

# m-axis

Permanent magnet measurement system

昊量光电



# m-axis - Measurement of permanent magnets

## Investigation of permanent magnet properties

m-axis is a measurement system to investigate the magnetic specifications of permanent magnets (magnetization angle and magnetic moment). Due to its modular setup it is possible to customize the measurement range of the m-axis system in addition to the four standard ranges and for 100% quality control.



## Highlights

- Determination of the magnetic moment
- Calculation of the remanence
- Measurement of the magnetization direction
- Tabular and graphic illustration of size and orientation of the error angle
- Geometry independent investigation
- Statistic evaluation of the parameters
- Automated documentation and conversion of the data in CSV format
- System implementation and/or integration into running manufacturing processes



## Technical specifications

- Accuracy of the magnetic moment and the remanence  $B_r$ :  $\pm 1\%$
- Repeatability of the magnetic moment and the remanence  $B_r$ :  $\pm 0,1\%$
- Accuracy magnetization angle: up to  $\pm 0,1^\circ$
- Fast classification
- Optional North/ South modul
- Automatability (with I/O Module)
- PC operating with USB interface
- Dimensions: 450x450x250 mm



No temperature-related signal drift due to calibrated AMR sensors with temperature compensation

Extensive user software for definition of various measurement processes and magnet types

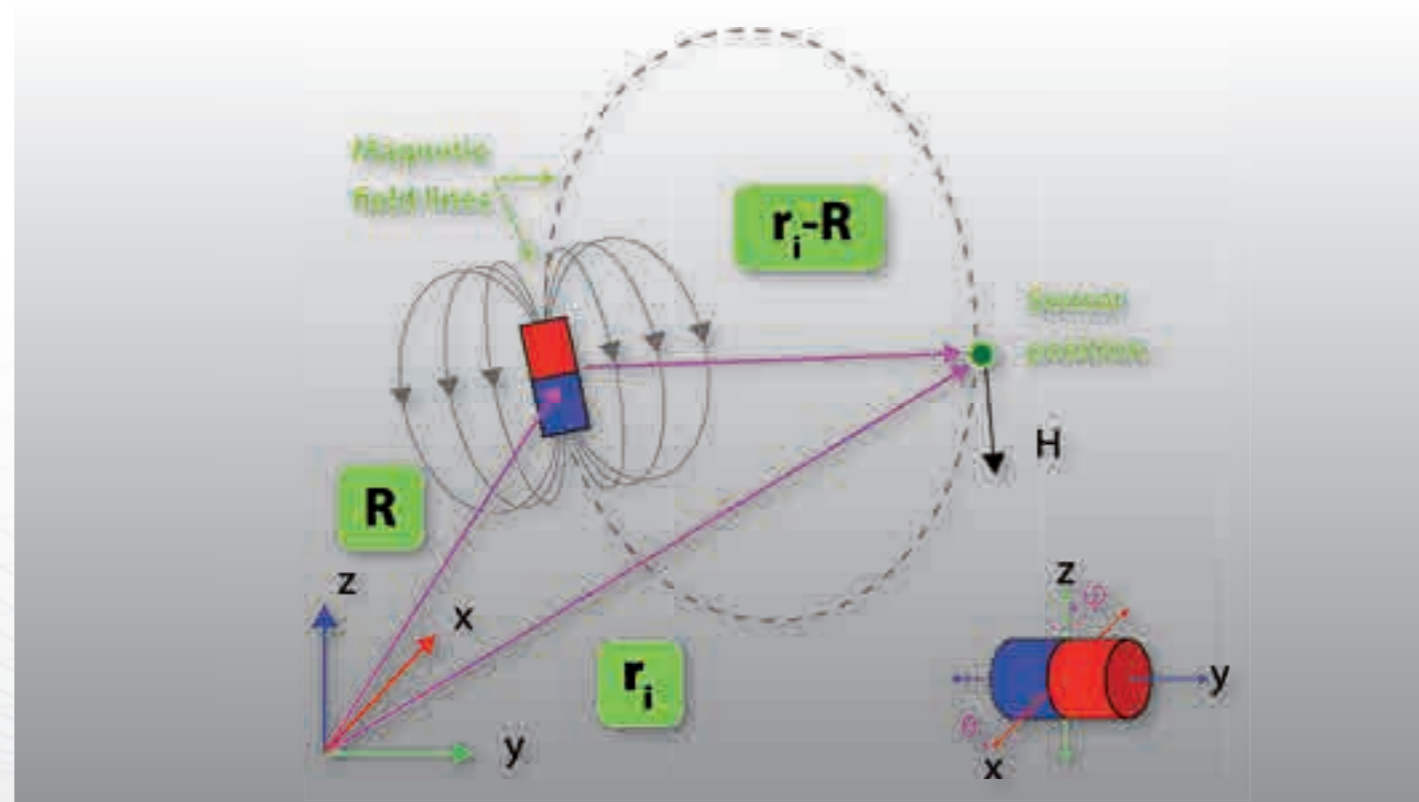
Measurement independent of direction of magnetization (axially or diametrically magnetized magnets)

