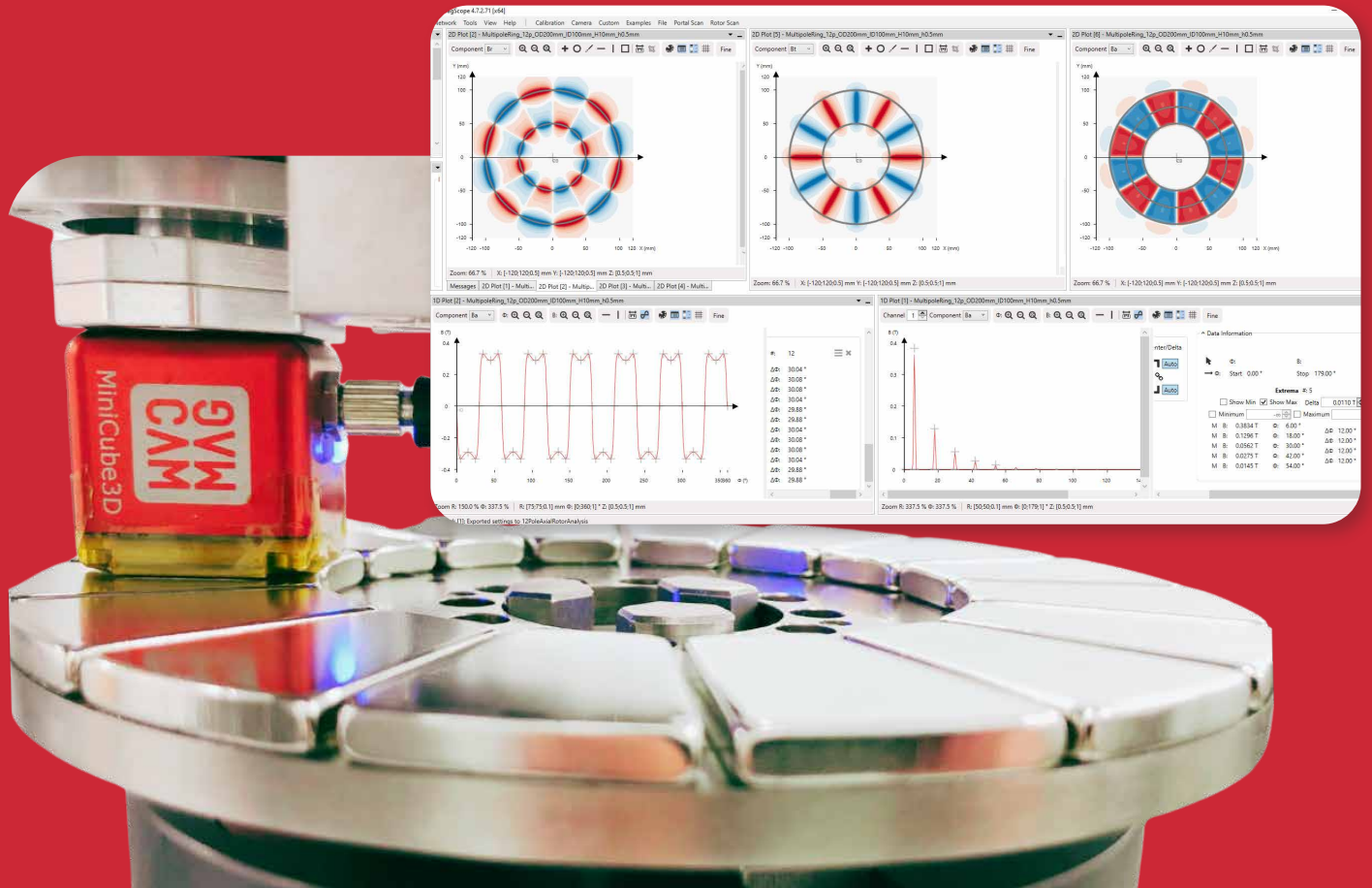


# MAGCAM



## UNLOCK YOUR MAGNETS' SECRETS

Fast and accurate measurement and analysis of permanent magnets, PM rotors and assemblies

Magnetic field camera technology and scanners | For R&D and production

MULTIPOLE MAGNETS | UNIAXIAL MAGNETS | SENSOR MAGNETS | MOTOR MAGNETS | PM ROTORS

# DISCOVER MAGCAM

Your Ultimate Partner in Advanced Magnetic Solutions

Unlock the full potential of permanent magnets with Magcam, the global trailblazer in cutting-edge magnet measurement and analysis systems. Our groundbreaking magnetic field camera technology is revolutionizing the way you work with magnets, ensuring precision and efficiency in every application.

## Experience Unparalleled Quality and Performance

Magcam's unrivaled magnetic field cameras and scanners are designed for an array of applications, including quality control, in-line production testing, and the development of high-end permanent magnets, magnet assemblies, and PM rotors. By utilizing our state-of-the-art technology, you'll gain a competitive edge, ensuring optimal performance and reliability across your operations.

## Empowering a Diverse Range of Industries

Our prestigious clientele spans various sectors, from electric motor constructors and sensor manufacturers to medical & biotech companies and consumer electronics producers. In addition, hybrid & electric vehicle manufacturers, research labs, magnet producers, and magnet assembly manufacturers trust Magcam to elevate their magnetic applications to new heights.

## Beyond the Camera: Comprehensive Support and Services

At Magcam, we are focused on providing solutions for our customers. That's why we go beyond offering cutting-edge cameras, providing our customers with measurement and analysis services and application consulting. Our team of experts is committed to ensuring your success, assisting you every step of the way as you harness the power of Magcam technology.

Choose Magcam and join the magnetic revolution today.  
Together, we'll shape the future of advanced magnetic solutions.

Contact us at:  
[www.magcam.com](http://www.magcam.com)  
Email: [info@magcam.com](mailto:info@magcam.com)  
Tel: +32 16 79 53 22

# CONTENTS

<a href="#">Discover Magcam: The Future of Magnet Inspection</a>	p2
<a href="#">Advanced Magnet Inspection Expertise: Your Key to Success</a>	p4
<a href="#">The Magcam Advantage: Your Bottom Line</a>	p5
<a href="#">Magnetic Field Camera Technology: Gathering the Data</a>	p6
<a href="#">Comprehensive Scanning Solutions for Every Need</a>	p8
<a href="#">MagScope Software: The Power of Data and Insights</a>	p16
<a href="#">Applications in Various Industries</a>	p22
<a href="#">Services: Expert Support for Your Success</a>	p34



2023



# Advanced Magnet Inspection Expertise

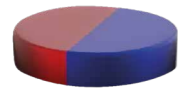
## Unlock Comprehensive Quantitative Characterization

Discover Magcam's innovative platform for inspecting permanent magnets, based on our patented magnetic field camera technology. With a high-density 2D Hall sensor array on a single chip, our system records high-resolution magnetic field maps at high speed.

**Invaluable Insights for Magnet Quality**  
Our quantitative magnetic field maps, analyzed with the versatile MagScope software, reveal

crucial information about magnet quality. Extracting numerous properties from the measurement data, Magcam's system is ideal for R&D, Quality Control, and production applications.

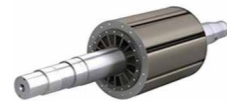
**Leverage Our Vast Expertise**  
Benefit from Magcam's experience in magnet quality testing across various applications through our Measurement & Analysis and Application Consulting services. Optimize your processes with tailored support and guidance for your magnet applications.



Permanent Magnets



Magnet Assemblies



Permanent Magnets Rotors



## DIVERSE APPLICATIONS

- Inspection of sensor magnets
- Inspection of motor magnets
- Quality control of radial- and axial-flux PM rotors
- Development of new sensor systems
- Magnet classification and sorting (pass/fail, binning, ...)
- Integration in production lines for 100% quality control
- Sample quality control
- Incoming / outgoing magnet inspection
- Magnet failure diagnosis
- Magnet certification
- Magnet assembly inspection



## KEY BENEFITS

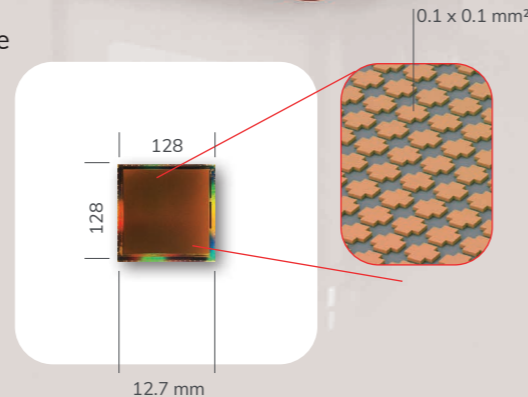
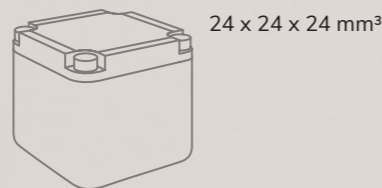
R&D	Production & Quality Control
Accelerate innovation with faster development cycles	Boost productivity with higher yields
Achieve design excellence with precise product designs	Ensure precision through tighter tolerances
Rapidly identify and address magnet quality issues	Pinpoint root causes for efficient problem-solving
Cut costs with streamlined development processes	Expedite magnet failure diagnostics for swift resolution

# MINICUBE3D MAGNETIC FIELD CAMERA

Experience 3-Axis Magnetic Field Mapping with Unparalleled Speed and Resolution

## KEY FEATURES:

- Comprehensive digital 3-axis magnetic field measurement (Bx, By, Bz)
- On-chip integrated 2D array of Hall sensors
- Perfect component orthogonality thanks to patented 3-axis technology
- Measurement points: 128 x 128 = 16,384
- Unparalleled pixel measurement volume: 40 x 40 x 1  $\mu\text{m}^3$
- Spatial resolution: 0.1 x 0.1 mm<sup>2</sup>
- Measurement area: 12.7 x 12.7 mm<sup>2</sup>
- Magnetic field range (Bx,By,Bz): +/- 1000 mTesla
- Magnetic field resolution (Bx,By,Bz): 0.1 mT
- Magnetic field accuracy: 0.1 mT
- Single measurement for comprehensive magnet analysis
- Ultra-fast measurements: less than 1 second per image (16,384 pixels)
- No moving sensor parts



