DESCRIPTION

MMS-2A-ROT, the Magnetic Field Mapping System allows users to perform a fast, high resolution mapping of magnetic field around a cylindrical-form permanent magnets, such as rotors, disk and ring magnets, both radially and axially magnetized. The map of the magnetic field can be presented as color coded 1D, 2D or 3D display on a PC screen and as a table of numerical values of the magnetic field (each component Bx, By, Bz, Bxy, Btot, etc.). Due to unique features of the applied fully integrated 3-axis Hall probe (Si-chip), all three components of the magnetic field are measured simultaneously at virtually same point (field sensitive area is within a 150µm square). Optionally, a Hall probe can provide up to three selectable magnetic field measuring ranges. The mapping system is controlled by an extremely easy-to-use-software built on MS Windows platform and LabVIEW. Measured data visualization is fully customizable.

In addition to acquiring the measured magnetic field data, the multifunction Data Acquisition Card (NI DAQ) controls the motor of the rotary stage, using the data from the rotary encoder to regulate the angular position. The non-magnetic multi-jaws scroll chuck is mounted on the rotary stage for a precise holding of magnets under test. The probe can be positioned in X- and Z-axis.

KEY FEATURES

- **3D (B_x, B_y, B_z) magnetic field mapping utilizing an integrated 3-axis Hall probe with very high spatial resolution (150x10x150µm).**
- **Mapping of DC and AC magnetic fields (up to 30ks/S)**
- **On-the-fly scanning (continuous mapping)**
- **Simple text command-based scan setup**
- **Standard multipole analysis including, poles, zero crossings, pole width, SPD, TPD, frequency spectrum analysis, data comparison**
- **1D,2D,3D Visualization of B_x, B_y, B_z, B_{xy}, B_{Total}**
- **Scanning volume: 155 mm x 55 mm x 360°**
- **Scanning speed adjustable: up to 180°/s**
- **Rotary stage with the encoder (resolution 0.022°) and with a non-magnetic scroll-chuck for magnet fixing.**
- **Very high magnetic field resolution**
- **Magnetic flux density accuracy: better than 1%**
- **Selectable measurement ranges: 0.1T; 0.5T**
- **Mapper software running on Windows**

