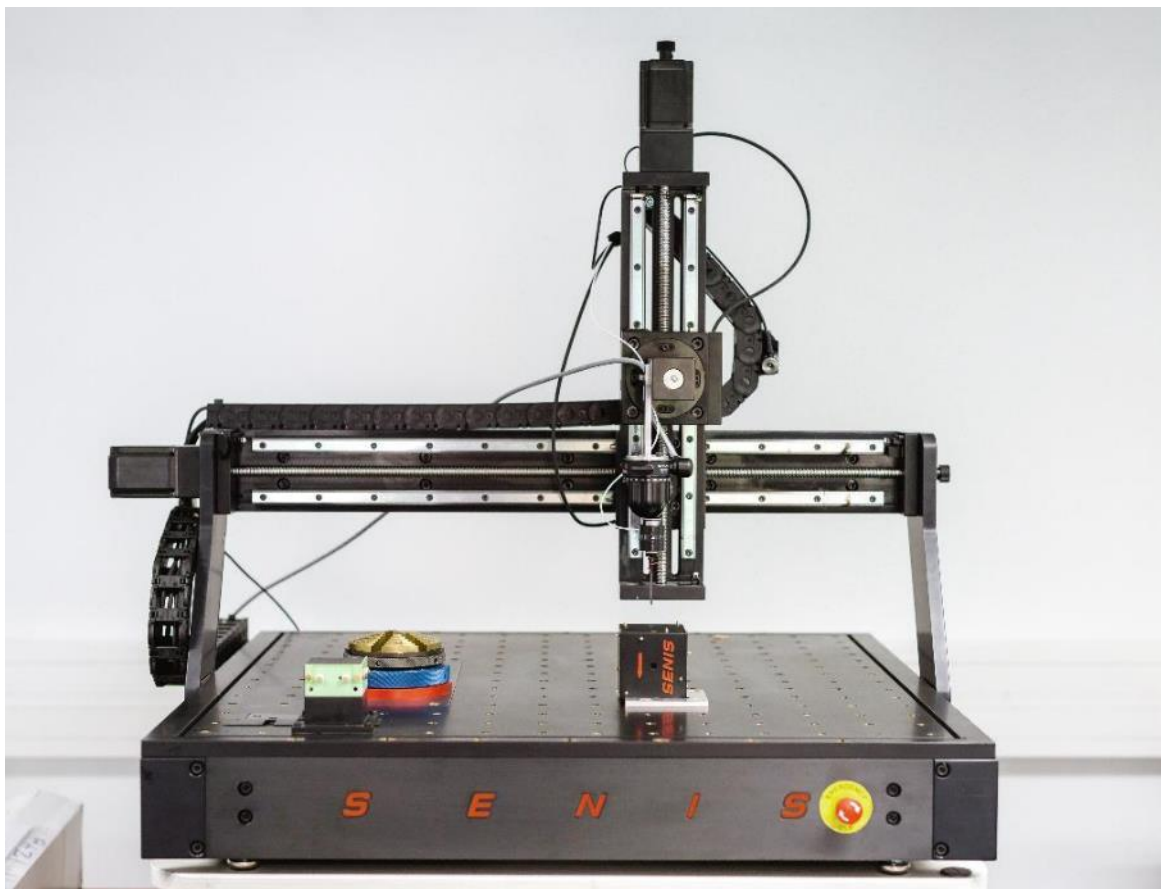


## KEY FEATURES

- Scanning volume (X x Y x Z):
  - MMS-1A-RS: 125 x 125 x 150mm<sup>3</sup>
  - MMS-1X-RS: 570 x 570 x 290mm<sup>3</sup>
  - Other sizes on request
- Scanning speed: adjustable, up to 100 mm/s
- Continuous (on-the-fly) or Step by Step scanning
- X-, Y-, and Z-linear modules with 1µm resolution and 10µm positioning repeatability.
- Rotary stage with 0.022° resolution and 0.04° repeatability.
- 3-axis fully integrated CMOS Hall probe (Bx, By, Bz) with the spatial resolution (By: 0.02x0.005x0.02mm<sup>3</sup>; Bx & Bz: 0.14x0.01x0.14mm<sup>3</sup>); high angular accuracy: 0.1° (compensated)
- Up to 3 selectable magnetic field meas. ranges: 0.1T, 0.5T, 2T (Option MMS-MR2/3)
- Accuracy of magnetic field measurement: typical 0.1%
- DC and AC field measurements from DC to 25kHz (-3dB point)
- Multi-jaw scroll chuck for precise magnet holding of diameters of 0-90mm
- Protection cabinet for a safe operation and CE compatibility (Option MMS-SafetyCabinet/Curtains)
- Customizable, easy to use mapper software on MS Windows platform
- Color coded 2D and 3D isometric representation of the magnetic field
- Measurement results in magnet coordinates.
- Plug-in installation, configuration and calibration
- In-situ location of probe's sensitive area with a repeatability of 20µm
- In-situ calibration of the Hall probe (offset, sensitivity and orthogonality error)
- In-situ calibration of the mechanical system geometry (planarity & orthogonality)