## VERSATILE APPLICATIONS

- Small magnet measurements with MiniTable setup
- Large flat magnet and assembly measurements in Portal/Combi Scanner setup
- Radial-flux rotor measurements in Rotor/Combi Scanner setup
- Axial-flux rotor measurements in Rotor/Combi Scanner setup



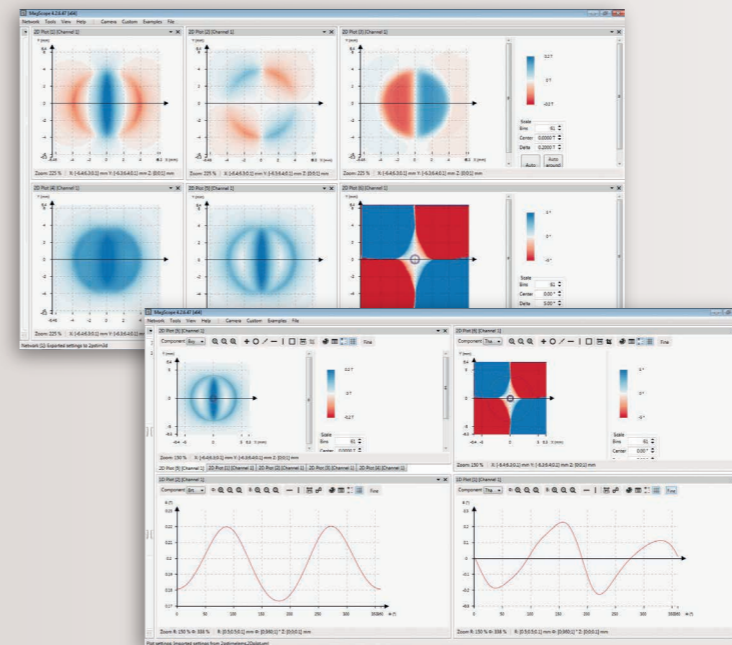
## MINITABLE Precision Platform for Small Magnet Measurements

The MiniTable is a precision platform designed for measuring small magnets, integrating the MiniCube3D magnetic field camera. It features an adjustable magnet positioning frame that enables accurate and reproducible positioning of magnets with respect to the camera sensor. The frame's position can be adjusted in the XY plane to accommodate magnets of varying sizes.

## KEY FEATURES

- Adjustable calibrated magnet positioning frame
- Compact size: 85 x 85 x 30 mm
- Retractable reference plates on X and Y sides
- Capability to mount custom positioning frames
- Durable anodized aluminium material

Bx, By, Bz magnetic field distributions (top left to right). Bx, By, azimuth angle (bottom left to right)



Circle sections of the Bxy field (left) and of the azimuth angle

# MAGCAM COMBI SCANNER

Experience High-Speed, High-Precision 4-Axis Motorized Scanning.

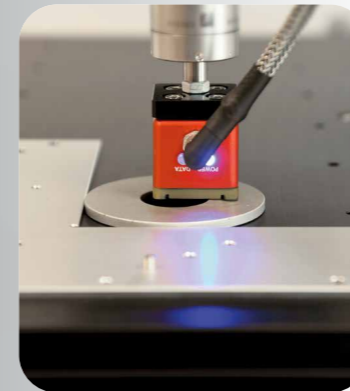
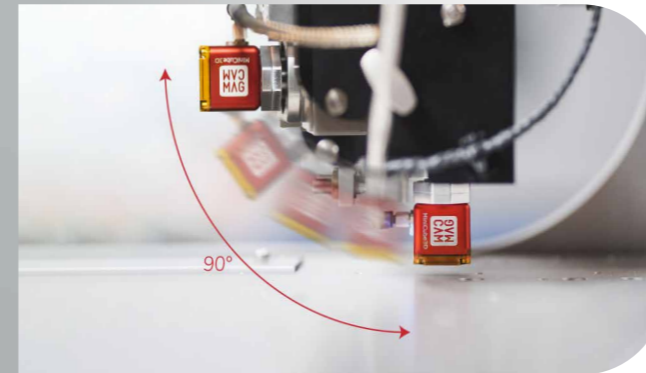
The Magcam Combi Scanner is a cutting-edge 4-axis motorized scan stage that incorporates the MiniCube3D magnetic field camera. Utilizing an image stitching algorithm, it measures large areas at high speed. The Combi Scanner functions in portal mode for large flat magnets and magnet assemblies, and in rotary mode for radial- and axial-flux PM rotors. The scan stage is automatically controlled by the

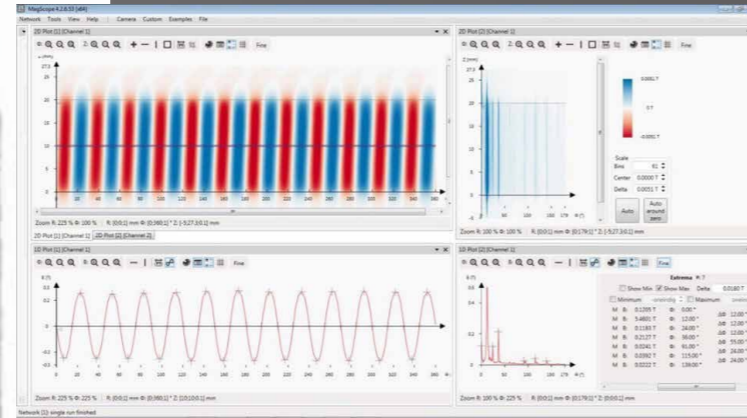
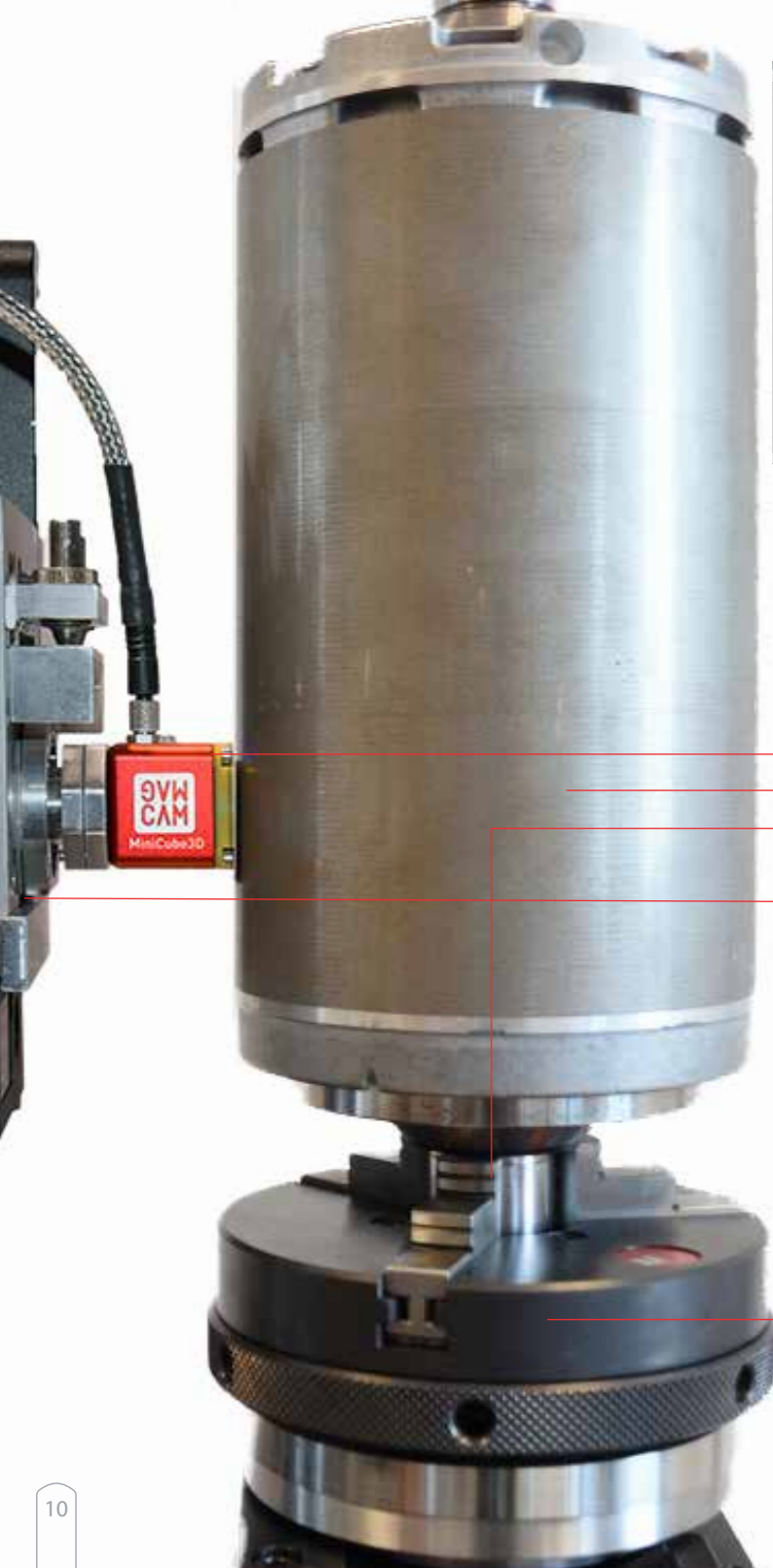
## KEY BENEFITS:

- 30x faster than single sensor systems
- Fully automatic measurement procedure
- Large area magnets and assembly measurements
- Volume magnetic field measurement a single plane measurement
- Accurate magnet size measurements using laser
- Precise magnet positioning
- Batch testing of magnets in trays

## FEATURES:

- Easy switching between Portal, Radial Rotor and Axial Rotor modes
- XYZ scan range in Portal mode: 290 x 290 x 250 mm
- Radial-flux rotor diameter range in Radial Rotor mode: 0-300 mm
- Axial scan range in Radial Rotor mode: 200 mm
- Axial-flux rotor diameter range in Axial Rotor mode: 0-500 mm
- Integrated MiniCube3D magnetic field camera
- Closest measurement distance: 0.5 mm
- Mapping speed: 120 mm<sup>2</sup>/s (full resolution)
- Repeatability per axis: +/- 1.3 μm
- Integrated calibrated positioning frame for accurate magnet positioning
- Optional safety housing
- Automated scanning and image stitching with MagScope Measurement & Analysis
- Integrated high accuracy laser triangulation sensor





Measured magnetic field map of a 24-pole rotor and cross section graph with automatic zero crossing detection, pole angle and peak values measurement, as well as Fourier analysis of harmonics in the magnetic field distribution.

