws
4	Encoder		

Note:

When mounting the MAGIC-PG encoder, make sure that the minimum cable bending radius of 40 mm is not undercut!

Assembly steps:

- ▶ The MAGIC-PG encoder must be adjusted in height. Please refer to [Fig. 4.4](#).
- ▶ Dismantle the wiper [3] by loosening the screws [7].
- ▶ Set the distance between the cover strip [1] and the MAGIC-PG encoder [4] to 0.2 ±0.1 mm. To do this, loosen the screws [2]. The use of a feeler gauge is recommended for adjustment.
- ▶ Fix the encoder by tightening the screws [2] with 1 Nm.
- ▶ Fasten the wiper [3] to the MAGIC-PG encoder using screws [7], nuts [6] and the lock washers in such a way that the sealing lip rests lightly against the rail contour on all sides.
- ✓ The MAGIC-PG encoder is mounted.

4.2.4 Replacing the MAGIC-PG encoder

Note:
To replace the MAGIC-PG encoder, the block on which the MAGIC-PG encoder is to be replaced must be mounted on the profile rail.

Note:
The deflection unit [7] must not be disassembled!

Assembly steps:

- ▶ On the side where the MAGIC-PG encoder [6] is to be replaced, remove the wiper [5] by loosening the screws [4].
- ▶ Disassemble the defective MAGIC-PG encoder [6] by loosening the screws [9].

Fig. 4.5: Replacing the MAGIC-PG encoder

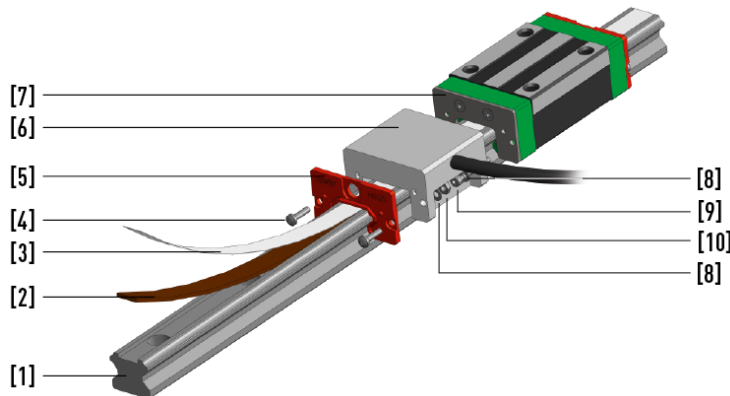


Table 4.2: Replacement of MAGIC-PG encoder – HG and QH series

Art. no.	Name	Art. no.	Name
1	Profile rail	6	Encoder
2	Magnetic scale	7	Deflection unit
3	Cover strip	8	Lock washer
4	Screws	9	Screws
5	Wiper	10	Nut

Note:

The new MAGIC-PG encoder can be mounted in two directions depending on the desired counting direction and/or cable output side. The counting direction results as shown in the "Linear motors and distance measuring system" catalogue when the cable is connected according to [Table 5.1](#).

- ▶ Attach the new MAGIC-PG encoder [6] to the recirculation [7] with the screws [9] as well as the lock washers [8] according to [Fig. 4.5](#). Only lightly tighten the screws [9].
- ▶ Set the distance between the cover strip [3] and the MAGIC-PG encoder [6] to 0.2 ± 0.1 mm. To do this, loosen the screws [9]. The use of a feeler gauge is recommended for adjustment.
- ▶ Fix the encoder by tightening the screws [9] with 1 Nm.
- ▶ Fasten the wiper [5] to the MAGIC-PG encoder using screws [4], nuts [10] and lock washers [8] in such a way that the sealing lip rests lightly against the rail contour on all sides.
- ✓ The MAGIC-PG encoder is replaced.

4.3 Mounting the HIWIN MAGIC-PG – CG series

4.3.1 Assembly of the profile rails

- ▶ Mount the linear guideways according to the "Linear guideways" assembly instructions.