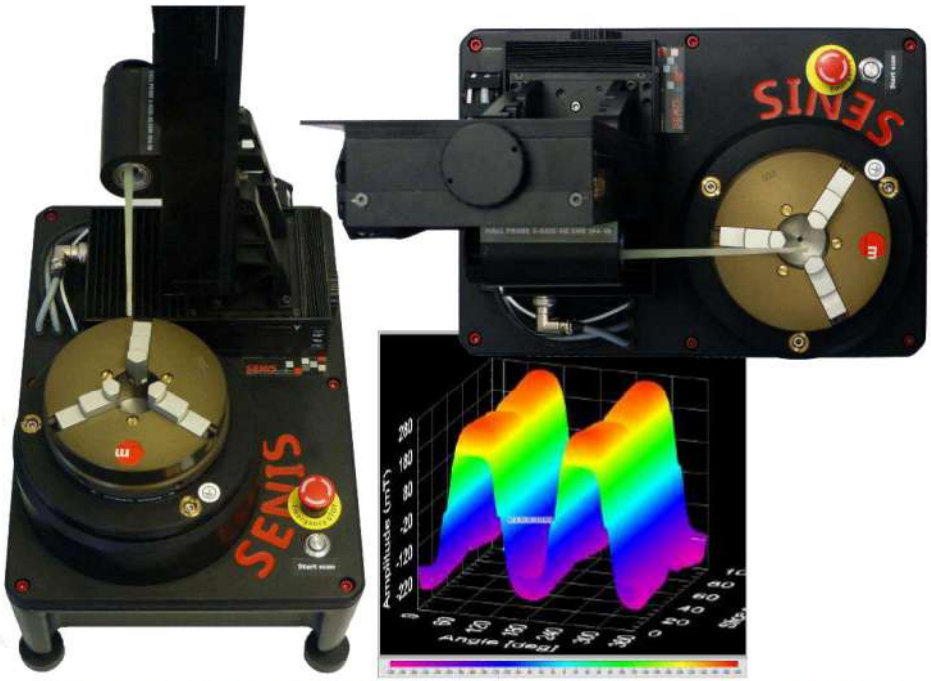


Figure 1: Prototype MMS-2A-ROT and Measured Data Visualization

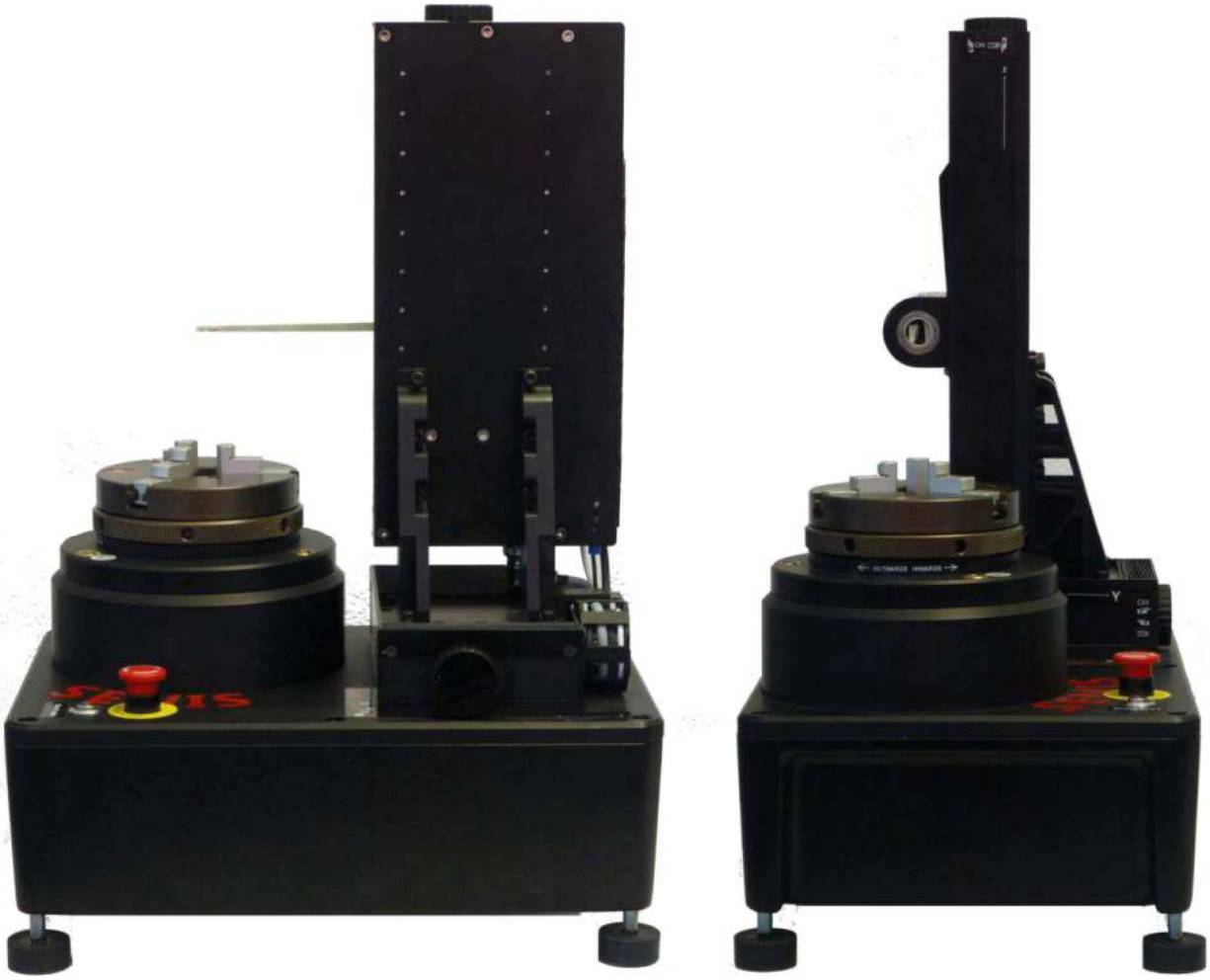
SYSTEM SPECIFICATION

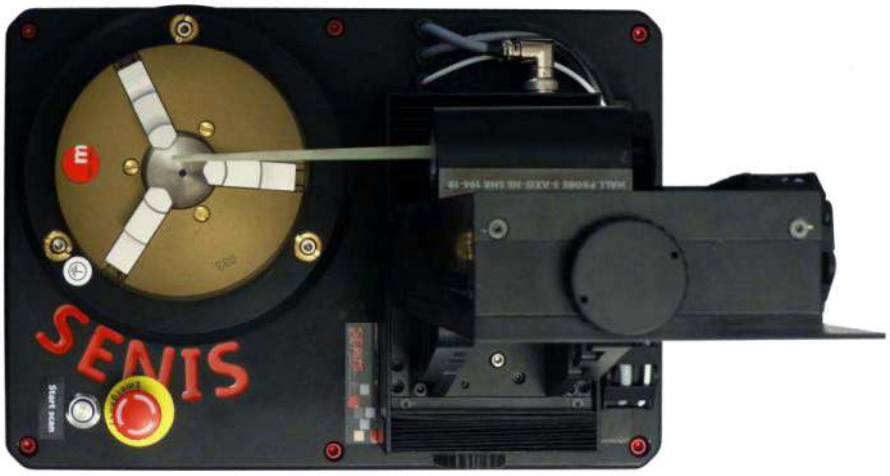
Parameter	Values	
Scanning volume	Z-axis, vertical: 155 mm X-axis radial: 55 mm R-axis rotational: 360°	
Dimensions	240 x 340 x 500 mm	
Minimal distance of FSV to magnet surface	0.5mm	
Maximal scanning speed	180deg/s	
Positioning	Resolution	Reproducibility
Angular	0.022°	0.1°
Linear	0.01mm	0.02mm
Centre of rotation detection		<0.05mm
Magnetic field measurement specifications:		
Available measurement ranges	Standard: ±100 mT	
	Optional: ±500 mT, 2T	
Resolution	better than 0.05% of the measurement range	
