

Assembly Instructions

HIWIN MAGIC Positioning Measurement Systems

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1. General information

1.1 About these assembly instructions

These assembly instructions are intended for planners, developers and operators of systems into which the positioning measurement systems described are to be integrated. They are also intended for people who perform the following tasks:

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

1.1.1 Applicability of these assembly instructions

These assembly instructions are applicable to HIWIN positioning measurement 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 practices for HIWIN positioning measurement systems MAGIC and MAGIC-PG and have read and understood these assembly instructions in full;
- maintenance personnel maintain and repair the HIWIN positioning measurement systems MAGIC and MAGIC-PG in such a way that they pose no danger to people, property or the environment.

1.1.3 Availability

These assembly instructions must remain constantly available to all persons who work with or on the HIWIN positioning measurement systems MAGIC and MAGIC-PG.

1.2 Depictions used in these assembly instructions

1.2.1 Instructions

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

Example:

...

- ▶ Fix the encoder by tightening the screws [7] with 1 Nm.
- ▶ Fasten the end seal [14] onto the MAGIC-PG encoder [5] using screws [11], nuts [10] and lock washers [9]. Make sure that the end seal's complete sealing lip lightly touches the outline of the profile rail.

✓ The MAGIC-PG encoder has now been mounted.

1.2.2 Lists

Lists are indicated by bullet points.

Example:

Two types are available:

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

1.2.3 Depiction of safety notices

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

The following signal words and risk levels are used:

 DANGER!
Imminent danger! Noncompliance with the safety notices will result in serious injury or death!
 WARNING!
Potentially dangerous situation! Noncompliance with the safety notices runs the risk of serious injury or death!
 CAUTION!
Potentially dangerous situation! Noncompliance with the safety notices runs the risk of slight to moderate injury!
ATTENTION!
Potentially dangerous situation! Noncompliance with the safety notices runs the risk of damage to property or environmental pollution!

1.2.4 Symbols used

The following symbols are used in these assembly instructions:

Table 1.1 **Warning signs**

	Warning of dangerous electrical voltage!		Substance hazardous to the environment!
---	--	---	---

1.2.5 Information

NOTE

Describes general information and recommendations.

General information

1.3 Warranty and liability

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

1.4 Manufacturer's details

Table 1.2 **Manufacturer's details**

Address	HIWIN GmbH Brücklesbünd 2 D-77654 Offenburg
Phone	+49 (0) 781 / 9 32 78 - 0
Technical customer service	+49 (0) 781 / 9 32 78 - 77
Fax	+49 (0) 781 / 9 32 78 - 90
Technical customer service fax	+49 (0) 781 / 9 32 78 - 97
E-mail	support@hiwin.de
Website	www.hiwin.de

1.5 Copyright

These assembly instructions are protected by copyright. Any reproduction, publication in whole or in part, modification or abridgement requires the written approval of HIWIN GmbH.

1.6 Product monitoring

Please inform HIWIN, the manufacturer of the HIWIN positioning measurement systems MAGIC and MAGIC-PG of:

- Accidents
- Potential sources of danger in the positioning measurement systems MAGIC and MAGIC-PG
- Anything in these assembly instructions which is difficult to understand

2. Basic safety notices

WARNING!

This chapter serves the safety of everybody who is present in the area around mobile systems and assembles, installs, connects, operates, maintains or disassembles the positioning measurement systems described.

2.1 Intended use

The HIWIN MAGIC is a magnetic positioning measurement system for measuring tasks with linear movement within an automated system. It is used, above all, in linear motors.

The positioning measurement systems named may not be used outdoors or in hazardous areas where there is a risk of explosions. The positioning measurement systems may only be used as described for the intended purpose.

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

No changes may be made to the positioning measurement systems that are not described in these assembly instructions. If it is necessary to change the design, please contact the manufacturer.

In the event of alterations or improper assembly, installation, putting into operation, maintenance or repair, the manufacturer assumes no liability.

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

2.3 Qualified personnel

The positioning measurement system may only be assembled, integrated into higher-level systems, put into operation, operated and maintained by qualified personnel. Qualified personnel are those who:

- has suitable technical training and
- has been trained to operate the machine by the machine operator, received instruction in the applicable safety guidelines from the machine operator and can assess the risks to be expected and
- has read and understood these assembly instructions in their entirety and has access to them at all times.

2.4 General safety information

WARNING!

Danger of serious or fatal injuries!

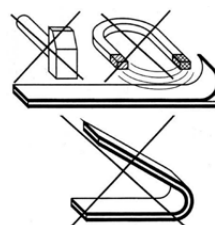
- ▶ Before and during all assembly, disassembly or repair work, the positioning measurement system and/or the higher-level system must be disconnected from the power supply, and you must ensure that the power supply cannot be restored by anyone else!
- ▶ The positioning measurement systems must not be used in hazardous areas where there is risk of explosions!
- ▶ The positioning measurement systems may only be used and operated indoors!

2.5 Safety information for storage and transportation

The positioning measurement systems are shipped in suitable packaging. The systems must be left in this packaging until they are built.

The positioning measurement systems must be stored so that they are dry and protected against shocks.

During storage and transportation, there may be no heavy objects on the products.



Basic safety notices

NOTE

The measuring scale of the magnetic positioning measurement systems must not be subjected to any strong magnetic fields (keep it away from permanent magnets of linear motor axes!). Strong shocks (e.g. hammer blows) can also damage the magnetization of the measuring scale.

2.6 Safety information on handling current-carrying, live products

 **WARNING!**



Danger from electrical voltage!

Before and during assembly, disassembly and repair work, dangerous currents may flow.

- ▶ Before connecting the electrical power supply, ensure that the system (e.g. linear motor axis) is correctly earthed via the PE rail in the switch cabinet!
- ▶ Electrical currents may flow even if the motor is not moving. Never loosen electrical connections when energized. In unfavourable cases, electric arcs can form, causing injury and damage to contacts!
- ▶ Heed the assembly instructions for the other system components (e.g. linear motor, drive amplifier)!

NOTE

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

2.7 Further information

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

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

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

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

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

3. Product descriptions

The magnetic positioning measurement systems of the HIWIN MAGIC series are optimised for measuring the distances travelled in linear movements and particularly on linear motor axes. They are particularly suitable for use in harsh environmental conditions and are resistant to oil, dirt, vibrations and shocks.

The robust housing is electrically shielded, and signals are output in real time (see Chapters 5 and 9 for more information).

Two types are available:

- HIWIN MAGIC: type with separate encoder
- HIWIN MAGIC-PG: positioning measurement system integrated in a linear guideway

The measuring scale of the magnetic measurement systems may not be subjected to any strong magnetic fields (keep it well away from the permanent magnets of linear motor axes!). Strong shocks (e.g. hammer blows) can also damage the magnetization of the measuring scale.

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

NOTE

3.1 HIWIN MAGIC

This positioning measurement system consists of a separate encoder (Fig. 3.1) and a magnetic scale (Fig. 3.2). The customer can select suitable positions for both of these and install them.



Fig. 3.1 MAGIC encoder



Fig. 3.2 MAGIC magnetic scale

3.2 HIWIN MAGIC-PG

For this type, the positioning measurement system is integrated in a linear guideway. The complete unit is referred to as a positioning guideway (PG).

The encoder is fitted to a standard block. It is suitable for HG-20, HG-25, QH-20 and QH-25 blocks. A magnetic scale is integrated directly in a profile rail (see Fig. 3.3).

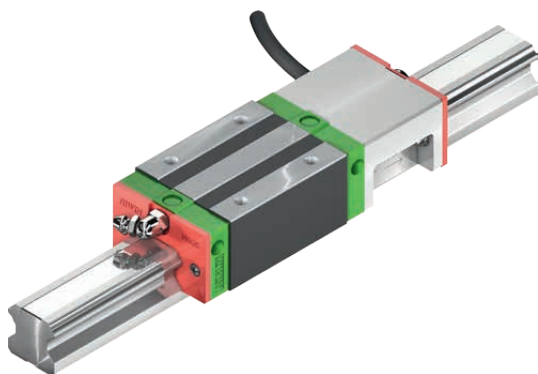


Fig. 3.3 Linear guideway with MAGIC-PG system

NOTE

The magnetic scale is adhered to the rail using a high-strength glue. The effect of the glue can be loosened by certain solvents. If this happens, the magnetic scale can bulge up. This must be prevented by taking additional measures (e.g. additional clamping of the magnetic scale at the ends).