4.3.2 Mounting the magnetic tape

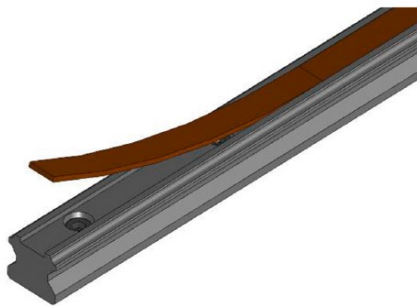
- ▶ Pull the block off the rail.

Note:

For this purpose, use the installation aid supplied to prevent balls from falling out.

- ▶ Clean the groove thoroughly with alcohol or isopropanol so that it is free of grease and dust.
- ▶ Insert the magnetic tape with the black side facing upwards (see [Fig. 4.6](#))

Fig. 4.6: Inserting the magnetic tape



- ✓ The magnetic tape is mounted.

4.3.3 Mounting the cover strip

Note:

For assembled profile rails, the cover strip is delivered in the required length and with finished ends according to [Table 4.3](#).

Note:

We recommend using the assembly and disassembly tool from HIWIN for mounting the cover strip. Information on the disassembly tool can be found in [section 9.2 Assembly/disassembly tool for cover strip](#).

Note:

Mounting the cover strip secures the magnetic tape underneath and protects it from soiling.

- ▶ Clean the cover strip with a suitable cleaning agent.
- ▶ Place the cover strip on the profile rail

Fig. 4.7: Cover strip with finished ends and distance L_s

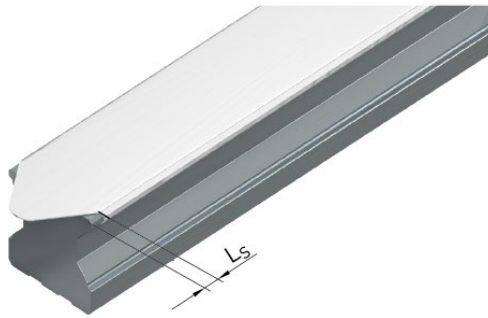


Table 4.3: Strip end distance

Size	Distance L_s [mm]
15	5.0
20	8.0
25	9.5
30	10.0
35	10.0
45	11.0
55	12.0
65	14.5

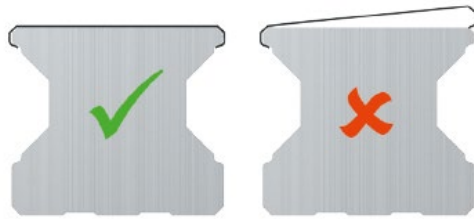
- ▶ Maintain distance L_s in accordance with [Table 4.3](#).
- ▶ Starting from one side, clamp the cover strip onto the profile rail over a length of approx. 15 cm.
- ▶ Press down the cover strip fold on the reference side of the profile rail.
- ▶ Starting from the front side, press on the second fold of the cover strip.

Fig. 4.8: Fitting the beginning of the tape



- ✓ The cover strip is resting flush on the upper side of the profile rail.

Fig. 4.9: Correctly and incorrectly fitted cover strip



- ▶ Place the assembly tool on the front side. (See Fig. 4.10)
- ▶ Push the assembly tool over the entire rail.

Fig. 4.10: Mounting the cover strip using the assembly tool



- ▶ Carefully bend the two strip ends of the cover strip with a rubber hammer.

Fig. 4.11: Bending over the strip ends



- ✓ The cover strip has been mounted.

4.3.4 Mounting the MAGIC-PG encoder

The encoder is delivered pre-assembled on the block as shown in Fig. 4.12. The standard alignment is shown. The assembly steps apply to all 4 possible orientations of the encoder (see "Linear motors and distance measuring systems" catalogue). To mount the block on the linear guideway, please refer to the "Linear guideways" assembly instructions.

