**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 (Bx, By, Bz) 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 Bx, By, Bz, Bxy, Btot
- 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](image-url)
SYSTEM SPECIFICATION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning volume</td>
<td>Z-axis, vertical: 155 mm</td>
</tr>
<tr>
<td></td>
<td>X-axis radial: 55 mm</td>
</tr>
<tr>
<td></td>
<td>R-axis rotational: 360°</td>
</tr>
<tr>
<td>Dimensions</td>
<td>240 x 340 x 500 mm</td>
</tr>
<tr>
<td>Minimal distance of FSV to magnet surface</td>
<td>0.5mm</td>
</tr>
<tr>
<td>Maximal scanning speed</td>
<td>180deg/s</td>
</tr>
<tr>
<td>Positioning</td>
<td>Resolution</td>
</tr>
<tr>
<td>Angular</td>
<td>0.022°</td>
</tr>
<tr>
<td>Linear</td>
<td>0.01mm</td>
</tr>
<tr>
<td>Centre of rotation detection</td>
<td>&lt;0.05mm</td>
</tr>
</tbody>
</table>

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)                      |

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
STANDARD ANALYSIS EXAMPLES

**Component Field**
- Component view for elemental and multipole modes for full rotation.
- Different settings include: 3D view, 2D view, max, min, and average.

**Field Component**
- Displays peak values for different components:
  - Max Peak 5: 35.92 mT
  - Min Peak 5: 34.38 mT
- Average peak induction: 38.88 mT
- RMS Value: 28.87 mT
- Max pole width: 22.68 deg
- Min pole width: 22.33 deg
- Number of poles: 16
- Average pole width: 22.0 deg
- Max angle deviation: 0.36 deg
- Max SFD (%): 0.19
- Min SFD (%): 0.04
- Detected frequency: 0.01 Hz
- SNR/HD: 15.67 dB
- SHO: 0.0277

**Print Button**
- Options for printing results include:
  - 0% Angle
  - Angle theor.
  - Diff.
  - Delta
  - Slope
  - Area
  - Area theor.

**Reference**
- Ref. No.: DS.400.ROT MAPPER.19
- Rev. 1.3, 26.8.2019
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**Contact Information**
- SENIS AG
  - Neuhostrasse 5a
  - 6340 Baar, Switzerland
  - Phone +41 44 508 70 29
  - Fax +41 43 205 26 38
  - E-mail info@senis.ch