HIWIN GmbH assumes no liability if a scale that was not secured by means of suitable measures should come loose from the rail.

3.3 Connection

The positioning measurement system is connected with the fixed cable mounted on the encoder to a superior controller (e.g. amplifier). It is supplied with a low voltage of 5 V.

The cable can be delivered with open ends (see Fig. 3.4) or optionally converted finished with round plug coupling (see Fig. 3.5).

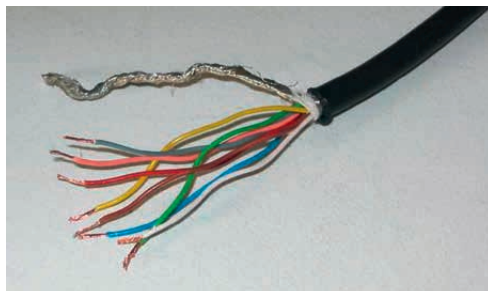


Fig. 3.4 Connection cable with open ends



Fig. 3.5 Cable with coupling (optional)

3.4 Reference switch

The MAGIC encoder delivers index signals at a distance of 1 mm. For the definition of a reference point, a reference switch ("cam switch") is required.

For this purpose, HIWIN offers an inductive proximity switch (see Fig. 3.6).

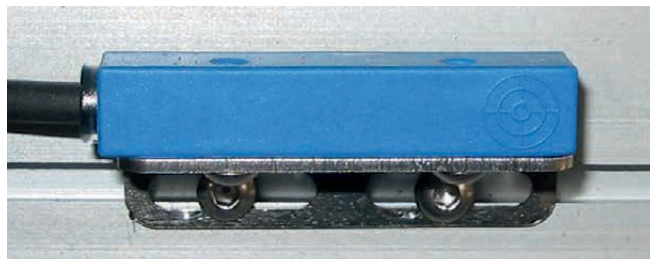


Fig. 3.6 Reference switch on mounting

3.5 Scope of delivery

Depending on customer requirements, the positioning measurement systems MAGIC and MAGIC-PG are offered in different forms and with different scope.

Individual components can be supplied to retrofit existing linear guideway systems.

In addition, HIWIN offers the positioning measurement systems integrated in linear guideways as a complete system.

The standard scope of delivery and the optional accessories are shown in Table 3.1. The item numbers of the individual parts are given in Section 10.1, and the order codes for systems are shown in Section 10.2.

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

Positioning measurement system	MAGIC	MAGIC-PG
Encoder	Select cable length	Select cable length
Magnetic scale (incl. stainless steel protective cover tape)	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 from electrical voltage!

Before and during assembly, disassembly and repair work, dangerous currents may flow.

- ▶ Before and during all assembly, disassembly or repair work, the positioning measurement system and/or the higher-level system must be disconnected from the power supply, and you must ensure that the power supply cannot be restored by anyone else!
- ▶ Electrical currents may flow even if the motor is not moving. Never loosen electrical connections when energized. In unfavourable cases, electric arcs can form, causing injury and damage to contacts!
- ▶ Heed the assembly instructions for the other system components (e.g. linear motor, drive amplifier)!

ATTENTION!

Damage to the HIWIN MAGIC positioning measurement systems!

The measuring scale of the magnetic positioning measurement systems must not be subjected to any strong magnetic fields!

Magnetic dust can falsify the encoder signal or damage the positioning measurement system!

- ▶ Keep the positioning measurement system away from permanent magnets of linear motor axes!
- ▶ Exercise caution when using magnetic devices (gauge holders) to align the profile rails, for example!
- ▶ Avoid strong shocks (e.g. hammer blows)!
- ▶ Do not use the system in environments where there is magnetic dust (e.g. graphite dust)!

ATTENTION!

Damage to the HIWIN MAGIC positioning measurement systems!

Magnetic chippings or other foreign materials can get left on the magnetic scale. This can mechanically destroy the encoder.

- ▶ Regularly check the air gap between the encoder and the magnetic scale and keep it clear.

NOTE

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

NOTE

The numbers used for identification in the assembly instructions are also shown in the item overview in Section 10.1 in order to make it easier to select individual parts.

4.1 Assembly of the HIWIN MAGIC

The following assembly steps for the HIWIN MAGIC are shown in Fig. 4.1.

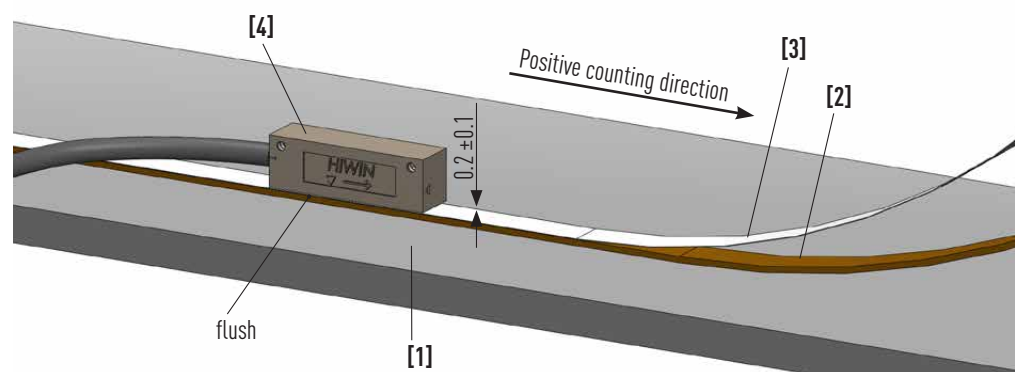


Fig. 4.1 Assembly of the HIWIN MAGIC

4.1.1 Assembly of the magnetic and protective cover tape

The magnetic scale can be mounted on a suitable, even surface selected by the customer parallel to the movement direction on the fixed part of the system. The following criteria must be met:

- Mean surface roughness $R_a \leq 3.2 \mu\text{m}$
- Difference in height (parallelism) in relation to the direction of movement of the encoder: $\leq 0.1 \text{ mm}$
- Lateral parallel deviation in relation to the direction of movement of the encoder $\leq 0.2 \text{ mm}$ (ideally use stop edge)

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

- ▶ **Only remove the protective tape shortly before or during assembly!**

Assembly steps:

- ▶ Clean the surface [1] to which the tape is to be fastened thoroughly with alcohol or isopropyl alcohol .

The surface used for the magnetic scale must be absolutely clean, dry and grease-free! This is the only way to ensure a reliable bond is obtained.

NOTE

- ▶ Glue on the magnetic scale [2], and then use a mounting roller to press it on with a force of approx. 250 N/cm^2 . Ensure that the tape is neither compressed nor overstretched.
- ▶ Clean the surface of the magnetic scale as described above.
- ▶ Glue the protective cover tape [3] onto the magnetic scale. Make sure that no bubbles form under the tape during gluing. Use a mounting roller to press the protective cover tape with a force of approx. 250 N/cm^2 .

- ✓ The magnetic scale and the cover tape have now been mounted.

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

NOTE

4.1.2 Assembly of the encoder

- ▶ Mount the encoder [4] on the moving part of the system, so that the stop edge of the encoder is flush with the edge of the magnetic scale. The stop edge of the encoder is indicated by a mark on the front side.

- ✓ The encoder has now been mounted.

The distance between the stainless steel protective cover tape and the encoder must be $0.2 \pm 0.1 \text{ mm}$. It is advisable to use a feeler gauge to set the correct distance. Make sure that the minimum cable bending radius of 40 mm is not underrun.

NOTE

4.2 Assembly of the HIWIN MAGIC-PG

4.2.1 Assembly of the profile rails

Fit the profile rails as described in the assembly instructions for the linear guideways.

4.2.2 Assembly of the magnetic scale and the protective cover tape

The magnetic scale and protective cover tape must be stuck on after the rails are installed.

Prior to use, the pressure roller inside the fitting tool has to be checked for possible damages and has to be replaced if necessary. Unevenness on the roller might deform and damage the magnetic scale during assembly.

NOTE

Parts required to replace the pressure roller:

1 pcs 8-18-0011 slide bearing

1 pcs 8-12-0144 roller

Assembly

Assembly steps:

The profile rail must be fitted as described in the assembly instructions for linear guideways.

