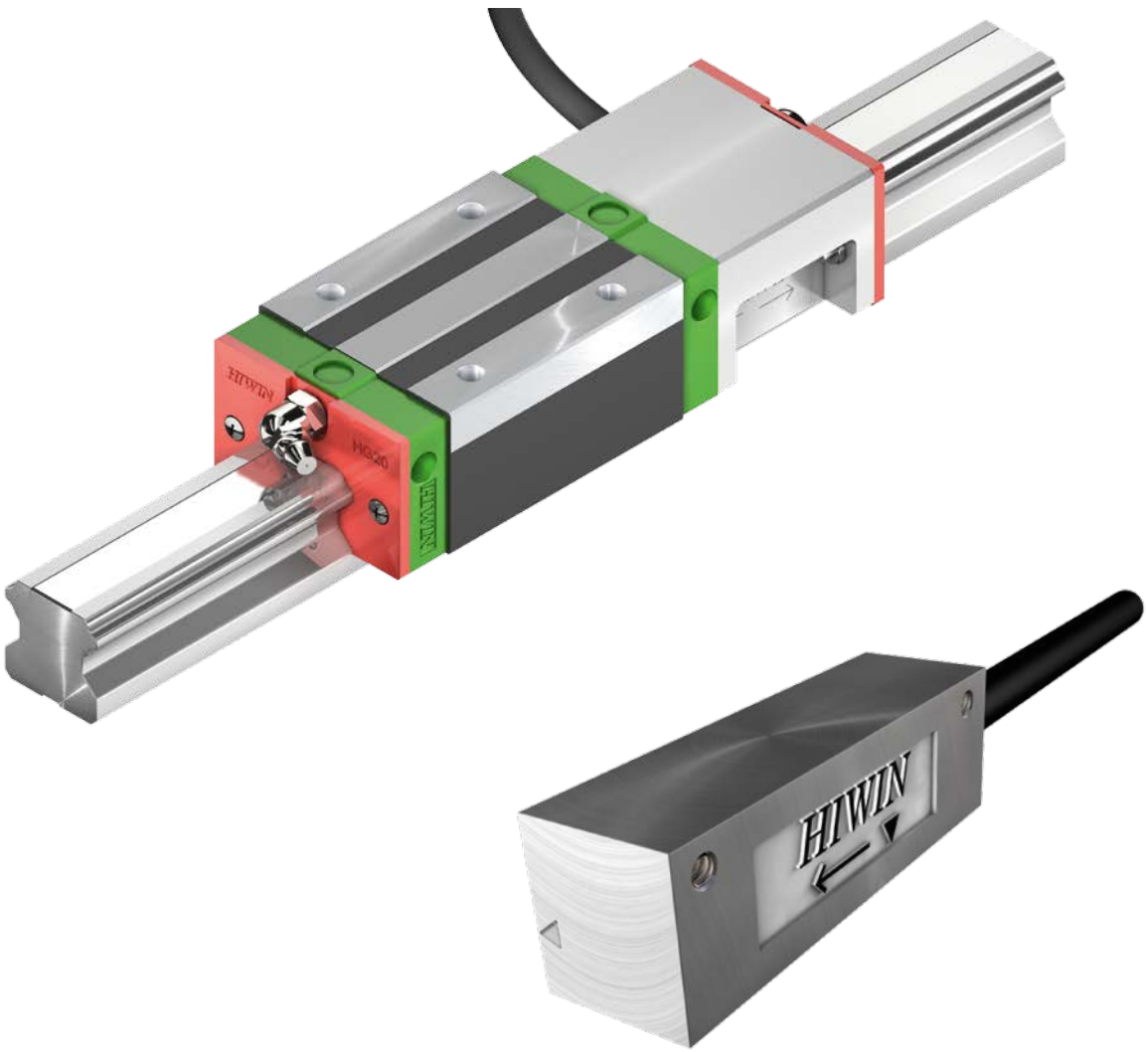
HIWIN®

Motion Control & Systems



Assembly Instructions

HIWIN MAGIC Positioning Measurement Systems

Contents

1. Information about this document

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 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

1.2 Symbols used

The following symbols are used in these instructions.

⚠ WARNING!

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

NOTE

Note: Notes serve to protect the positioning measurement system or other components or provide hints for efficient work processes.

Info: Infos offer helpful additional information about positioning measurement systems or their environment.

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

2. Safety

⚠ 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 Proper 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 Experienced personnel

The positioning measurement system may only be assembled, integrated into higher-level systems, put into operation, operated and maintained by experienced personnel. Experienced is anyone who:

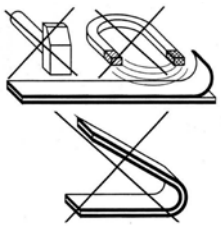
- has suitable technical training
  and
- has been trained to operate the machine by the machine operator, received instruction in the applicable safety guidelines from the machine operator and can assess the risks to be expected
  and
- has read and understood these assembly instructions in their entirety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

2.4 General safety information

- Before and during all assembly, disassembly or repair work, the positioning measurement system or complete system must be switched to zero current, and you must ensure that the power supply cannot be restored by anyone else. Otherwise, there is a danger of death and injury.
- 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.
- The air gap between the encoder and the magnetic scale must be checked regularly and kept clear. Magnetic chippings or other foreign materials can get left on the magnetic scale. This can mechanically destroy the encoder.

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.



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!

- **Make absolutely certain that the system (e.g. linear motor axis) is properly grounded with the PE rail in the control cabinet as reference potential. Without low-ohm grounding, safety is not guaranteed.**
- **Power connections may be live even when the motor is not moving. Never loosen electrical connections when energized. In unfavorable 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.**

2.7 Additional information

Please read the installation explanation in chapter 10.
If you have any questions, please contact our sales organization:
Phone: +49 (0) 781 / 9 32 78-0
Fax: +49 (0) 781 / 9 32 78-90
If you have questions about the documentation, suggestions or corrections, please send a fax to the following fax number:
+49 (0) 781 / 9 32 78-90

3. Product descriptions

The magnetic positioning measurement systems of the HIWIN MAGIC series are optimized 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 8 for more information).
Two types are available:

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

NOTE

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.

