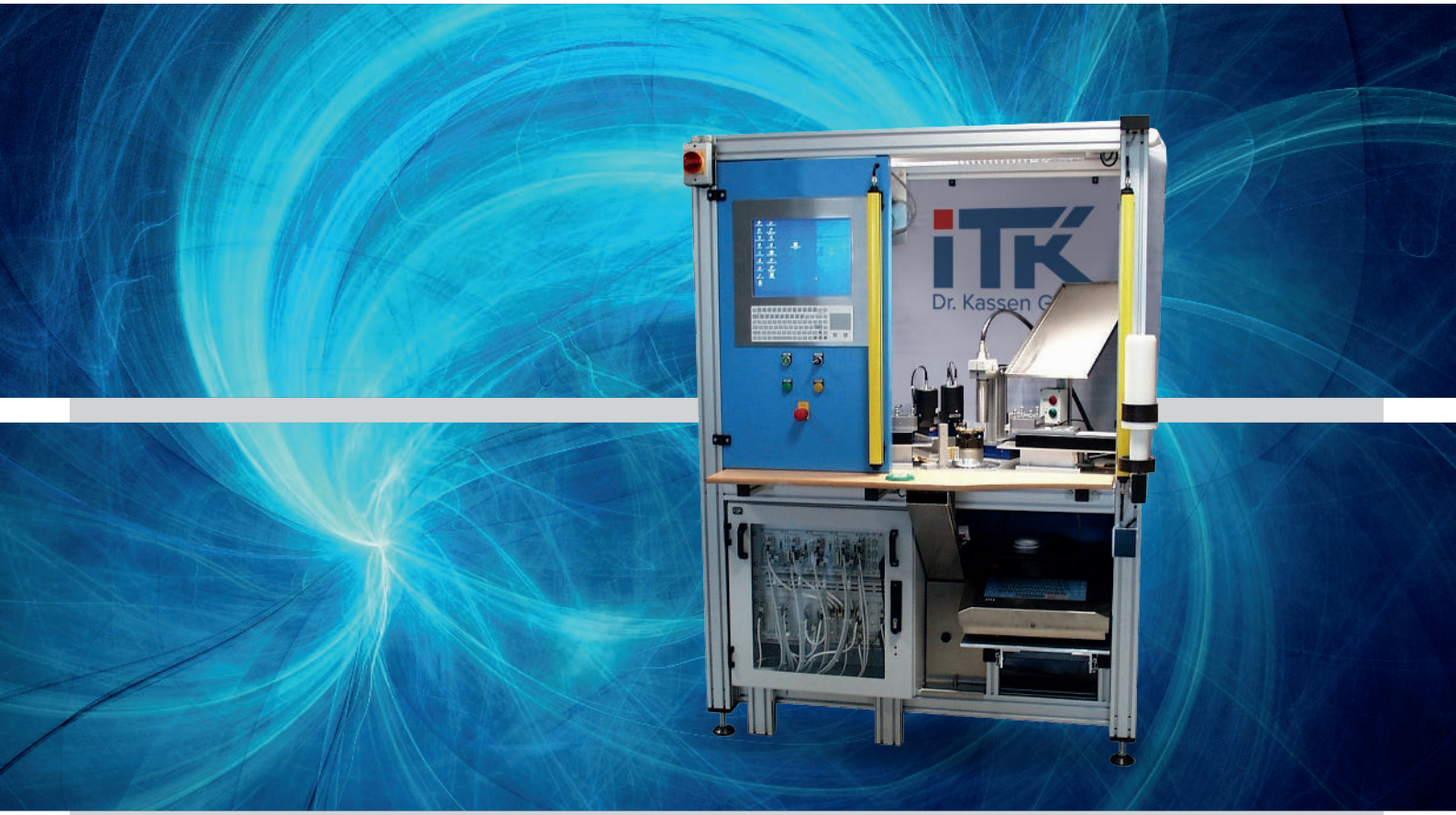


Linear and rotary measurement scales

Customized magnetization machines.

Measuring. Controlling. Moving. Positioning.

One-stop shop for customized solutions.