## Description

MMS-1A-RS, the high-end version of the SENIS Magnetic Field Mapping System allows users to perform a fast, high resolution mapping of magnetic field around permanent magnets, electromagnets and electronic circuit PCBs. Due to unique features of the applied fully integrated Hall probe (Si-chip), all three components of the magnetic field are measured simultaneously at virtually same point. A motion control unit allows for the simultaneous control of four axes (X, Y, Z-linear modules and rotation stage). It enables a fast probe positioning with the highest accuracy and repeatability. A Renishaw TP20 Touch Sensor prevents probe damage and allows probe positioning by touching. The mapping system is controlled by an easy-to-use software built on MS Windows platform and LabVIEW. Scanning profiles and measured data visualization are fully customizable. Various onsite semi-automatic automatic procedures are available for the MMS-1A-RS. The re-calibration process can be completed on-site by customer.



## MMS-1A-RS Magnetic Field Mapper

### MMS-1A-RS Magnetic Field Mapper

1. 3-axis Senis Magnetic Field Transducer (F3A), including the Hall probe.
2. Personal Computer (PC) including the Motion Control (NI 73xx) and DAQ (NI 6212).
3. Electronic box with power supply, magnetic transducer, step motor drivers, encoder electronics, touch sensor control and current supply for calibration tool
4. Cartesian moving platform with linear modules for three axes (X, Y and Z) featuring step motors, boundary switches and Heidenhain optical encoders.
5. Non-magnetic rotary stage with encoder for rotating the object under test with multi-jaw scroll chuck.
6. Touch sensor for probe protection and absolute Hall probe positioning
7. Emergency Stop safety equipment
8. Zero Gauss Chamber for Offset Cancelling

## Options

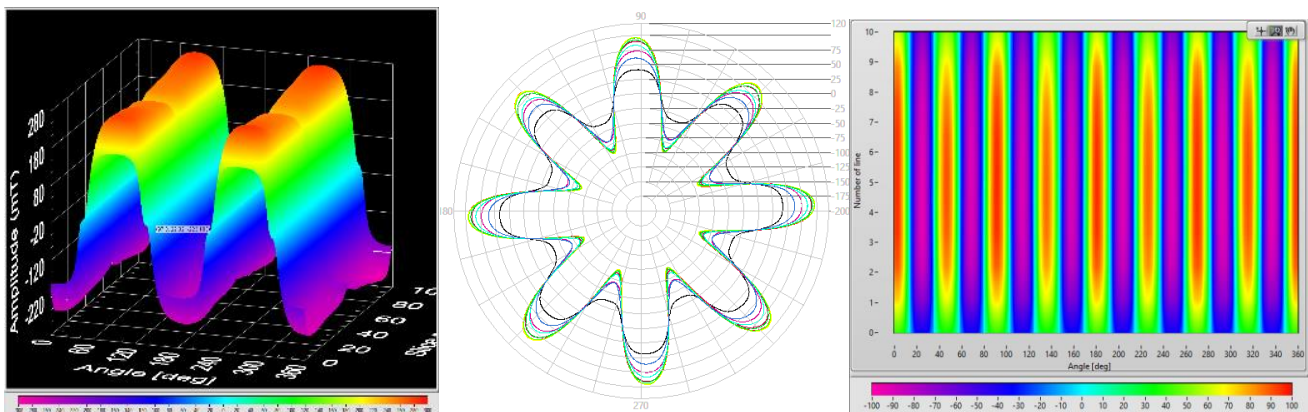
1. Various or customized scanning volumes.
2. MMS-SafetyCabinet/Curtains: Safety Cabinet to satisfy the CE directives (mandatory for the production environments).
3. MMS-CAL/REF: Calibration tool for In-Situ calibration of the Hall probe (sensitivity matrix of the Hall probe)
4. MMS-CMM: Dimensional measurement of objects under test and absolute magnet positioning utilizing 3D touch sensor.
5. MMS-MR2 and MMS-MR3: Up to three selectable magnetic field ranges.
6. MMS-DEF: Eddy-current probes for crack detection in magnetized and non-magnetized parts.
7. MMS-SLID: Sliding probe for in-contact magnetic field measurement; Field sensitive volume to magnet surface of 0.5mm.