MiniCube3D magnetic field camera

PM rotor under test

Clamping chuck

Motorized rotary stage

Motorized X and Z stages

Housing with safety door



# MAGCAM ROTOR SCANNER

Magcam's Rotor Scanner is a high-speed, 3-axis motorized scan stage, featuring an integrated MiniCube3D magnetic field camera. It is designed to rapidly measure the 3D magnetic field distribution of radial-flux and axial-flux permanent magnet rotors with exceptional resolution at close distances. The PLC-controlled motorized axes deliver precision in radial, axial, and angular directions, while the MagScope Measurement & Analysis software ensures accurate calibration and control.

We offer Long and Heavy Rotor Scanner versions for longer axial lengths and/or more massive rotors

## HARDWARE FEATURES:

- Integrated MiniCube3D magnetic field camera
- Compatible with radial-flux and axial-flux rotors (0-500 mm diameter)
- Axial measurement range: 250 mm (standard) or 450 mm (Long version)
- Maximum PM rotor weight: 30kg (standard), 100kg (Heavy version)
- Scan speed: up to 12.7 mm axial length per second
- PLC controller
- Rotor mounting: vertical axis
- Automatic collision detection
- Repeatability: X and Z axes (1.3µm), angular axis (0.2 arc-min, unidirectional)
- Runout correction function using Laser Distance Sensor (~1µm)

## SOFTWARE FEATURES:

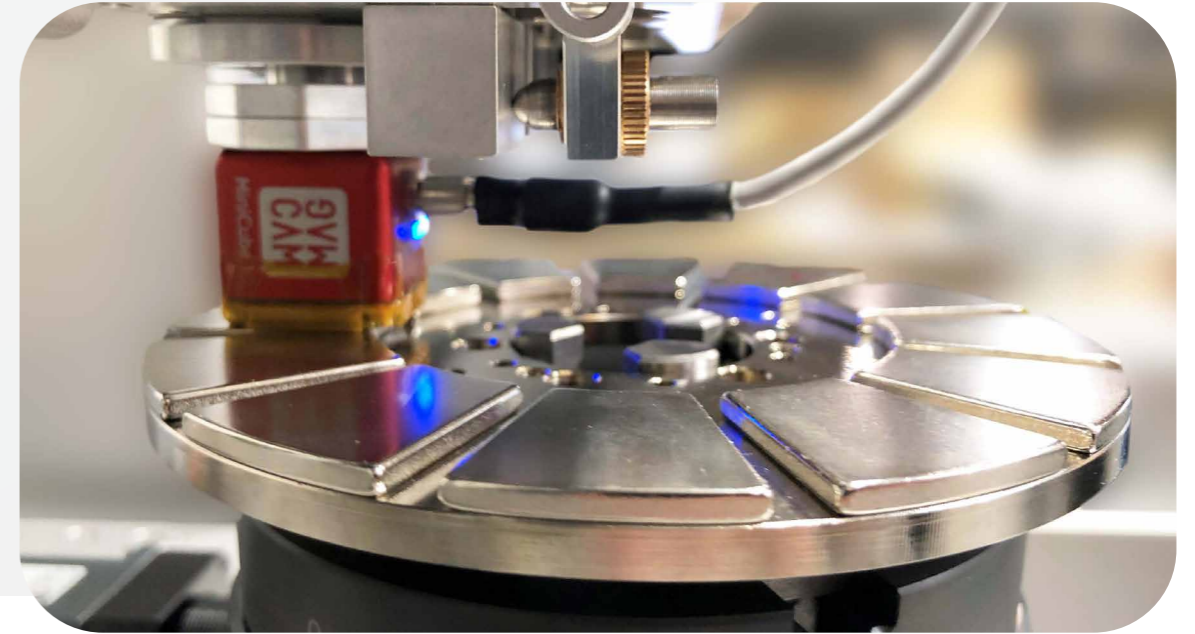
- MagScope Measurement & Analysis software controls the scan stage
- Automated scanning and image stitching

## DATA ANALYSIS POSSIBILITIES INCLUDE:

- Zero crossing detection
- Automatic pole count and size measurement
- North-South pole symmetry
- Pole height uniformity
- Local magnetization / material defects
- Crack detection
- Radial, tangential, and axial magnetic field component analysis
- Fourier analysis for harmonics and noise
- Total Harmonic Distortion analysis
- Cogging torque analysis

# MAGCAM AXIAL-FLUX ROTOR SCANNER

The Magcam Axial-Flux Rotor Scanner is specifically designed for swift and precise quality inspection of permanent magnet axial-flux rotors, combining fast 3-component magnetic field mapping hardware and sophisticated data analysis software. The Axial-Flux Rotor scan mode is available in both the Combi and Rotor Scanners.



## KEY APPLICATIONS:

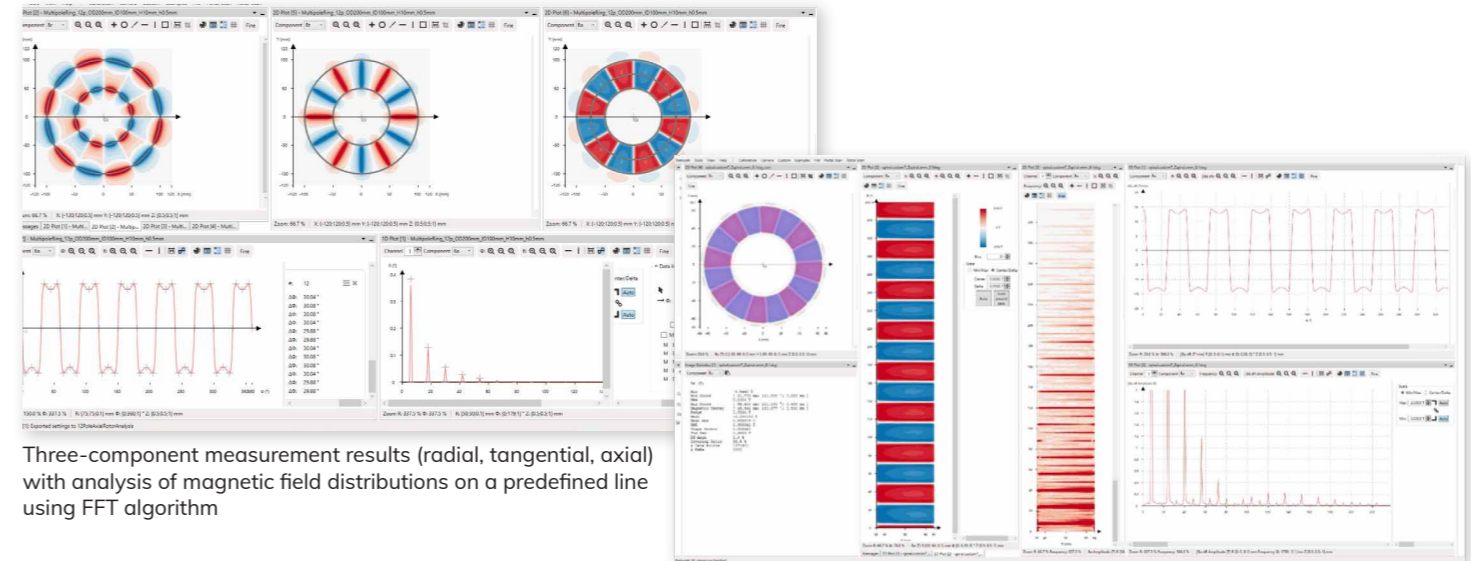
- Prototype development: Characterization of pre-assembled magnets or post-assembled rotors
- Process evaluation: Comprehensive assessment of various magnetizing processes
- Production quality control: Inspection of axial-flux rotors after magnetization
- Magnet placement: Ensuring accurate magnet placement during assembly
- Performance correlations: Investigating links between magnetic rotor quality, electric tests, and performance

## HARDWARE FEATURES:

- Rapid inspection of axial flux rotors up to 500 mm in diameters
- Integrated MiniCube3D camera with 128 Hall sensors at 0.1 mm pitch
- Precise clamping chuck and easy sample mounting for smooth operation
- Surface height profile measurement using Laser Distance Sensor

## SOFTWARE CAPABILITIES:

- Comprehensive magnetic field analysis: Similar to radial-flux rotors
- Versatile color graph plotting: Displaying all magnetic field components and their combinations
- Detailed cross-section analysis: Including statistic, pole peak, and zero crossing analysis
- Efficient data management: Automatic saving and Pass/Fail analysis
- Customization options: Python scripting and adjustable HMI
- Advanced analysis tools: Fourier analysis and cogging torque analysis
- Accuracy enhancement: Runout correction functionality



Three-component measurement results (radial, tangential, axial) with analysis of magnetic field distributions on a predefined line using FFT algorithm

FFT analysis of the axial magnetic field component, integrated in the radial direction

# HIGH ACCUARCY LASER SENSOR

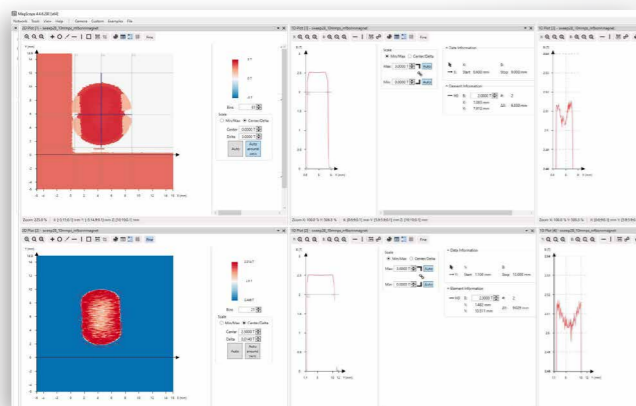
Elevate your magnetic inspection process with the optical triangulation Laser Distance Sensor, a valuable add-on for the Magcam Combi and Rotor Scanners. This cutting-edge tool measures the dimensions of magnets, magnet assemblies, and rotors under test with incredible accuracy, providing comprehensive surface mapping and size measurements.

