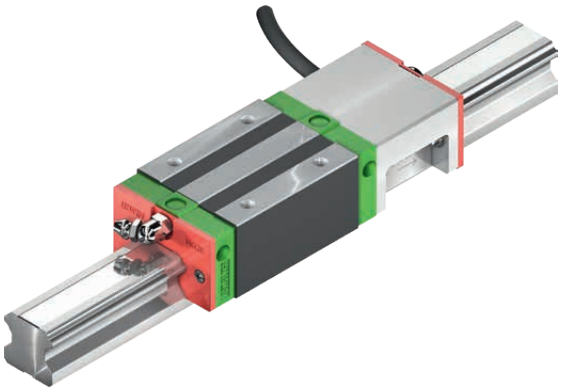
3.8 PG series

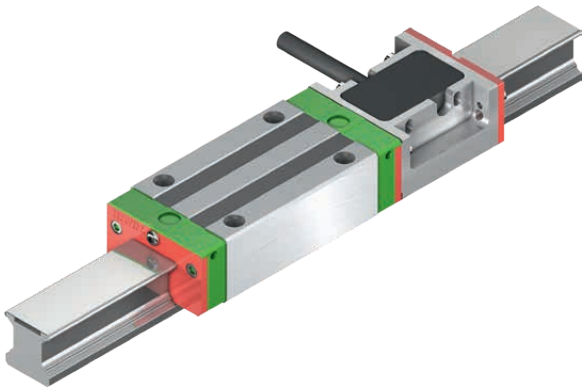
3.8.1 Properties of the PG series linear guideways

The HIWIN linear guideways of the PG series are a special version of the HG/QH/CG series with integrated MAGIC magnetic position measuring system. The magnetic positioning measuring systems of the MAGIC series are optimised for measuring the distances travelled in linear movements and particularly on linear motor axes. The measuring system consists of a magnetic measurement strip on a stainless steel carrier strip and an encoder unit. The rugged housing with excellent electrical shielding and signal output in real time make the HIWIN MAGIC series the positioning measuring systems of choice for demanding applications.
In the PG series, the encoder is mounted directly on the block of the HG/QH/CG series. The magnetic tape is integrated in an additional groove in the HGR/CGR profile rails. The MAGIC positioning measuring system is also available in a version independent of the profile rail. The position of the magnetic tape and encoder can then be specified at a suitable location to suit the customer. For details, please refer to the "Linear motors & positioning measuring systems" catalogue.

3.8.2 Layout of PG series

- Blocks of HG/QH/CG series
- Profile rail of the HG/CG series with additional groove for the measuring tape
- Encoder can be mounted on blocks of sizes HG_20, HG_25, QH_20,QH_25, CG_20, CG_25, CG_30, CG_35 and CG_45
- Mounting direction: When facing the reference edge of the block, the encoder is located on the left side by default. The line of the encoder is also located on the side of the reference edge