3.1 HIWIN MAGIC

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

Figure 3.1 **MAGIC encoder**

Figure 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 Figure 3.3).

Figure 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 Figure 3.4) or optionally converted finished with round plug coupling (see Figure 3.5).

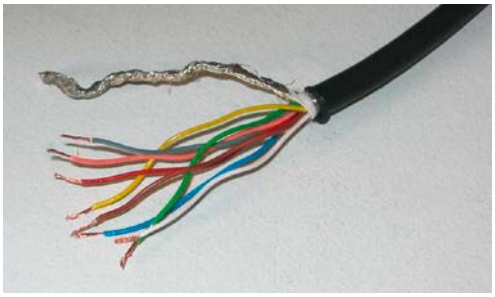


Figure 3.4 **Connection cable with open ends**

Figure 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 Figure 3.6).

Figure 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 chapter 9.1, and the order codes for systems are shown in chapter 9.2.

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!

Before and during all assembly, disassembly or repair work on a linear motor axis, the positioning measurement system, the linear motor and the associated systems and controls must be disconnected from the power source, and it must be ensured that the power supply cannot be restored by anyone else. Otherwise, there is danger of death and significant danger of injury.
The 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 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!).
Exercise caution when using magnetic devices (gauge holders) to align the profile rails, for example!
Strong shocks (e.g. hammer blows) can also damage the magnetization of the measuring scale.
The system is not suitable for environments where there is magnetic dust (e.g. graphite dust). These things can falsify the encoder signal or damage the positioning measurement system.

The numbers used for identification in the assembly instructions are also shown in the item overview in chapter 9.1 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 Figure 4.1.

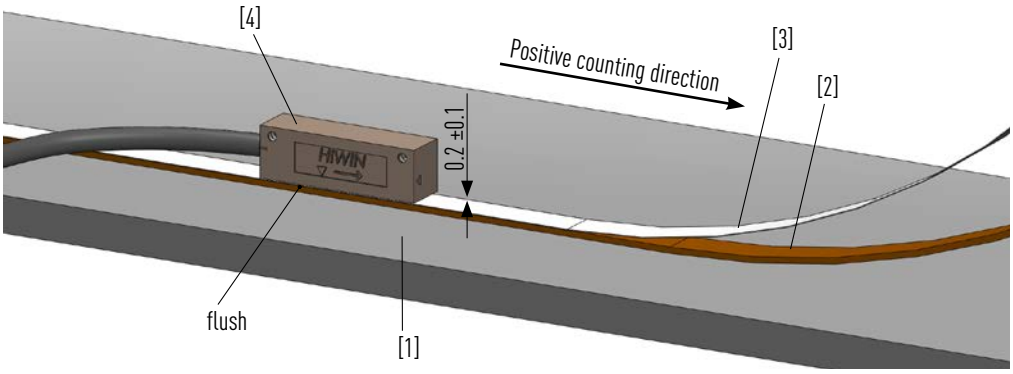


Figure 4.1 **Assembly of the HIWIN MAGIC**

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 $R_a \leq 3.2\,\mu m$
- Difference in height (parallelism) in relation to the direction of movement of the encoder: ≤ 0.1 mm
- Lateral parallel deviation in relation to the direction of movement of the encoder ≤ 0.2 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 acetone.
  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.
- Glue on the magnetic scale [2], and then use a mounting roller to press it on with a force of approx. 250 N/cm². 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/cm².

NOTE

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

The encoder [4] is mounted 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 distance between the stainless steel protective cover tape and the encoder must be 0.2 ± 0.1 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

The following assembly steps for the HIWIN MAGIC-PG are shown in Figure 4.2.

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

One-piece T-shaped rails (threaded holes from below) are generally shipped with the magnetic scale and protective cover tape already installed. In the case of R-shaped rails consisting of one or more parts (bored holes from above) and T-shaped rails consisting of several parts, the magnetic scale and protective cover tape must be stuck on after the rails are installed.

NOTE

Prior to use the pressure roller of 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.
Parts required to replace the pressure roller:
1 pcs 8-18-0011 slide bearing
1 pcs 8-12-0144 roller

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 tool provided in order to prevent balls from falling out).
- Clean the groove thoroughly with alcohol or acetone 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.

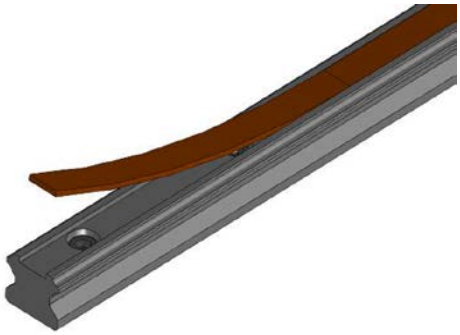


Figure 4.2 **Inserting the magnetic scale**

- Install the fitting tool on the profile rail using the tool provided. First check that the fitting tool's pressure roller 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.

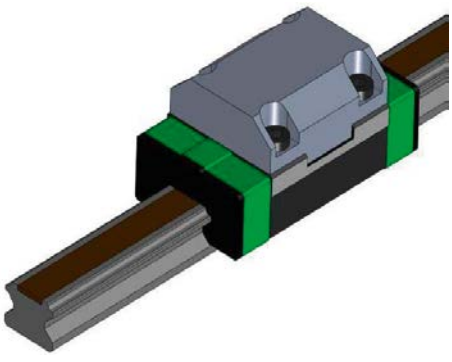


Figure 4.3 **Fitting tool for pressing down on the magnetic scale**

- Use alcohol or acetone to remove the 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 bond strengthens under pressure. The final strength is obtained after approx. 48 hours at room temperature.

