

Operation Manual for

Mag900 & Mag901

Three-Axis Magnetic Field Sensors

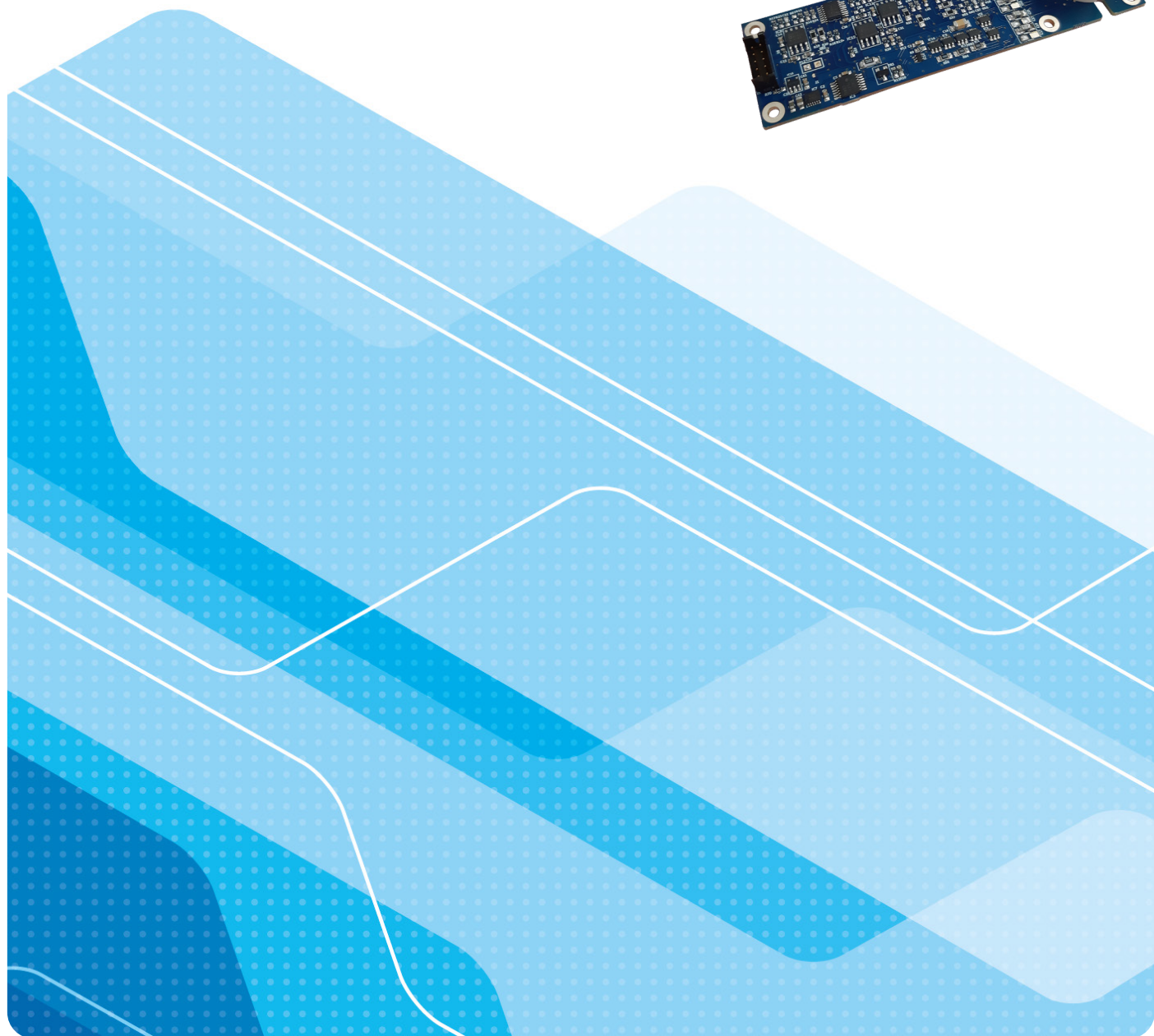
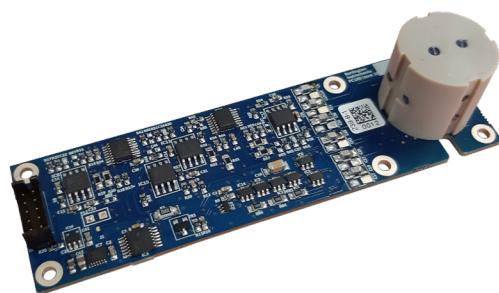