- ▶ Pull the block from the rail (using the assembly aid provided in order to prevent balls from falling out).
- ▶ Clean the groove thoroughly with alcohol or isopropyl alcohol so that it is free of grease and dust.
- ▶ Pull the adhesive film from the magnetic scale. Insert the magnetic scale in the groove by hand with the adhesive surface against the profile rail (see Fig. 4.2).

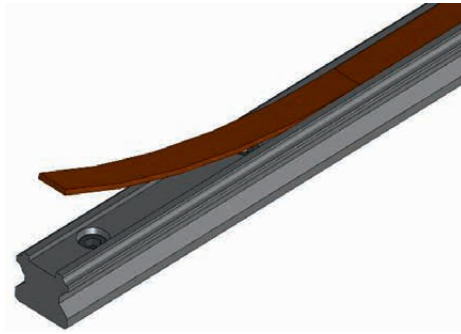


Fig. 4.2 Inserting the magnetic scale

- ▶ Slide the fitting tool onto the profile rail using the assembly aid provided. First check that the pressure roller inside the fitting tool is free of grease. Run the fitting tool along the whole length of the profile rail a number of times. Then remove the fitting tool.

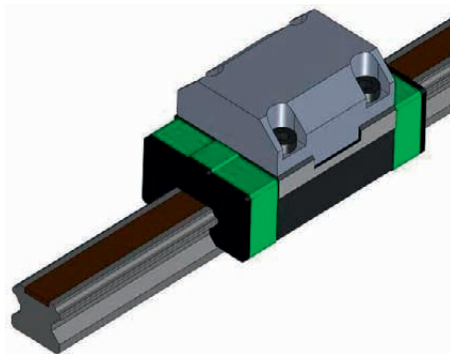


Fig. 4.3 Fitting tool for pressing down on the magnetic scale

- ▶ Use alcohol or isopropyl alcohol to remove grease from the surface of the magnetic scale.
- ▶ Glue the cover tape onto the magnetic scale. Make sure that no bubbles form under the tape during gluing.
- ▶ Press the cover tape down using the fitting tool.
- ▶ **Grease rail and cover tape to prevent corrosion and dry operation of the end seal (thin lubricating film)**
- ▶ Pull the block onto the rail again. Ensure no balls fall out while you are doing this.

✓ The magnetic scale and the cover tape have now been mounted.

NOTE

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

4.2.3 Assembly of the MAGIC-PG encoder

As shown in Fig. 4.4, the encoder is delivered pre-assembled at the block. Shown is the default orientation. The assembly steps below apply to all 4 possible orientations of the encoder (see also Section 9.1). For the assembly of the block on the rail, please refer to the Assembly Instructions "Linear Guideways".

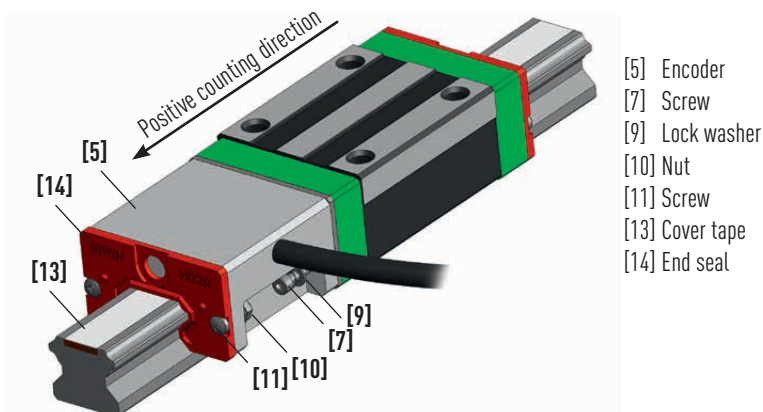


Fig. 4.4 MAGIC-PG encoder, pre-assembled at the block

Assembly steps:

The height of the encoder must be adjusted (please refer to Fig. 4.4).

- ▶ Remove the end seal [14] by loosening the screws [11].
- ▶ **Adjust the distance between the cover tape [13] and the MAGIC-PG encoder [5] to 0.2 ± 0.1 mm. It is recommended to use a feeler gauge to set the correct distance.**
- ▶ Fix the encoder by tightening the screws [7] with 1 Nm.
- ▶ Fasten the end seal [14] onto the MAGIC-PG encoder [5] using screws [11], nuts [10] and lock washers [9]. Make sure that the end seal's complete sealing lip lightly touches the outline of the profile rail.

✓ The MAGIC-PG encoder has now been mounted.

4.2.4 Replacement of the MAGIC-PG encoder

To replace the MAGIC-PG encoder, the block with the MAGIC-PG encoder that should be replaced, has to be mounted on the profile rail.

NOTE

- ▶ On the side where the MAGIC-PG encoder [5] should be replaced, remove the end seal [14] by loosening the screws [11].
- ▶ Remove the defective MAGIC-PG encoder [5] by loosening the screws [7].

Do not disassemble the recirculation unit [8]!

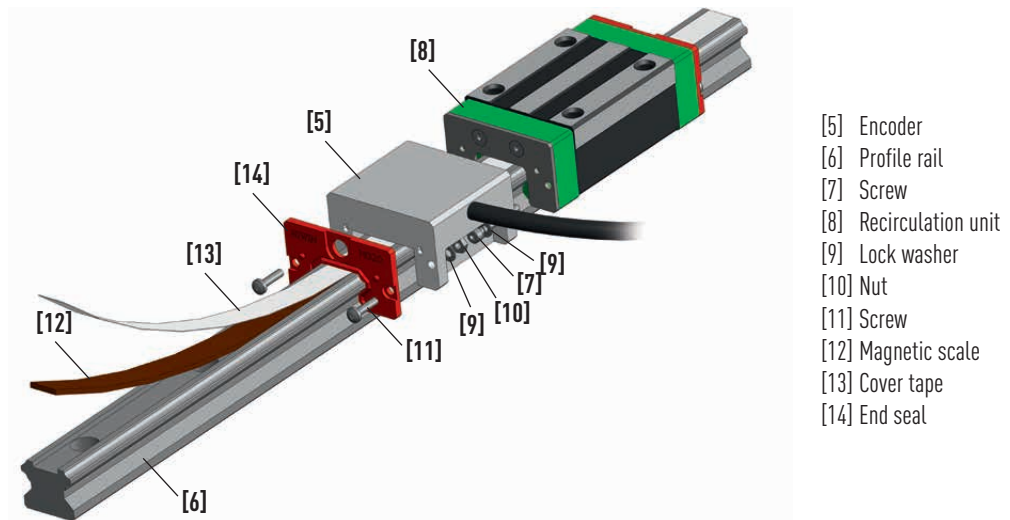


Fig. 4.5 Replacement of the MAGIC-PG encoder

The MAGIC-PG encoder can be mounted in two directions – depending on the desired counting direction and/or cable outlet side. **The counting direction is as shown in Section 9.1 if the cable is connected as in Table 5.1.**

- ▶ Fasten the new MAGIC-PG encoder [5] onto the recirculation unit [8] using the screws [7] and the lock washers [9] (see Fig. 4.5). Do not tighten screws [7] all the way
- ▶ **Adjust the distance between the cover tape [13] and the MAGIC-PG encoder [5] to 0.2 ± 0.1 mm. It is recommended to use a feeler gauge to set the correct distance.**
- ▶ Fix the encoder by tightening the screws [7] with 1 Nm.
- ▶ Fasten the end seal [14] onto the MAGIC-PG encoder [5] using screws [11], nuts [10] and lock washers [9]. Make sure that the end seal's complete sealing lip lightly touches the outline of the profile rail.

NOTE

When assembling the MAGIC-PG encoder, ensure that you do not violate the connecting cable's minimum bending radius of 40 mm.

- ✓ The MAGIC-PG encoder has now been replaced.

4.3 Reference switch

The reference switch is generally fitted to the fixed part of the system, and a cam switch is fitted to the moving part. The distance between the cam switch and switch must not be more than 2 mm (see the technical data in Section 9.5).