Accuracy	better than 1% of the measurement range, 2T better than 2%.	
Sampling rate	30 kSamples/s, for 3-channels acquisition	
Frequency Bandwidth	DC to 25 kHz (-3dB point)	
System requirements		
PC with Windows 7/10 and USB 2.0		

TYPICAL APPLICATIONS

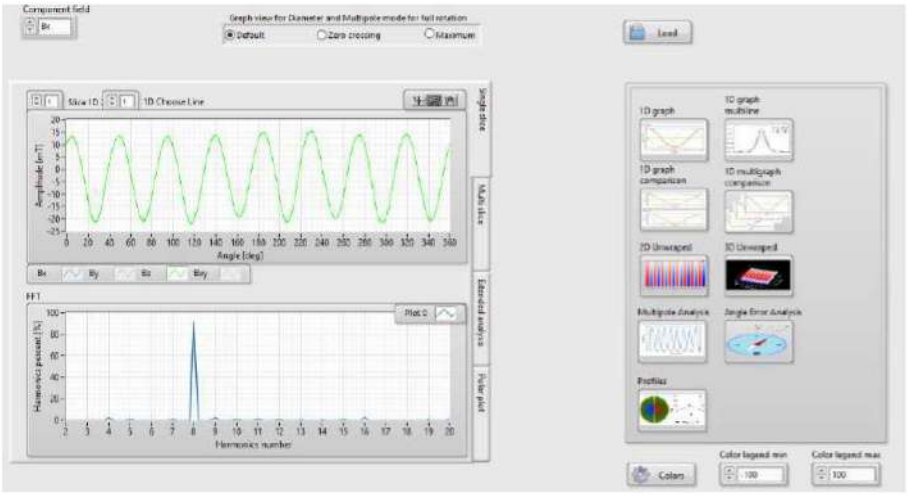
- Multipurpose for cylindrical shape magnets and magnet assemblies, especially permanent magnet rotors and multipole sensor magnets
- Quality assessment in for production, for assemblies such as single and multi-pole permanent magnets, rotors, encoders, etc.
- Development of magnet systems, design process improvement and verification
- Integration in semi-automatized production lines