NOTE

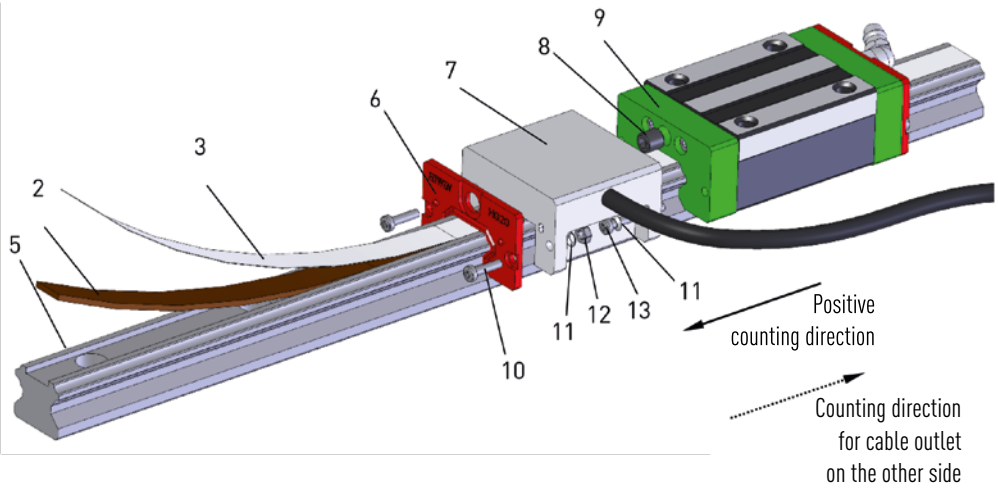


Figure 4.4 **Assembly of the HIWIN MAGIC-PG**

4.2.3 Assembly of the MAGIC-PG encoder

- On the side where the MAGIC encoder [7] should be mounted, remove the metal scraper [6] by loosening the screws. **Do not disassemble the deflection unit [9]!**
- Screw the headless screw [8] into the threaded hole of the deflector.
- Place the MAGIC housing on the deflector. The housing can be mounted in two directions – depending on the desired counting direction and/or cable outlet side. **The counting direction is as shown in** Figure 4.4 **if the cable is connected as in** Table 5.1**.** Do not tighten screws [13] all the way (underlay lock washers [11]).
- The height of the encoder must be adjusted. **There must be a distance of 0.2 ±0.1 mm between the cover tape and the encoder.** It is advisable to use a feeler gauge to set the correct distance. Then tighten the screws [13] with 1 Nm.
- Fasten the metal scraper onto the MAGIC housing using screws [10] and nuts [12] (use lock washers [11]). The block must also be on the rail in order to guarantee a correct alignment of the seal.

When fitting the encoder and glider, ensure that you do not violate the connecting cable's minimum bending radius of 40 mm.

NOTE

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 chapter 8.4).

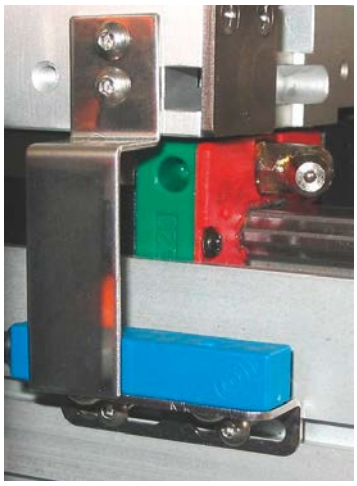


Figure 4.5 **Reference switch and cam switch (linear motor axis installation example)**

5. Electrical connection

⚠ WARNING!

Make absolutely certain that the system (e.g. linear motor axis) is properly grounded with the PE rail in the control cabinet as reference potential. Without low-ohm grounding, safety is not guaranteed.
Power connections may be live even when 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.

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 drag chains. The high-quality 8-wire cables (each: V1+, V1– / V2+, V2– and V0+, V0– and B, $\bar{B}$ und Z, $\bar{Z}$ with digital signals to RS 422 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. Figure 5.1 shows the design of this connector.

NOTE

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

Table 5.1 **Cable and connector assignments**

Color 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	V+ / B
Red	2	V– / $\bar{B}$
Purple	3	Ref+ / Z
Gray	11	Ref– / $\bar{Z}$
	Connector housing	Shielding

When the encoder is connected as in Table 5.1, the counting direction (with a moving encoder) is as specified in the assembly instructions (see Figure 4.1 and Figure 4.2).
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 "$\bar{B}$".

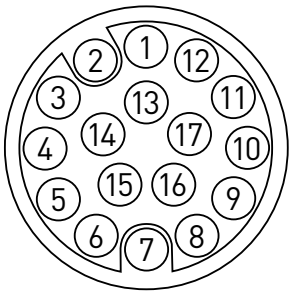


Figure 5.1 **Pin assignment of the round connector**

5.2 Subsequent switching

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

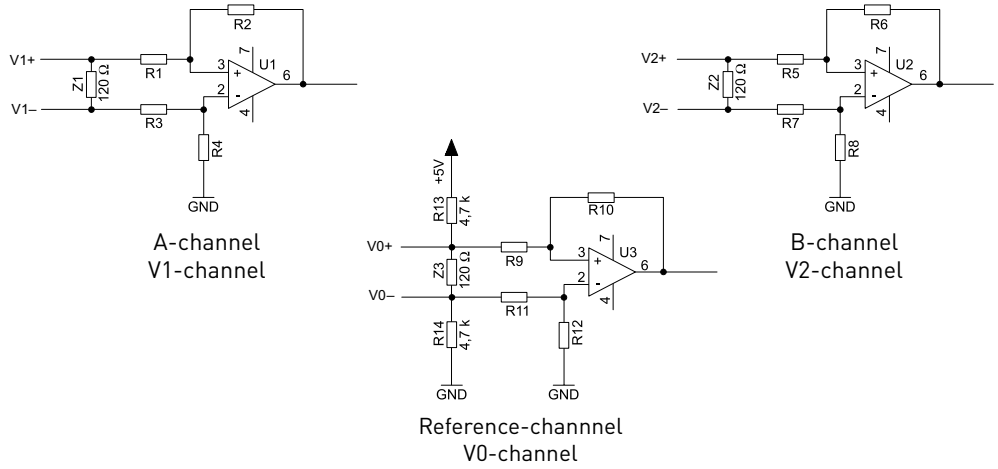


Figure 5.2 **Recommended switching of the subsequent electronic components for sin/cos 1 V_{PP} output**