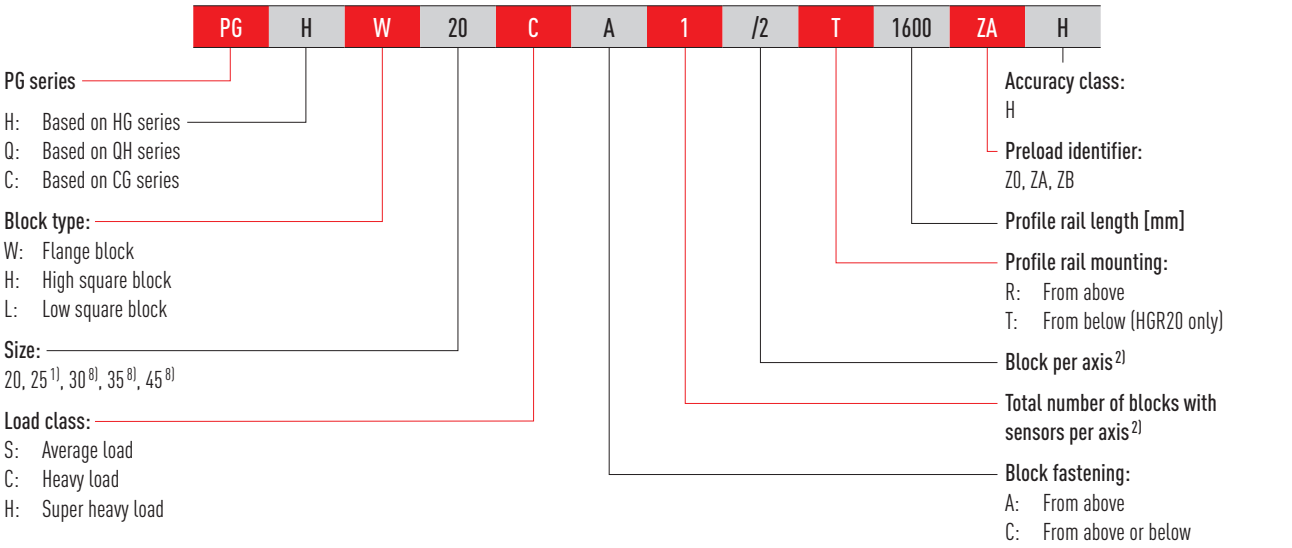




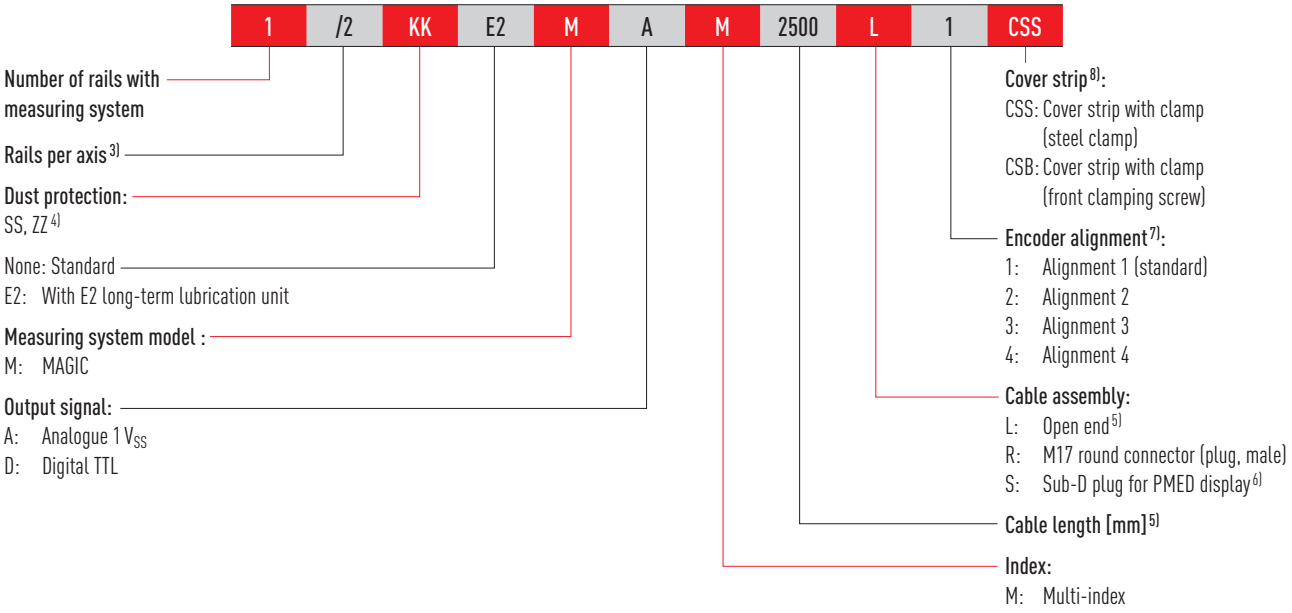
Properties:

- Zero contact measurement with 1 V_{SS} or digital output
- Digital resolution 1 µm
- Encoder and housing are resistant to dust, humidity, oil and chips
- Encoder with metal housing and IP67 protection mode
- Simple assembly and adjustment
- Signal output in real time
- Special housing for EMC optimisation

3.8.3 Order code of PG series



Continuation of order codes of PG series



1) PGH, PGQ: not identical in construction with standard rail HGR25R without groove. Mounting screw 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. In the case of multi-part rails, the joint is offset as standard.
4) If not specified, the block is supplied with standard dust protection (standard end seal and lower sealing strip). For an overview of the different sealing systems, see Page 22
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) See section 3.8.6
8) Only available for PGC

3.8.4 Dimensions of the PG blocks

The following figure shows an HGH20CA/HGH25CA block. It is also possible to attach to the other versions of the HG_20, HG_25, QH_20, QH_25, CG_20 and CG_25:and CG_25 sizes. The overall dimensions then change accordingly. The dimensions of all block sizes are listed in Table 3.125.

