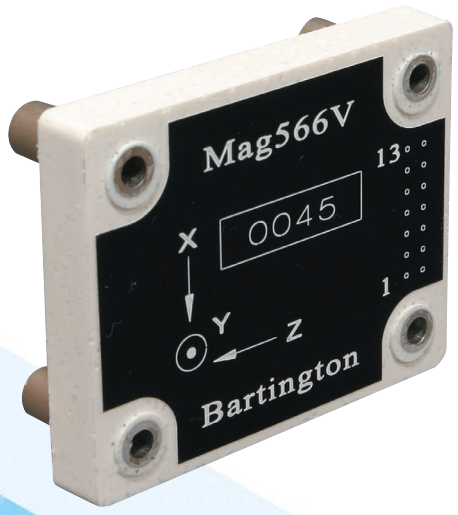
Operation Manual for

Mag566

Low Power Three-Axis Magnetic Field Sensor



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1. About this Manual

This document describes the installation, operation and maintenance of the Mag566 magnetic field sensor. It should be read in conjunction with product brochure DS1453, which can be found on the product page on the Bartington Instruments website at www.bartington.com. Outline drawings are also available on the product page.

Note that failure to follow the instructions in this manual may invalidate your product's warranty. If in doubt, do not hesitate to contact Bartington Instruments.

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 Instruments 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 the Mag566

The Mag566 magnetic field sensor 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.

The unit is of compact design, and optimised for low power operation while providing superior temperature stability.

The lightweight construction allows the magnetometer to be used in applications where it may be subjected to high levels of shock and vibration. Typical applications include parimeter surveillance and orientation control.

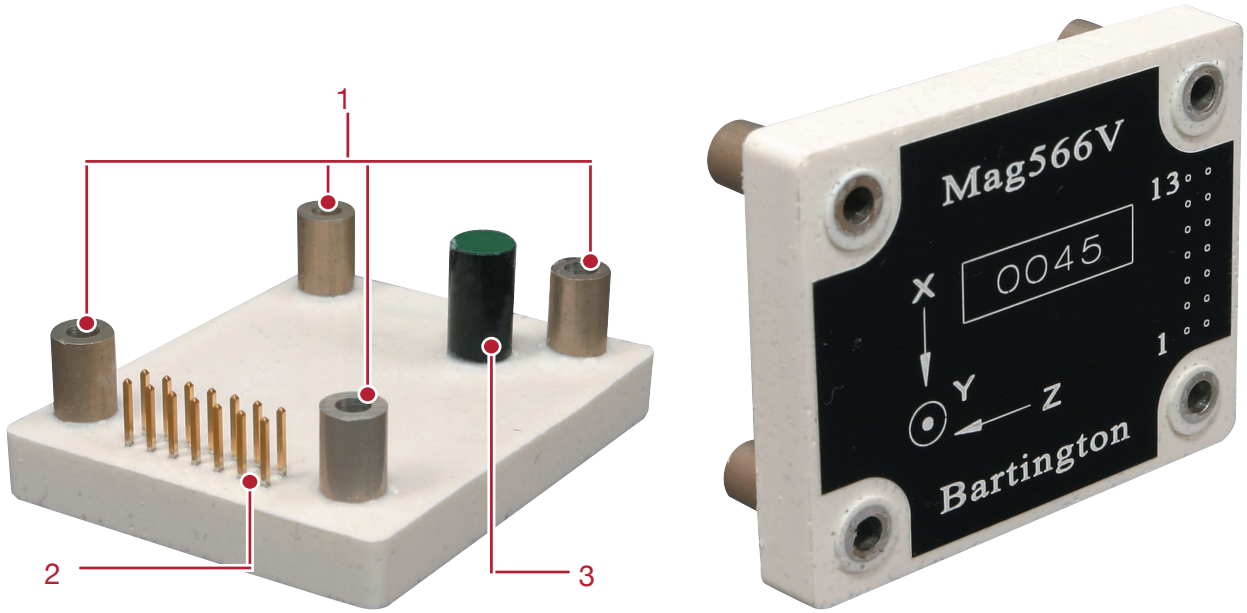


Figure 1: The Mag566, back and front views

Key

1: Mounting Pillars

2: 14-Way Samtec Connector

3: Coil tube housing Y-axis (vertical) coil. The other coils are placed horizontally on the PCB, inside the white potting compound.