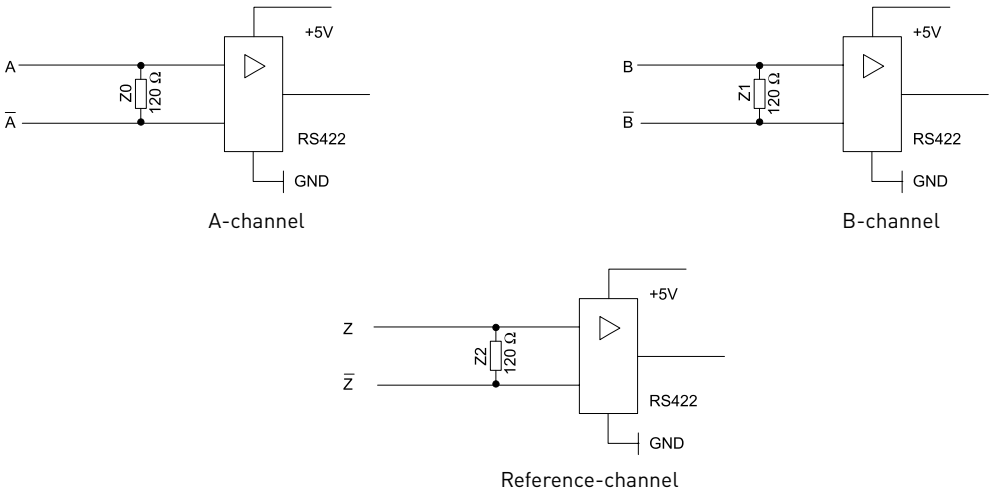


Figure 5.3 **Recommended switching of the subsequent electronic components for digital TTL output**

5.3 Voltage amplitudes

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

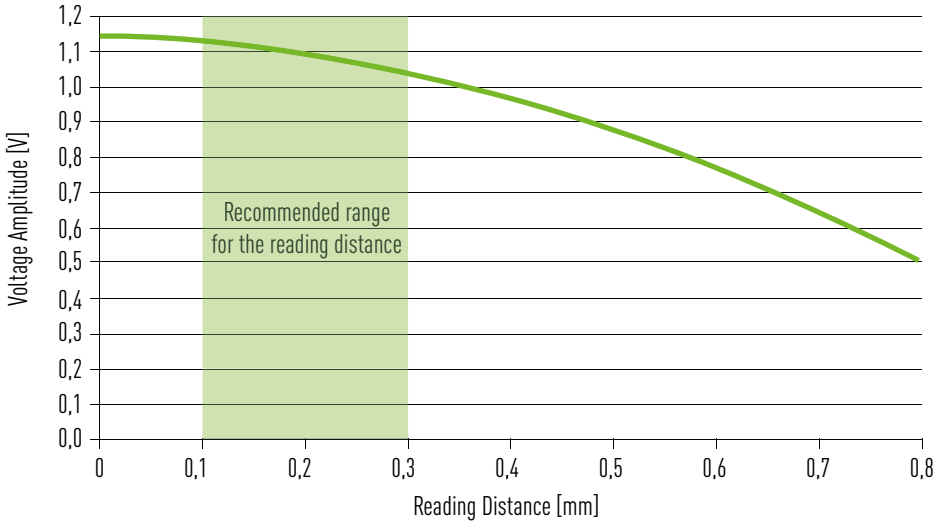
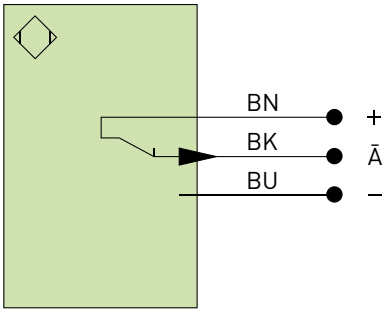


Figure 5.4 **Voltage amplitude by reading distance**

5.4 Reference switch

The reference switch must be connected according to Figure 5.5.



Explanation of symbols

+ Power supply "+"
– Power supply "0V"
A Switch output/opener (NC)

Wire colors

BN Brown
BK Black
BU Blue

Figure 5.5 **Circuit diagram of the optional reference switch**

6. Putting into operation

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

NOTE

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

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

7. Maintenance

⚠ WARNING!

Before and during all maintenance work on a linear motor axis, the positioning measurement system, the linear motor and the associated systems and controls must be disconnected from the power source, and it must be ensured that the power supply cannot be restored by anyone else. Otherwise, there is danger of death and significant danger of injury.

The 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.
Grease the steel parts again to prevent corrosion.