For more than 35 years, ITK Dr. Kassen GmbH has been a recognized partner for the development and production of sophisticated mechatronic solutions. During this time the company has grown from a one-man engineering office to a medium-sized company with a wide range of services focusing on hard- and software development.

Today we conceive, design, manufacture and service high-quality mechatronic systems. Always in close exchange with our customers and with a a depth of production and breadth of competence that is second to none.

We develop, manufacture and calibrate all the major components used in-house, including

- Mechanical components
- Controls
- Linear actuators
- Position sensors

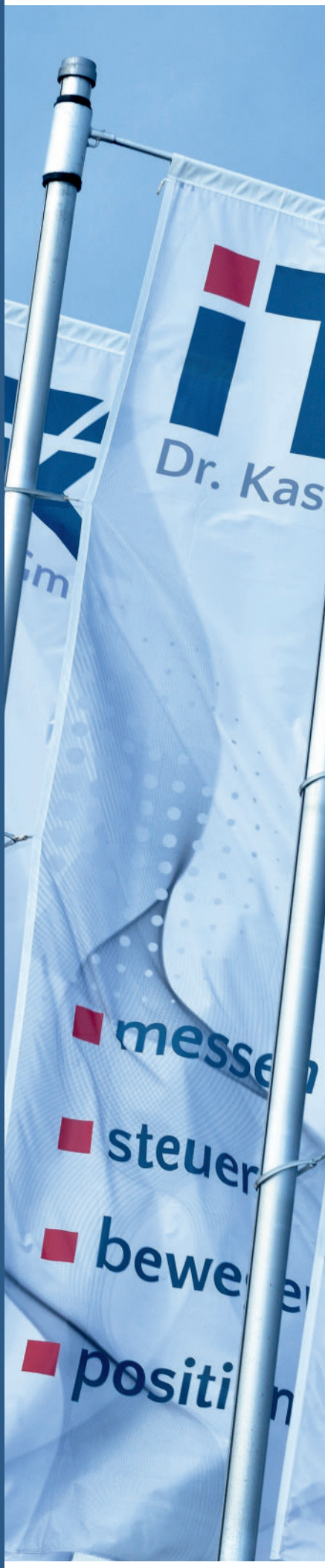
This enables us to offer our customers

- High flexibility regarding the design of products
- Series production of small series for mechatronic systems

The result of this strong combination: broad knowledge and extensive experience in design and construction of complete machines, which we design and develop in interdisciplinary teams.

For added value, which can only be achieved thanks to an integral technical understanding of the individual disciplines: Electronics, mechanics and software. These are our fields of competence:

Measurement technology. Control technology. Drive Technology. Positioning Technology.



Magnetic measurement scales for linear and rotary applications

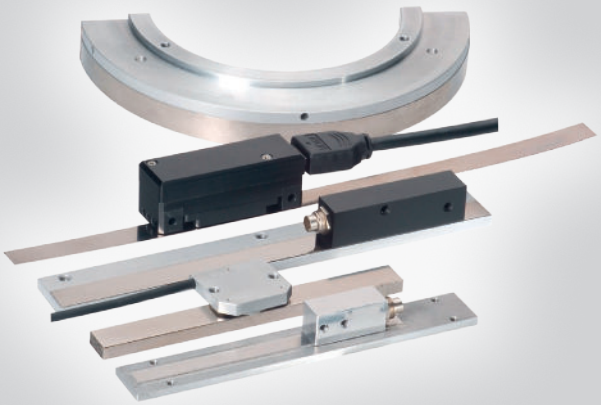
Quality needs experience.

Our magnetization machines write magnetic codes, typically comprising equidistant north and south poles on a wide range of magnetic materials. The quality of the resulting magnetic scales depends on a wide range of factors to create high quality magnetic scales for linear and rotary applications takes years of experience. That is exactly what you will find at ITK Dr. Kassen GmbH.

Different magnetization machines can be used to produce either linear or rotary magnetic scales. The direction of magnetization can be both “in-plane”, that is, parallel to the surface of the scale, or “out-of-plane”, that is, perpendicular to the surface. Impulse or inductive magnetization heads can be used to write the magnetic code.

Application examples.