Maximize the precision and reliability of your magnetic inspection process with the high-accuracy Laser Distance Sensor, and optimize your operations for superior results.

## KEY HIGHLIGHTS:

Precise measurement of:

- Sample height (Portal mode)
- Radial-flux rotor diameter (radial Rotor mode)
- Axial-flux rotor height (Axial Rotor mode)
- Intricate magnet shapes
- Magnet placement
- Magnet assembly height variations
- Radial and axial runout
- Tilt



## COMPELLING BENEFITS:

- Eliminates the need for manual height measurement
- Enhances axes positioning accuracy
- Compensates for thermo-mechanical effects
- Leverages the high positioning accuracy of the Magcam system
- Provides exportable height measurement results
- Enables correlation between mechanical and magnetic maps
- Facilitates correcting between mechanical and magnetic maps
- Allows adjusting measurement distance based on actual magnet size



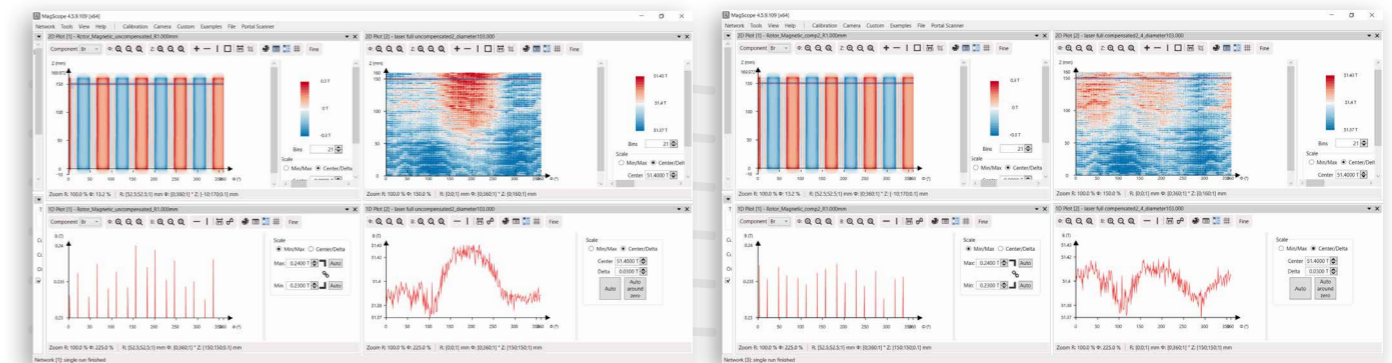
# ROTOR RUNOUT CORRECTION WITH LASER DISTANCE SENSOR

Utilize Magcam's high-precision Laser Distance Sensor to effectively measure and actively compensate for radial and axial rotor runout during your subsequent measurements.

## KEY HIGHLIGHTS:

- Eliminate axial and radial runout during measurements
- Select reference surfaces (shafts, body, etc.)
- Measure and counteract rotor tilt
- Retrofittable for existing Magcam Scanners

Upgrade your rotor inspection process with our state-of-the-art Laser Distance Sensor, ensuring unparalleled measurement accuracy and adaptability.



Rotor measurement with cross section before runout correction

Rotor measurement with cross section after runout correction

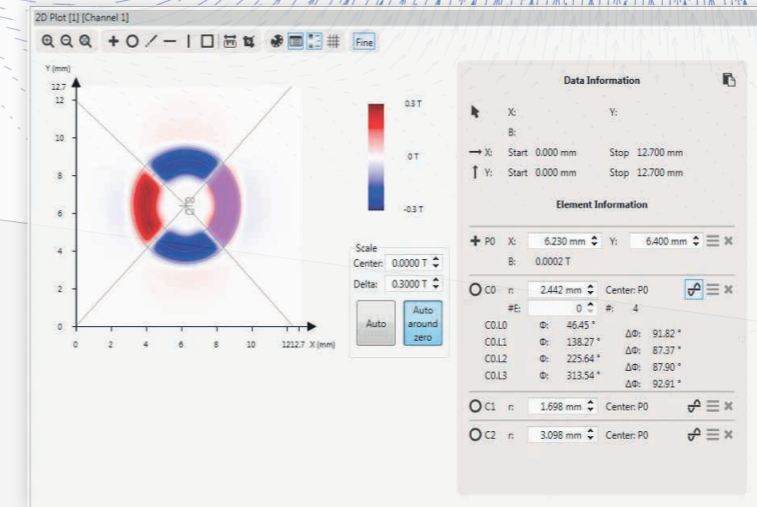
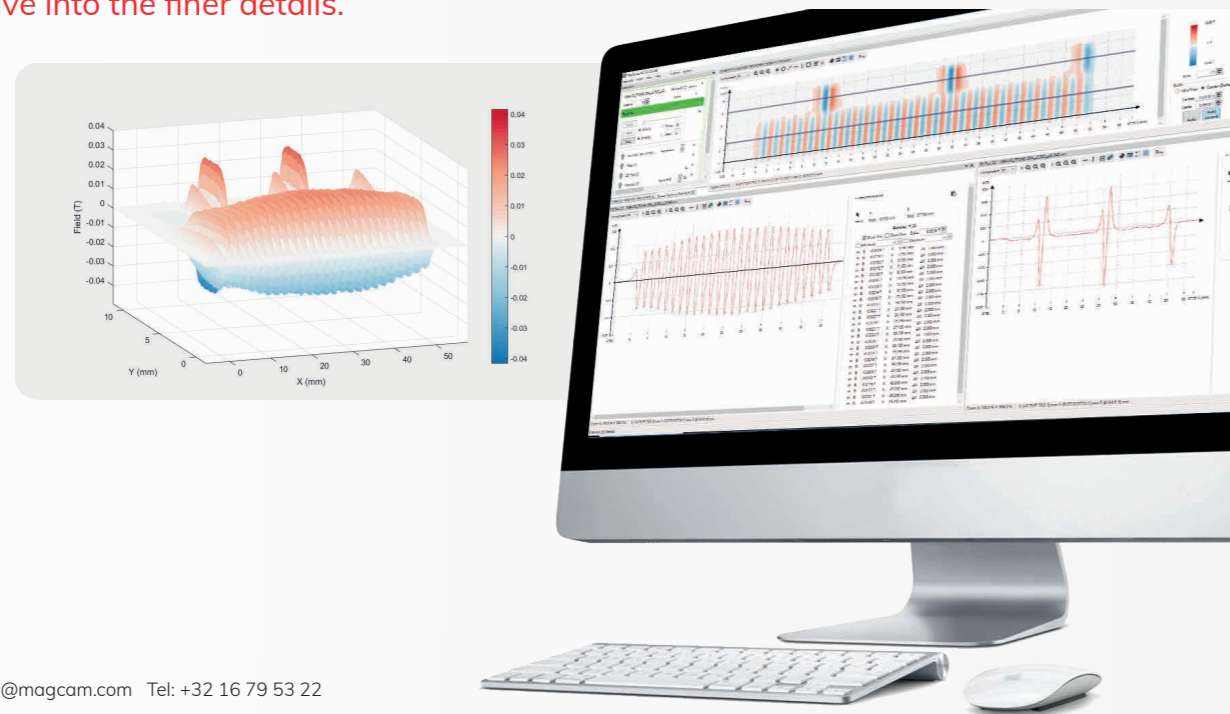


# MAGSCOPE

## ADVANCED MEASUREMENT & DATA ANALYSIS SOFTWARE SOLUTION

MagScope Magcam's versatile software, offers you seamless control over Magcam's magnetic field cameras and scanners while enabling real-time magnet measurement configuration. Visualize and analyze the magnetic field distribution of your magnets in 1D, 2D or 3D with MagScope, expertly designed to maximize information extraction from the measurement data.

Experience the rich library of advanced analysis functions offered by MagScope, and save your analysis configurations to delve into the finer details.



### MAGSCOPE FEATURES:

- Enjoy highly adaptable measurement and analysis capabilities with modular components
- Perform real-time measurement and analysis of magnetic field images captured by MiniCube3D magnetic field cameras
- Benefit from the integrated Python Scripting Module for automated pass/fail analysis and data logging
- Utilize the integrated Matlab and C# scripting modules for advanced calculations and processing
- Employ the integrated MagFit analysis module for magnetization vector size and angle analysis
- Achieve micrometer-resolution analysis with magnetic field map interpolation
- View 2D color plots and surface plots of magnetic field maps
- Select 2D and 1D (cross-section) regions in Cartesian and polar coordinates for cut-out and analysis
- Generate line plots of cross-sections in Cartesian or polar coordinates
- Automatically detect multipole segments and measure pole sizes/angles
- Create custom Python scripts for enhanced flexibility
- Perform comprehensive rotor analysis, including cogging torque, skewing angles, THD, FFT, pole size analysis, zero crossings, and pole peak analysis
- Access a multitude of additional functions

Unlock the full potential of your magnetic field analysis with MagScope, the comprehensive software solution designed for optimal performance and flexibility.