8. Technical data

8.1 Dimensions

8.1.1 HIWIN MAGIC dimensions

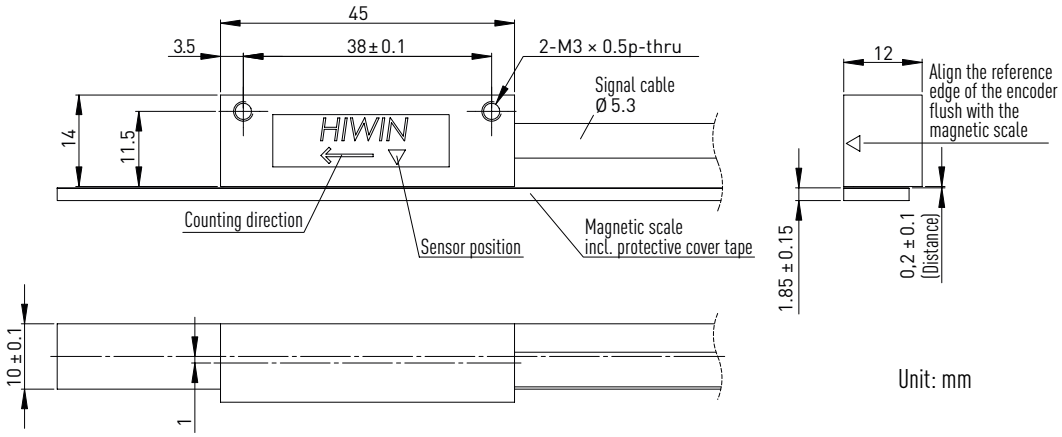


Figure 8.1 **Scale drawing of the HIWIN MAGIC encoder**

8.1.2 HIWIN MAGIC-PG dimensions

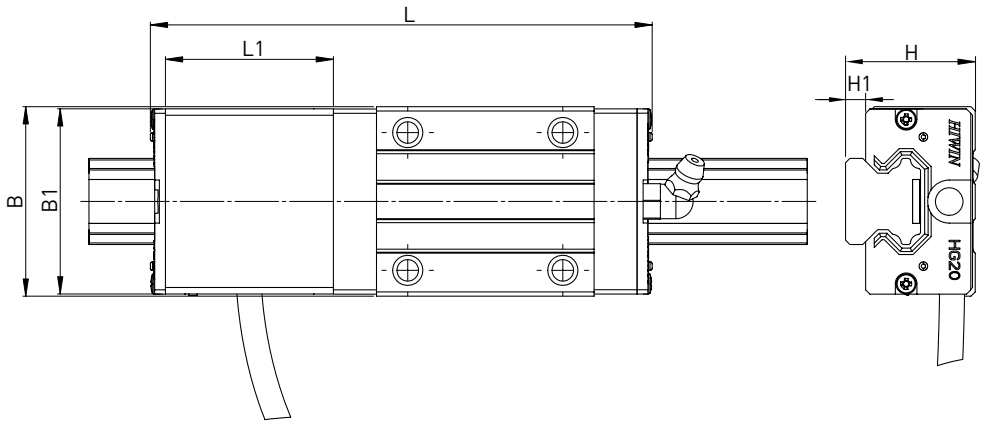


Figure 8.2 **Scale drawing of the HGH20CA block including the MAGIC-PG housing**

Figure 8.2 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" catalog). The overall dimensions then change accordingly. The dimensions of all block sizes are shown in Table 8.1.

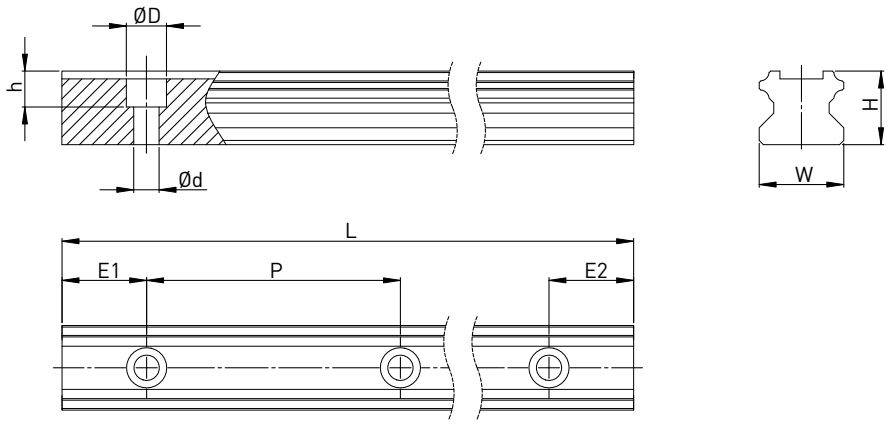
Table 8.1 **Dimensions of the block sizes including MAGIC-PG housing**

	HG_20C	HG_20H	HG_25C	HG_25H	QH_20C	QH_20H	QH_25C	QH_25H
L	116.5	131.2	123.0	143.6	115.7	130.4	122.4	143.0
L1	39.0	39.0	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

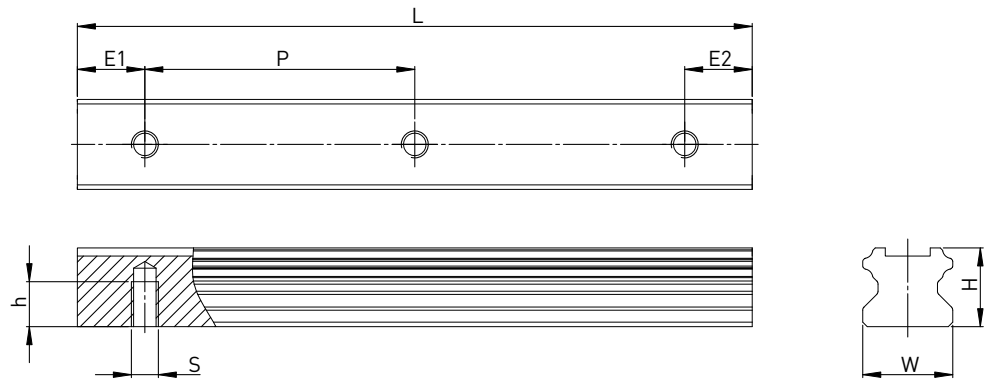
8.1.3 PG-rail dimensions

Rail with groove, mounting from above



Series/Size	d [mm]	D [mm]	h [mm]	H [mm]	W [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	4000	3900	7	53	2.3
HGR25R G1C	6.0	9.5	8.5	22.0	23.0	60.0	2500	2500	7	53	3.2