- Measurement scales for incremental and absolute encoders
- Coding of pole rings
- Scales for measuring machines (e.g. swivel axes for applications in the optical industry)
- Scales for processing machines (metal-/ glass-/ plastic-/ woodworking)
- Magnetic coding for automotive steering systems/ drive shafts/suspension systems



Linear measurement scales

Linear scales are produced on linear magnetization machines. The magnetic material to be coded is fixed mechanically on the machine bed. The write head is then moved along the scale and the appropriate pole pattern and magnetization direction is created. Essential for the high quality of the scale are

- Precise positioning of the write head in the writing direction
- Exact control of the gap between the write head and the scale
- Precise magnetization parameters and magnetization currents

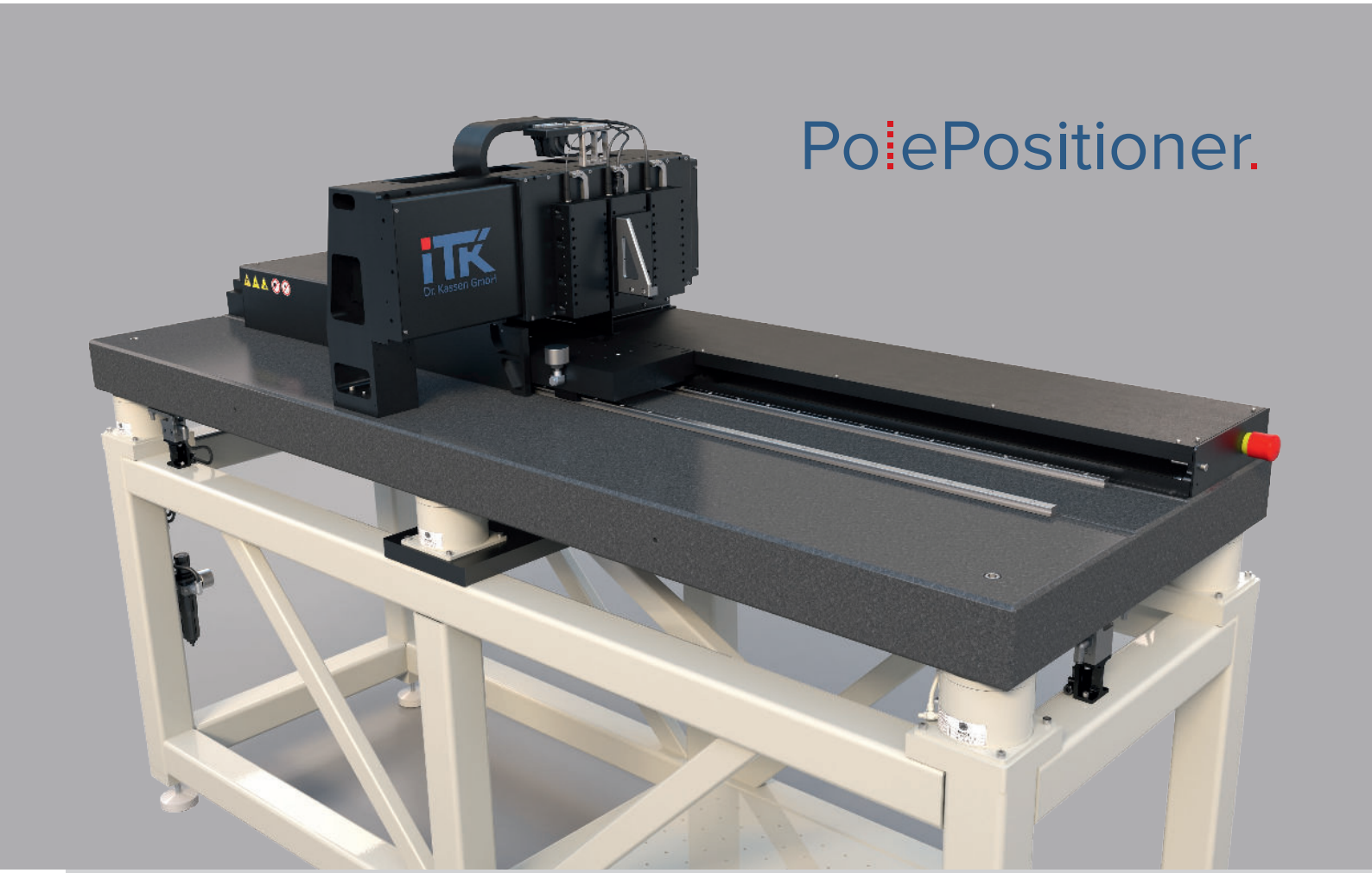
Alternatively, the write head can be fixed and the scale can be moved relative to the write head. Using this principle, scales of any length can be produced. However, the positioning of the scale is more complex and, particularly for very long scales, thermal and slippage effects need to be compensated for.