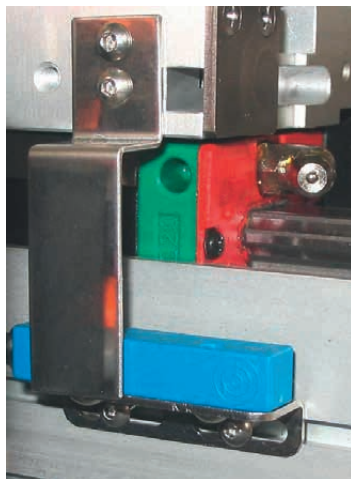


Fig. 4.6 Reference switch and cam switch (linear motor axis installation example)

5. Electrical connection

WARNING!



Danger from electrical voltage!

Before and during assembly, disassembly and repair work, dangerous currents may flow.

- ▶ Before connecting the electrical power supply, ensure that the system (e.g. linear motor axis) is correctly earthed via the PE rail in the switch cabinet!
- ▶ Electrical currents may flow even if the motor is not moving. Never loosen electrical connections when energized. In unfavourable cases, electric arcs can form, causing injury and damage to contacts!
- ▶ Heed the assembly instructions for the other system components (e.g. linear motor, drive amplifier)!

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

NOTE

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

NOTE

5.1 Cable and connector

The maximum length of the cable for the encoder is 5 meters. Up to a length of 5 meters, the drop in voltage is minimal and the encoder meets the EMC requirements of EN 61000-4-4, test severity level 3. This covers immunity to electrical fast transients.

For HIWIN linear motor axes, and in general for all highly dynamic applications we recommend our pre-assembled extension cables that are specifically designed for dynamic use in energy chains. The high-quality 8-wire cables (each: V1+/V1-, V2+/V2- and V0+/V0- and B, \bar{B} and Z, \bar{Z} with digital signals to RS422 as a twisted pair with double shielding) are shipped with a round connector (coupling, female) on one side or customer-specific.

It is also recommended when using the sensor near a source of EMC interference, such as a linear motor, to keep the sensor cable as short as possible. As a general rule, the shorter the cable, the less sensitivity there is to interference.

Up to a cable length of 500 mm, when the connector described and the prescribed extension cable are used and the encoder housing is insulated from the machine frame with an insulation level of greater than 4 kV to EN61000-4-4, test severity level 4 is reached.

Table 5.1 shows the assignment of the open cable ends as well as of the optionally available round connector. Fig. 5.1 shows the design of this connector.

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

NOTE

Table 5.1 Cable and connector assignments

Colour of the encoder cable	Round connector pin no.	Signal
Brown	4 and 5	5 V power supply
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
Gray	11	Ref- / \bar{Z}
	Connector housing	Shielding

Electrical connection

When the encoder is connected as in Table 5.1, the counting direction (with a moving encoder) is as specified in 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 "A̅" with "B̅".

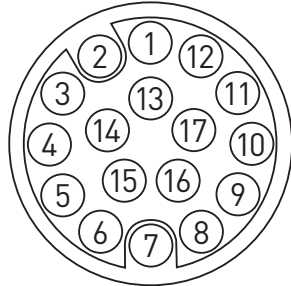


Fig. 5.1 Pin assignment of the round connector

5.2 Subsequent switching

Fig. 5.2 and Fig. 5.3 show the recommended switching of the subsequent electronic components for the individual channels for the analog and digital encoders.

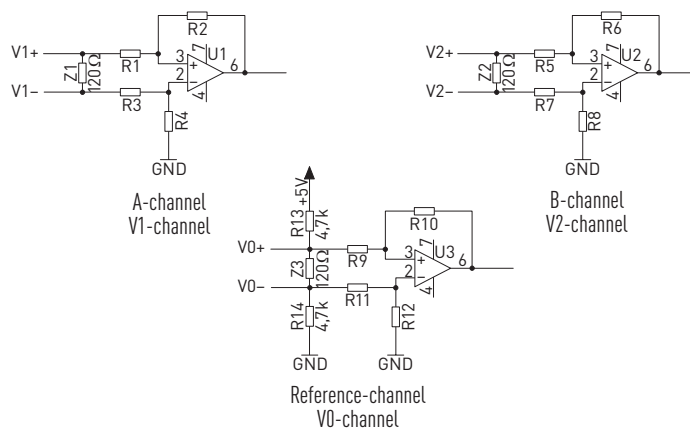


Fig. 5.2 Recommended switching of the subsequent electronic components for sin/cos 1 V_{pp} output

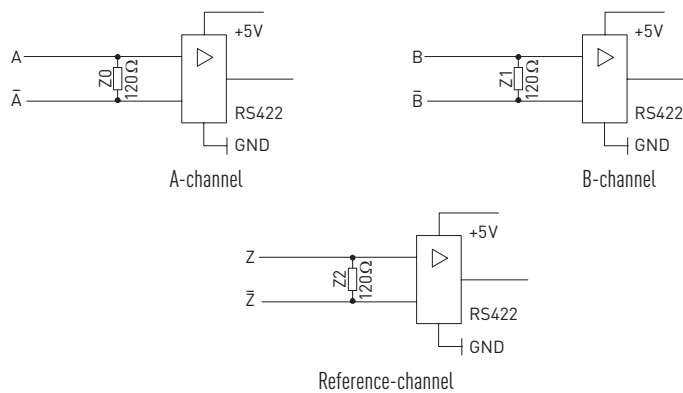


Fig. 5.3 Recommended switching of the subsequent electronic components for digital TTL output

5.3 Voltage amplitudes

The output voltage of the encoder ($1 V_{PP}$) depends on its distance from the magnetic scale. Fig. 5.4 shows the relationship between amplitude and reading distance.

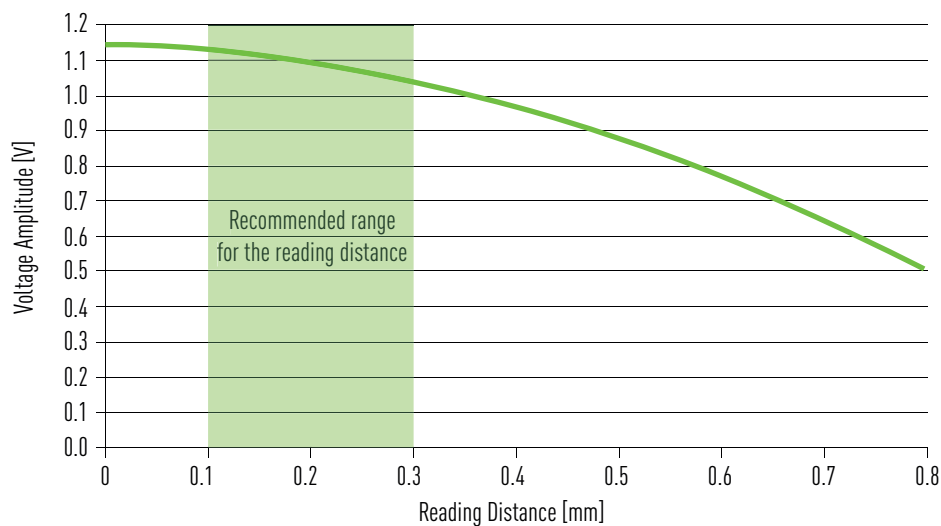


Fig. 5.4 Voltage amplitude by reading distance

5.4 Reference switch

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

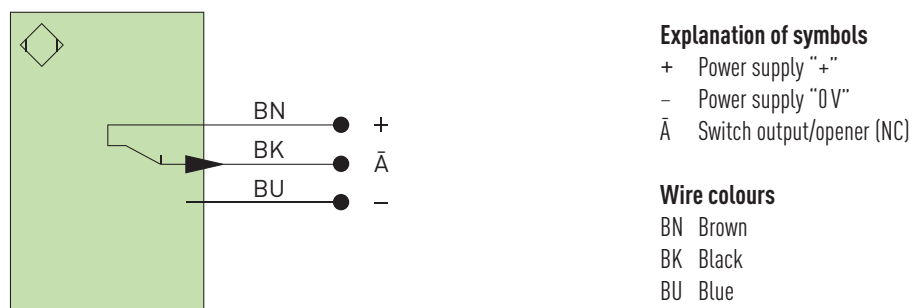


Fig. 5.5 Circuit diagram of the optional reference switch

6. Commissioning

NOTE

Read the assembly instructions for the other system components (e.g. linear motor, drive amplifier).

