SENSITEC
KÖRBER SOLUTIONS

Magnetic Scales.

For Length and Angle Measurement.

Magnetization for Angle, Length and Position Measurement.

A precisely magnetized measurement scale or pole ring is an essential part of a perfect measurement system. Beside the MR sensor, the active measurement scale is the most important component for the highly precise and robust angle, length and position measurement.

As a manufacturer of magnetic sensors and a supplier of complete sensor solutions special know-how concerning magnetization is one of our core competences. In addition to our highly precise magnetization facilities for pole rings and linear measurement scales we apply simulation tools to ensure the optimized design of measurement scales. This enables us to evaluate parameters like magnetic material, air gap and alignment tolerances and to select the ideal measurement scale for your application. The chip characteristics of our MR sensors are reflected in this calculation to achieve a maximum performance for the complete system.

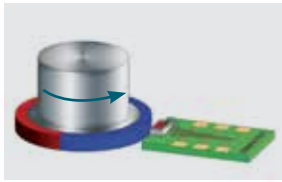
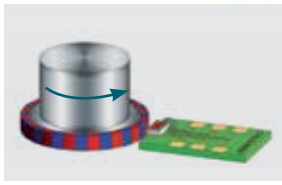
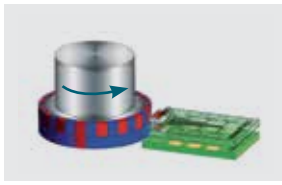
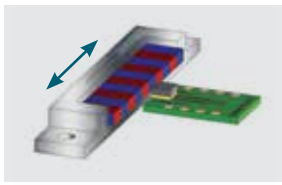
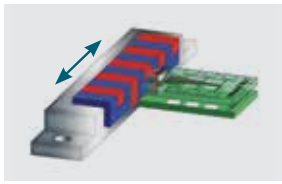
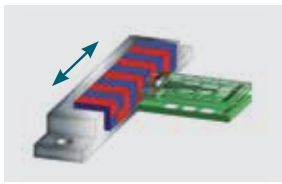
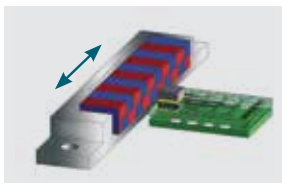
Our magnetization systems are equipped with highly precise reference systems which provide highest accuracy during the magnetization process as well as during the subsequent measurement. The magnetization systems are designed for series application and cost effective production. Furthermore this concept allows a highly flexible utilization for samples and small volumes as well. This is a special advantage because the production takes place on series production systems and the cost for sample production can be reduced to a minimum even in early development stages.
The magnetization is carried out using a pulsed procedure. This means that each magnetic pole is implemented with a very high field strength into the magnetic material. This allows, for example, the magnetization of polymer-bound NeFeB material among others. During magnetization of pole rings the resulting „joint“ between start and end of the magnetization is eliminated by a specially developed process.

Pole rings and linear scales can be magnetized with up to three tracks. In addtion to incremental tracks it is also possible to magnetize reference tracks with one or more poles and furthermore code tracks with different north and south pole patterns.

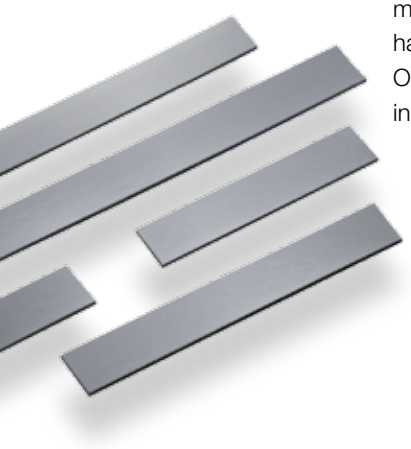
» To set the standard
you have to be able to
measure it.
Set the standard. «

Measuring Configurations.

Sensitec can magnetize a variety of different codes on both pole rings and magnetic scales. The table below gives an overview of possible sensor arrangements for pole wheels/pole rings or measurement scales.

		Configuration	Application Example
1		Rotating magnet; sensor mounted on a substrate on the axis of rotation	Absolute angle measurement up to 360° at the shaft end (axial)
2		Rotating magnet; sensor mounted on a substrate perpendicularly to the axis of rotation	Absolute angle measurement up to 180° at the shaft circumference
3		Magnetic pole ring with fixed pitch; sensor mounted on substrate radially to the pole ring; sensor surface in the plane of the pole ring	Incremental angle measurement at the shaft circumference
4		Sensors mounted perpendicularly to the magnetic tracks on the scale	Incremental angle measurement with reference point
5		Linear magnetic scale with fixed pole length (pitch); sensor mounted perpendicularly to the magnetic track on the scale	Incremental length measurement
6		Sensors mounted perpencicularly to the magnetic tracks on the scale	Incremental linear measurement with reference point
7		Multi track linear magnetic scale with fixed pole length (pitch); sensors mounted perpendicularly to the magnetic track on the scale	Absolute length measurement with code track
8		Linear measurement scale with nonius track. Both sensors are mounted perpendicularly to the magnetic tracks	Absolute length measurement using nonius principle

Linear Measuring Scales.