Fig. 4.12: MAGIC-PG encoder pre-mounted on the CG block

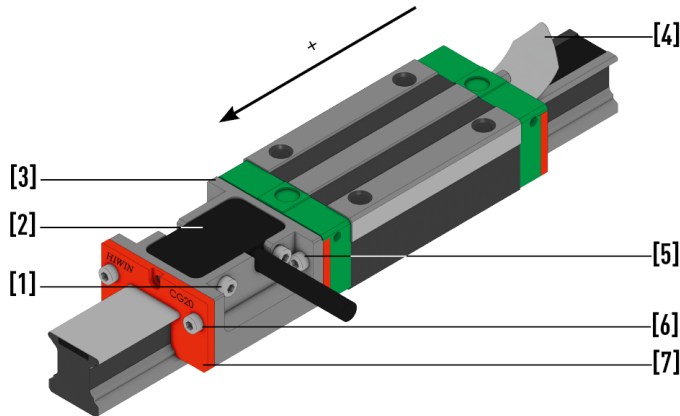


Table 4.4: MAGIC-PG – CG series

Art. no.	Name	Art. no.	Name
1	Screws A	5	Screws B
2	Encoder	6	Wiper screw
3	Encoder housing	7	Wiper
4	Cover strip		

Note:

When mounting the MAGIC-PG encoder, make sure that the minimum cable bending radius of 40 mm is not undercut!

Note for MAGIC CG_45:

- The encoder must be mounted on the same side of the rail as the magnetic tape (the magnetic tape is not centred in the rail).
- An additional cover is mounted on the encoder housing [3].

Assembly steps:

- ▶ Dismantle the wiper [7] by loosening the screws [6].
- ▶ Loosen screws A [1] and B [5].
- ✓ The encoder [2] can now be moved.
- ▶ Set the distance between the cover strip [4] and the MAGIC-PG encoder [2] to 0.2 ±0.1 mm. The use of a feeler gauge is recommended for adjustment.
- ▶ Fix the encoder by tightening screws A [1] and B [5].

Note:

Tighten the screws with a torque of 1 Nm.

- ▶ Attach the wiper [7] to the MAGIC-PG encoder using screws [6] so that the sealing lip rests lightly against the rail contour on all sides.
- ✓ The MAGIC-PG encoder is mounted.

4.3.5 Replacing the MAGIC-PG encoder

Fig. 4.13: Replacing the MAGIC-PG encoder (CG)

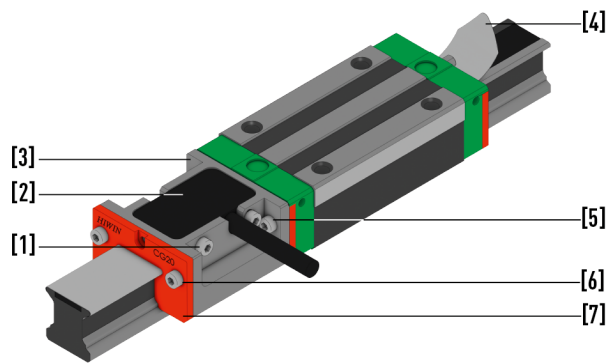


Table 4.5: Replacing the MAGIC-PG encoder – CG series

Art. no.	Name	Art. no.	Name
1	Screws A	5	Screws B
2	Encoder	6	Wiper screw
3	Encoder housing	7	Wiper
4	Cover strip		

Assembly steps:

- ▶ Loosen and remove screws A [1] and B [5].
- ▶ Remove the MAGIC-PG encoder [2].

Note:

The new MAGIC-PG encoder can be mounted in two directions depending on the desired counting direction and/or cable output side. The counting direction results as shown in the “Linear motors and distance measuring system” catalogue when the cable is connected according to [Table 5.1](#).