# MAGFIT ADVANCED MAGNET ANALYSIS MODULE

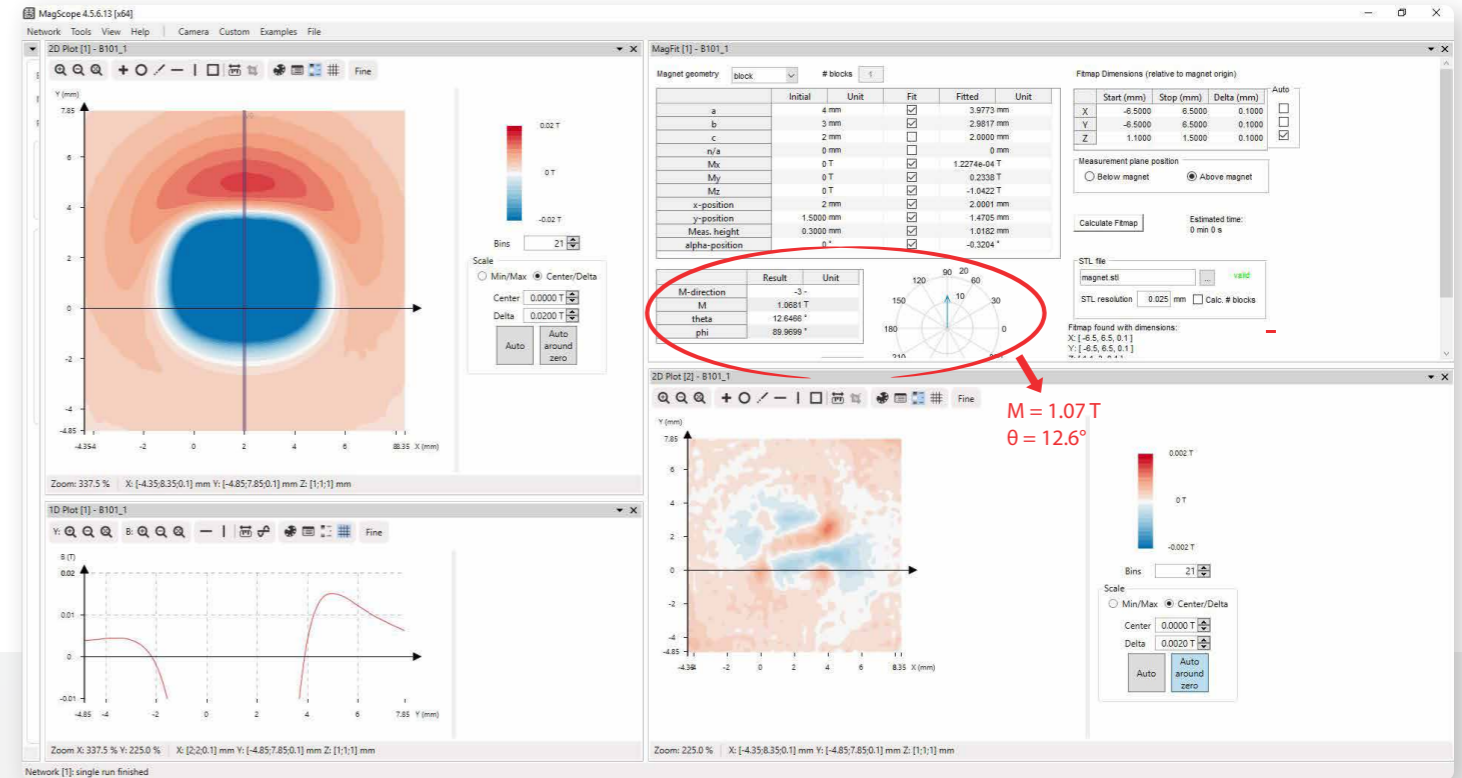
The MagFit Magnet Analysis software module, included as a standard feature in MagScope, provides sophisticated data analysis capabilities for comprehensive characterization of uniaxial permanent magnets.

By comparing the measured data with theoretical magnet models, MagFit extracts valuable insights from the data.

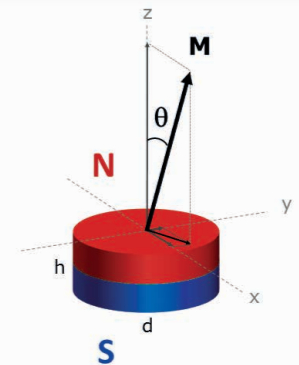
## MagFit features:

- Extract magnetization vector in Cartesian and spherical coordinates
- Measure angle deviation of magnetization vector from the geometrical magnetization axis
- Identify the main magnetization axis relative to the magnet geometry
- Detect deviations from an ideal theoretical magnet
- Identify local material defects in both the magnet material and magnetization
- Determine precise 3D magnet position (X, Y, Z)
- Determine accurate angular position of the magnet in the sensor plane
- Get magnet dimensions
- Integrate Pass/Fail quality control (using Python Scripting Module)
- Automate data logging (using Python Scripting Module)
- Detect cracks in magnets
- Import STL files for any magnet geometry

MagFit allows users to choose whether to optimize each parameter or keep it constant during the fitting procedure. The fitted parameters can be employed for pass/fail quality control, with customizable quality tolerances defined by the user. Experience unparalleled magnet analysis with the MagFit module, designed to maximize your understanding of permanent magnets.



The MagFit Magnet Analysis software module adds substantial value to the MagScope software by extracting additional quantitative magnet properties from the Magcam data, resulting in a complete magnet inspection solution for permanent magnets.



MagFit calculates the angle deviation ( $\theta$ ) of the magnetization vector ( $M$ ) based on the measured magnetic field distribution.

# PYTHON SCRIPTING MODULE

## UNLEASH UNLIMITED POSSIBILITY

The MagScope Measurement and Analysis software offers support for Python scripts, enabling infinite flexibility and functionality. MagScope comes standard with Python script templates that can serve as a foundation for crafting your own script to define customized features. Additionally, Magcam provides services for developing tailored scripts.

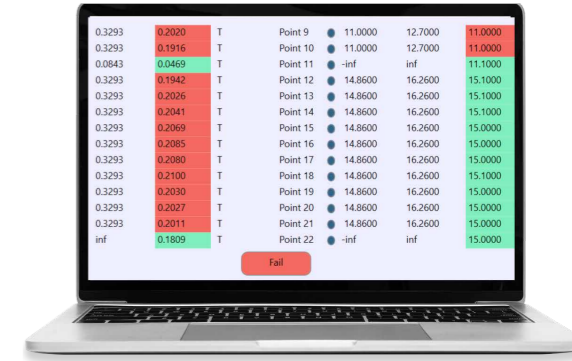
- Enjoy seamless integration, as the module comes standard with MagScope software.
- Experience unlimited flexibility with MagScope.

### TYPICAL APPLICATIONS:

- Utilize MagScope analysis results directly in scripts for pass/fail analysis
- Automatically log analysis results or export raw data in custom formats
- Conduct personalized data analysis
- Design custom user interfaces
- Remotely control MagScope using protocols like TCP/IP communication
- Integrate MagScope control in production lines
- Establish communication with other programs (e.g., LabVIEW®, MATLAB®, etc.)

## VERSATILE WAYS TO IMPLEMENT PYTHON SCRIPTS IN MAGSCOPE:

- Execute a Python script in response to a measurement
- Initiate a measurement using a Python script
- Develop custom MagScope elements with Python
- Combine multiple Python scripts for enhanced functionality



```
1 # Get element data.
2 measurementNumber = magscope.networks['LineAnalysis'].MeasurementNumber
3 inPrimRange = magscope.elements['Field Line Analysis'].GetData()[0].GetDataVector(2)
4 inSecRange = magscope.elements['Field Line Analysis'].GetData()[1].GetDataVector(2)
5
6 # Analyse: all points between [upper, secondary lower] range,
7 # sample passes if >= 80% of these are also in [upper, primary lower] range.
8 inRange = [x != 0 for x in inSecRange]
9 result = all(inRange)
10 if result:
11     numInSecRange = inRange.count(True)
12     numInPrimRange = [x != 0 for x in inPrimRange].count(True)
13     ratio = float(numInPrimRange) / float(numInSecRange)
14     magscope.mslogger.Info('Primary range {}, Secondary range {}, ratio {}'.format(numInPrimRange, numInSecRange, ratio))
15     result = ratio >= 0.8
16
17 # Show result in user interface.
18 if result:
19     self.ui.Pass(ratio)
20 else:
21     self.ui.Fail(ratio)
22
23 # Save data.
24 date = datetime.date.today().strftime('%Y%m%d')
25 csvFile = CsvFileWriter(DataFileName(date + '.csv'), self.csvHeader)
26 csvFile.Append(measurementNumber, result)
27
28 magscope.elements['Input Data'].SaveDataToMcb(DataFileName('mcb'))
29
```

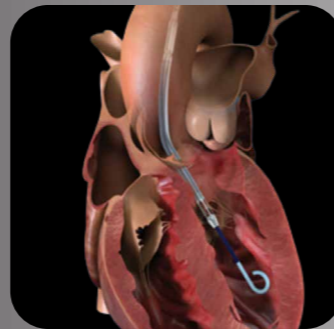
# APPLICATIONS

Magcam's inspection systems are versatile and can be utilized in a wide range of industries and applications involving magnets and magnet assemblies. Our magnetic field camera equipment is well-suited for R&D, production, and quality control environments across various sectors.

Contact us to discuss how Magcam can contribute to your unique application requirements.