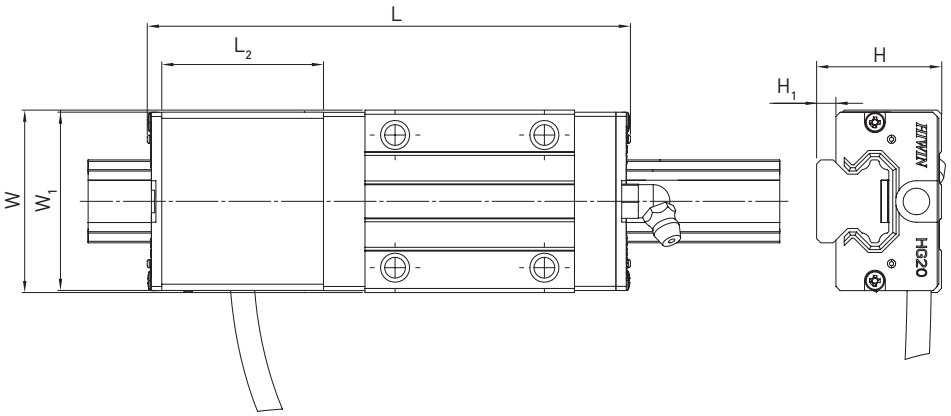


Table 3.125 **Dimensions of the blocks including MAGIC-PG housing**

Series/Size	L [mm]	L_2 [mm]	W [mm]	W_1 [mm]	H [mm]	H1 [mm]
HG_20C	118.0	40.5	44	43.0	30	4.6
HG_20H	132.7	40.5	44	43.0	30	4.6
HG_25C	124.5	40.5	48	46.4	40	5.5
HG_25H	145.1	40.5	48	46.4	40	5.5
QH_20C	117.2	40.5	44	43.0	30	4.6
QH_20H	131.9	40.5	44	43.0	30	4.6
QH_25C	123.9	40.5	48	46.4	40	5.5
QH_25H	144.5	40.5	48	46.4	40	5.5
CG_20C	121.4	44.0	44	43.0	30	4.6
CG_20H	137.4	44.0	44	43.0	30	4.6
CG_25C	130.5	44.0	48	47.0	40	6.1
CG_25H	147.9	44.0	48	47.0	40	6.1
CG_30C	144.1	44.0	60	58.0	45	7.0
CG_30H	166.6	44.0	60	58.0	45	7.0
CG_35C	158.1	44.0	70	69.0	55	7.6
CG_35H	182.5	44.0	70	69.0	55	7.6
CG_45C	184.3	45.0	86	84.0	70	9.7
CG_45H	220.7	45.0	86	84.0	70	9.7

3.8.5 Dimensions of the PG rails

3.8.5.1 Profile rail with groove, mounting from above (HG/QH series)

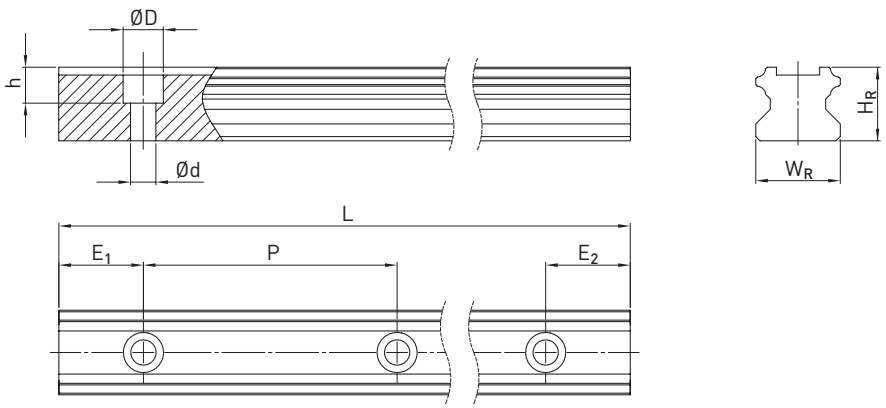


Table 3.126 **Dimensions HGR_R G1**

Series/size	Dimensions of the rail [mm]						Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	D	h	d	P					
HGR20R G1	20	17.5	9.5	8.5	6.0	60	4,000	3,900	7	53	2.05
HGR25R G1C	23	22.0	9.5	8.5	6.0	60	4,000	3,900	7	53	3.05

