

## Overhauser magnetometer SmartMag



### Main features:

- Highest precision and sensitivity
- The World's most compact base station magnetometer
- Optimal for operation in magnetic observatories
- Several SmartMags can be combined into gradiometer
- Built-in GNSS receiver

**SmartMag** – the World's most advanced and portable magnetometer based on the Overhauser effect. The instrument is designed for precise measurement of magnetic field. SmartMag can be used as an observatory magnetometer, base station, or as part of a multi sensor gradiometer. It is fully compatible with MaxiMag console and can be used for any type of ground magnetic surveys.

## **Magnetometer for magnetic observatories**

High sensitivity, sampling rate, and accuracy (less than 0.1 nT) make the SmartMag one of the best magnetometers for magnetic observatories. Real-time data upload is realized via USB, CAN FD or RS-232 connection. With the optional CAN-Ethernet interface SmartMag can be connected directly to network. The digital CAN FD cable can be up to several kilometers long. The device is supplied with the SmartManager software that has all the necessary functionality to perform observations in the INTERMAGNET network of magnetic observatories.

## **Multi-sensor gradiometer**

SmartMag supports the ability to link through a CAN FD interface to create a synchronized distributed network of magnetometers. This unique feature allows flexible formation of multi-sensor gradiometers with the necessary measurement base. You can connect up to 30 SmartMags to the MaxiMag console or build a multi-sensor gradiometer with an almost unlimited number of sensors using CAN-Ethernet interface unit.

## **Internal or external GNSS receiver**

Time and coordinates are provided by the internal multisystem GNSS receiver and additional possibility of connecting an external antenna. In some cases the connection of external GNSS receiver is required - SmartMag supports NMEA-0183 protocol and can be connected to navigation devices via RS-232 connection.

## **Easy-to-use portable console**

SmartMag console is equipped with OLED display and a switch panel. The control of measured values and their quality is provided in digital, graphical, and audible modes. Data download is available via USB, RS-232 or from the built-in industrial microSD card. All our parts and connectors are non-magnetic, which allows SmartMag setup to be even smaller in size compared to other magnetometers.

## **Metrology - a guarantee of high accuracy**

Every SmartMag is metrologically tested. We control the standard deviation of random error (noise), absolute accuracy and orientation error. All magnetometers are delivered with a certificate of calibration performed on a certified measure of magnetic induction. Metrological tests guarantee the accuracy and reliability of the measured data.

## **Reliability and warranty**

Our R&D specialists have extensive experience in performing geophysical surveys. We are well aware that such equipment must be reliable, and the service must be fast and convenient. We give 3 years warranty on all our magnetometers,

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and our technical support will promptly answer any of your questions. Our Overhauser sensors have the longest in the World lifecycle of more than 10 years. If you are still working with outdated magnetometers - take advantage of our trade-in offer and protect your projects from potential problems.

## Important “little things”

- Operating temperature range from -40 to +60 °C
- Durable connectors and cables for high performance
- All SmartMag electronic modules are sealed and unaffected by rain and dust
- Supplied high-capacity and lightweight Li-ion battery power is enough for several days of data acquisition on one charge at temperature range - 40 ÷ +85°C and has an MSDS certificate for air transportation
- Advanced signal processing algorithms provide enhanced gradient tolerance and noise protection
- Built-in multi-system GNSS receiver, thermometer, barometer and IMU
- Several SmartMag units can be easily combined into a single distributed network of magnetometers
- On request you can get SDK API for Windows environment allowing to upload both data recorded in the device memory and real-time measurements

## Operating modes:

- Single or continuous measurement mode with a cycle from 0.2 s
- Magnetic base station with the option to record measured data to microSD card, upload them in real time to a PC or broadcast via Internet
- High sampling rate allows to use [MaxiMag](#) on vehicles such as carts, all-terrain-vehicles, boats etc.
- Test mode without data saving with calculation of the average value and standard deviation

## Application area:

- Magnetic observatory measurements
- Volcanology and earthquake prediction
- Base station for ground and airborne surveys
- Combined operation with [MaxiMag](#) gradiometer for any type of ground magnetic surveys for mineral exploration, engineering and environmental applications, pipeline mapping, UXO detection and archaeological prospecting

## Features of the SmartManager software:

- Magnetic field measurement mode control
  - Visualization of measured data
  - Saving daily data files
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- Recording of measurement results to backup data storage devices
- Visualization of the predicted measurement sensitivity

### Capabilities of the CAN-Ethernet interface module:

- Real-time data acquisition and transferring via Ethernet to a PC or standard network equipment
- Data backup
- Power adapter 100-240 VAC to 12 VDC
- Backup power supply from external 12 V battery

### Delivery set:

- Overhauser sensor on flexible cable
- Remote control with built-in GNSS receiver
- USB cable
- Li-ion rechargeable battery with charger
- Sectional rod with a clamp for sensor
- Transportation case

### Optional:

CAN-Ethernet interface unit for connecting to router or PC, supplying 100-240 V, 50/60 Hz power and data back up

- External GNSS antenna
- Communication cable with CAN-Ethernet interface unit or another SmartMag
- RS-232 cable
- RS-232 sealed Data Logger for data backup

### Specification:

|                    |   |
|--------------------|---|
| Type               | overhauser magnetometer   |
| Dynamic range      | 20 000 to 120 000 nT  |
| Absolute accuracy  | 0.1 nT  |
| Sensor sensitivity | 0.021 nT/ $\sqrt{\text{Hz}}$ rms<br>0.012 nT/ $\sqrt{\text{Hz}}$ rms (on request) |
| Resolution         | 0.001 nT  |
| Gradient tolerance | 30 000 nT/m   |
| Sample rates       | 0.2, 0.33, 0.5, 1, 1.5, 2, 2.5, 3 s and longer with 1 s step                      |
| Sensors stability  | > 10 years  |
| Additional sensors | IMU, thermometer, barometer   |

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|------------------------------------|---|
| Data I/O                           | built-in: USB, RS-232, CAN FD.<br>optional: Ethernet (CAN-Ethernet interface module required)         |
| Maximum communication cable length | up to 6 km (CAN FD), up to 100 m (RS-232)   |
| GNSS receiver                      | built-in and optional external  |
| GNSS antenna                       | built-in and optional external  |
| GNSS signals                       | GPS L1C/A, GLONASS L1OF, Galileo E1B/C, BeiDou B1I, QZSS L1C/A. SBAS: WAAS, EGNOS, MSAS, GAGAN, SDCM. |
| Connectors                         | 2 × CAN FD / RS232 / 12V, USB, external GNSS antenna, Overhauser sensor                               |
| Display                            | 160 × 128, OLED   |
| Membrane switch panel              | 6 buttons   |
| Memory                             | up to 32 Gb (industrial microSD)  |
| Power                              | 10 ÷ 16.8 V, Li-ion or lead battery<br>100-240 VAC, optional CAN-Ethernet interface required          |
| Operating temperature              | -40 to +60 °C   |
| Li-ion battery                     | 14.6 V, 4 A·h   |
| Dimensions with connectors         | Ø73×116 mm – sensor<br>125×100×35 mm – console  |











