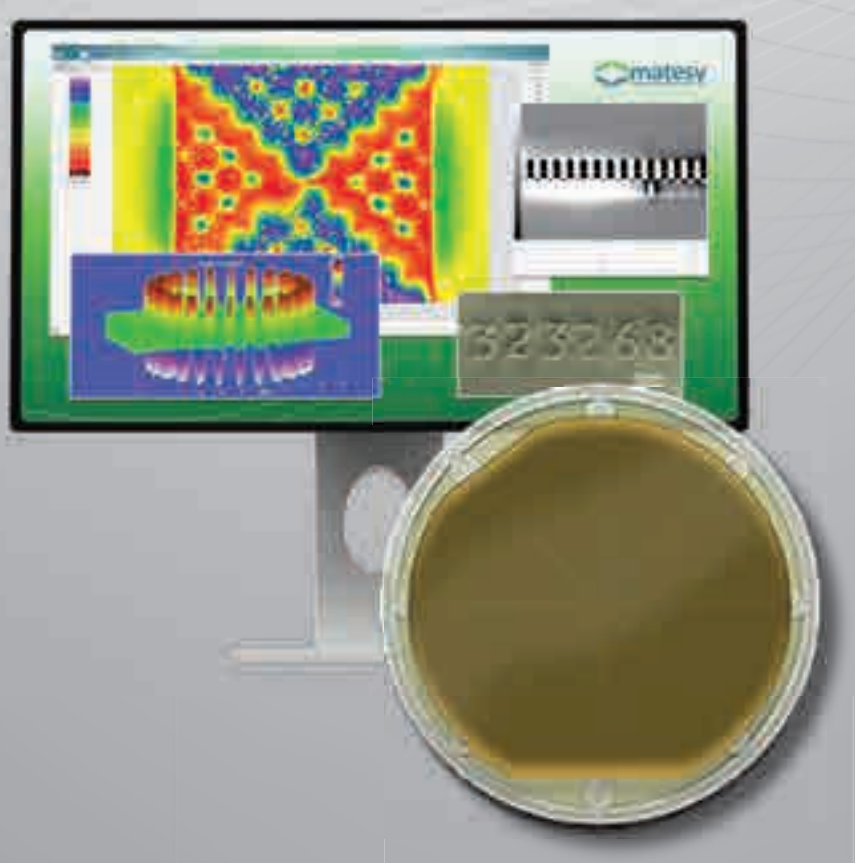
MO systems

Magneto-optical visualization technology and systems



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MO systems

Magneto-optical sensors

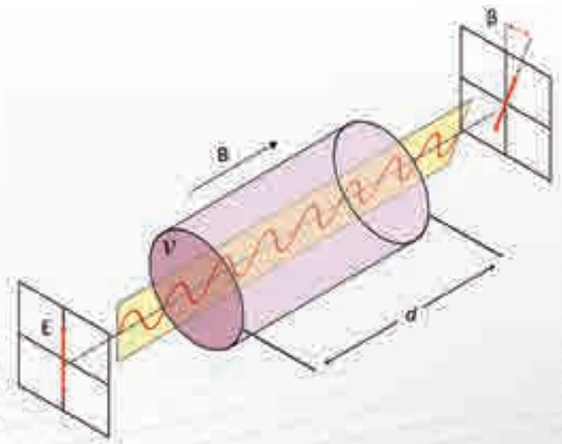
Sensor-technology for high-precision visualization, optical analysis and control of magnetic fields, structures and components.

Visualization of magnetic fields

The magneto-optical sensor technology enables non-destructive real-time investigations of soft and hard magnetic specimens. It allows the near field analysis of the polarity, homogeneity, distribution of the magnetic material and magnetization properties.