3.8.5.2 Profile rail with groove, mounting from below (HG/QH series)

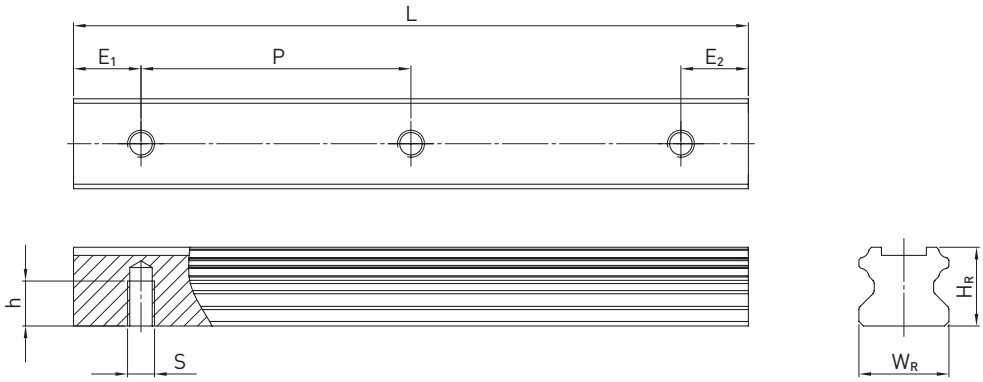


Table 3.127 **Dimensions HGR_T G1**

Series/size	Dimensions of the rail [mm]					Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	S	h	P					
HGR20T G1	20	17.5	M6	10	60	4,000	3,900	7	53	2.13

3.8.5.3 Profile rail with groove, mounting from above (CG series)

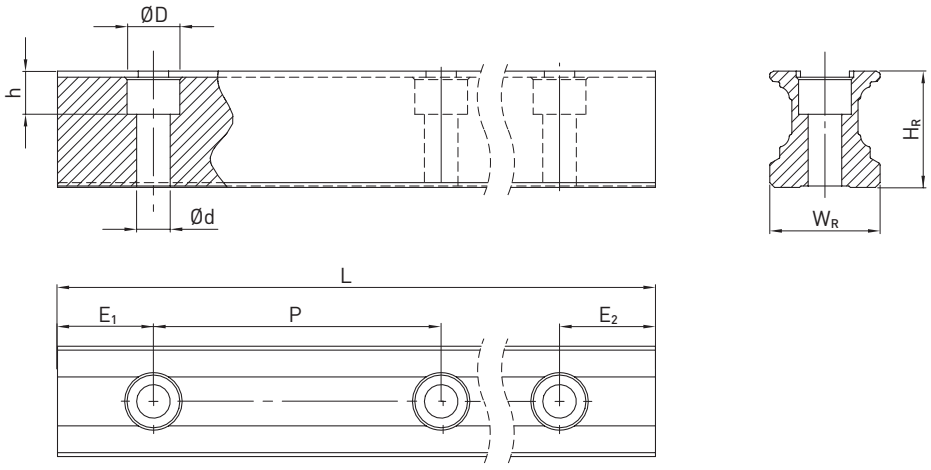


Table 3.128 **Dimensions CGR_R G1**

Series/size	Dimensions of the rail [mm]						Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm] [1]	$E_{1/2}$ min [mm] [2]	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	D	h	d	P						
CGR20R G1	20	20.55	9.5	8.5	6.0	60	4,000	3,900	7	16	53	2.05
CGR25R G1	23	24.25	11.0	9.0	7.0	60	4,000	3,900	8	17	52	3.05
CGR30R G1	28	28.35	14.0	12.4	9.0	80	4,000	3,920	9	18	71	5.10
CGR35R G1	34	31.85	14.0	12.0	9.0	80	4,000	3,920	9	24	71	7.14
CGR45R G1	45	39.85	20.0	17.0	14.0	105	4,000	3,885	12	27	93	11.51

[1] $E_{1/2}$ min with cover strip (clamp: steel clamp)
[2] $E_{1/2}$ min with cover strip (clamp: front clamping screw)

Note: The PGC types always requires the cover strip of the rail to clamp the magnetic tape.