When putting the positioning measurement system into operation, you must adhere to the following sequence:

- ▶ Connect the encoder.
- ▶ Connect the power supply (5V).
Do not exceed the operating voltage. This can destroy the encoder.
- ▶ Check the output signal with an oscilloscope, for example.

7. Maintenance

⚠ WARNING!



Danger from electrical voltage!

Before and during assembly, disassembly and repair work, dangerous currents may flow.

- ▶ Before connecting the electrical power supply, ensure that the system (e.g. linear motor axis) is correctly earthed via the PE rail in the switch cabinet!
- ▶ Electrical currents may flow even if the motor is not moving. Never loosen electrical connections when energized. In unfavourable cases, electric arcs can form, causing injury and damage to contacts!
- ▶ Heed the assembly instructions for the other system components (e.g. linear motor, drive amplifier)!

The positioning measurement system works on a non-contact basis and thus requires no maintenance. However, it must be checked regularly for soiling and, if necessary, cleaned with a suitable cleanser (e.g. alcohol). Dirt particles between the encoder and the measuring scale can destroy the positioning measurement system.

After maintenance works grease the steel parts again to prevent corrosion.

8. Disposal

⚠ ATTENTION!



Danger caused by environmentally hazardous substances!

The danger to the environment depends on the type of substance used.

- ▶ Clean contaminated parts thoroughly before disposal!
- ▶ Clarify the requirements for safe disposal with disposal companies and, where appropriate, with the competent authorities!

Table 8.1 Disposal

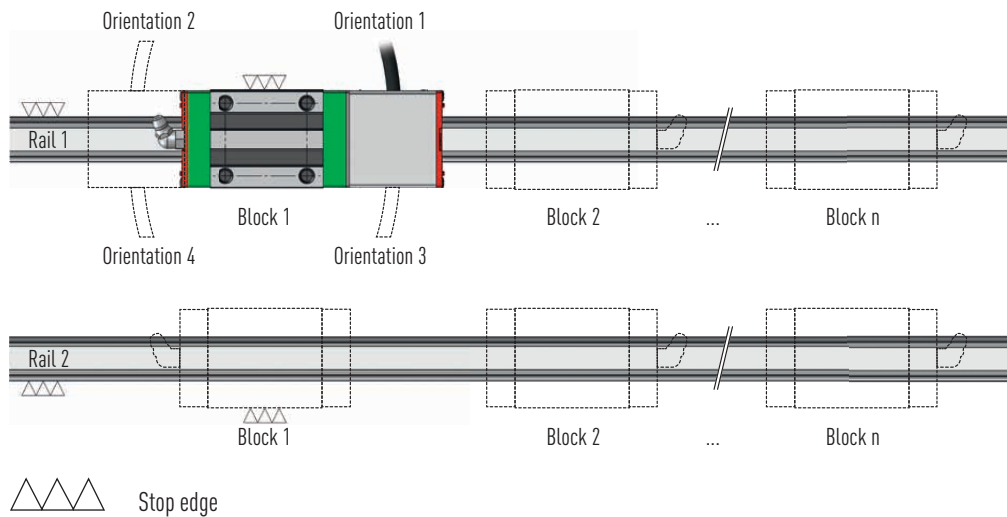
Fluids	
Lubricants	Dispose of as hazardous waste in an environmentally friendly way
Soiled cleaning cloths	Dispose of as hazardous waste in an environmentally friendly way
Blocks	
Steel components	Dispose of separately
Plastic components	Dispose of as residual waste
Positioning measurement system	
Cabling, electrical components	Dispose of as electrical waste
Rails	
Steel components	Dispose of separately
Plastic bolt caps	Dispose of as residual waste

9. Technical data

9.1 Orientation of the HIWIN MAGIC-PG encoder

According to the order code (see Section 10.2) the HIWIN MAGIC-PG encoder is available in the orientations 1 to 4. Without a statement about the required orientation the encoder is delivered by default (orientation 1).

For more blocks on one rail or on a pair of rails the encoder is mounted to block 1 on rail 1 (see Figure below). If a non-standard orientation is needed, it has to be defined on the MAGIC-PG project planning sheet (www.hiwin.de).



Technical data

9.2 Dimensions

9.2.1 HIWIN MAGIC dimensions

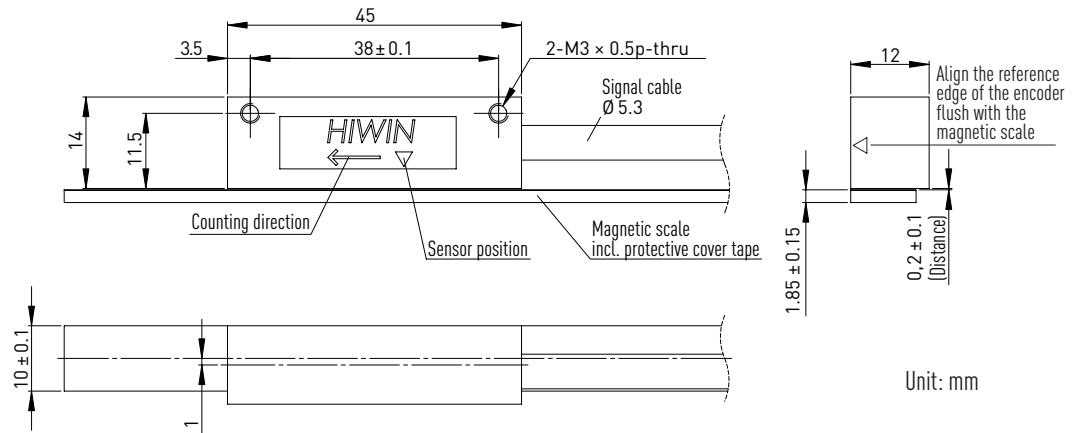


Fig. 9.1 Scale drawing of the HIWIN MAGIC encoder

9.2.2 HIWIN MAGIC-PG dimensions

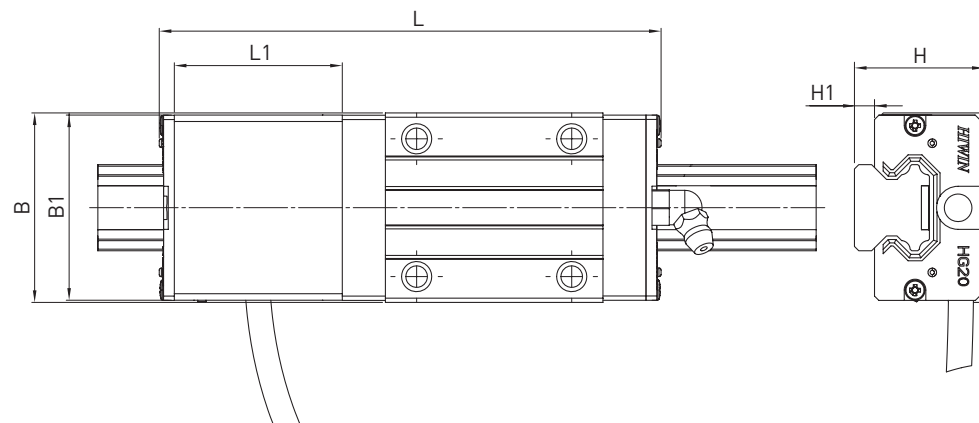


Fig. 9.2 Scale drawing of the HGH20CA block including the MAGIC-PG housing

Fig. 9.2 shows an HGH20CA/HGH25CA block. It is also possible to use the modules with HG20, HG25, QH20 and QH25 block sizes (long type and flange type, see the "Linear Guideways" catalogue). The overall dimensions then change accordingly. The dimensions of all block sizes are shown in Table 9.1.