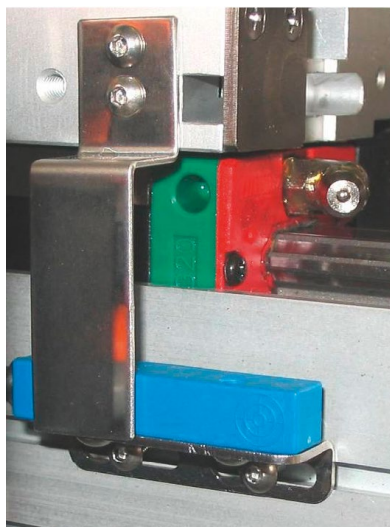
- ▶ Insert the new MAGIC-PG encoder [2] into the housing [3].
- ▶ Fasten the new MAGIC-PG encoder [2] with screws A [1] and B [5]. Only lightly tighten the screws.
- ▶ Set the distance between the cover strip [4] and the MAGIC-PG encoder [2] to 0.2 ± 0.1 mm. The use of a feeler gauge is recommended for adjustment.
- ▶ Fix the encoder by tightening screws A [1] and B [5].
- ▶ Attach the wiper [7] to the MAGIC-PG encoder using screws [6] so that the sealing lip rests lightly against the rail contour on all sides.
- ✓ The MAGIC-PG encoder is replaced.

4.4 Reference switch

The reference switch is usually attached to the fixed part of the system and a switching lug to the moving part.

The distance between the switching lug and the switch must not exceed 2 mm (see "Linear motors and distance measuring systems" catalogue).

Fig. 4.14: Reference switch and switching lug (installation example of linear motor axis)



5 Electrical connection

⚠ Warning! Danger due to electrical voltage!

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

- ▶ Make sure that the system (e.g. linear motor axis) is properly earthed via the PE rail in the switch cabinet before connecting the electrical power supply!
- ▶ Electrical currents can also flow when the motor is not moving. Never disconnect electrical connections while they are live. In unfavourable cases, electric arcs can occur and injure persons and damage contacts!
- ▶ Observe the assembly instructions of the other system components (e.g. linear motor, servo drive)!

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!

5.1 Cable and plug

The cable at the encoder is a maximum of 5 m long. Up to a length of 5 m, the voltage drop is minimal and the encoder complies with EMC interference immunity according to EN61000-4-4, test severity level 3.

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 8-core extension cables (each: V1+/V1-, V2+/V2- and V0+/V0- or: A, \bar{A} and B, \bar{B} and Z, \bar{Z} for digital signals according to RS422, twisted pair and double shielded) are supplied with a single-sided round connector (coupling, female) or are customised.

Keeping the sensor cable as short as possible is also recommended when using the sensor near an EMC interference source, e.g. a linear motor. Generally, the shorter the line, the lower the sensitivity to interference.

Up to a cable length of 500 mm and use of the described plug and the prescribed extension cable, test severity level 4 is also achieved with insulation of the encoder housing to machine ground with an insulation thickness greater than 4 kV in accordance with EN61000-4-4.

[Table 5.1](#) shows the assignment of the open cable ends and the optionally available round plug. The structure of this plug is illustrated at [Fig. 5.1](#).

Note:

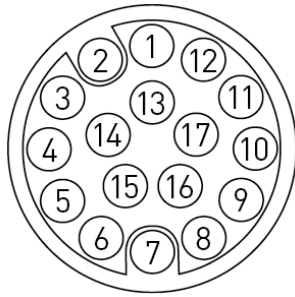
To avoid EMC interference in the encoder signal, the encoder cable extension must be shielded and the shielding must be contacted over a wide area via the plugs. High-quality, fully shielded plugs must be used.