Two different material variants are used for active linear measurement scales. High remanence and high precision are characteristic features of linear measurement scales made of hard ferrite material whereas Tromaflex® measurement scales mounted on a stainless steel strip allow a flexible handling and are suitable for larger lengths.
On the scales different pole pitches with alternating north and south poles as well as reference tracks can be magnetized. For a magnetization with only an incremental track the width of magnetization equals the width of the measurement scale. The length of the measurement scale of Tromaflex® scales can be chosen freely. Due to their individual material characteristics hard ferrite measurement scales are more suitable for short lengths - please contact us if you have special requirements.

Product code

MLx YYYYUAz UA
MLx YYYYHAz UA

Tromaflex®
Hard ferrite

- Product specific temperature range, standard packaging
- Pole pitch (see table right)
- Number of poles
- I - Linear scale incremental magnetization
- R - Linear measurement scale incremental magnetization with reference track

z	Pitch
A	0.5 mm
B	1.0 mm
C	2.0 mm
D	2.5 mm
E	5.0 mm

Example: MLI0050UAC-UA
Incremental, 2 mm pole pitch, 100 mm scale length

Technical Data – Tromaflex® Measurement Scales

Parameter	Value	Unit
Lengths (from stock) [1]	10 / 20 / 50 / 100 / 200 (± 1 mm)	mm
Width	10	mm
Height	1.3	mm
Pitch	0.5 / 1.0 / 2.0 / 2.5 / 5.0	mm
Accuracy of pole length	1	%
Ambient temperature range	-20 to +70	°C

Tromaflex® – Registered trademark of Max Baermann GmbH
[1] Further scale lengths on request

Technical Data – Hard Ferrite Measurement Scales

Parameter	Value	Unit
Lengths (from stock) [1]	14 / 24 / 35	mm
Width	4	mm
Height	2	mm
Pitch	0.5 / 1.0 / 2.0 / 2.5 / 5.0	mm
Accuracy of pole length	1	%
Ambient temperature range	-20 to +200	°C

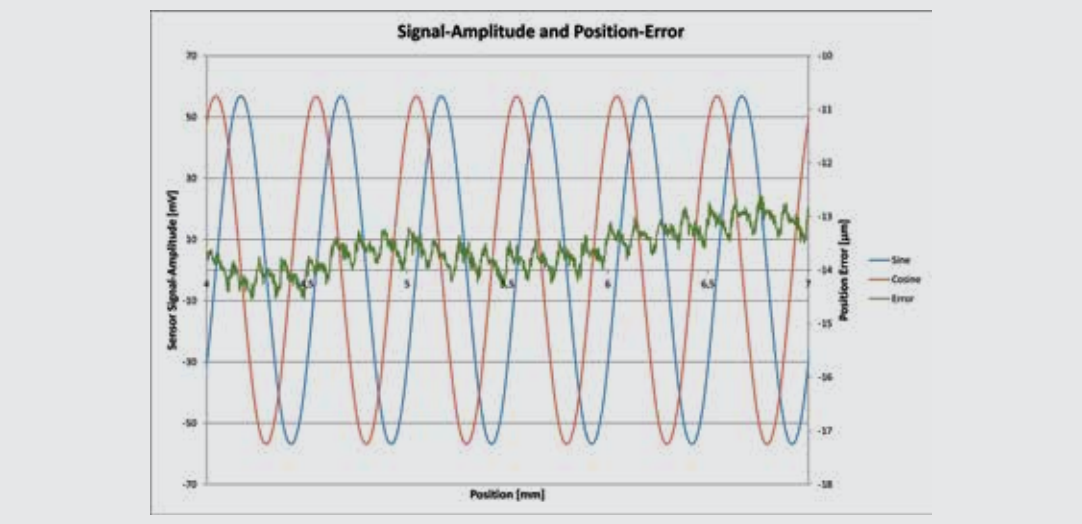
[1] Further scale lengths on request

Magnetisation.

The magnetization of pole rings and measurement scales by Sensitec is carried out

- on our own magnetization systems
- using patented processes
- adapted to the performance requirements of the customer
- using specific simulation tools for an optimized geometry and robust and reliable measurement results

We use special tools to create pole rings customized for your application requirements. In accordance with the given geometry and the measurement requirements the optimized pole ring parameters are determined depending on the diameter, the number of poles, size or demanded air gap.



Pole Rings.