## Industries

- Automotive
- Industrial
- Medical
- Consumer electronics
- Magnet production
- University research labs
- Aerospace
- Energy generation and storage
- Robotics

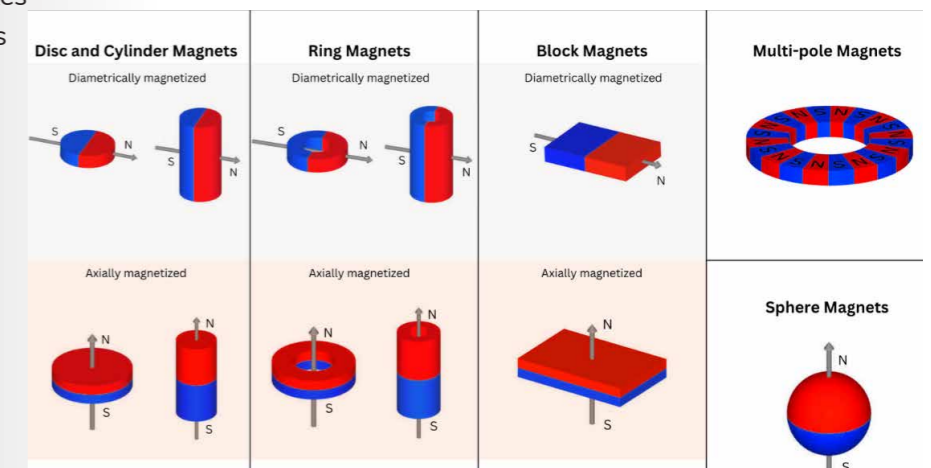


## Industry Applications

- Rotary encoder magnets
- Radial- and axial-flux PM rotors
- EV motor magnets and rotors
- Gear tooth speed sensor magnets
- Linear encoder strip magnet
- Reed switch magnets
- Magnetic coupling magnets
- Microphone and speaker magnets
- Linear actuator magnets
- Linear motor magnet tables
- Halbach arrays
- NMR magnets
- Precision positioning and holding magnets
- Hearing implants
- Wind turbine magnets
- Pump systems
- Magnetic bearings
- Magnetic levitation systems
- Electromagnetic clutches and brakes
- Magnetron and microwave devices

## Analyzed Properties

- 3D magnetic field distribution
- Field direction (azimuth angle) distribution
- Field homogeneity
- Magnetic center vs mechanical center
- Material defects
- Magnetization vector size and angle deviation
- North-south symmetry
- Pole peak detection
- Field distribution statistics
- Zero crossing detection
- Pole length/angle measurement
- Pole skewing angle measurement
- Crack detection
- Rotor cogging torque
- FFT and THD analysis
- Dimensional measurements (using laser)
- Evaluation of magnetic materials and coatings

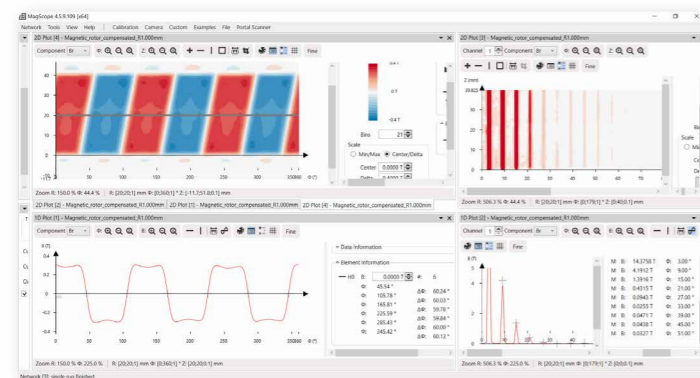


## PERMANENT MAGNET ROTORS

Magcam's Rotor or Combi Scanner efficiently measures radial- and axial-flux permanent magnet rotors of varying sizes, from small electric rotors in servo steering systems to larger rotors in electric vehicle drives. The scanner provides high-speed measurements of radial, tangential, and axial field distributions on the rotor body.

### Magnet quality issues

- Pole angle deviations
- Skewing angle deviations
- Cogging torque
- Pole peak inhomogeneity
- Noise problems (harmonics)
- Cracks



Magnet poles analysis + Fourier spectrum (SPM)

### Magcam solutions

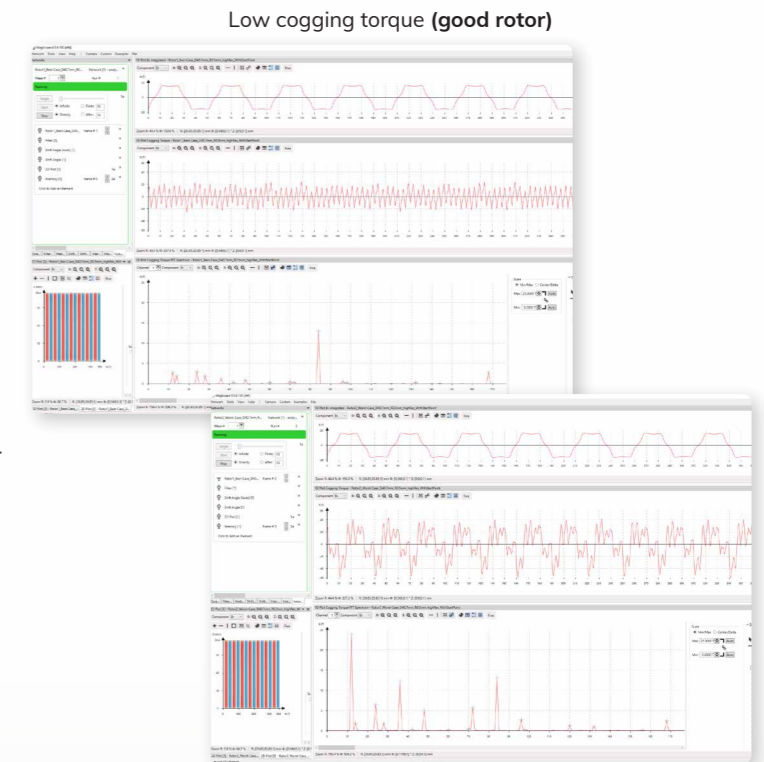
- Radial/tangential/axial (3D) field distribution measurement
- Active runout and tilt compensation
- Pole angle measurement
- Pole skewing measurement
- Pole peak analysis
- Fourier analysis of harmonics

Compare your simulations with real test results.

### Cogging torque analysis

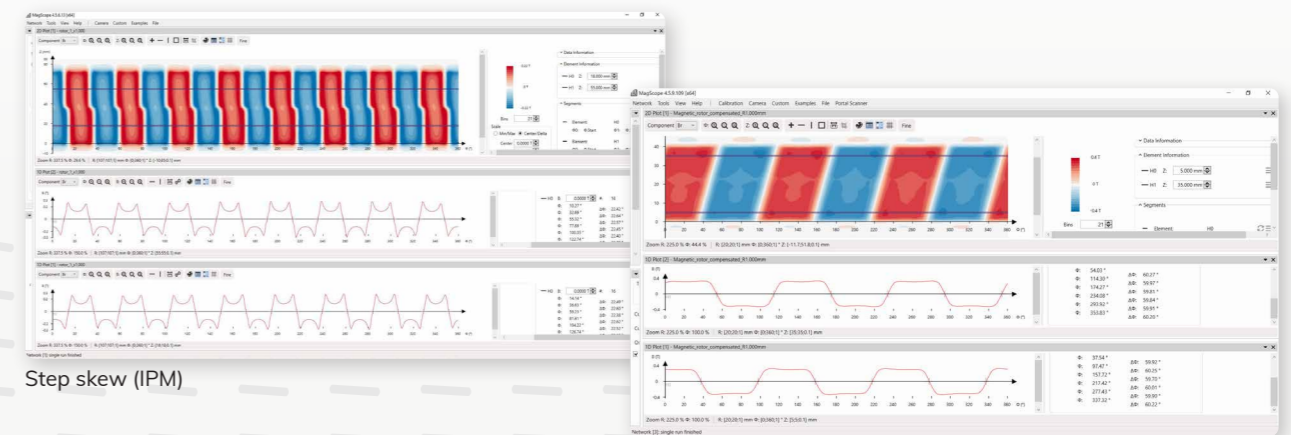
Magcam's system enables you to predict cogging torque from a bare rotor measurement, streamlining your analysis process.

- Measure high-resolution PM rotor surface magnetic field distribution in air
- Input stator geometry parameters
- Calculate qualitative cogging torque curve
- Derive quantitative harmonics ratios
- Predict cogging torque quality
- Screen out rotors that don't meet your requirements



High cogging torque (bad rotor)

### Measure skewing angle



Step skew (IPM)

Continuous skew (SPM)

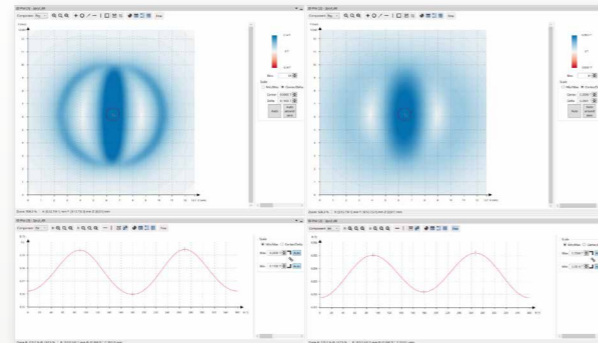
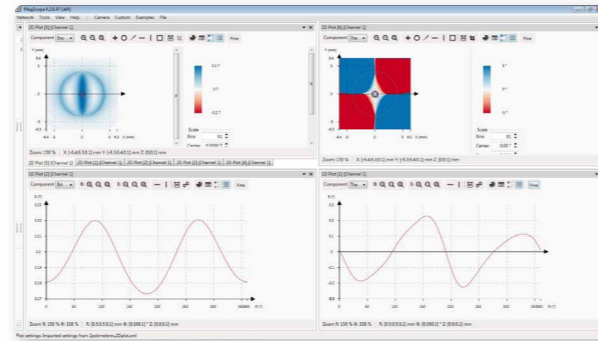
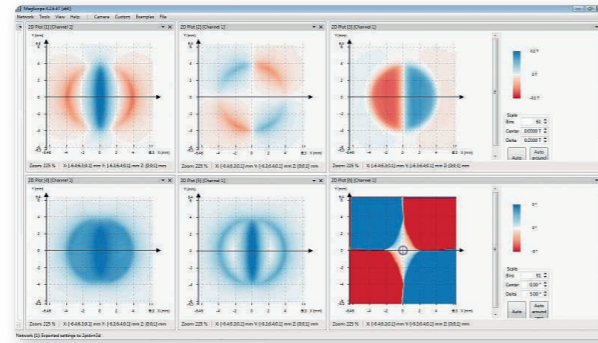
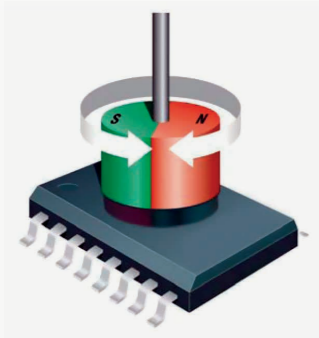
## ROTARY ENCODER MAGNETS

In 2-pole rotary encoder magnets, it is crucial for the in-plane magnetic field to be highly homogeneous, as a Bxy sensor in end applications measures the local magnetic field direction to determine the angular position of a rotating component. The angular position =  $\text{atan2}(B_y, B_x)$  of the magnet.