3.8.5.4 Profile rail with groove, mounting from above (CG series)

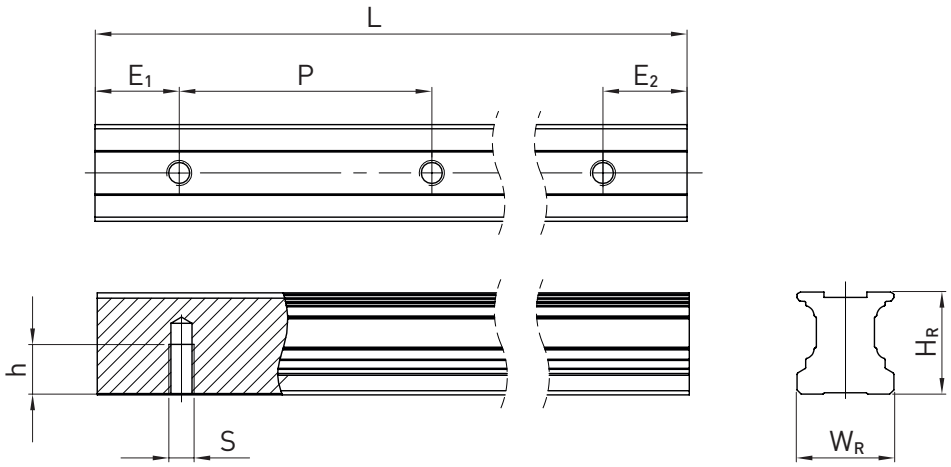


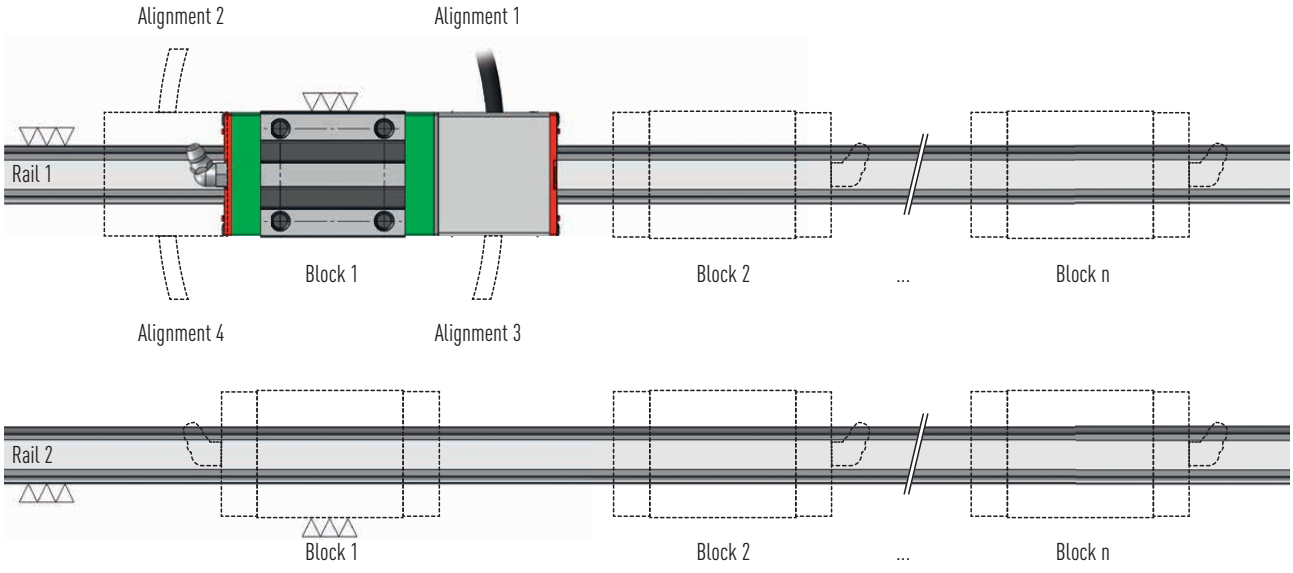
Table 3.129 **Dimensions CGR_T G1**

Series/size	Dimensions of the rail [mm]					Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm] 1)	$E_{1/2}$ min [mm] 2)	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	S	h	P						
CGR20T G1	20	20.55	M6	10	60	4,000	3,900	10	15	53	2.48
CGR25T G1	23	24.25	M6	12	60	4,000	3,900	11	15	52	3.38
CGR30T G1	28	28.35	M8	15	80	4,000	3,920	12	16	71	5.10
CGR35T G1	34	31.85	M8	17	80	4,000	3,920	16	22	71	7.14
CGR45T G1	45	39.85	M12	24	105	4,000	3,885	19	24	93	11.51