Table 9.1 Dimensions of the block sizes including MAGIC-PG housing

	HG_20C	HG_20H	HG_25C	HG_25H	QH_20C	QH_20H	QH_25C	QH_25H
L	118.0	132.7	123.0	143.6	115.7	130.4	122.4	143.0
L1	41.5	41.5	39.0	39.0	39.0	39.0	39.0	39.0
B	44.0	44.0	48.0	48.0	44.0	44.0	48.0	48.0
B1	43.0	43.0	46.4	46.4	43.0	43.0	46.4	46.4
H	30.0	30.0	40.0	40.0	30.0	30.0	40.0	40.0
H1	4.6	4.6	5.5	5.5	4.6	4.6	5.5	5.5

Unit: mm

9.2.3 PG-rail dimensions

Rail with groove, mounting from above

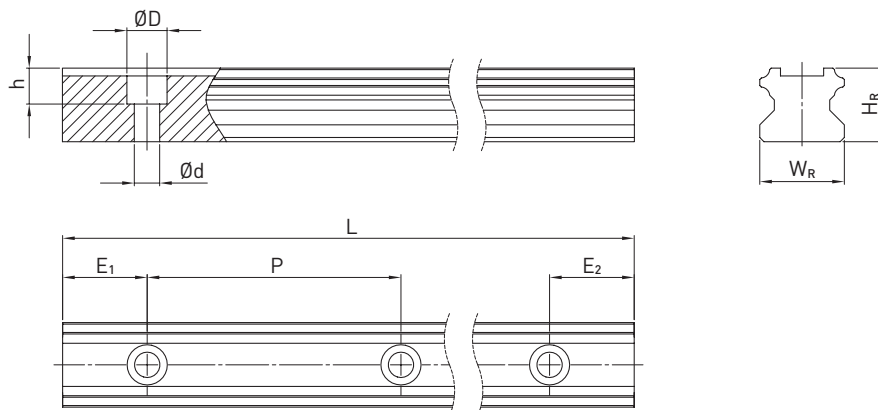


Table 9.2 Dimensions of HGR_R G1

Series/Size	d [mm]	D [mm]	h [mm]	HR [mm]	WR [mm]	P [mm]	Max. length [mm]	Max. length E ₁ = E ₂ [mm]	E _{1/2} min [mm]	E _{1/2} max [mm]	Weight [kg/m]
HGR20R G1	6.0	9.5	8.5	17.5	20.0	60.0	4,000	3,900	7	53	2,05
HGR25R G1C	6.0	9.5	8.5	22.0	23.0	60.0	4,000	3,900	7	53	3,05

Rail with groove, mounting from below

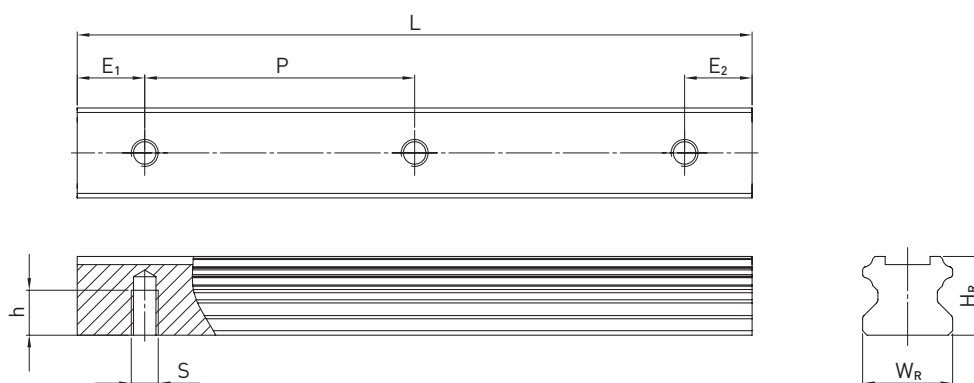


Table 9.3 Dimensions of HGR_T G1

Series/Size	S	h [mm]	HR [mm]	WR [mm]	P [mm]	Max. length [mm]	Max. length E ₁ = E ₂ [mm]	E _{1/2} min [mm]	E _{1/2} max [mm]	Weight [kg/m]
HGR20T G1	M6	10.0	17.5	20.0	60.0	4,000	3,900	7	53	2,13

Table 9.4 Tightening torques of the mounting bolts according to ISO 4762-12.9

Series/Size	Screw size	Torque [Nm]
HGR20R G1	M5 × 16	9
HGR20T G1	M6	13
HGR25R G1C	M5 × 20	9

Technical data

9.3 Technical data of the MAGIC encoder

Table 9.5 Electrical and mechanical properties of the HIWIN MAGIC and HIWIN MAGIC-PG

Type	1 V _{PP} (analog)	TTL (digital)
Electrical properties		
Output signal	sin/cos, 1 V _{PP} (0.85 V _{PP} – 1.2 V _{PP})	Quadrature signal, RS422
Resolution	Infinite, signal period 1 mm	1 μm
Repetition accuracy bidirectional	0.003 mm	0.002 mm
Absolute accuracy	± 20 μm/m	
Reference signal ¹⁾	Periodic index impulse at a distance of 1 mm	
Phase angle	90° ± 0.1° el	90°
DC component	2.5 V ± 0.3 V	
Distortion factor	Typ. < 0.1 %	
Operating voltage	5 V ± 5 %	
Power consumption	Typ. 35 mA, max. 70 mA	Typ. 70 mA, max. 120 mA
Max. measurement speed	10 m/s	5 m/s
EMC class	3, according to IEC 801	
Mechanical properties		
Housing material	High-quality aluminium alloy, encoder bottom made of stainless steel	
Dimensions of MAGIC encoder	L × W × H: 45 mm × 12 mm × 14 mm	
Cable length ²⁾	5 m	
Min. bending radius cable	40 mm	
Protection class	IP67	
Operating temperature	0 °C to +50 °C	
Weight of MAGIC encoder	80 g	
Weight of MAGIC-PG encoder	80 g	
MAGIC-PG suitable for blocks	HG-20, HG-25, QH-20, QH-25	

¹⁾ E.g. usable with proximity switch (see Section 3.4)

²⁾ For the use in energy chains we recommend our pre-assembled encoder cable with a pre-mounted round connector M17 (coupling, female) on one side, which matches the optional round plug connector M17 (male) of the encoder. For details, please contact your HIWIN technician.

Signal format sin/cos of the 1 V_{pp} output

The electrical signals after the differential input of the downstream electronic components. The sin/cos interface of HIWIN MAGIC-PG is strictly based on the Siemens specifications. The period length of the sinus output signal is 1 mm. The period length of the reference signal is 1 mm.

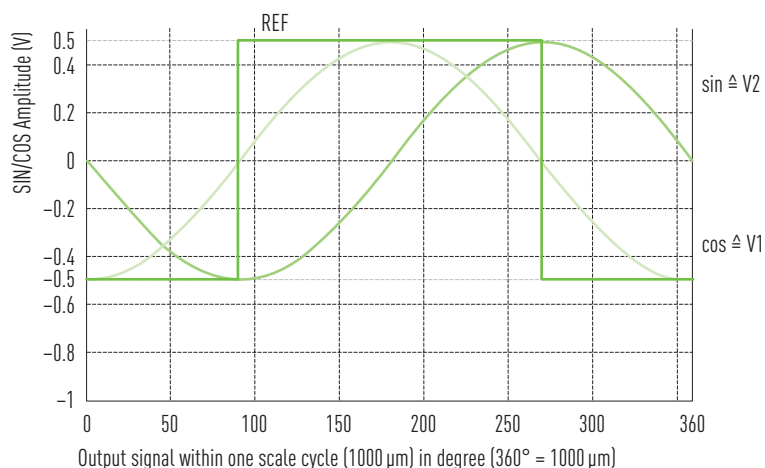


Fig. 9.3 Electrical signals after the differential input of the downstream electronic components (analogue version)

Digital TTL Output

The signals on A and B channels have a 90° phase shift (according to RS422 specification in DIN 66259). Recommended terminal resistance $Z = 120 \Omega$. Output signals: A, \bar{A} and B, \bar{B} and Z, \bar{Z} . Individual reference pulse and definition of a minimum pulse duration are possible as an option.

