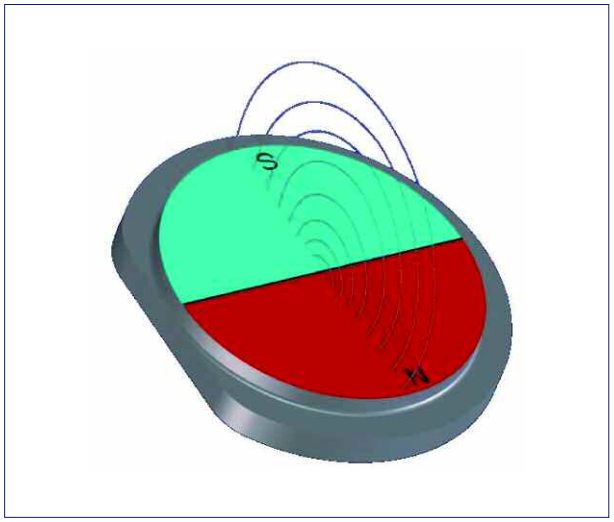
Our reply to the resource issues rare earth: Sensor magnets on material basis hard ferrite in plastic bonding

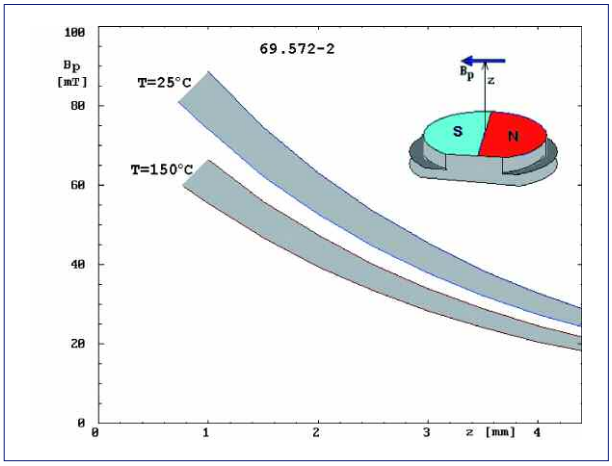
The encoder magnets introduced here are the result of the further development of our series of plastic-bound magnets for angular sensors. Our objective was

- to provide a more economical solution compared with magnets on the material basis of rare earth metals,
- to achieve a greater independence from raw material sources in Asia,
- to realise shaping and magnetising in a single production process.

Below is some technical data of a sample magnet:

Specification:	Round magnet
Article No.:	69.572-2
Material:	Sprox 13/21p (Brand name of Magnetfabrik Bonn)
DIN IEC 60404-8-1:	Hard ferrite 15/22p
Magnetisation:	2-pole front on head with ø 15
Operating temperature:	T_{max} = 150 °C





Field strength centric above the encoder 69.572-2, ø 18 x ø 15 x 2.5, D-surface 16.5 mm

We have developed a rotary encoder magnet on a hard ferrite material basis. It is produced in an injection moulding process and magnetised directly in the too. This reduces material and production costs a well as part-specific tool costs.

Measuring distance

Corresponding with the field loss on the middle axis the angle can be recorded at an effective distance to the active sensor surface up to approx. 4.5 mm depending on sensor type and temperature.

Angular accuracy

The lateral D-surface permits field alignment to a reference surface (absolute field strength measurement). The accuracy of the alignment can be realised in the range of approx. 1° depending on geometry and tolerance.
The relative accuracy (linearity) of the angle measurement typically amounts to 0.5° to 0.6° depending on meas-urement distance and sensor. The reliable tolerance of the linearity can be kept at approx. 1° at a c_{pk} of 1.67.

Geometry

The sample magnet is pointed in the rear centre and demoulded over the collar. The surface in the sensor area is designed level for broad homogeneity of the magnetic field. Cavity markings, material labelling etc. should be affixed on the rear on the collar. The collar can be utilised for fastening (beading, overmoulding etc.).

Summary

Summary of technical advantages of encoder magnets made of plastic-bound hard ferrite and plastic-bound NdFeB in comparison

Advantages of magnets based on hard ferrite:

- better contour accuracy due to smaller granulation of magnetic filler
- corrosion stability
- no irreversible magnetic loss at high temperatures up to 150 °C
- single level safe manufacturing process

Advantages of solutions on rare-earth basis (NdFeB):

- greater field strength, measuring distance at comparable diameter approx. 1-2 mm larger
- less possibility of external manipulation (greater coercive field)
- smaller reversible temperature drift (approx. 13 % per 100 K instead of 20 % per 100 K), however, this also causes irreversible losses!

Résumé

We are introducing a new magnet concept for a magnet for angular sensors for front-face retrieval. We can offer approx. 30 % cost reduction for large serial production; the part-specific tool costs are generally also more economical.

Challenge us!

We hope we have been able to raise your interest. Our team in Bonn is happy to provide you with further explanations. We would be pleased to develop an encoder magnet together with you which constructively suites your requirements.

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