Rotary measurement scales

Rotary scales are manufactured on rotary magnetization machines. The magnetic material to be coded, typically in the form of a pole ring, is fixed on the axis of rotation of a precise rotary table. The write head is positioned with the appropriate air gap and the appropriate pole pattern and magnetization direction is created by rotating the pole ring relative to the write head.

Conceivable for you. Feasible for us.

Using 2D or 3D positioning platforms a spatial curve can be generated using a path control system to write codes on almost any shape of object. Everything from simple spiral or ball shapes, right up to the most complex spatial curves is possible. The movement is provided by our 3-axis gantry machines, which currently can cover a volume up to 1300 x 1300 x 250 mm. In order to generate even more complex paths, the linear axes can be supplemented by one or more rotary axes.



ITK linear magnetization machines type LMP.

PolePositioner® Linear magnetization machines from the LMP family can be used to produce measurement scales from many different magnetic materials, including:

- hard magnetic,
- elastomer-bonded and
- plastic-bonded materials.

The magnetization machine is designed for maximum flexibility yet high productivity. With the standard machine, scale lengths from 50 to 2000 mm can be coded, though machines for other lengths are available on request. If you want to produce scales with different magnetic or geometric properties, then this is no problem – the interchangeability of the write and measurement heads offers almost unlimited possibilities from just one machine.

The LMP magnetization machines are typically equipped with ITK's own linear motor and measurement technology. Mechanical transmission elements such as ballscrews or toothed belts are not used, which offers the following convincing benefits:

- Inaccuracies due to backlash are eliminated
- Scales can therefore be coded with very high precision and yet still be manufactured with a high productivity

The use of a laser interferometer as reference measurement system allows the pole pattern to be coded with extremely high accuracy. This allows highly precise measurement scales to be produced with a high reproducibility, so avoiding any scrap. These are the best prerequisites to enable you to open up new application areas.
Highest reliability.

Maximum design freedom.

The material of the measurement scale is coded by the write head using either a digital impulse or analogue inductive magnetization principle. Fixed geometries in the write head for different period lengths and high machine precision ensure high reproducibility when coding the measurement scale. Furthermore, write heads for high currents are available, so creating stronger magnetization fields, which enable a stronger and deeper magnetization of the magnetic material.

Your advantage: You benefit from more degrees of freedom in your end application. Stronger magnetization allows larger air gaps between sensor and magnetic scale and/or the application is less sensitive to stray magnetic fields.

We manufacture our machines according to the individual needs of our customers. On request you can receive a turnkey package from us. For example, this could look like the following:

LMP magnetization machine, including:

- CE-conformity
- Customer software
- Commissioning
- Calibration
- Training
- Service/maintenance

LEFT AND RIGHT:
Design examples from the LMP family.

Technical data.

Scale lengths	50 - 2000 mm
Materials	hard magnetic, elastomer-bonded and plastic-bonded materials
Track widths	1 - 5 mm
Number of tracks	1 - 3, several coded tracks possible (incremental, absolute; reference marks)
Period lengths	500 - 5000 µm
Accuracy	down to the sub-µm range (compensated), ca. 5 µm (uncompensated)
Resolution	in the nanometer range
Writing method	digital or analogue
Software	customer-specific operating and evaluation software optional
Quality inspection	ceasuring the scale on the same machine
Intended use	continuous industrial use (24h / 7 days)
Marking	each scale can be individually marked

Please note: These exemplary technical data are based on the specifications from realized machines. They give a first impression of machine capabilities. If you have other requirements just give us a call.

ITK rotary magnetization machines type RMP.