Rail with groove, mounting from below



Series/Size	s	h [mm]	H [mm]	W [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	2500	2500	7	53	2.21

8.2 Technical data of the MAGIC encoder

Table 8.2 **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, RS 422
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, nach IEC 801	
Mechanical properties		
Housing material	High-quality aluminium alloy, encoder bottom made of stainless steel	
Dimensions of MAGIC encoder	L × B × 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 bis +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 reference switch (see chapter 3.4)

2) For the use in drag 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 conector M17 (male) of the encoder. For details, please contact your HIWIN technician.

Signal format sinus/cosinus of the 1 V_{PP} output

Electrical signals after the differential input of the downstream electronic components. The sinus/cosinus 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.

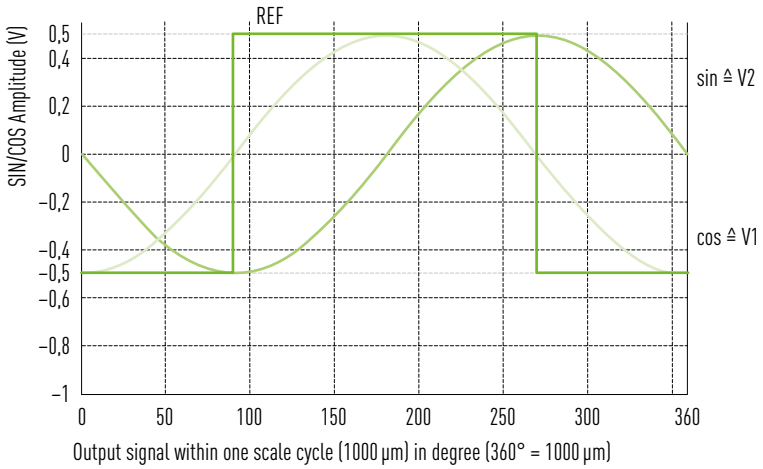


Figure 8.3 **Electrical signals after the differential input of the downstream electronic components (analog version)**

Digital TTL Output

- 90° phase shifted square signal in compliance with RS422 specification (according to DIN 66259)
- Recommended termination Z = 120 Ω
- Differential output signal: A, $\overline{A}$ und B, $\overline{B}$ and Z, $\overline{Z}$
- Single reference pulse (optional)
- Definition of a minimum pulse duration (optional)

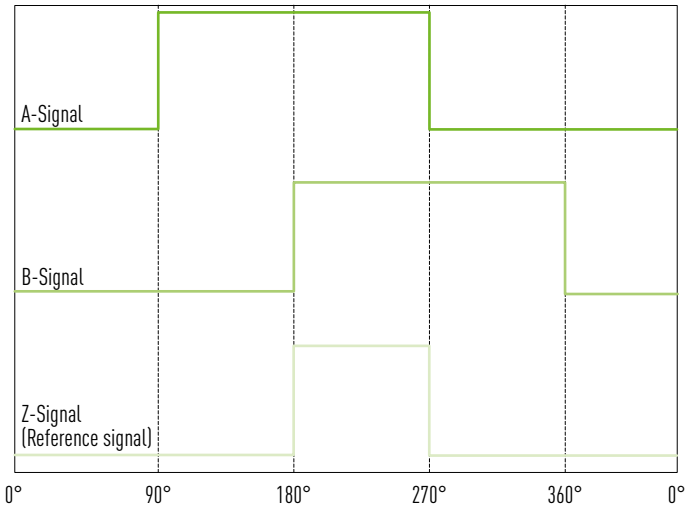


Figure 8.4 **Signals of the MAGIC encoder (TTL version)**

8.3 Technical data of the magnetic scale

Table 8.3 **Technical data of the magnetic scale**

Ordering code (xxxx = length [mm])		8-08-0028-xxxx (incl. stainless steel protective cover tape)	Stainless steel protective cover tape
Accuracy class [1]		± 20 µm/m	–
Linear expansion coefficient		11.5 × 10^{-6} m/K	
Period		1 mm	–
Thickness incl. adhesive tape	Magnetic scale only	1.70 ± 0.10 mm	–
	with protective cover tape	1.85 ± 0.15 mm	–
		–	ca. 0.15 mm
Width		10.05 ± 0.10 mm	10 mm
Maximum length		25 m	25 m
Magnetic remanence		> 240 mT	–
Pole pitch (distance north/south pole)		1 mm	–
Single reference marks		optional	–
Material		Elastomers, nitrile and EPDM	Stainless steel, adhesive tape
Temperature range		0 °C bis +50 °C	0 °C bis +50 °C
Weight		70 g/m	–