Table of Contents

1. About this Manual	3
1.1. Symbols Glossary	3
2. Safe Use	3
3. Introduction	4
4. Overview	5
4.1. Vector Measurements and Conventions	5
5. Installation	6
5.1. Unpacking	6
5.2. Orientation	6
5.3. Mounting	6
5.4. Cable Recommendations	6
5.5. Pre-Installation Tests	7
6. Operating Instructions	8
7. Troubleshooting	8
8. Storage & Transport	9
10. Environmental Precautions	9
11. End of Life Disposal	9

1. About this Manual

This manual provides the information necessary to help customers connect, install and operate the Mag900 & Mag901 three-axis magnetic field sensor.

Technical specifications of the products, including power supply requirements and analogue output details, can be found in [DS4550](#), whilst outline drawings of both sensor head, electronics board and cable can be found on [Mag900/Mag901 product page](#).

1.1. Symbols Glossary

The following symbols used within this manual call your attention to specific types of information:



WARNING: Indicates a situation in which serious bodily injury or death could result if the warning is ignored.



Caution: Indicates a situation in which bodily injury or damage to your instrument, or both, could result if the caution is ignored.



Identifies items that must be disposed of safely to prevent unnecessary damage to the environment.

Note: A paragraph in this format provides useful supporting information on how to make better use of your purchase.

2. Safe Use



WARNING: These products are not qualified for use in explosive atmospheres or life support systems. Consult Bartington Instruments for advice.



WARNING: Environmental and electrical specifications should not be exceeded.



To prevent irreparable damage, electrostatic discharge (ESD) protection and precautions must be used when handling the unpackaged sensor electronics board.

Note: Do not expose to strong magnetic fields while being stored as this can magnetise the sensor and affect its offset performance.

3. Introduction

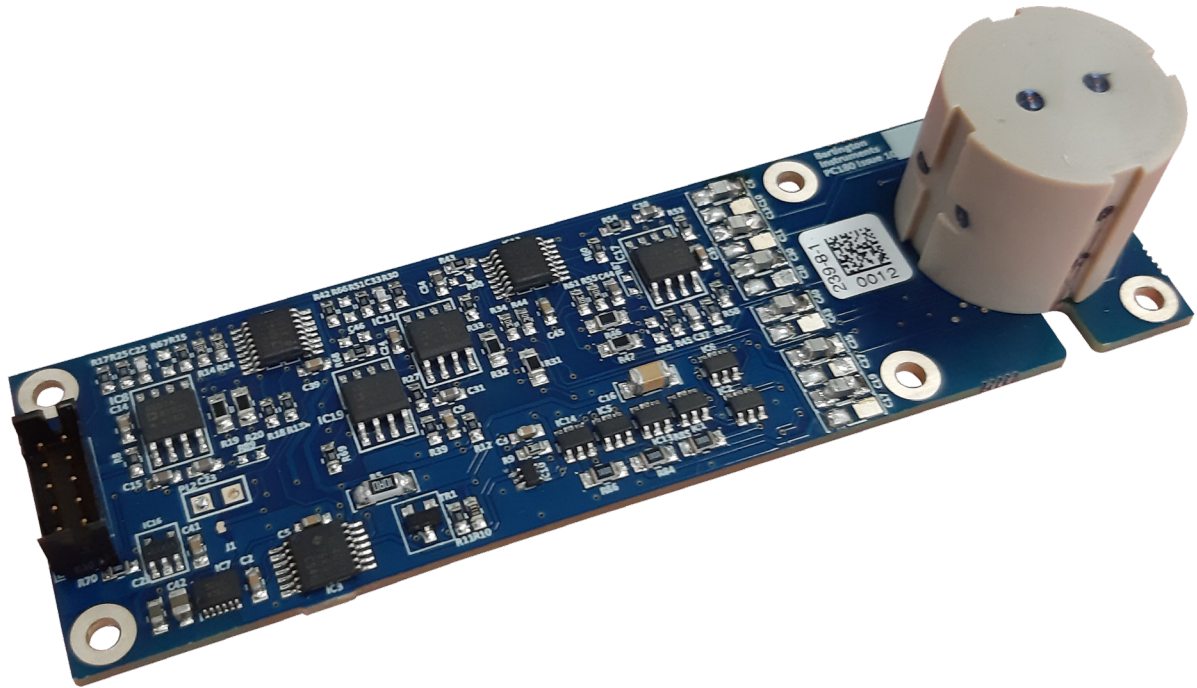


Figure 1. Mag900 & Mag901.

