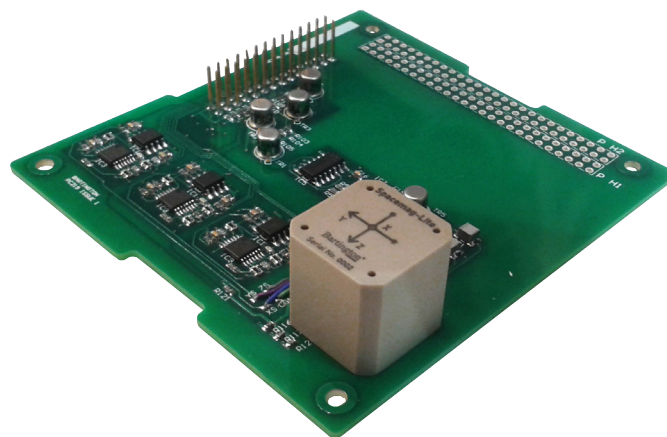


# Operation Manual for Spacemag-Lite Three-Axis Magnetic Field Sensor



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## 1. About this Manual

This document describes the installation, operation and maintenance of the Spacemag-Lite three-axis magnetometer. It should be read in conjunction with product brochure [DS2714](#), which can be found on the [product page](#) on the Bartington Defence & Space website. Outline drawings are also available on the 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 note provides useful supporting information and sometimes suggests 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 Defence & Space for advice.



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

## 3. Introduction to Spacemag-Lite

Spacemag-Lite is a low-cost, unpackaged fluxgate sensor consisting 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.

This product is made for space use has been specifically designed to fit into the chassis of a CubeSat. Regulating the power supply internally ensures the Spacemag-Lite is suitable for battery powered operation, over both long and short cables.

It is available either as a fluxgate probe mounted directly onto electronics, or in two parts, with the probe connected to the electronics by a cable. The latter allows the probe to be deployed at the end of a boom.

It has been designed to withstand the typical levels of radiation encountered in space.

Applications include spacecraft attitude sensing, and magnetic signature measurement.

### 3.1. Vector Measurements and Conventions

The magnetometer produces three independent analogue output voltages in response to the magnitude and direction of the orthogonal X, Y and Z components of a magnetic field.

The centres of the three vector sensors are superimposed; each orientation is denoted on the coil enclosure. The point of each vector arrow indicates the positive direction of each axis.

## 4. Installing Spacemag-Lite

The magnetometer should be installed within a spacecraft or CubeSat according to standard practice. The board is designed such that it can be fitted into a Pumpkin® Cubesat chassis, and conforms to the PC/104 standard.

**Note:** The sensor head must be sited away from magnetic materials to prevent false results in service. This requirement must be considered during the design of the craft.

Bartington can supply sensors specifically intended for checking the magnetic cleanliness of spacecraft during construction.

### 4.1. Connection Recommendations

#### 4.1.1. Cables and Connectors

The Spacemag-Lite is designed to connect directly to the CubeSat Kit Bus. Connection details are provided in the outline drawing available on the product page.

#### 4.1.2. Power Supplies

Power should be supplied by the CubeSat, required voltage and current levels are specified in the product brochure.

**Note:** There is no protection on the electronics assembly. The customer must ensure that the correct voltages are provided on the motherboard connectors.

## 4.2. Pre-Installation Tests

Prior to assembly of the system the connection must be checked as follows:

1. Check the power supply voltages using a voltmeter.
2. Ensure the leads to each sensor head are connected.

## 4.3. Mounting Recommendations

The sensor mounting holes conform to the Pumpkin® CubeSat Kit PCB specification. Refer to outline drawing for details.

See product brochure DS3777, available on the Bartington Defence & Space website, for further information.

## 4.4. Post-Installation Testing

When power is applied, each analogue output registers a voltage equivalent to the earth's magnetic field, this will be positive or negative according to sensor head orientation.

# 5. Using Spacemag-Lite

## 5.1. Operation

Spacemag-Lite functions immediately after power is supplied, providing an analogue voltage on each of three channels in response to the applied magnetic field.

## 5.2. Magnetic Hysteresis

Spacemag-Lite is designed to have an extremely low magnetic hysteresis. However, Bartington Defence & Space recommends your magnetometer is not subjected to magnetic fields greater than their stated measuring range for extended periods as this could alter the DC offset. If this occurs, the offset will exhibit drift as it returns to its original offset specification.



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

### 5.3. Environmental Precautions

Refer to the product brochure for maximum environmental, electrical and mechanical ratings.



**Caution:** Exceeding the maximum ratings may cause irreparable damage to your sensor.

## 6. 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@bartingtondefenceandspace.com](mailto:service@bartingtondefenceandspace.com) or telephone the Bartington Defence & Space service team on +44 (0)1993 706565.

Symptom	Cause	Action
Output floats to saturation (close to supply rails).	Severance or uncoupling of sensor head to electronics unit cable.	Major failure – will immediately be detected by operator. Contact Bartington Defence & Space.
Output goes high impedance.	Loss of power to the magnetometer.	Check power connections and voltages on connectors.
Output becomes 0V.	Internal component failure.	Return unit to Bartington Defence & Space.

In the event of physical damage to the PCB or components, return it to Bartington Defence & Space for repair or replacement.

## 7. Care and Maintenance

Some servicing of the electronics assembly is possible with Spacemag-Lite. For further information, refer to [Troubleshooting](#).

### 7.1. Cleaning Spacemag-Lite

Spacemag-Lite is cleaned during manufacture but may require further cleaning during assembly of the CubeSat. Electronic cleaning solvents such as IPA may be used on external surfaces.



**Caution:** The sensor coil enclosure should not be soaked in any solvent. Solvent may enter the vent hole of the sensor enclosure and damage the coil windings, resulting in changes to calibration.

## 7.2. Calibration

Return Spacemag-Lite to Bartington Defence & Space for calibration at the recommended intervals. Refer to the Calibration Certificate for further details.

## 8. End of Life Disposal

### 8.1. Waste Electrical and Electronic Equipment (WEEE) Regulations



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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