[1] at 20 °C

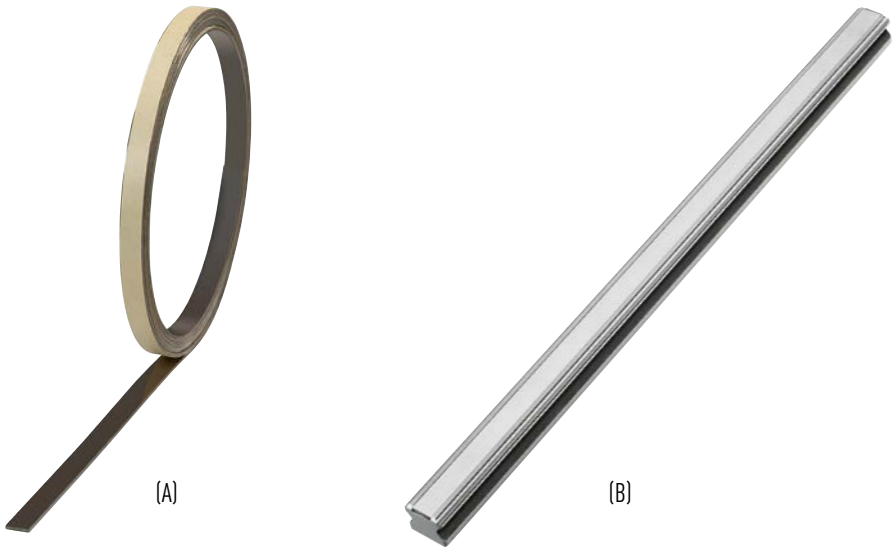


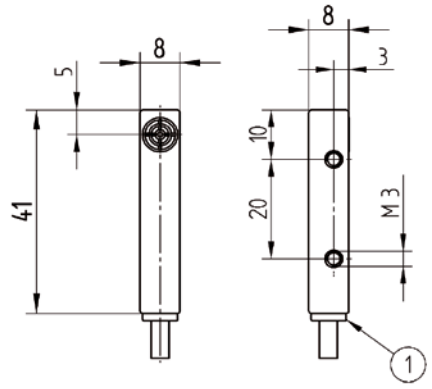
Figure 8.5 **Seperate magnetic scale (A) without protective cover tape and integrated into a profile rail (B) with stailess steel protective cover tape**

8.4 Technical data of the reference switch

The reference switch is an inductive proximity switch. See Table 8.4 for the technical data and Figure 8.6 for the dimensions.

Table 8.4 **Technical data of the reference switch**

Inductive	
Switching distance	2 mm
Correction factor V2A / brass / Al	0.73 / 0.49 / 0.39
Installation type	Flush
Switch hysteresis	< 15 %
Electrial	
Power supply	10...30 VDC
Power input (Ub = 24 V)	< 6 mA
Switching frequency	1500 Hz
Temperature drift	< 10 %
Operating temperature	–25...80 °C
Voltage drop switch output	< 2.5 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 mode	IP 67
Connection type	Cable
Cable length	2 m, 4 m
Protective insulation, rated voltage	50 V



1 = switch state indicator

Figure 8.6 **Scale drawing of the reference switch**

9. Spare parts and item numbers

9.1 Item 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	[7]
8-08-0215	TTL, multi-index, cable length 5 m	[7]
8-08-0130	1 V_{PP}, single index, cable length 5 m	[7]
8-08-0131	1TTL, single index, cable length 5 m	[7]

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	[7]
8-08-0119	TTL, multi-index, cable length 5 m	[7]
8-08-0128	1 V_{PP}, single index, cable length 5 m	[7]
8-08-0134	1TTL, single index, cable length 5 m	[7]

Magnetic scale

8-08-0028	Multi-index, including cover tape, sold by the meter	[2+3]
–	Single index requires technical agreement	

Referene switch

8-14-0003	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	[8]
	2 × cylindric head screws with M2.5 × 20 hexagonal socket	[13]
	2 × rounded head screws with M2.5 × 10 cross slot	[10]
	2 × hex nut (low) M2.5	[12]
	4 × lock washer (Schnorr) Ø2.5	[11]