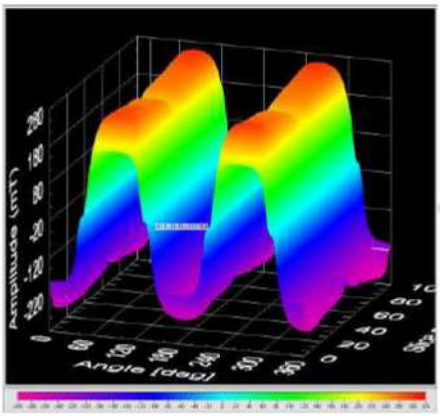
PICTURES

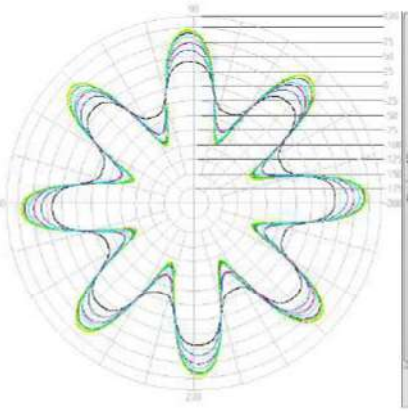


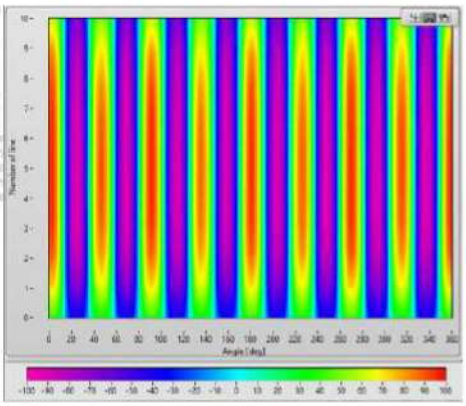


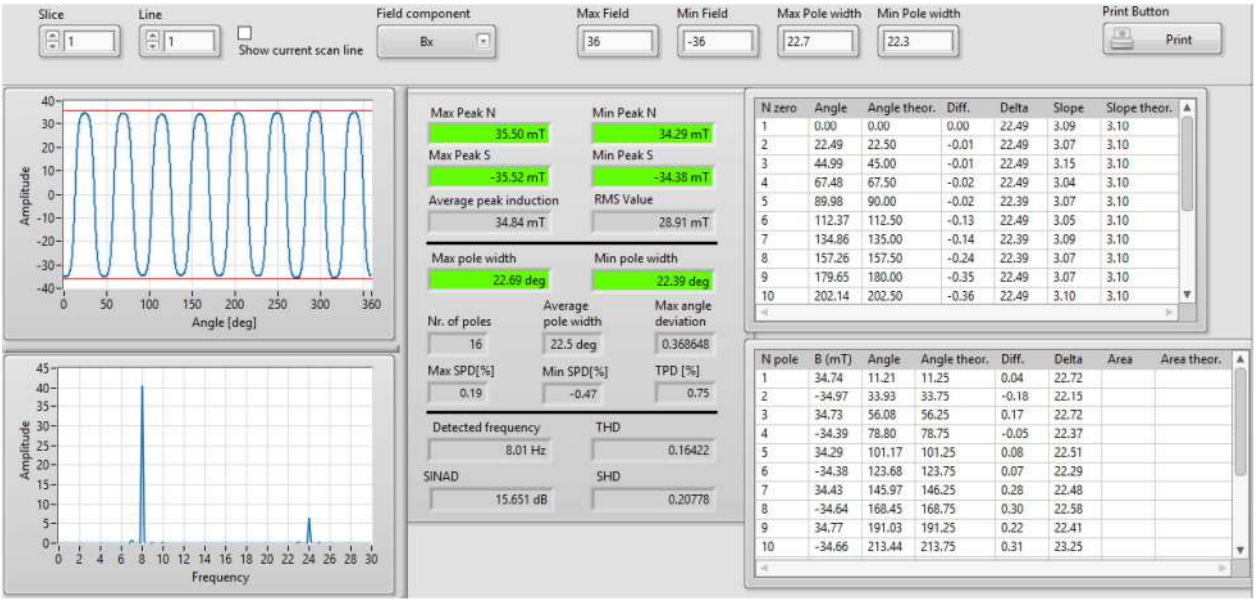
STANDARD ANALYSIS EXAMPLES











N zero	Angle	Angle theor.	Diff.	Delta	Slope	Slope theor.
1	0.00	0.00	0.00	22.49	3.09	3.10
2	22.49	22.50	-0.01	22.49	3.07	3.10
3	44.99	45.00	-0.01	22.49	3.15	3.10
4	67.48	67.50	-0.02	22.49	3.04	3.10
5	89.98	90.00	-0.02	22.39	3.07	3.10
6	112.37	112.50	-0.13	22.49	3.05	3.10
7	134.86	135.00	-0.14	22.39	3.09	3.10
8	157.26	157.50	-0.24	22.39	3.07	3.10
9	179.65	180.00	-0.35	22.49	3.07	3.10
10	202.14	202.50	-0.36	22.49	3.10	3.10

N pole	B (mT)	Angle	Angle theor.	Diff.	Delta	Area	Area theor.
1	34.74	11.21	11.25	0.04	22.72		
2	-34.97	33.93	33.75	-0.18	22.15		
3	34.73	56.08	56.25	0.17	22.72		
4	-34.39	78.80	78.75	-0.05	22.37		
5	34.29	101.17	101.25	0.08	22.51		
6	-34.38	123.68	123.75	0.07	22.29		
7	34.43	145.97	146.25	0.28	22.48		
8	-34.64	168.45	168.75	0.30	22.58		
9	34.77	191.03	191.25	0.22	22.41		
10	-34.66	213.44	213.75	0.31	23.25		