Physical background

The magneto-optical principle is based on the Faraday effect. It describes the rotation of the polarization plane of linear polarized light that passes the magneto-optical sensor.The plane rotation is due to the different refractive indices of the magneto-optical sensor for left- and a right-circular polarized wave parts of the polarized light. The rotation angle of the polarization plane is formally defined by the empirical equation. Different strengths of local magnetic fields generate optical contrasts due to different angles of the Faraday rotation. This magneto-optical image enables a direct realtime visualization of magnetic stray fields throughout the entire sensor surface.

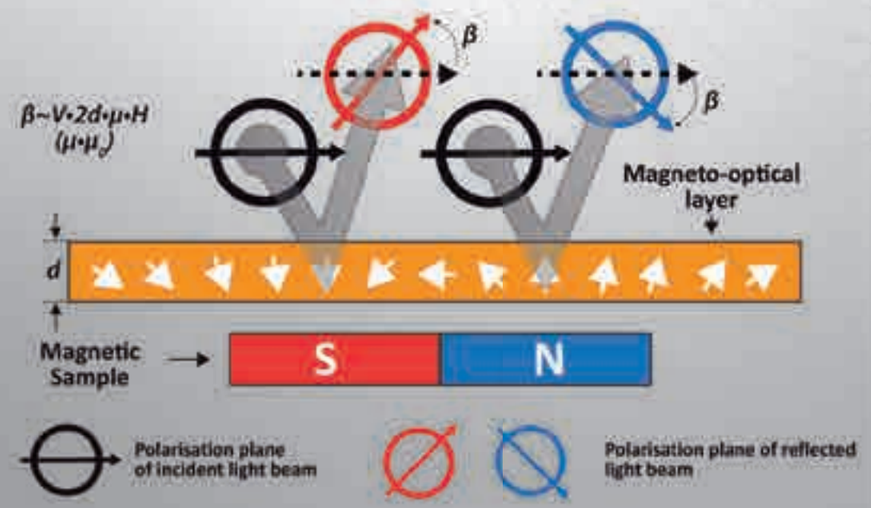


Principle of the Faraday rotation:

d = Sensor thickness V = Verdet constant
B = Magnetic flux density ß = Angle of rotation

Faraday effect in reflexion mode:

Different directions of the Faraday rotation depend on the field polarity.



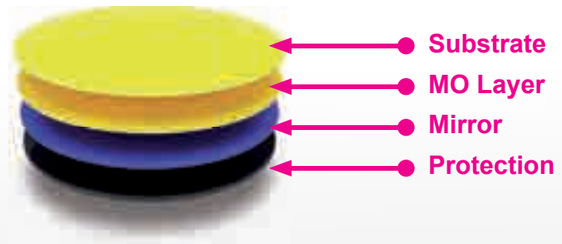
Specifications

Sensor geometries

- Thickness: 0.5 mm
- Rectangle*: 8 x 8 | 15.5 x 20.5 | 45 x 60 mm

*Special sensor geometries on request

Sensor setup & layers

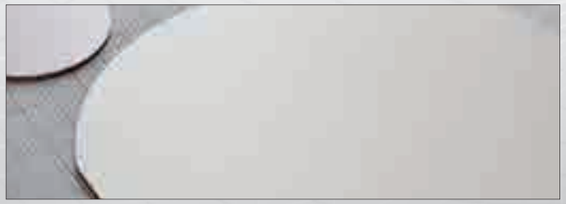


Sensor characteristics

- Resistance to temperature changes: up to +50°C
- Working temperature range : up to +35°C
- Optical resolution: up to 1µm
- Faraday rotation angle: (λ=590nm) 1 to 10°

Additional functional layers

- Mirror layer (visible spectral range) for high reflectivity
- Resistant material layer for mirror protection
- Anti reflexion coated glass stabilization (thickness+ 1 mm)