Magcam can precisely measure the 2D distribution of the azimuthal angle error in the magnetic field without the need for rotating the magnet, enabling immediate pass/fail testing and failure diagnosis. Magcam's innovative Distance Filter algorithm provides virtually noise-free measurements at greater distances from the magnet, allowing comprehensive magnetic field assessments with a single planar measurement.

### Magcam solution:

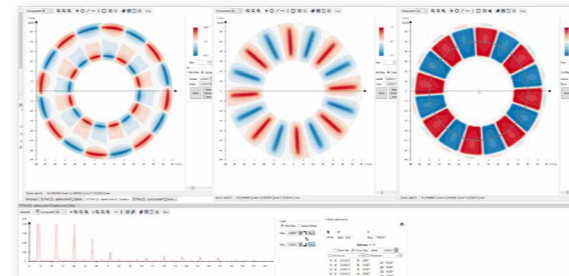
- Precise direct measurement of azimuthal angle error
- Direct measurement of Bxy field
- Circle/ring/volume analysis without rotation
- Eliminate noise in measurements using Magcam's unique Distance Filter algorithm



Top figure: 3-axis Bx,By,Bz magnetic field distribution with derived B, Bxy and azimuthal angle distributions.

Middle figure: Bxy and azimuthal angle distributions with circle section.

Bottom figure: Bxy distribution with a circle section in the middle of the magnet for Z = 0.3 mm (left) and Z = 2 mm (right), using the Distance Filter function.



Top: 2D FFT analysis of the axial field component

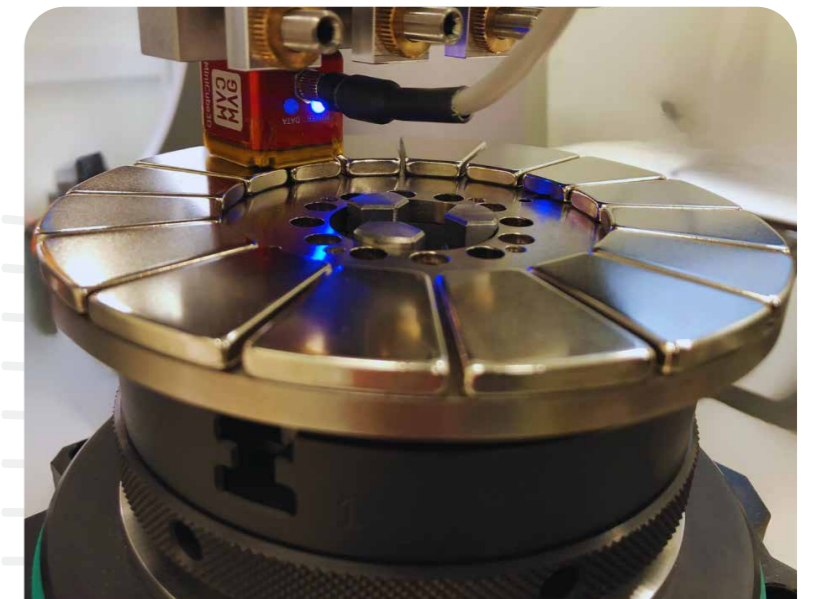
Middle: 3-axis magnetic field distribution (radial, tangential, axial)

Bottom: Combined magnetic and topographic magnet surface measurements to test magnet placement quality.

## AXIAL-FLUX PM ROTOR ANALYSIS

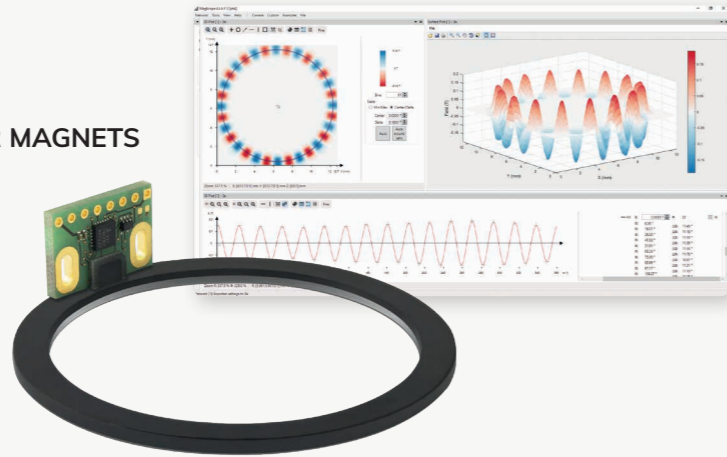
Permanent magnet axial-flux motors are increasingly used in hybrid and pure electric powertrains in the automotive, aviation and electric bike industry. With short-path axial-flux rotors, the direction of the magnetic flux is aligned parallel with the axis of rotation which allows the production of lighter and shorter motors with high torque density. The mass production of this type of motor comes with certain challenges, where the magnetic field distribution inspection of the high-quality rotors axial flux in the rotor is of critical importance.

The axial-flux measurement mode is available for Magcam's Combi and Rotor Scanner configurations and benefits from all well-known Magcam features, such as high radial and angular resolutions, integrated laser surface measurements for mechanical verification and runout compensation measurements, fast cycle times and in-line advanced data analysis.



## INDUSTRIAL MULTIPOLE ROTARY ENCODER MAGNETS

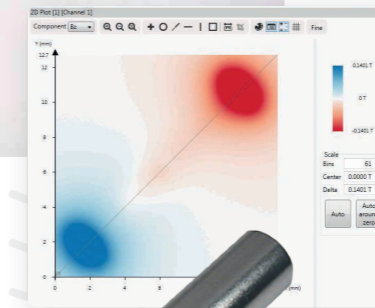
- Pole peaks detection
- Peak homogeneity analysis
- Zero crossings detection
- Pole angles measurement
- Fourier harmonics analysis
- THD analysis



## MEDICAL DIPOLE POSITION SENSOR MAGNETS

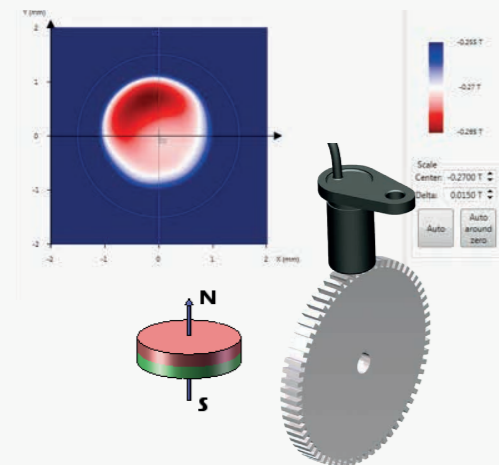
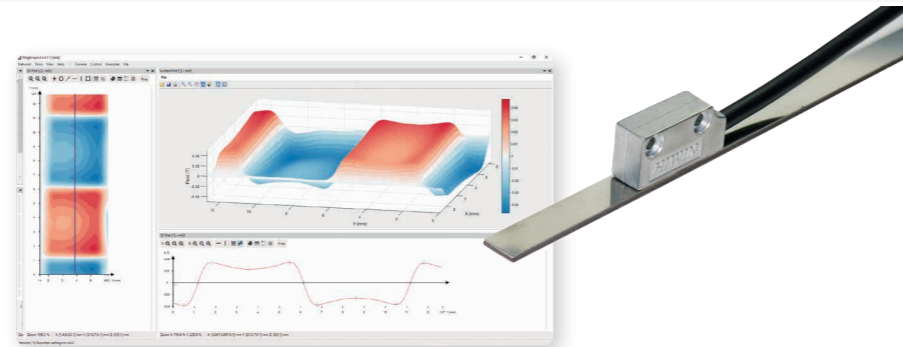
- 3D field distribution
- North-south asymmetry
- Zero crossing detection
- Magnetization vector angle deviation\*
- Magnetization magnitude\*
- Deviation from perfect theoretical magnet\*

\*MagFit analysis



## LINEAR ENCODER STRIP MAGNETS

- Pole peaks detection
- Peak homogeneity analysis
- Zero crossings detection



## GEAR TOOTH SPEED SENSOR MAGNETS

For this application, the Bz component is relevant. The MiniCube1D camera instantly measures the Bz field distribution and offers various analysis possibilities:

- Field homogeneity
- Magnetization vector size
- Angle deviation
- Deviations from a perfect theoretical magnet

## CONSUMER ELECTRONICS COMPONENTS

- Microphone and speaker magnets
- Precision positioning and holding magnets



# CRACK DETECTION

Low-quality magnets can possess small cracks, which may result in product failure. The Magcam systems can identify both visible and just-below surface cracks.