Table 5.1: Line and plug assignments

Colour of encoder cable	Round plug pin no.	Signal
Brown	4 and 5	Power supply 5 V
White	12 and 13	GND / 0 V
Green	9	V1+ / A
Yellow	1	V1- / \bar{A}
Blue	10	V2+ / B
Red	2	V2- / \bar{B}
Purple	3	Ref+ / Z
Grey	11	Ref- / \bar{Z}
	Plug connector housing	Shielding

If the encoder is connected according to Table 5.1, the counting direction (with the encoder in motion) results according to the definitions in illustrations Fig. 4.1 and Fig. 4.4. If you wish to have a positive counting direction in the opposite direction, when connecting to the electronic evaluation system, you must switch "A" with "B" and " \bar{A} " with " \bar{B} ".

Fig. 5.1: PIN assignment of the round plug



5.2 Sequential control

Fig. 5.2 Fig. 5.3 shows the recommended circuits of the subsequent electronics for the individual channels for the analogue and the digital encoder.

Fig. 5.2: Recommended switching of the downstream electronic components with sin/cos $1V_{SS}$ output

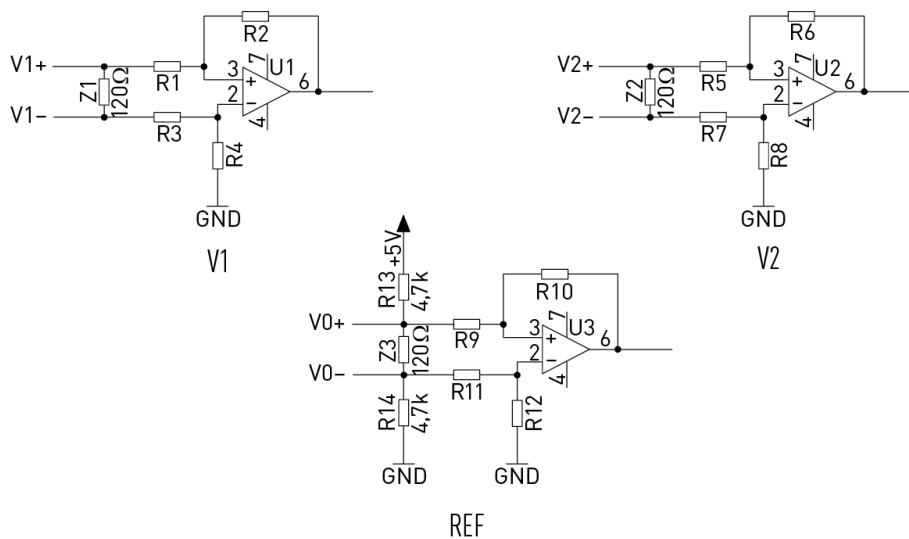
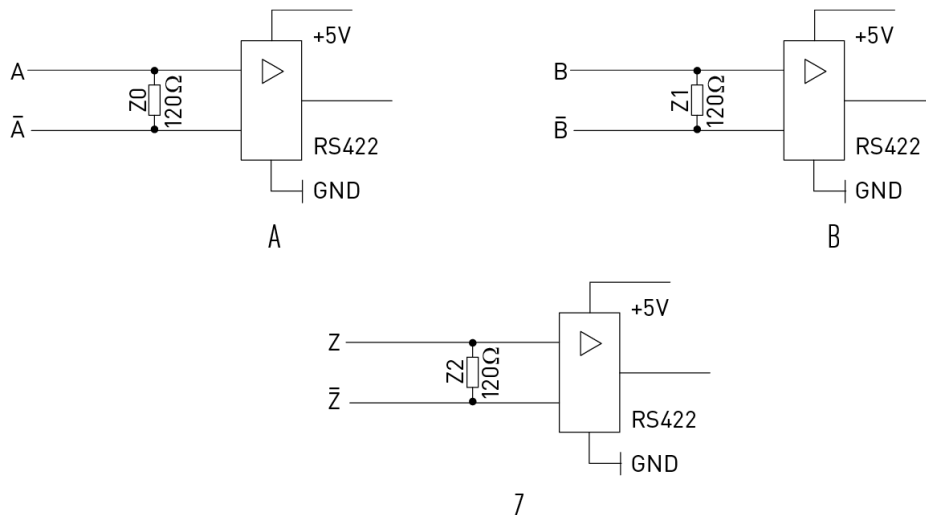