Type	Measuring range (kA/m)	Typical applications/ materials
A	0.05 to 2.0	Magnetic stripe cards, hard magnetic inks (banknotes),steel alloys (material testing), magnetic tapes (audio tape manipulation testing), minerals (thin sections)
B	0.4 to 55.0	Magnetic stripe cards, polymer bounded permanent magnets (material testing), magnetic tapes (audio tape manipulation testing), domain material (magnetic shape memory)
C	0.7 to 130	Magnetic encoders, dipole- and multipole permanent magnets and polymer bounded magnets and foils
D	0.03 to 5.0 (special for bias)	Printed magnetic inks (documents, banknotes testing)and magnetizable steels alloys (car serial number testing)
E	5 to 800	Dipole- and multipole permanent magnets, high-field applications

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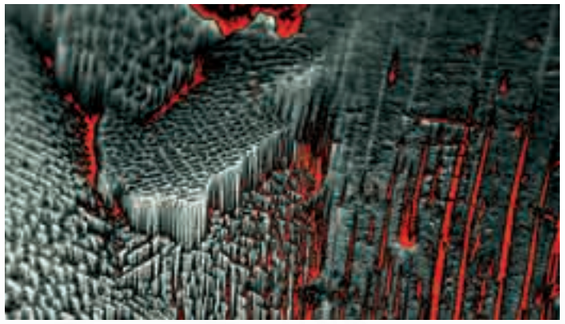
Sensor types and applications

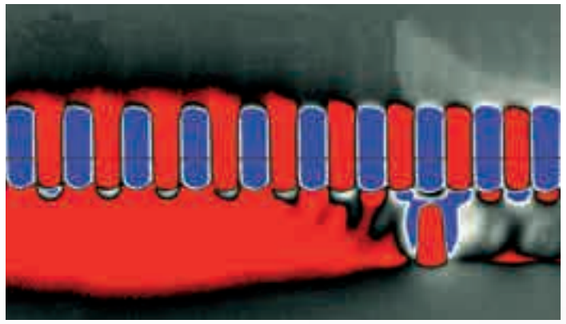
MO devices can be equipped with different sensor types depending on the application.



Sensor type A

Quality inspection & geometric assessment:

- of magnetic encoders
- of electrical steel sheets
- of security features for forensics
- of residual magnetism



Sensor type B/C

Surface inspection and quantitative analysis:

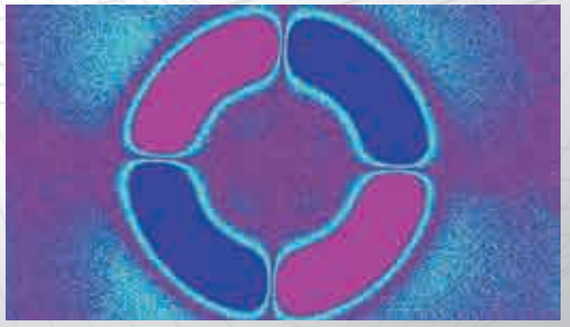
- of permanent magnets
- of magnetic encoders with strong magnetization
- of polymer bonded magnets
- of magnetic particles in composites
- of superconductor investigations

Sensor type D

Investigation and visualization of:

- soft magnetics
- magnetic inks in banknotes
- magnetic inks in documents

(with excitation by external magnetic fields)