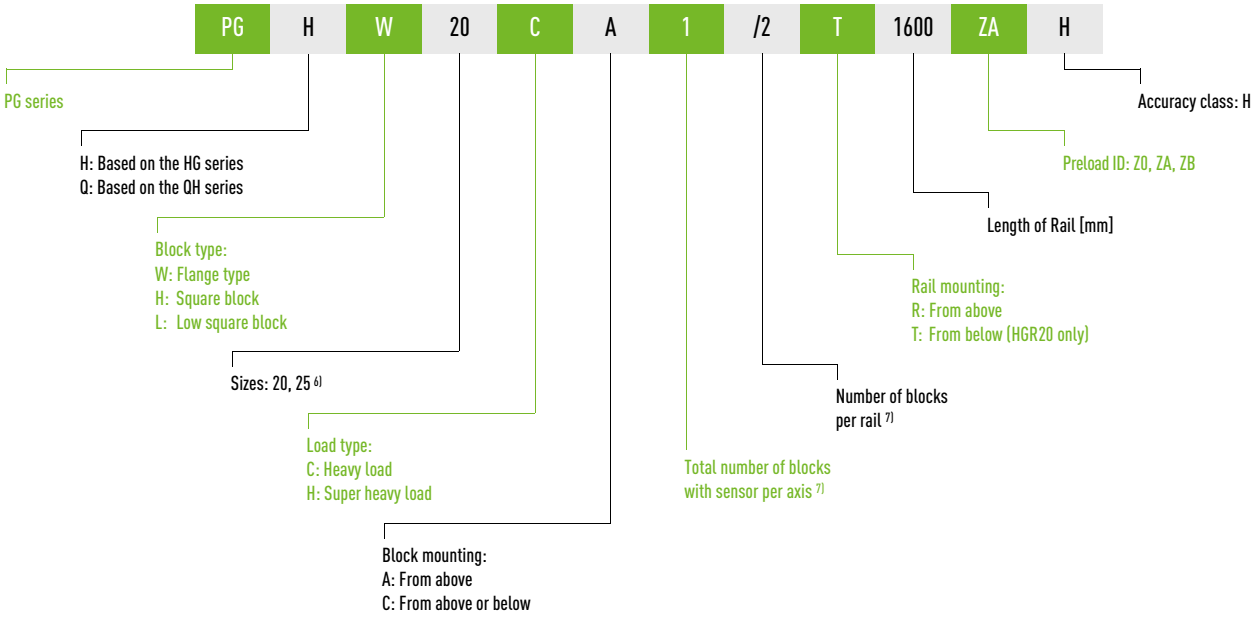
Fitting too for the MAGIC-PG

8-12-0139	For all HG20 rails
8-12-0165	For all HG25 rails

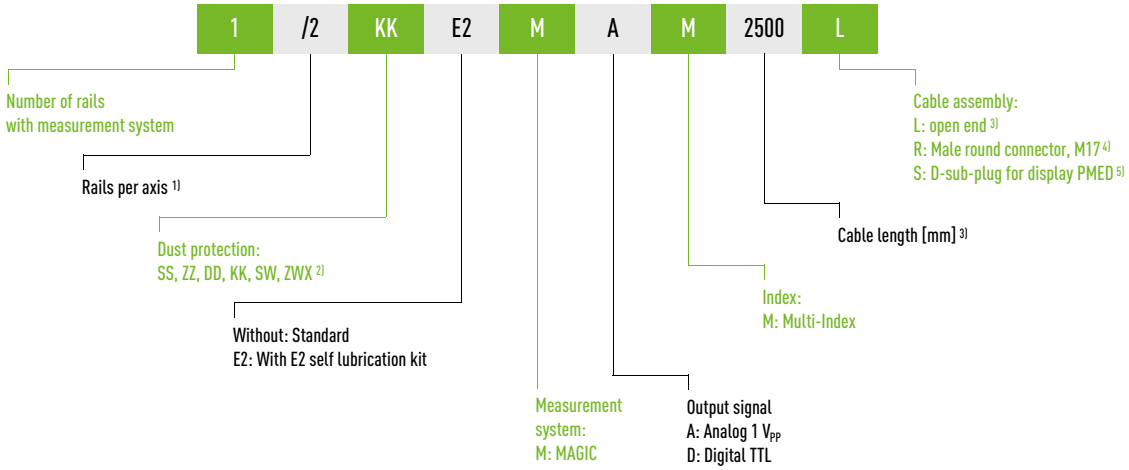
[1] The numbers specified in [ ] relate to the labels on the components in chapter 4.

9.2 Ordering code for PG linear guideway

9.2.1 Ordering code for profile rail with positioning measurement system HIWIN MAGIC-PG



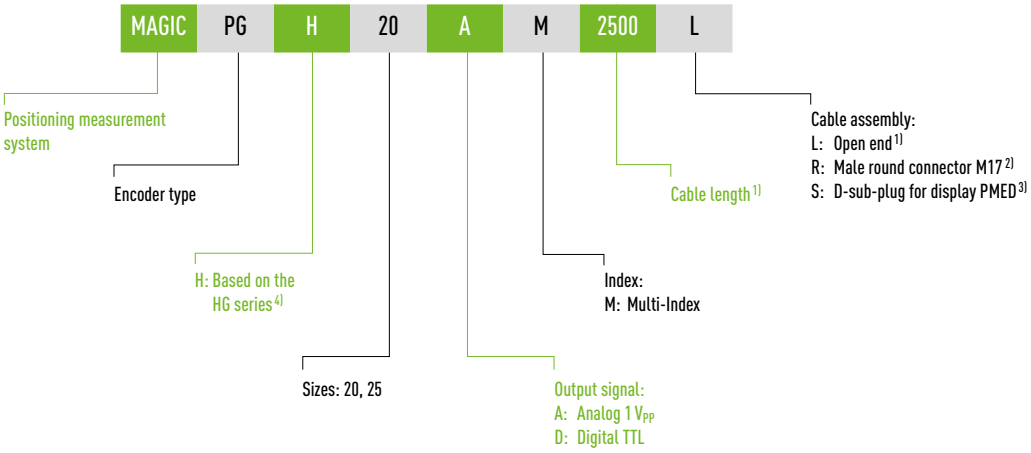
Continuation ordering code



Comments:

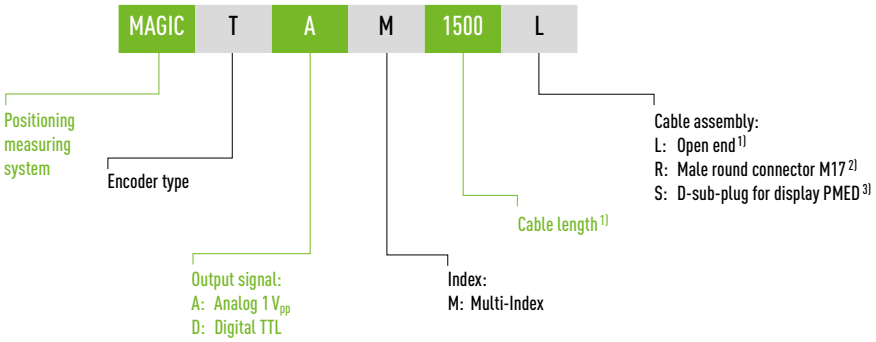
1) Figure 2 is also a quantity statement, i.e. a part of the article described above consists of a pair of rails. No figures are provided for individual linear guideways.
2) Without specification the block will be delivered with standard dust protection (standard end seal and bottom seal).
3) For cables with open end the standard cable length is 5000.
4) Suitable for the pre-assembled HIWIN extension cable, see chapter 5.1.
5) The display has to be ordered separately.
6) Not identical to the standard rail HGR25R without groove. Mounting screw M5 instead of M6.
7) In the PG series, the total number of blocks per axis is specified (all blocks of the ordered article)

9.2.2 Ordering code for encoder HIWIN MAGIC-PG



Comments:
1) For cables with open end the standard cable length is 5000
2) Suitable for the pre-assembled HIWIN extension cable, see chapter 5.1
3) The display has to be ordered separately
4) Suitable also for the QH series

9.3 Ordering code for HIWIN MAGIC



Comments:
1) For cables with open end the standard cable length is 5000
2) Suitable for the pre-assembled HIWIN extension cable, see chapter 5.1
3) The display has to be ordered separately