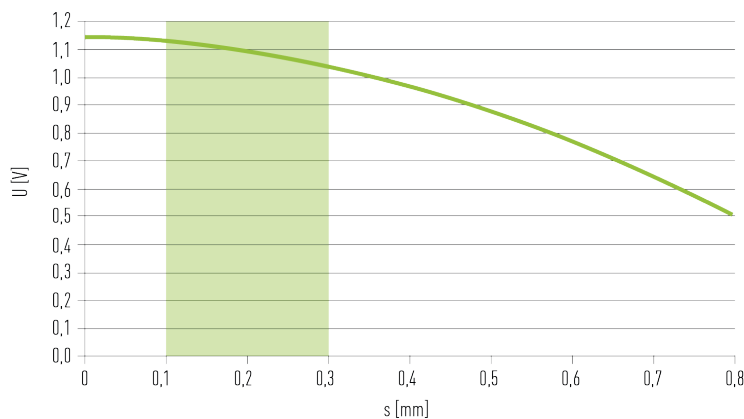
Fig. 5.3: Recommended switching of the downstream electronic components with digital TTL output



5.3 Voltage amplitude

Output voltage U of the encoder ($1 V_{ss}$) depends on its distance from the magnetic tape. The correlation between voltage amplitude U and encoder distance s is illustrated by Fig. 5.4, the recommended range for the reading distance is marked in green.

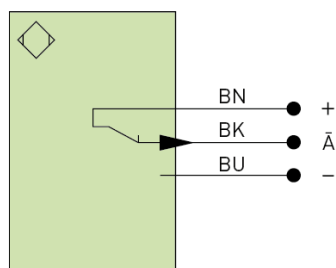
Fig. 5.4: Voltage amplitude U over reading distance s



5.4 Reference switch

The reference switch must be connected according to Fig. 5.5.

Fig. 5.5: Circuit diagram of the optional reference switch



Explanation of symbols

- + Power supply "+"
- Supply voltage "0 V"
- \bar{A} Switching output / NC contact (NC)

Core colours

- BN Brown
- BK Black
- BU Blue

6 Commissioning

Note:

Observe the assembly instructions of the other system components (e.g. linear motor, servo amplifier)!

The following sequence must be observed when commissioning the distance measuring system:

- ▶ Connect encoder
- ▶ Apply supply voltage (5 V)
- ▶ Do not exceed the operating voltage, otherwise the encoder may be destroyed!
- ▶ Check output signal e.g. with an oscilloscope

7 Maintenance

⚠ Warning! Danger due to electrical voltage!

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

- ▶ Make sure that the system (e.g. linear motor axis) is properly earthed via the PE rail in the switch cabinet before connecting the electrical power supply!
- ▶ Electrical currents can also flow when the motor is not moving. Never disconnect electrical connections while they are live. In unfavourable cases, electric arcs can occur and injure persons and damage contacts!
- ▶ Observe the assembly instructions of the other system components (e.g. linear motor, servo drive)!

The distance measuring system works without making contact and thus in principle maintenance-free. However, it must be regularly checked for dirt and, if necessary, cleaned with a suitable cleaning agent (e.g. alcohol). Dirt particles between the encoder and the measuring tape can destroy the distance measuring system.

Note:

After maintenance work, re-grease steel parts to avoid corrosion!

8 Disposal

! **Caution!** Environmentally hazardous substances!

The risk posed to the environment depends on the type of materials used.

- ▶ Always clean contaminated components before disposal!
- ▶ Clarify proper disposal with disposal companies and, if necessary, with the responsible authorities!