1) $E_{1/2}$ min with cover strip (clamp: steel clamp)
2) $E_{1/2}$ min with cover strip (clamp: front clamping screw)

3.8.6 Alignment of HIWIN MAGIC-PG encoder

The HIWIN MAGIC-PG encoder can be delivered in alignments 1 to 4 according to the order code (section 3.8.3). If the alignment is not specified, the encoder is delivered with alignment 1 by default.
If there are several blocks on one rail or on a pair of rails, the encoder is mounted on block 1, rail 1 as shown in the following figure. If an alignment deviating from the standard is required, this must be defined in the MAGIC-PG project planning sheet (www.hiwin.de).



3.8.7 Specifications of the HIWIN MAGIC and HIWIN MAGIC-PG positioning measuring systems

Table 3.130 **Electrical and mechanical properties of the HIWIN MAGIC and HIWIN MAGIC-PG**

	1 V_{SS} (analogue)	TTL (digital)
Electrical properties		
Output signal specification	sin/cos, 1 V_{SS} (0.85 V_{SS} – 1.2 V_{SS})	Quadrature signals acc. to RS-422
Resolution	Infinite, signal period 1 mm	1 µm
Repeatability bidirectional	0.003 mm	0.002 mm
Absolute accuracy	± 20 µm/m	
Reference signal [1]	Periodic index impulse at a distance of 1 mm	
Phase angle	90° ± 0.1° el	90°
DC component	2.5 V ± 0.3 V	–
Distortion factor	Typ. < 0.1 %	–
Operating voltage	5 V ± 5 %	
Power consumption	Typ. 35 mA, max. 70 mA	Typ. 70 mA, max. 120 mA
Max. measurement speed	10 m/s	5 m/s
EMC class	3, according to IEC 801	
Mechanical properties		
Housing material	High-quality aluminium alloy, encoder bottom made of stainless steel	
Max. cable length[2]	PGH/PGQ: 5,000 mm; PGC: 1,000 mm	
Min. bending radius cable	40 mm	
Protection class	IP67	
Operating temperatures	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, CG_20, CG_25	

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

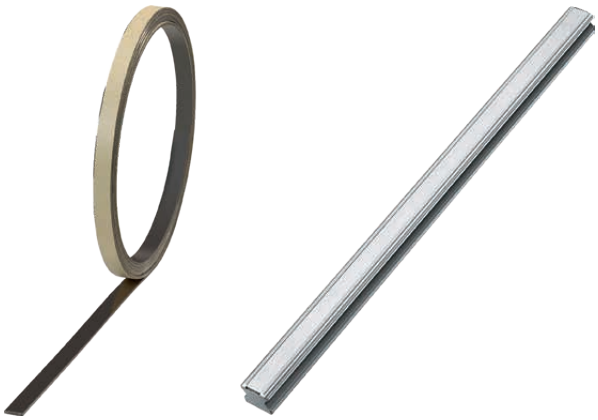
[2] For use in energy chains, we recommend our pre-assembled encoder cable with a pre-mounted M17 round connector (coupling, female) on one side, which matches the optional M17 round plug connector (male) of the encoder. For details, please contact your HIWIN technician.

Table 3.131 **Magnetic tape specifications**

Properties	MAGIC-PG	MAGIC
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

Magnetic tape separate (left) without cover strip and integrated in a guide rail (right) with stainless steel cover strip