As with the PolePositioner® LMP family, the RMP rotary magnetization machines can also be used for a variety of different magnetic materials, ranging from hard magnetic material, elastomer-bonded to plastic bonded materials. The magnetic poles can be written both in radial and axial directions with either in-plane or out-of-plane magnetization.

The rotary magnetization machine can be used to code pole rings with a wide range of diameters. In no time at all you can change from a diameter of just 3.5 mm to a large diameter of e.g. 500 mm – all with the same machine.

The use of a highly accurate reference encoder in the rotary table allows poles with extremely small pole length deviations and extremely high pole location accuracy. The result: magnetic scales for high precision applications can be manufactured repeatably with high productivity.

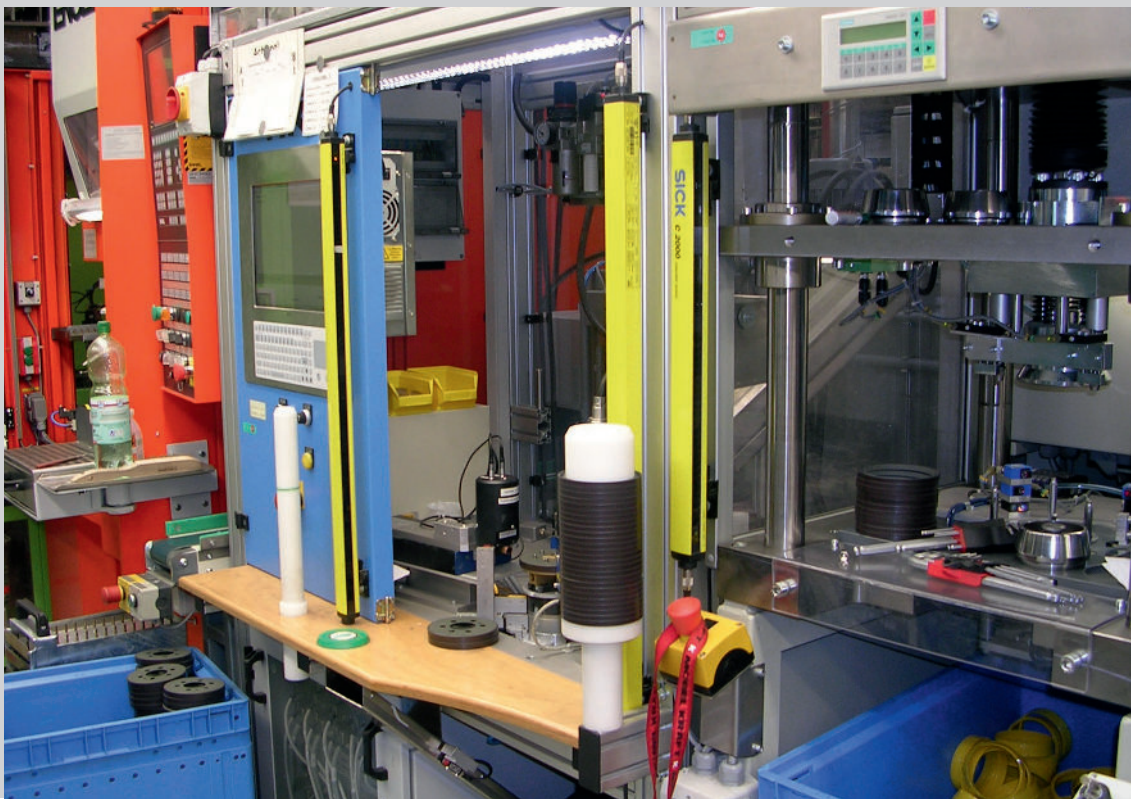
Once the writing and calibration process is complete each measurement scale can be individually marked. Bar codes can be printed on the scale with the following benefits:

- Less danger of mixing up scales
- Traceability is much easier – even many years after production