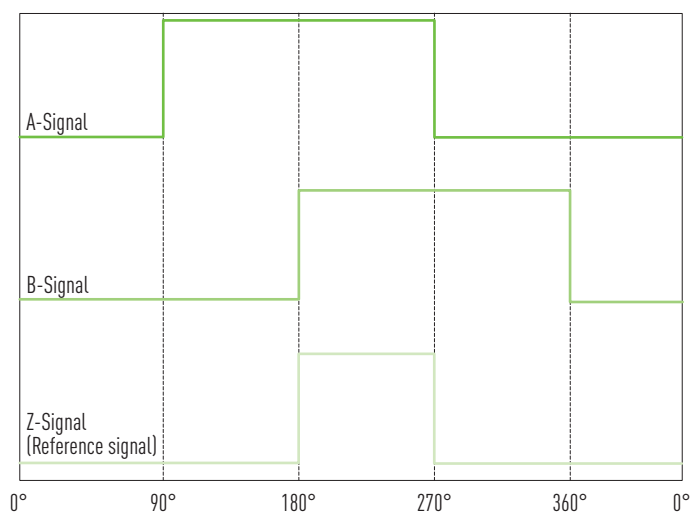


Fig. 9.4 Signals of the MAGIC encoder (TTL version)

Technical data

9.4 Technical data of the magnetic scale

Table 9.6 Technical data of the magnetic scale

Technical data	Magnetic scale (incl. stainless steel protective cover tape)
Accuracy class ¹⁾	± 20 µm/m
Linear expansion coefficient	11.5 × 10 ⁻⁶ m/K
Period	1 mm
Thickness magnetic scale	1.70 ± 0.10 mm
Thickness magnetic scale + protective cover tape	1.85 ± 0.15 mm
Width	10.05 ± 0.10 mm
Maximum length	24 m
Magnetic remanence	> 240 mT
Pole pitch (distance north/south pole)	1 mm
Single reference marks	Optional
Material	Elastomers, nitrile and EPDM
Temperature range	0 °C to +50 °C
Weight	70 g/m

¹⁾ at 20 °C

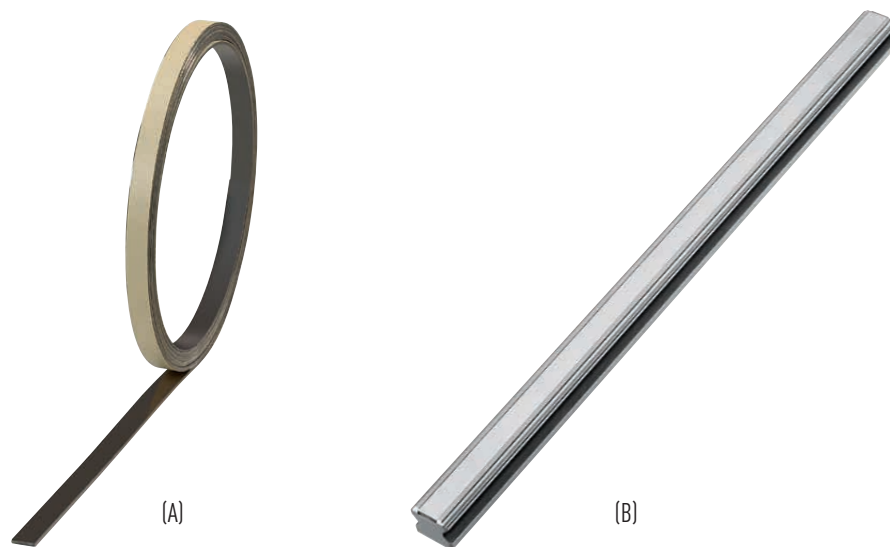


Fig. 9.5 Separate magnetic scale (A) without protective cover tape and integrated into a profile rail (B) with stainless steel protective cover tape

9.5 Technical data of the reference switch

The reference switch is an inductive proximity switch. See [Table 9.7](#) for the technical data and [Fig. 9.6](#) for the dimensions.

Table 9.7 **Technical data of the reference switch**

Inductive	
Switching distance	2 mm
Correction factor V2A/brass/aluminium	1.16 / 0.70 / 0.67
Installation type	Flush
Switch hysteresis	< 10 %
Electrical	
Power supply	10 to 30 VDC
Power input (U _b = 24 V)	< 8 mA
Switching frequency	930 Hz
Temperature drift	< 10 %
Operating temperature	-25 to +80 °C
Voltage drop switch output	< 1 V
Switching current	100 mA
Residual current voltage drop	< 100 µA
Short circuit protection	Yes
Reverse polarity protection	Yes
Overload protection	Yes
Mechanical	
Housing material	Plastic
Full encapsulation	Yes
Protection type	IP67
Connection type	Cable
Cable length	4 m, 2 m
Protective class	III

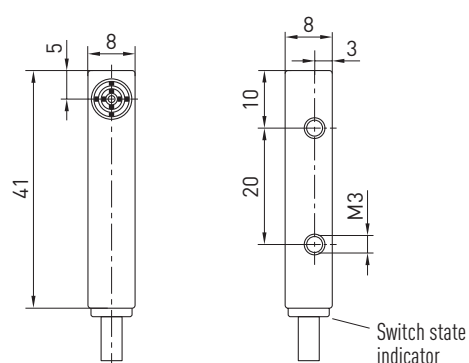


Fig. 9.6 **Dimensional drawing of the reference switch**

Spare parts and article numbers

10. Spare parts and article numbers

10.1 Article numbers of the individual parts

HIWIN MAGIC encoder

8-08-0120	1 V _{PP} , multi-index, cable length 5 m, open ends	[4] ¹⁾
8-08-0121	1 V _{PP} , single index, cable length 5 m, open ends	[4]
8-08-0122	TTL, multi-index, cable length 5 m, open ends	[4]
8-08-0123	TTL, single index, cable length 5 m, open ends	[4]

HIWIN MAGIC-PG HG20 encoder, open ends

(including an 8-12-0093 screw set in each case)

8-08-0211	1 V _{PP} , multi-index, cable length 5 m	[5]
8-08-0215	TTL, multi-index, cable length 5 m	[5]
8-08-0130	1 V _{PP} , single index, cable length 5 m	[5]

HIWIN MAGIC-PG HG25 encoder, open ends

(including an 8-12-0093 screw set in each case)

8-08-0118	1 V _{PP} , multi-index, cable length 5 m	[5]
8-08-0119	TTL, multi-index, cable length 5 m	[5]
8-08-0128	1 V _{PP} , single index, cable length 5 m	[5]
8-08-0134	1 TTL, single index, cable length 5 m	[5]

HIWIN MAGIC-PG QH25 encoder, open ends

(including an 8-12-0093 screw set in each case)

8-08-0375	1 V _{PP} , multi-index, cable length 5 m	[5]
8-08-0376	TTL, multi-index, cable length 5 m	[5]
8-08-0377	1 V _{PP} , single index, cable length 5 m	[5]

Magnetic scale

8-08-0028	Multi-index, including cover tape, sold by the meter	[12+13]
—	Single index requires technical agreement	

Reference switch

8-14-0002	Reference switch with 2 m cable
8-14-0040	Reference switch with 4 m cable
8-12-0011	Bracket for reference switch

Round connector (for connecting cable of the MAGIC encoder)

8-10-0222	Coupling, 17-pin, central fastening, external M17 × 1 screw thread (Type: NAKUA874MR1087004A000, InterContec), assembled Specify cable length on order!
8-10-0090	Male connector, 17-pin, M17 × 1 coupling nut (Type: ASTA876FR0785001A000, InterContec)