3.8.8 Connection of MAGIC positioning measuring system

3.8.8.1 Line assignment (for analogue and digital variants)

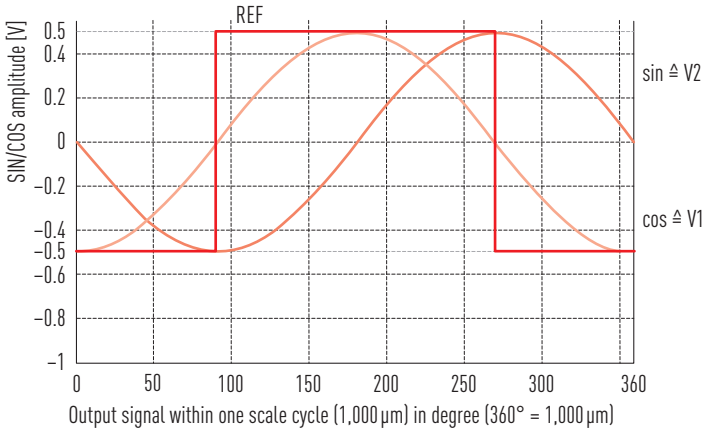
A high-quality 8-core cable is used, each V1+, V1-, V2+, V2- and V0+, V0- (or A, $\bar{A}$, B, $\bar{B}$ and Z, $\bar{Z}$ for the digital variant) twisted in pairs.
For use in energy chains, we generally recommend our pre-assembled extension cables, which are specially designed for use in energy chains. The extension cables are supplied with a single-sided M17 round plug connector (coupling, female) or a customer-specific version.

3.8.8.2 Formats and outputs

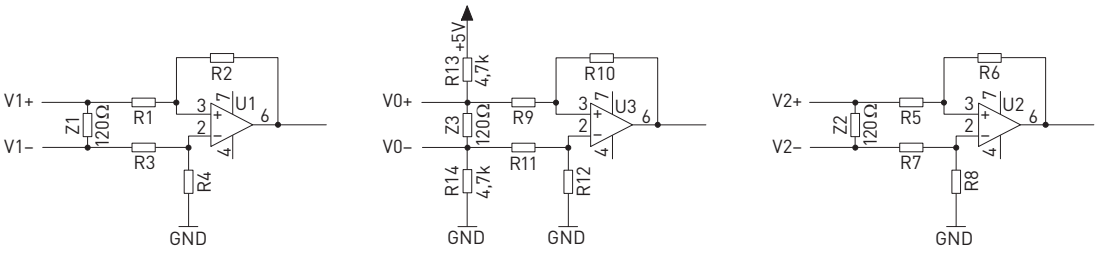
Signal format sin/cos 1 V_{SS} output (analogue)

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

Electrical signals after the difference input of the subsequent electronics (analogue version)



Recommended downstream electronic circuit with sin/cos-1 V_{SS} output



A channel
V1 channel

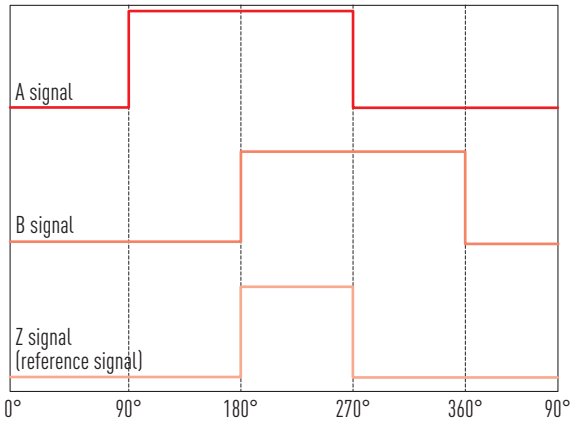
reference channel
V0 channel

B channel
V2 channel

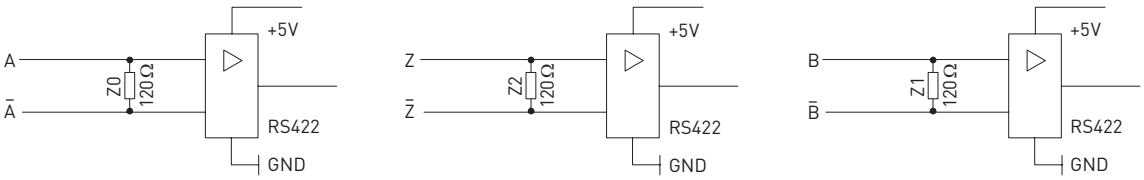
TTL output (digital)

The signals to the A and B channels phase-shifted by 90° (according to the RS-422 specifications conforming to DIN 66259). Recommended terminating resistance Z = 120 Ω. Output signals: A, $\bar{A}$, B, $\bar{B}$ and Z, $\bar{Z}$. Single reference pulse and the definition of a minimum pulse duration are possible as an option.

Signals of the MAGIC encoder (TTL version)



Recommended switching of the downstream electronic components with digital TTL output



A channel

reference channel

B channel