Table 8.1: 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
Block	
Steel components	Sort by type before disposal
Plastic components	Dispose of as residual waste
Distance measuring system	
Cabling, electrical components	Dispose of as electrical waste
Profile rails	
Steel components	Sort by type before disposal
Plastic cover caps	Dispose of as residual waste

9 Spare parts and accessories

9.1 Article numbers of the individual parts

Reference switch

8-14-0002	Reference switch with 2 m cable
8-14-0040	Reference switch with 4 m cable
8-12-0011	Mounting bracket for reference switch (for connection cable of the MAGIC encoder)
Round plug	
8-10-0222	Coupling, 17-pin, central fixing, external thread M17 × 1 (Type: NAKUA874MR1087004A000, InterContec), mounted Define cable length when ordering!
8-10-0090	Mating connector, 17-pin, union nut M17 × 1 (Type: ASTA876FR0785001A000, InterContec)

Assembly tool for MAGIC-PG

8-12-0139	For all HG20 rails
8-12-0165	For all HG25 rails
8-18-0011	Replacement slide bearing
8-12-0144	Replacement castor

9.2 Assembly/disassembly tool for cover strip

Size (all series)	Article number
15	5-002557
20	5-002417
25	5-002416
30	5-002554
35	5-002555
45	5-002556

9.3 Order code for HIWIN MAGIC-PG linear guideway

Number	1	2	3	4	5	6	7	8	9	10	11
Order code	PG	H	W	20	C	A	1	/2	T	1600	ZA
1	PG	PG series									
2	H	H: Based on HG series Q: Based on QH series C: Based on CG series									
3	W	Block type: W: Flange block H: High square block L: Low square block									
4	20	Size: 20, 25 ¹⁾									
5	C	Load type: S: Medium load C: Heavy load H: Super heavy load									
6	A	Block fastening: A: From above C: From above or below									
7	1	Total number of blocks with sensors per axis ²⁾									
8	/2	Block per axis ²⁾									
9	T	Rail mounting: R: From above T: From below (HGR20 only)									
10	1,600	Length of rail [mm]									
11	ZA	Preload ID: Z0, ZA, ZB									

Number	1	2	3	4	5	6	7	8	9	10	11
Continuation of order code	H	1	/2	KK	E2	M	A	M	2500	L	1
1	H	Accuracy class: H									
2	1	Number of rails With measuring system									
3	/2	Rails per axis ³⁾									
4	KK	Dust protection ⁴⁾ : SS, ZZ									
5	E2	None: Standard E2: With E2 oil lubrication unit									
6	M	Measuring system model: M: MAGIC									
7	A	Output signal: A: Analogue 1 V _{SS} D: Digital TTL									
8	M	Index: M: Multi-index									
9	2,500	Cable length [mm] ⁵⁾									
10	L	Cable assembly: L: Open end ⁵⁾ R: Round connector M17 (male connector) ⁷⁾ S: Sub-D plug for PMED display ⁶⁾									
11	1	Encoder alignment ⁸⁾ : 1: Alignment 1 (standard) 2: Alignment 2 3: Alignment 3 4: Alignment 4									

Notes:

- 1) PGH, PGQ: not identical in construction with standard rail HGR25R without groove. Mounting bolt M5 instead of M6
- 2) For the PG series, the total number of blocks per axis is specified (all blocks of the ordered item)
- 3) The number 2 is also a quantity indication, i.e. one piece of the article described above consists of one pair of rails. No number is given for single profile rails.
- 4) If not specified, the block is supplied with standard dust protection (standard end seal and bottom seal).
- 5) For open ends, select cable length 1,000 by default (max. length PGH, PGQ: 5,000 mm; PGC: 1,000 mm).
- 6) The display must be ordered separately.
- 7) Suitable for the pre-assembled HIWIN extension cable, see section [5.1 Cable and plug](#)
- 8) See "Linear motors and distance measuring systems" catalogue

9.4 Order code for HIWIN MAGIC

9.4.1 Order code for magnetic tape distance measuring system HIWIN MAGIC

Number	1	2	3	4
Order code	MAGIC	PS	B	XXXX
1	MAGIC	Distance measuring system model		
2	PS	PS: Magnetic scale		
3	B	Division: 1: 1 mm		
4	XXXX	Length [mm]		