The Mag900 & Mag901 is an unpackaged, three-axis, low power sensor intended for customer system integration.

Technical specifications for the Mag900 & Mag901 are provided in datasheet DS4550.

4. Overview

The Mag900 & Mag901 consists of a cluster of three feedback stabilised, fluxgate sensors arranged along X, Y and Z axes. Each axis provides a highly linear magnetic response with low hysteresis, and low crosstalk between axes. These characteristics, combined with the compact design and very low power consumption, make this product ideally suited for perimeter surveillance with a multi-sensor network.

Internal regulation of the power supply ensures the Mag900 & Mag901 is suitable for battery powered operation, over both long and short cables (subject to the minimum supply voltage specified in datasheet DS4550).

4.1. Vector Measurements and Conventions

Each sensor produces three independent analogue output voltages in response to the magnitude and direction of the orthogonal components of a magnetic field. A “right-hand” coordinate system is adopted. In this system the X, Y and Z axis correspond to the thumb, first and second finger respectively of the right hand.

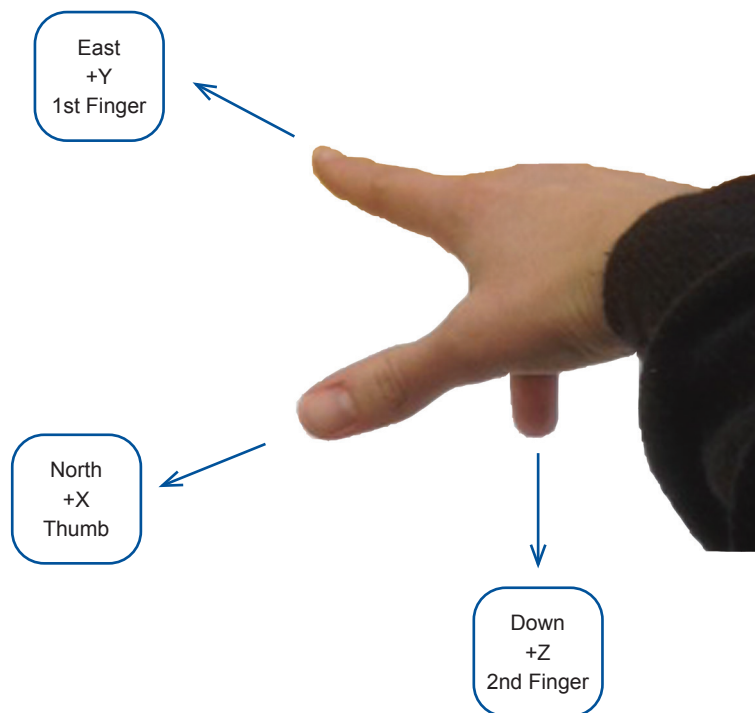


Figure 1. The “right hand” tool

The centres of the three vector sensors are superimposed. Refer to outline drawing DR4576 for the orientation of each sensor and the centre of the sensing elements. The point of each vector arrow in DR4576 indicates the positive direction of each axis.

5. Installation

The Mag900 & Mag901 is intended for integration into the customer's own system. Bartington Instruments cannot advise on the operation of third-party systems.

5.1. Unpacking

Safe handling precautions must be observed. The Mag900 and Mag901 fluxgates are wound with thin copper wire. While these wires are covered with silicone coating and are recessed inside the coil block, extra care must be taken not to break these delicate wires. Doing so will render the magnetometer inoperable.

5.2. Orientation

Note: The direction of the geomagnetic field will vary with geographical location. It is generally vertical at the poles, becoming horizontal at the equator.