Pole rings are active measurement scales. They can be manufactured from different materials. The basic magnetic material is often hard ferrite, bound for example in an elastomer or polyamide matrix. The pole rings are typically magnetized with alternating north-south poles around the circumference. Multi-track pole rings are typically used if an additional reference track is required and other magnetic encodings are also realizable. The pole length is given approximately by the relationship circumference/number of poles. The width of magnetization for a single track pole ring is typically the width of the pole ring. The tracks for multi-track rings are applied so that the signal quality of the total system is optimal.

Sensitec offers standard pole rings in three versions: elastomer bound pole rings are already mounted on a metallic ring – the sintered hard ferrite rings and polymer bound variants can be mounted on a hub by the customer. We would be pleased to offer advice on the right choice of pole ring.

Technical Data

Standard pole rings (elastomer bound)[1]	Product code	Pole pitch [mm]	Sensor	Air gap [µm][2]	Number of poles
Da/Di/H 31.87/20/10	MWx0200FAA-UA	0.5	AL795 / TL912	140	200
	MWx0100FAB-UA	1.0	AL798 / TL913	300	100
	MWx0050FAC-UA	2.0	AL796	620	50
	MWx0040FAD-UA	2.5	AL797 / AL794 / TL915	780	40
	MWx0020FAE-UA	5.0	AL780	1570	20
Da/Di/H 40.78/30/10	MWx0256FAA-UA	0.5	AL795 / TL912	140	256
	MWx0128FAB-UA	1.0	AL798 / TL913	300	128
	MWx0064FAC-UA	2.0	AL796	620	64
Da/Di/H 57.3/45/10	MWx0360FAA-UA	0.5	AL795 / TL912	160	360
	MWx0180FAB-UA	1.0	AL798 / TL913	320	180
	MWx0090FAC-UA	2.0	AL796	630	90
	MWx0072FAD-UA	2.5	AL797 / TL915	790	72
	MWx0036FAE-UA	5.0	AL780	1590	36
Da/Di/H 122/90/10	MWx0768FAA-UA	0.5	AL795 / TL912	270	768
	MWx0384FAB-UA	1.0	AL798 / TL913	430	384
	MWx0192FAC-UA	2.0	AL796	750	192

Da: outer diameter
Di: inner diameter
H: width

MWx-I:
Pole ring with incremental magnetization

MWx-R:
Pole ring with incremental magnetization and reference track

Standard pole rings (hard ferrite 8/22)[3]	Product code	Pole pitch [mm]	Sensor	Air gap [µm][2]	Number of poles
Da/Di/H 38/30/6.5	MWx0240HAA-UA	0.5	AL795 / TL912	260	240
	MWx0120HAB-UA	1.0	AL798 / TL913	420	120
	MWx0060HAC-UA	2.0	AL796	730	60
	MWx0048HAD-UA	2.5	AL797 / AL794 / TL915	890	48
	MWx0024HAE-UA	5.0	AL780	1690	24
Da/Di/H 41.2/25.05/10	MWx0260HAA-UA	0.5	AL795 / TL912	250	260
	MWx0128HAB-UA	1.0	AL798 / TL913	90	128
	MWx0064HAC-UA	2.0	AL796	410	64
Da/Di/H 72/54/7	MWx0226HAB-UA	1.0	AL798 / TL913	290	226
	MWx0112HAC-UA	2.0	AL796	290	112

[1] Ambient temperature range: -40 to +160 °C (ring on steel carrier).

[2] Ideal air gap for highest precision. By means of simulation tools Sensitec will be pleased to work out an optimized combination of sensor, pole ring and air gap for your application. Please contact our sales engineer.

[3] Ambient temperature range: -20 to +200 °C (ring without carrier).

Standard pole rings (polymer bound hard ferrite 8/22) [4]	Product code	Pole pitch [mm]	Sensor	Air gap [µm] [2]	Number of poles
Da/Di/H 20.44/15.5/3.5	MWR0032KAC-KH	2.0	AL796	600	32
Da/Di/H 29/25/5.5	MWx0180KAA-UA	0.5	AL795 / TL912	50	180
	MWx0090KAB-UA	1.0	AL798 / TL913	140	90
	MWx0046KAC-UA	2.0	AL796	780	46
	MWx0036KAD-UA	2.5	AL797 / AL794 / TL915	620	36
	MWx0018KAE-UA	5.0	AL780	1400	18
Da/Di/H 31.7/25/5.5	MWx0200KAA-UA	0.5	AL795 / TL912	220	200
	MWx0100KAB-UA	1.0	AL798 / TL913	380	100
	MWx0050KAC-UA	2.0	AL796	700	50
	MWx0040KAD-UA	2.5	AL797 / AL794 / TL915	860	40
	MWx0020KAE-UA	5.0	AL780	1660	20

Da: outer diameter
Di: inner diameter
H: width

[4] Ambient temperature range: -40 to +105 °C (ring without carrier).

October 2015
Subject to technical changes.

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