9.4.2 Order code for encoder for distance measuring system HIWIN MAGIC

Number	1	2	3	4	5	6
Order code	MAGIC	T	A	M	1500	L
1	MAGIC	Distance measuring system model				
2	T	Encoder model				
3	A	Output signal: A: Analogue 1 V _{SS} D: Digital TTL				
4	M	Index: M: Multi-index				
5	1,500	Cable length [mm] ¹⁾				
6	L	Cable assembly: L: Open end ¹⁾ R: Round connector M17 (male connector) ²⁾ S: Sub-D plug for PMED display ³⁾				

Notes:

¹⁾ For open ends, select cable length 1,000 by default

²⁾ Suitable for the pre-assembled HIWIN extension cable, see section [5.1 Cable and plug](#)

³⁾ The display must be ordered separately

10 Declaration of conformity

According to **EMC Directive 2014/35/EU**

Name and address of the manufacturer:

HIWIN MIKROSYSTEM CORP
 No.6, Jingke Central Rd.,
 Taichung Precision Machinery Park,
 Taichung 40852, Taiwan

This declaration refers exclusively to the product in the state in which it is placed on the market and expressly excludes components added and/or modifications made to the product by the user at a later date. This declaration is null and void if changes are made to the product without the express consent of the manufacturer.

We hereby declare that the product described below:

Product designation	MAGIC Positioning Measurement Systems
Model/Type:	PM-B-xx-xx-x
Year of manufacture	From 2016

Complies with all relevant requirements of EU Directive **2014/30/EU** (EMC/Directive).
 In addition, the product complies with the requirements of **Delegated Directive (EU) 2015/863** (Amendment to Annex II of Directive 2011/65/EU RoHS Directive).

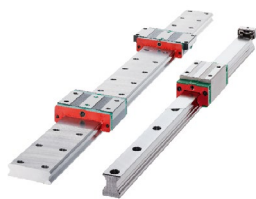
Applicable harmonised standards:

- EN 61000-6-2** Electromagnetic Compatibility (EMC) 2005
 Part 6-2: Basic technical standards - Immunity for industrial environments
- EN 61000-6-4** Electromagnetic Compatibility (EMC) 2007 + A1: 2011
 Part 6-4: Basic technical standards - Emission standard for industrial areas

Additional notes:

The product is intended for installation in machinery and therefore does not satisfy the requirements for a complete machine in the sense of the Machinery Directive. The product may only be put into service when installed as part of a complete machine that complies in its entirety with the provisions of the Machinery Directive.
 A safety assessment (electrical and/or mechanical) of the product may only be carried out after installation in a machine for the intended use.
 After installation and use as a component of a machine, the product may have an influence on the EMC properties of this machine. The assessment of the EMC behaviour of the complete machine must therefore be carried out by its manufacturer or distributor.

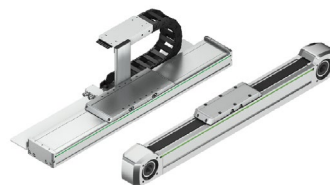
We live motion.



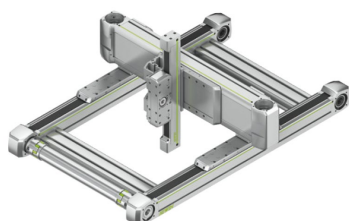
Linear guideways



Ballscrews



Linear axes



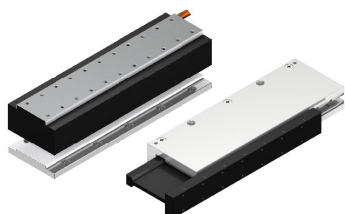
Linear axis systems



Torque motors



Robot



Linear motors



Rotary tables



Servo drives and servo motors

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