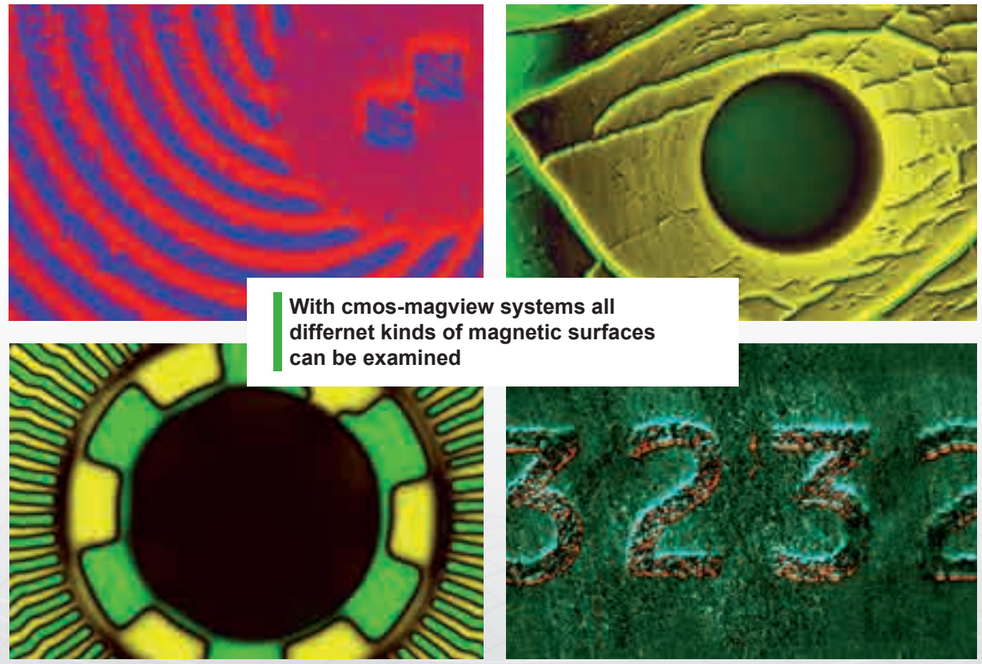


Sensor type E

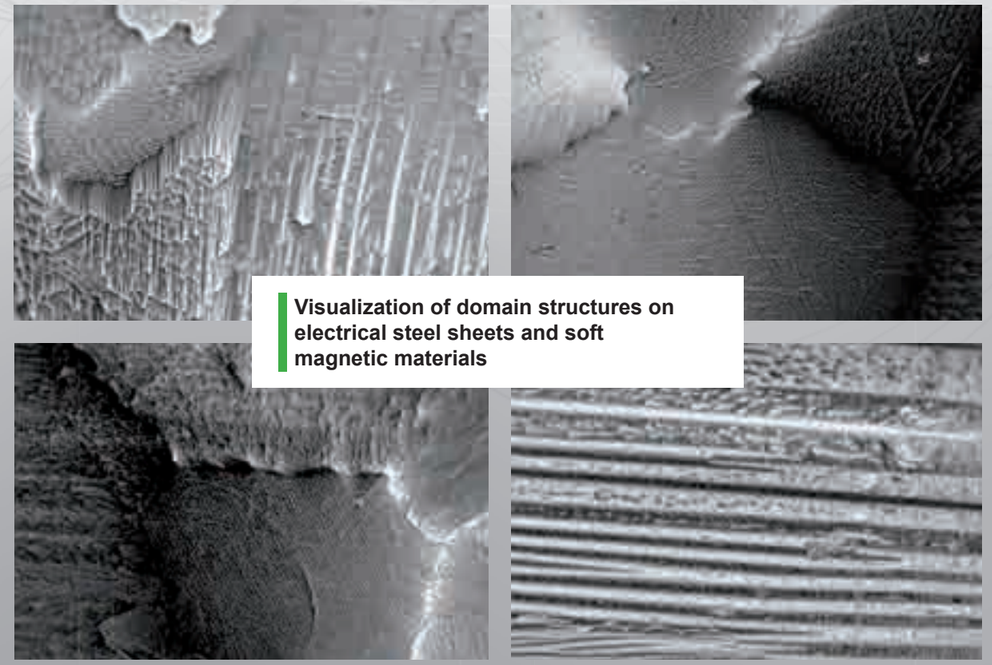
Measurement of:

- permanent magnets up to 1T
- multipole magnets with high fields

Visualization of magnetic structures



With cmos-magview systems all differnet kinds of magnetic surfaces can be examined



Visualization of domain structures on electrical steel sheets and soft magnetic materials

MO systems

cmos-magview - magnetic field camera

The devices of the cmos-magview family are high-resolution and precise measuring and visualization systems for magnetic materials, components and surfaces, with which it is possible to measure the magnetic flux density in addition to making magnetic fields and magnetic structures visible

cmos-magview S

- Sensor size: 20x15mm²
- Resolution: 25µm
- Sensor types: A, B, C, D (E on request)