5.3. Mounting

The Mag900 & Mag901 sensor assembly should be mounted in a stress-free manner using the six mounting holes on the PCB. Dimensions and locations of the holes are shown in outline drawing DR4576.

5.4. Cable Recommendations

The Mag900 & Mag901 provides differential output lines for analogue signal transmission.

The advantages of this differential arrangement are very high common-mode noise rejection and the suitability of readily available cable types. Each of the two anti-phase output lines has low output impedance at the signal source, damping the lines and preventing ringing.

The cable must be terminated with a differential amplifier having a circa 50k Ω input impedance, due to cable inductance and capacitance considerations. This arrangement will provide some damping to high frequencies but will attenuate the signals above the frequency range of the sensor.

Note: Due to these effects:

- The cable pair loop resistance should not exceed 0.1 Ω per metre.
- The pair loop inductance should not exceed 0.5 micro-Henry per metre.
- The capacitance between should not exceed 52pF per metre.
- The capacitance between conductors and shield should not exceed 120pF per metre.

5.5. Pre-Installation Tests

Prior to the installation into the customer's system, the Mag900 & Mag901 must be fully tested to ensure correct function as follows:



Caution: Take care to avoid bending or otherwise damaging the contacts whilst conducting the tests.



Caution: Ensure the polarity is correct. Incorrect polarity is likely to damage the sensor irreparably.

Note: Use a current-limited power supply.

- Check the power supply output voltage using a voltmeter. Refer to datasheet DS4550 for the required values.
- Connect the sensor to the cable connector.
- Connect the power supply to the other end of the cable connector.
- Switch on the power supply and wait until the sensor has stabilised. Refer to datasheet DS4550 for magnetic settling times.
- Confirm no magnetic objects are moving in the vicinity.
- For each of the three (X, Y and Z) axes in turn:
 - a. Connect a voltmeter to the axis sensor outputs.
 - b. Whilst monitoring the voltmeter readings, align the sensor with the terrestrial field until the maximum voltage value is determined.
 - c. Confirm the measured readings approach the local geomagnetic field value.

Note: Geomagnetic field values can be provided by your local magnetic observatory. A margin of error due to local disturbance should be taken into account.

6. Operating Instructions

Switch on the power supply to the Mag900 & Mag901.

Allow the system to warm up after switching on. Refer to datasheet DS4550 for magnetic settling times.

The Mag900 & Mag901 is designed to have an extremely low magnetic hysteresis.

However, your sensor should not be subjected to magnetic fields greater than their stated measuring range for extended periods as this could alter the DC offset and other performance specifications. If this occurs, the offset will exhibit drift as it returns to its original offset specification.



Caution: Subjecting the Mag900 & Mag901 to fields in excess of 2 x the nominal range may cause inaccuracy in future measurements. Degaussing the sensor can reverse such an effect.

7. Troubleshooting

Your sensor is unlikely to suffer any defects in normal use: no internal components are serviceable. The most likely causes of failure, and their solutions, are detailed in the following table.

In the event of any apparent malfunction beyond those described in the table below, please email service@bartington.com, or telephone the Bartington Instruments service team on +44 (0)1993 706565.

Cause	Solution
No operation	Check the power supply. If this is operating correctly then contact Bartington Instruments.
Damaged sensor	If any physical damage is apparent to the sensor then it may need to be replaced. For information about disposal of a damaged unit, refer to End of Life Disposal .

High stability circuitry ensures that no interim calibration should be required.

8. Storage & Transport

Your sensor is a precision electronic instrument and should be treated as such.

Note: Avoid exposing this instrument to shocks or continuous vibration.

Note: The sensor should be stored and transported in the original shipment packaging, or that of similar protective standard.

Note: Store only within the temperature range specified in datasheet DS4550.



Caution: Do not expose this instrument to strong magnetic fields while being stored.



Caution: Take particular care when cleaning around electrical connections. Bent or damaged pins may cause the Mag900 & Mag901 to malfunction.

10. Environmental Precautions

Refer to datasheet DS4550 for maximum environmental, electrical and mechanical ratings.



Caution: Exceeding the maximum environmental ratings may cause irreparable damage to the probe and electronics board.



Caution: This unpackaged product is susceptible to damage by electrostatic discharge.

11. End of Life Disposal



This product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

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The specifications of the products described in this brochure are subject to change without prior notice.

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