TECHNICAL INFORMATION

Version: Sept. 2007

BOGEN MAGNETIC METROLOGY

COMPENSATION PROCEDURES FOR HIGH-PRECISION MAGNETISATION OF ROTARY SENSORS

Magnetic rotary sensors are subject to mechanical tolerances and inhomogeneities (caused by production) in the applied magnetic materials. These problems can only be reduced through considerable additional work in the mechanical processing and through the use of more elaborate tools during the application of the magnetic layers. These solutions both mean much greater costs and longer process times.

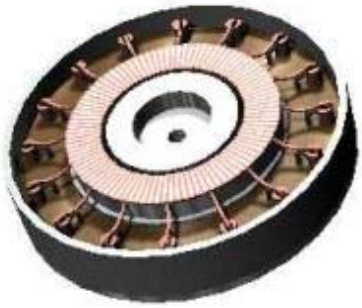

Fig.1: Impulse magnetisation tool with equal pole lengths

In conventional impulse magnetisation, the same sized poles are always applied to the rotary sensors with the magnetisation tools. Due to the above-described tolerances, this leads to larger deviations, limiting the achievable precision of the technique. From experience, one can assume this deviation to be about 0.1° or 360 arc seconds. In addition, the mechanical expenditures increase with smaller pole widths, and with them, the costs for building a magnetisation tool also increase greatly.

Using the patented Bogen magnetisation procedure, however, "true" angle graduations are possible.

The pole widths can thus be flexibly fitted to the diameter of the rotary sensors using a high-resolution angle measuring system. Existing deviations, such as eccentricities (s. Fig. 2), no longer play a role with this technique.
Through the development of a compensation procedure, it is now possible to achieve graduation precision of approx. 0.008° or approx. 10 arc seconds in mechanical high-quality sensors, which previously was not possible for optical and inductive systems. Even for simple mechanical rotary sensors, drastically improved precision is now possible in comparison to the traditional methods of magnetisation.

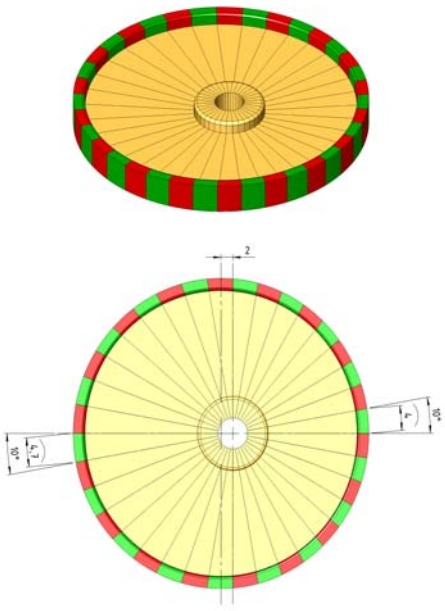

Fig. 2 Effects of eccentricity on the pole widths

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With the new **BOGEN COMPENSATION TECHNOLOGY**, in addition to taking the eccentricities into consideration, further individual ring characteristics can be corrected, such as layer-thickness tolerances and magnetic inhomogeneities.
In doing so, the not "ideal" rotary sensor is magnetised according to the specifications and then the deviations from the target values are measured. (s. Fig. 3)

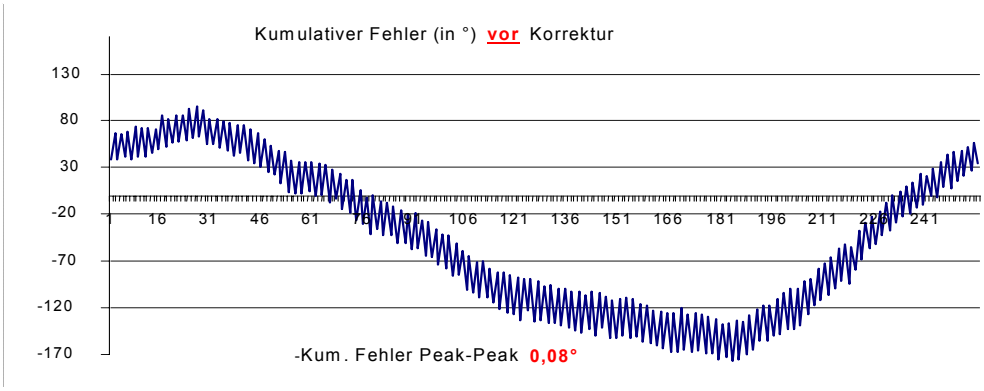

Fig. 3: 1. Magnetisiation without compensation

In the compensation run that is then carried out, every deviation in the pole positions vis-à-vis the specifications can be corrected using the software programme so that the deviation from the target values can be minimised. (s. Fig. 4)

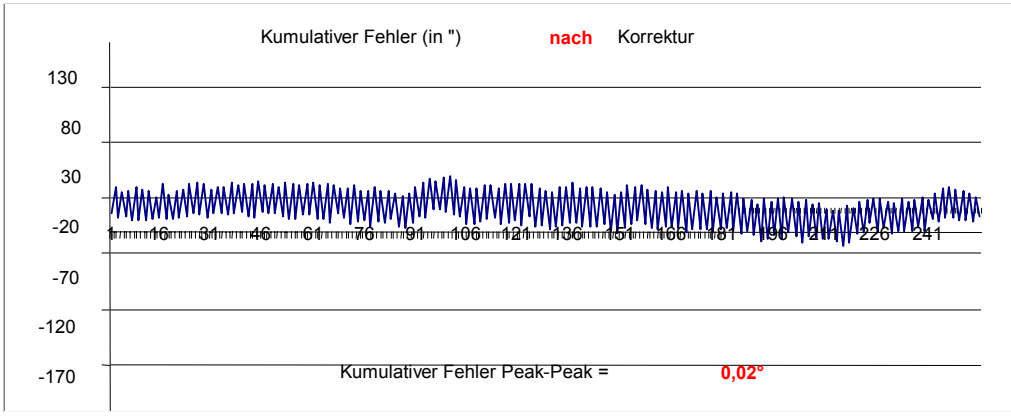

Abb. 4: Smoothing following the compensation run

The BOGEN COMPENSATION TECHNOLOGY is thus ideal for high-precision applications, where the user previously was not able to utilise the advantages of the magnetic systems due to a lack of precision.
The rotation speed measurement of engine shafts and the determination of the position of the crankshafts in automotive application are already being carried out using rotary sensors that have been magnetised using the new Bogen technology.
This presents a high-precision alternative for difficult environmental conditions as well as a considerably more cost-effective alternative to optical and inductive systems.

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