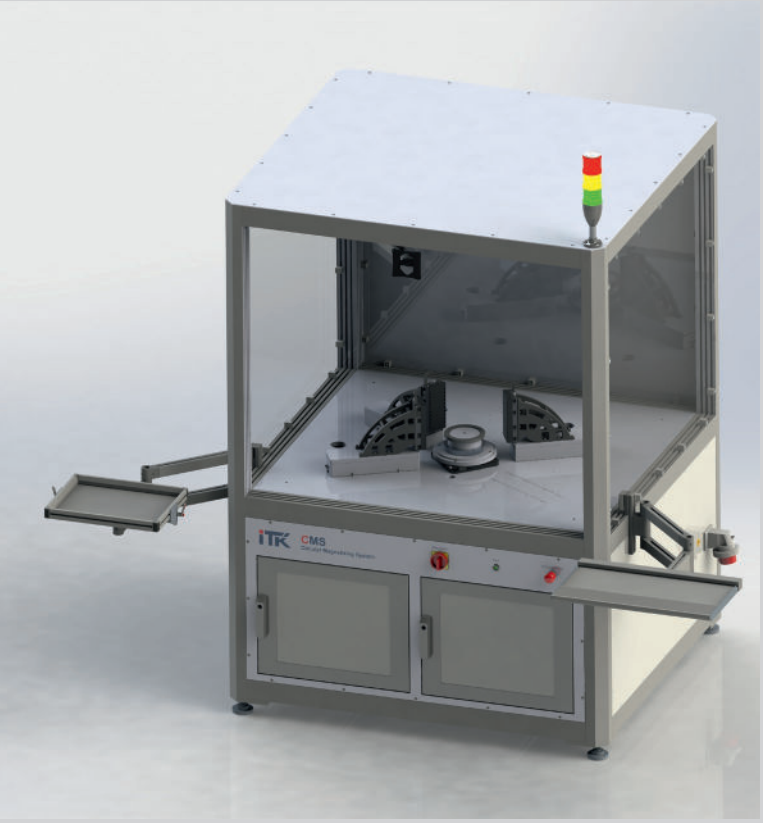
Proven products. Extensive know-how.

A magnetization machine is only as good as its' parts. This is why we only use tried and tested components. You can depend on us. Profit from nearly 40 years' experience in the design and manufacture of complex positioning and measurement systems. This will certainly give you a feeling of confidence.

Right: In-process integration of an RMP rotary magnetization machine



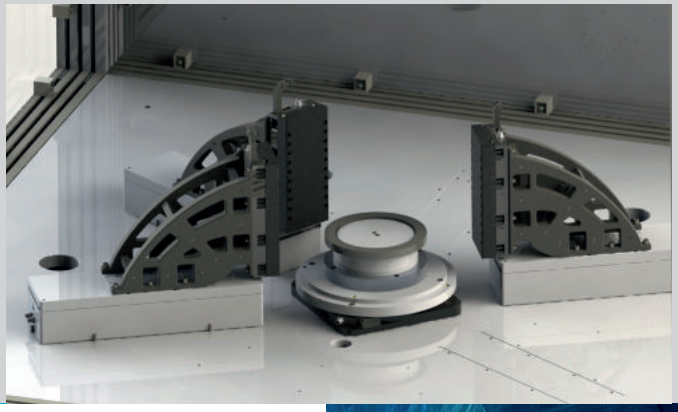
PolePositioner.



We manufacture our machines according to the individual needs of our customers. On request you can receive a turnkey package from us. For example, this could look like the following:

RMP magnetization machine, including:

- CE-conformity
- Customer software
- Commissioning
- Calibration
- Training
- Service/maintenance



ABOVE: Rotary magnetization machine
RIGHT: Writing system as part of the magnetization machine

Technical Data.

Scale diameter	3.5 - 500 mm (standard)
Scale materials	hard magnetic, elastomer- and plastic-bonded materials
Magnetization directions	radial and/or axial, in-plane and/or out-of-plane
Number of poles	freely selectable
Number of tracks	several coded tracks possible; incremental. (absolute or reference tracks)
Repeatability	down to 5 arcsec (depending on reference measuring system and magnetic material)
Angular resolution	down to 0.5 arcsec
Writing method	digital, impulse or analogue, inductive
Software	customer-specific operating and evaluation software optional
Quality inspection	measuring the scale on the same machine optional
Intended use	continuous industrial use (24 / 7)
Marking	each scale can be individually marked

Please note: These exemplary technical data are based on the specifications from realized machines. They give a first impression of machine capabilities. If you have other requirements just give us a call.

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