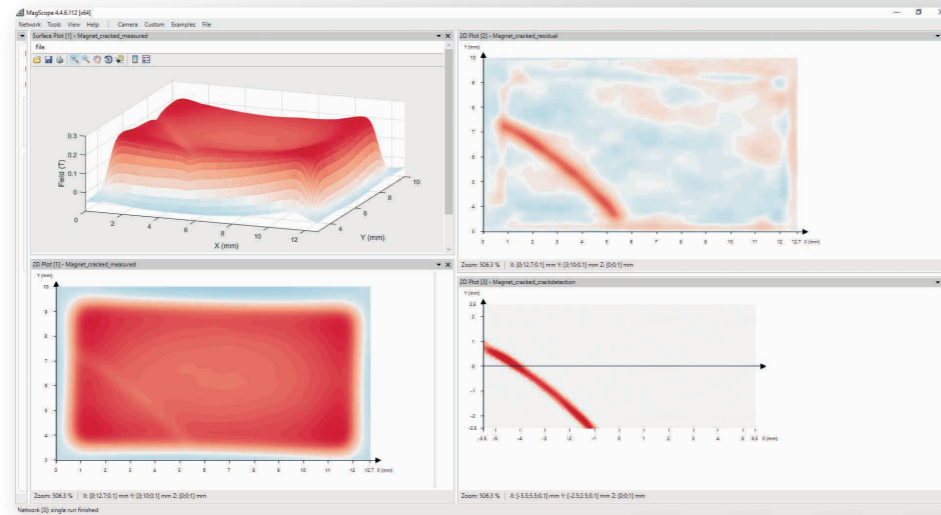
Magcam's crack detection solutions are useful in R&D to pinpoint the best materials and processes and can be employed in production environments to screen out magnets and PM rotors that don't meet customer requirements.

## Magnet quality issues

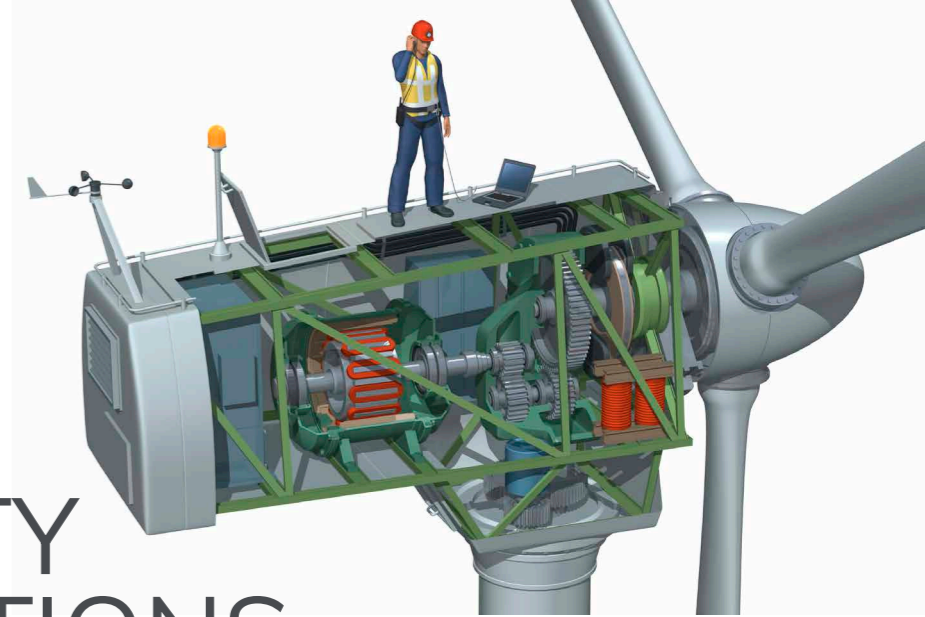
- Small cracks can cause premature product failure

## Magcam analysis

- Bz field distribution
- Subtract background field (e.g. using MagFit analysis)
- Image processing
- Threshold residual field
- Feature recognition
- Detect cracks



Magcam crack detection in a block magnet.



# SPECIALTY APPLICATIONS

Magcam's products offer solutions for various unique applications.

For measuring extremely large magnets and PM rotors, such as those found in industrial motors or wind turbines, with rotors longer than 400 mm and larger than 500 mm in diameter, Magcam can collaborate with customers to develop tailored solutions.

For example, using Magcam's Combi Scanner, a Contour Scan solution has been developed to measure large curved magnets in rotor scan mode. This allows for much faster measurements compared to portal scan mode.

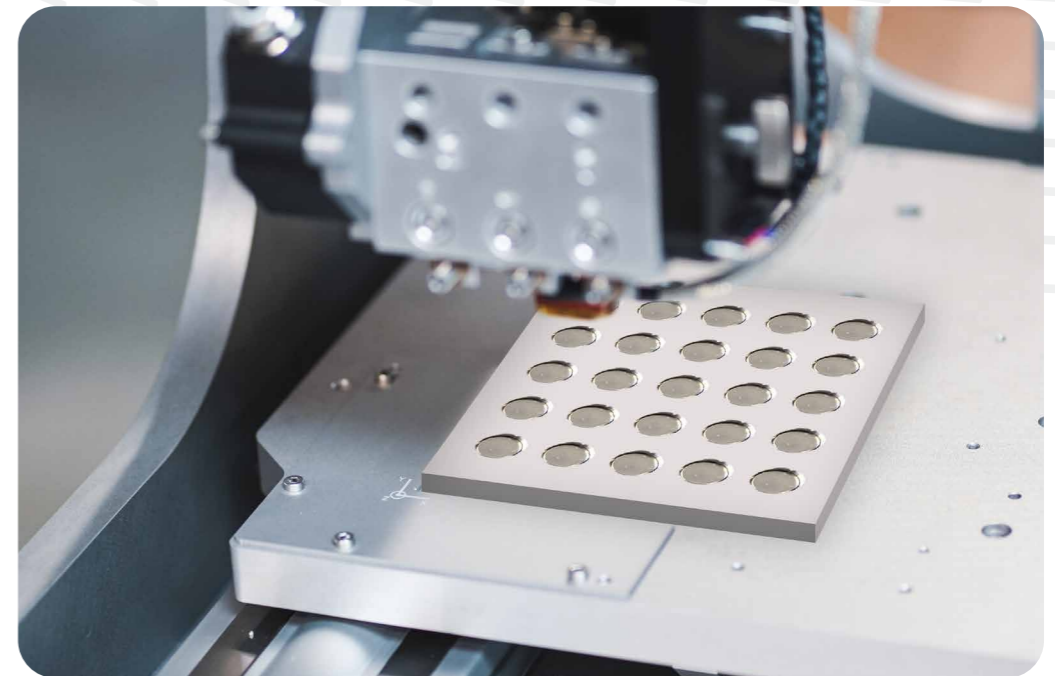


Please contact Magcam to discuss your custom measurement requirements.



# MAGNET BATCH TESTING

Utilizing the Combi Scanner, magnet batch testing can be conducted with a semi-automated setup involving magnet trays. This approach is best suited for low to medium volume testing and screening processes.



Reach out to Magcam to discuss your specific volume testing needs and requirements.



## 100% IN-LINE PRODUCTION TESTING

The MiniCube camera can be incorporated into a fully automated in-line production environment, utilizing robots for high-volume testing and screening of 100% of the produced magnets.

- Magnets can be measured and screened within seconds.
- Capable of processing millions of magnets annually.

# SERVICES

## Measurement and Analysis service

Take advantage of Magcam's expert team to measure and comprehensively analyze your magnets or magnetic assemblies with the most advanced magnetic field measurement systems on the market. Obtain detailed measurement reports for your permanent magnet products to accelerate progress in your R&D or production projects.



## Application Consulting

Also after installing a Magcam measurement system at your company, we remain committed to helping you uncover the hidden secrets of your magnets. Our magnet analysis experts are eager to assist you in interpreting your Magcam data and resolving any issues you encounter with your end application, such as a root cause analysis. We strive to deeply understand our customers' applications and work towards solutions, utilizing the extensive Magcam toolkit. Your success is our goal.



## Renting Service

Experience flexibility and convenience with Magcam's Renting Service, perfect for short-term projects or product evaluation. By renting our equipment, you can enjoy reduced upfront costs, trial the suitability of our products and access the latest technology. Furthermore, you'll receive full technical support and training throughout the rental period. Contact us to learn how renting Magcam equipment can propel your projects towards success.



## Calibration Service

To maintain the peak performance of your advanced Magcam system and adhere to internal or external calibration standards, periodic calibration is strongly advised. Our team of skilled support engineers ensures timely calibration for both your MiniCube3D magnetic field camera sensor and your Combi or Rotor Scanner.

## Tailored Software Development Service

Magcam provides specialized Python script development services to accommodate your distinct needs, including pass/fail classification, custom export formats, modified user interfaces, production line integration, and more. Our team of seasoned professionals is dedicated to delivering the required functionality while also guiding you toward the most effective strategies for achieving optimal results. Get in touch with us to explore how Magcam's solutions can be customized to perfectly suit your particular application. You may find that MagScope's existing capabilities are already well-equipped to address your magnet inspection task requirements.

## Technical Support

Our team is dedicated to delivering the technical support you require. Simply send an email to [support@magcam.com](mailto:support@magcam.com) with your technical inquiries, specifying the product you're utilizing and your desired results. Our engineers will promptly reply with a solution.

We're here to offer solutions!



Contact us at:  
[www.magcam.com](http://www.magcam.com)  
[info@magcam.com](mailto:info@magcam.com)  
[support@magcam.com](mailto:support@magcam.com)  
Tel: +32 16 79 53 22



**MAGCAM**  
advanced  
magnet  
inspection

# Measure. Analyze. Optimize.



@ Magcam

[www.magcam.com](http://www.magcam.com)



Magcam NV  
Researchpark Haasrode  
Romeinse straat 18  
B 3001 Leuven, Belgium  
Tel: +32 16 79 53 22  
[info@magcam.com](mailto:info@magcam.com)