Application:

Quality inspection and measurement of small permanent magnetic components and structures (e.g. linear encoders). Imaging of small areas on documents and electrical steel sheets with medium resolution

cmos-magview M

- Sensor size: 20x15mm²
- Resolution: 15µm
- Sensor types: A, B, C, D (E on request)

Application:

Quality inspection and measurement of small permanent magnetic components and structures (e.g. linear encoders) with requirement of high spatial resolution. Imaging of small areas on documents and electrical steel sheets with high resolution

cmos-magview L

- Sensor size: 60x45mm²
- Resolution: 70µm
- Sensor types: A, B, C, D

Application:

Large area inspection of small magnetic fields and of security features. Imaging of ring encoders and permanent magnets with structures larger than 100µm

cmos-magview XL

- Sensor size: 60x45mm²
- Resolution: 60µm (30µm possible)
- Sensor types: A, B, C, D

Application:

Quality inspection and measurement of extensive permanent magnetic components and structures (e.g. ring encoders). Suited for requirements of high resolution and large areas

magview - portable magnetic field viewer

magview is a magneto-optical readout device for fast and precise visualization of magnetic field structures. The handheld device can be applied for qualitative testings and stray field analyses. magview visualizes magnetic stray fields of credit cards, magnetic encoders and multipole magnets.

magview

- Sensor size: up to D = 25mm (1inch)
- Field range 0.01 to 130kA/m (0.1 to 1,600Oe)
- Portable and easy to use

Application:

Because of the adaptive design magview is suitable for visualization of low magnetic fields of audio and video tapes, debit and credit cards, floppy disks and hard drives.

mageye - magneto-optical hand-held microscope

Magnetic stray flux can be visualized and evaluated via a mobile „magnetic field sensor“. The mageye, Matesys miniaturized magneto-optical USB magnetic field camera, delivers information about the magnetization of the material in high resolution (µm).

mageye

- Sensor size: up to 8x8mm
- Field range 0.01 to 130kA/m (0.1 to 1,600Oe)
- Portable and easy to use

Application:

The mageye was developed for the mobile quality inspection and management, and for the stray field visualization of: magnetic stripe cards, magnetic encoders, welding seams, magnetic audio tapes, manipulated serial numbers, as well as dipole and multipole magnets. Furthermore the system can be applied within the forensics, geology and material development.

Magneto-optical sensors

Our highly sensitive magneto-optical sensors are the basis for the visualization of magnetic fields and are available in sizes up to 3 inches. Applications for the sensors can be found in forensics and quality control of magnetic materials.

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Magnetic Technologies & Systems

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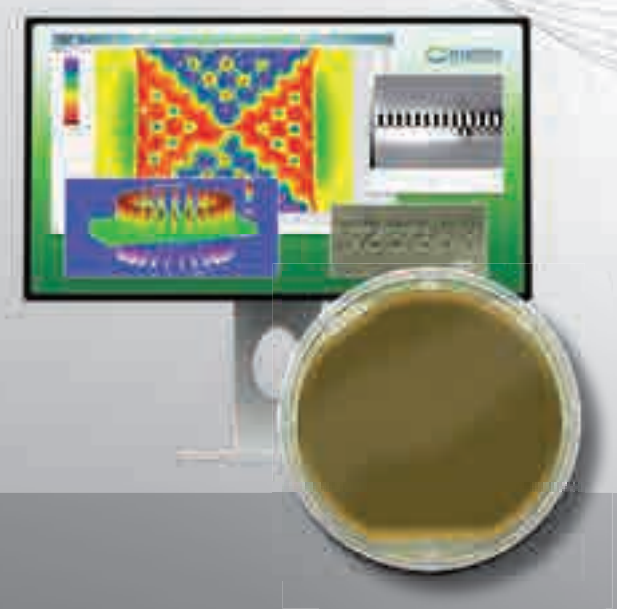

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