Screw set for the MAGIC-PG

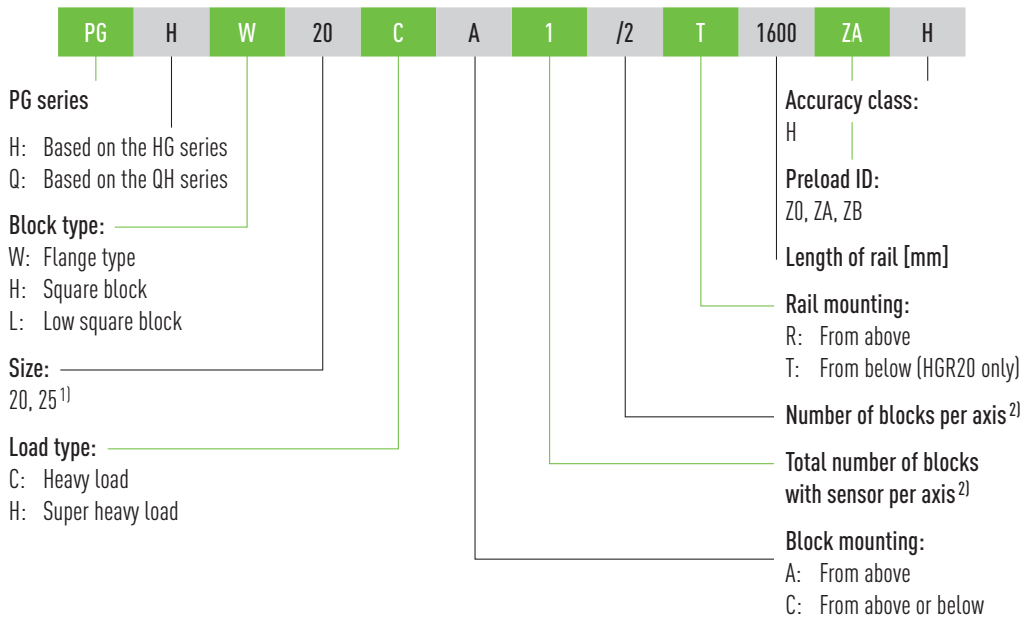
8-12-0093	Consisting of:	
	1 × headless screw with M6 × 8 hexagonal socket	
	2 × cylindric head screws with M2.5 × 20 hexagonal socket	[7]
	2 × rounded head screws with M2.5 × 10 cross slot	[11]
	2 × hex nut (low) M2.5	[10]
	4 × lock washer (Schnorr) Ø2.5	[9]

Fitting tool for the MAGIC-PG

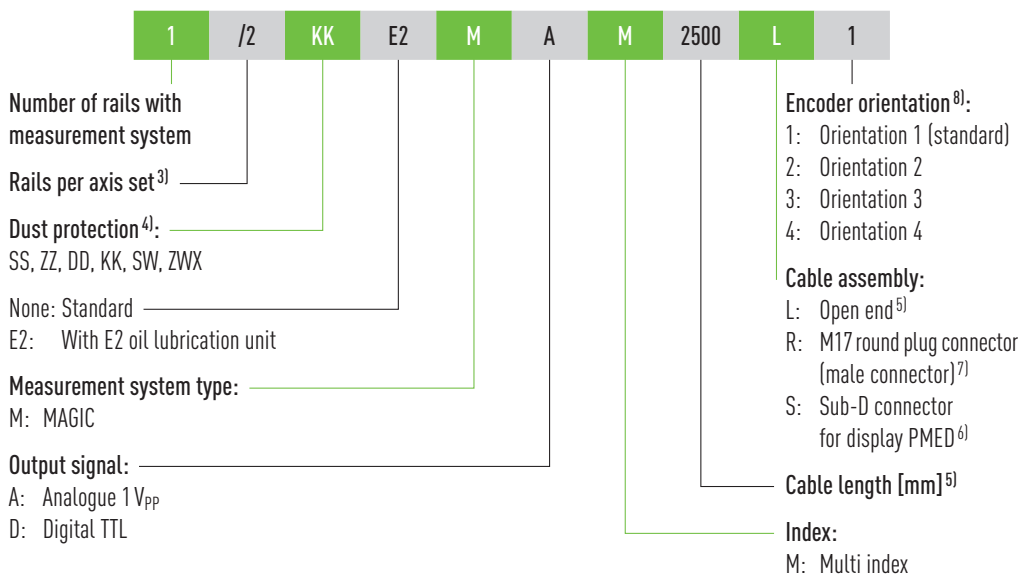
8-12-0139	For all HG20 rails
8-12-0165	For all HG25 rails
8-18-0011	Slide bearing
8-12-0144	Roller

¹⁾ The numbers specified in [] relate to the labels on the components in Chapter 4.

10.2 Order code for HIWIN MAGIC-PG linear guideway



Continuation order code



Comments:

¹⁾ Not identical to the standard rail HGR25R without groove. Mounting screw M5 instead of M6.

²⁾ In the PG series, the total number of blocks per axis is specified (all blocks of the ordered article)

³⁾ Figure 2 is also a quantity statement, i.e. a part of the article described above consists of a pair of rails.
No figures are provided for individual linear guideways.

⁴⁾ Without specification the block will be delivered with standard dust protection (standard end seal and bottom seal).

⁵⁾ For cables with open end the standard cable length is 5000.

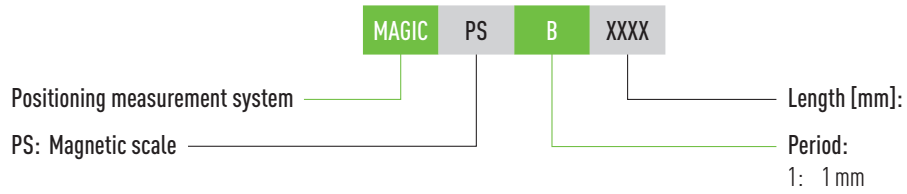
⁶⁾ The display has to be ordered separately.

⁷⁾ Suitable for the pre-assembled HIWIN extension cable, see Section 5.1.

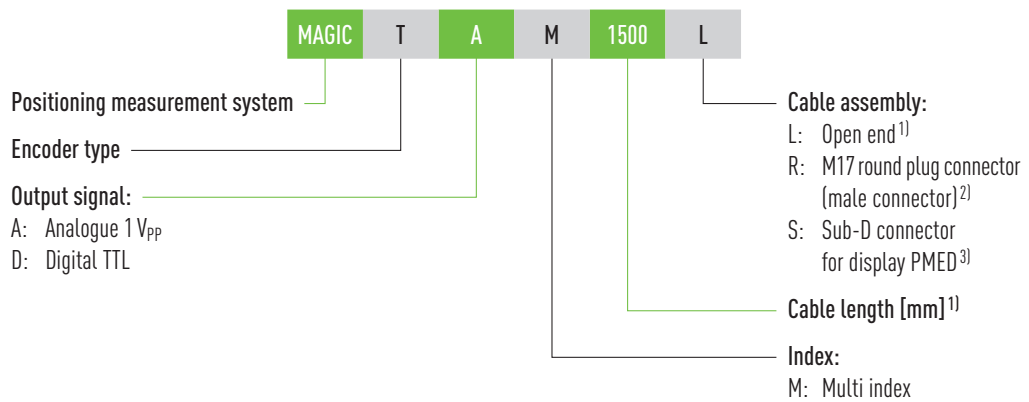
⁸⁾ See Section 9.1

10.3 Order code for HIWIN MAGIC

10.3.1 Order code for magnetic scale of HIWIN MAGIC positioning measurement system



10.3.2 Order code for encoder of HIWIN MAGIC positioning measurement system



Comments:

- ¹⁾ For cables with open end the standard cable length is 5,000
- ²⁾ Suitable for the pre-assembled HIWIN extension cable, see Section 5.1
- ³⁾ The display has to be ordered separately

11. EC Declaration of Conformity

according to EMC Directive (2014/30/EU)

Manufacturer

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

This declaration relates exclusively to the following product in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user. The declaration is no more valid, if the product is modified without agreement

Product denomination: Positioning measurement systems MAGIC, MAGIC-PG
Model/type: PM-B-xx-xx-G, PM-B-xx-xx-T
Year of manufacture: from 2016

The manufacturer hereby declares that the product is complying with all essential requirements of the EMC Directive (2014/30/EU) and of the EC RoHS Directive on the restriction of hazardous substances (2011/65/EU).

Harmonised Standards used:

- EN 61000-6-2:2005
Electromagnetic compatibility (EMC) – immunity for industrial environments
- EN 61000-6-4:2007+A1:2011
Electromagnetic compatibility (EMC) – emission standard for industrial environments
- EN61000-3-2:2014
Electromagnetic compatibility (EMC) – limits for harmonic current emissions
- EN61000-3-3:2013
Electromagnetic compatibility (EMC) – limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems

Offenburg, 20.04.2016
Managing Director



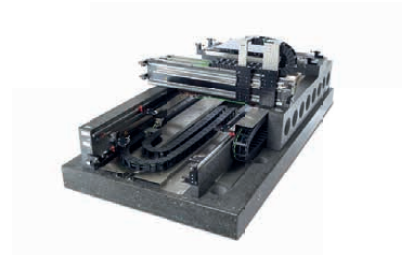
Werner Mäurer



Linear Guideways



Ballscrews



Linear Motor Systems



Linear Axes



Linear Actuators



Robots



Linear Motor Components



Rotary Tables



Drives & Servo Motors

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