Measurement processes are transferable to other m-axis systems



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## Measurement process



Picture: : Measurement principle

The calculation routine of the m-axis-system is based on the determination of the dipole parameters of permanently magnetic materials using an integrated AMR sensor set-up. That way the three-dimensional position (x, y, z) of the magnet as well as its magnetic moment (m) and the angular direction ( $\phi$ ,  $\theta$ ) of the magnetization are determined simultaneously. Because of the universally applicable approach the evaluation of axially as well as diametrically magnetized dipole permanent magnets regarding their quality and strength is possible. By implementation of various user defined magnet types and measurement processes in the comprehensive user software the system delivers a real time classification of numerous dipole possibilities. All relevant settings and measurement results can be saved to a single report file.



Picture: Software main window



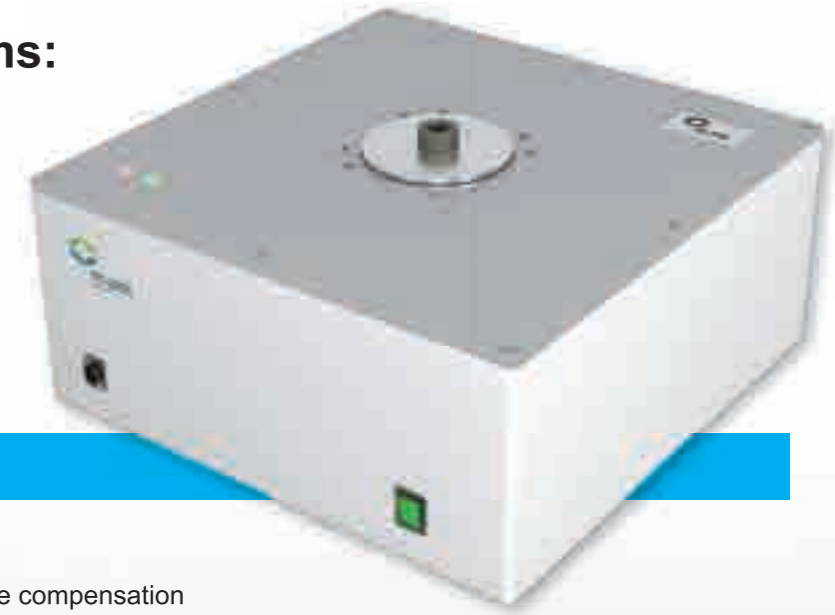
Picture: Schematic 3D view of a dipole magnet and the circuit boards

## m-axis measurement systems:

For small and medium magnets:

m-axis S | m-axis M | m-axis L

The concept of the m-axis-system allows by the help of different set-ups four standard models available:



### Technical Features

- Measuring range: 0.01 - 50.00 Am<sup>2</sup>
- Sensors: Calibrated AMR sensors with temperature compensation
- Determination of the magnetic moment:  $\pm 1\%$  (within calibration range)
- Repeatability of the magnetic moment: (determined through MSA):  $\pm 0.1\%$
- Accuracy of magnetization angle: Static measurement  $\pm 0.3^\circ$  / Rotation axis module measurement:  $\pm 0.1^\circ$
- Measurement time: static measurement: 1s / rotation axis module measurement: appr. 12s
- User software: software adjustable for data acquisition and storage (Q-DAS interface)
- Dimensions: 450 x 450 x 60 - 230 mm<sup>3</sup> (depending on module choice)
- Power supply: 100 - 230V/AC, 50 - 60Hz
- System check: testing with adapted fixtures possible through 4 included holes
- Items delivered: m-axis measurement system, software, test magnet, foot switch
- Options: PC, rotation axis module, temperature module, table module, North/South module, USB-cable
- Automation: possible (I/O module)
- Interface: USB

## For large magnets:

m-axis XL

The m-axis XL is the latest development in the m-axis family and was specially designed for large magnets. It is now possible to determine the magnetic properties in a measuring range from 4 to 50 Am<sup>2</sup>.



### Technical Features

- Measuring range: 4.0 - 50.0Am<sup>2</sup>
- Magnetization angle:  $\pm 0.5^\circ$
- Magnetic moment:  $\pm 1\%$
- Measurement speed: < 1s
- Max. sample size in mm: 90x90x90 (HxWxD)
- Sample geometry: various shapes possible
- Dimension in mm: 380x310x310 (HxWxD)
- Weight in Kg: 9.25
- Options: automation possible

Models with specifically customized measurement ranges can be offered as well.

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## Automatic measurement

The I/O module enables integration into automated environments and offers a large, adaptable measuring range for a wide variety of magnet types. The I/O module can communicate with almost any control software.



### I/O modul

The I/O module possesses 16 predefined PINs for inclusion of the m-axis into a measurement environment:

- Input: 110-230V/AC, 50-60Hz
- Output: 24V/DC
- Data-interface: USB
- Number of I/O PINs: 16
- Adjusted m-axis-software for inclusion of the I/O module



### Traffic light module

The traffic light module is an extension of the m-axis measurement system, which enables simple and fast visualization of good and bad parts in production.

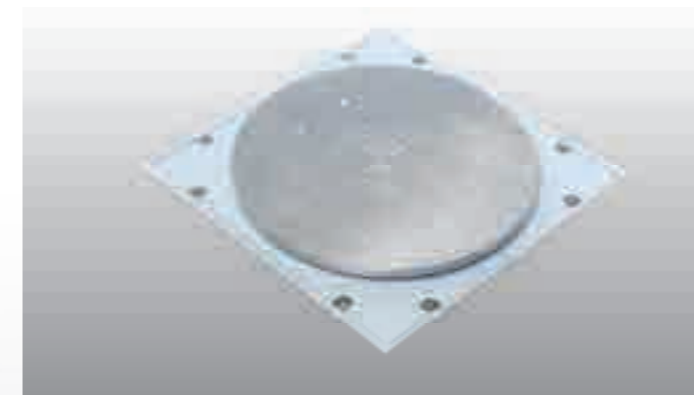
- GOOD / BAD part visualization without screen
- Plug and play
- USB connection

### Supplied accessories

The scope of delivery includes the following parts:

- PC (optional) & software
- Test magnet for system check
- Angled plate (optional)
- Foot switch

## Optional modules



### Rotation axis module

In systems with an integrated rotation axis, the magnets can be rotated over 360 ° during measurement if necessary. This improves the accuracy of the measurement.



### North/South module

The North/South module uses Hall sensors to measure the surface field of axially magnetized magnets. By turning the magnet by 180° and measuring again, the ratio of North and South can be determined and put out in %.



### Temperature module

The temperature module enables the magnetic moment to be corrected to the reference value at 20°C by measuring the room temperature and entering the temperature coefficient.



### Table module

In order to counteract magnetic disturbances caused by laboratory tables, the m-axis system can be supplied in a separate, non-magnetic table.