## SOFTWARE

The user-friendly software, based on LabVIEW on MS Windows platform, offers the following features:

1. Probe positioning via keyboard
2. Command editor for setting up measurement programs using an extensive text command structure for easy and flexible measurement setup.
3. Measurement programs can be stored and loaded.
4. 2D and 3D heatmaps and Various visualization tools for various applications
5. Standard analysis for:
6. Multipole rotary magnets (permanent magnet rotors, multipole encoder magnets)
7. Multipole linear magnets (linear motors, linear multipole encoders)
8. Dipole angle magnets (homogeneity angle error)
9. Report generation (PDF)
10. Semi-automatic user guided on-site calibrations
11. Raw data in txt/csv for easy loading in other applications
12. Dimensional measurement (CMM, optional)
13. Crack detection (eddy-current measurement, optional)
14. User guided production/quality measurements can be set up.
15. Operator and Administrator permissions
16. ... and much more.



## TYPICAL APPLICATIONS

1. Measurement of all three components of magnetic field ( $B_x$ ,  $B_y$ ,  $B_z$ ),
2. Calculation of magnetic angle measurement, angle error, poles and zero crossing positions and pole widths, number of magnetic poles counting, pole width calculation, ...
3. Quality assessment tool in production, for assemblies such as single and multi-pole permanent magnets, rotors, encoders, loudspeakers, photocopier rollers and magnetic ribbons, smartphones, tablets, PCBs, etc.
4. Detection of cracks in permanent magnets
5. AC magnetic field mapping
6. Development of magnet systems
7. Application in laboratories and in production lines, etc.



## Specifications

Mechanical Specifications				
Parameter	Values			
The dimensions of the mechanical part of the scanner	400 mm x 350 mm x 650 mm			
Total system weight	<ul style="list-style-type: none"> <li>Mechanical part: 26 kg</li> <li>Electronic module: 7 kg</li> <li>Personal Computer: 2 kg</li> </ul>			
Maximal scanning volume (other on request)		X [mm <sup>2</sup> ]	Y [mm <sup>2</sup> ]	Z [mm <sup>2</sup> ]
	MMS-1A-RS	125	125	150
	- extended Z-axis	125	125	290
	MMS-1X-RS	570	570	290
	- extended Z-axis	570	570	380
Minimal distance of MFSV (Magnetic Field Sensitive Volume) from the magnet	0.3 mm			
Maximal scanning speed	100 mm/s			
Encoder resolution	1 µm (linear); 0.022° (rotational)			
Positioning repeatability	10 µm (linear), 0.05° (rotational) at stable temperature			
Start-up time from cold start till availability for measurement	< 3 min			
Shut down time	< 1 min			
Recovery time from an emergency stop	< 1 min			
Hall sensor specifications				
Hall sensor measuring range	Included	± 100 mT		
	Optional	± 500 mT		
	Optional	± 2'000 mT		
Hall sensor resolution	better than 0.02% for measurement range ≥200mT better than 0.05% for measurement range ≤100mT			
Hall sensor accuracy	typical 0.1% of full range (at 23° C)			
System sampling rate	Standard rate (calibrated): 10 kSamples/s per channel 60 kSamples/s, for 3-channels acquisition 200 kSamples/s, for 1-channel acquisition			
Magnetic field Frequency Bandwidth	DC to 25 kHz (-3dB point)			

### Probe types:



Denomination	Description	Chip	Minimal measuring distance		Dimension (excl. holder)		
			X [mm]	Z [mm]	L [mm]	W [mm]	T [mm]
HM	Ceramic packaged probe	covered chip	0.25±0.05	0.3±0.05	47	2	0.78
HMs	Ceramic packaged probe	covered chip			47	2	0.5
HL	Ceramic packaged probe	covered chip			71	2	0.78
HLs	Ceramic packaged probe	covered chip			71	2	0.5
KM	Ceramic packaged probe	open chip	0.25±0.05	0.3±0.05	47	2	0.78
KMs	Ceramic packaged probe	open chip			47	2	0.5
KL	Ceramic packaged probe	open chip	Tip: <0.1	0.3±0.05	71	2	0.78
KLs	Ceramic packaged probe	open chip			71	2	0.5
KF	Flexprint and Ceramic	open chip	0.1±0.05	0.35±0.1	47	2	0.78
SHP	In-contact Sliding Probe	covered chip	0.5	-	25	3	3

**Probe Holder types:**