3.1. Vector Measurements and Conventions

Each magnetometer produces three independent analogue output voltages in response to the magnitude and direction of the orthogonal components of a magnetic field. A “right-hand” co-ordinate system is adopted (see figure 2). In this system the X, Y and Z axis correspond to the thumb, first and second finger respectively of the right hand. By convention, the magnetometer should be installed so that the X axis is arranged to point North, the Y axis to point East and the Z axis to point down.

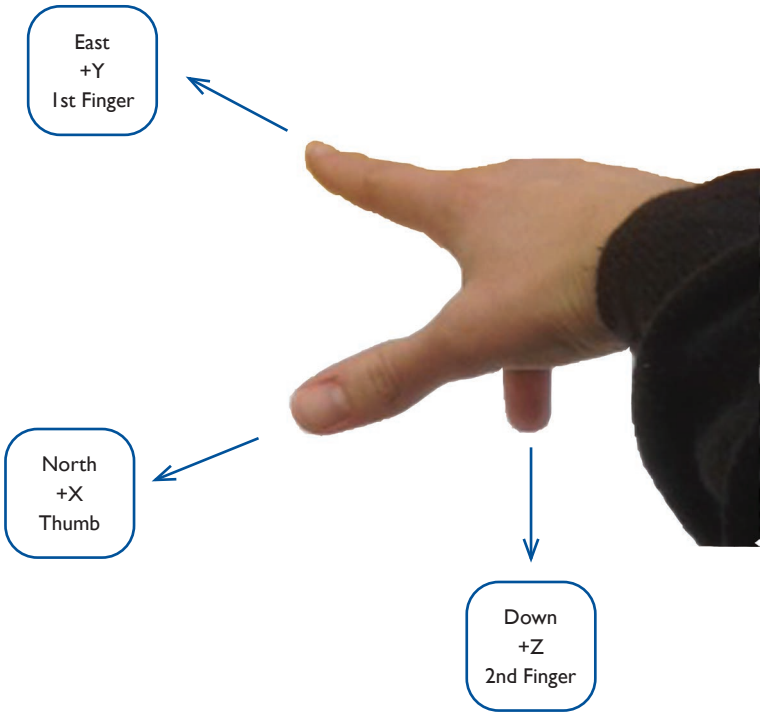


Figure 2.The ‘right hand’ rule.

Each orientation is denoted on the magnetometer’s label. The point of each vector arrow indicates the positive direction of each axis.

4. Installing the Mag566

4.1. Siting the Mag566 (Environment Recommendations)

Note: Site the Mag566 several metres from any magnetic base rock to avoid compromising measurements.

Note: Site the Mag566 several tens of metres from very large ferromagnetic objects that could become magnetised and create fields exceeding the measuring range of the sensor.

Note: Avoid siting the sensor near any ferromagnetic objects that may be subjected to the effects of magnetic hysteresis, which would affect the sensor in an unpredictable manner.

Note: For these reasons, a magnetic evaluation of any proposed installation site should be conducted to establish that it is free from magnetic contaminants. It is recommended that such an evaluation be carried out using total field or resonance magnetometers.

4.2. Cable Recommendations

The standard magnetometer provides a single-ended output for analogue signal transmission.

See Appendix for pin out and electrical interface diagram.

4.3. Pre-Installation Tests

Prior to the installation of the system, the sensor, and power supply must be fully tested to ensure correct function as follows:

1. Check the power supply output voltage using a voltmeter. Refer to the product brochure for the required values.

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

Note: Bartington recommends the use of a current-limited power supply.

2. Connect the Mag566 to the power supply
3. Switch on the power supply and wait until the magnetometer has stabilised. Refer to the product brochure for warm-up times.
4. Confirm no magnetic objects are moving in the vicinity.
5. 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 magnetometer 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.

4.4. Mounting Recommendations

The electronics are encapsulated in epoxy resin to provide a high level of environmental protection. It is recommended that any mating printed circuit board has a minimum diameter clearance hole of 9mm, with a 12mm diameter area clear of magnetic noise sources.

Each Mag566 has a set of mounting pillars to allow attachment to a stable base or fixture. Refer to the mechanical drawings in the Appendix.

4.5. Post Installation Testing

1. Site the magnetometer, and install the power supply.
2. Switch on the power supply and wait until the magnetometer has stabilised. Refer to the product brochure for warm-up times.
3. Confirm no magnetic objects are moving in the vicinity.
4. Monitor the sensor outputs.
5. Confirm that the vector sum of the measured magnetic field vectors is similar to the expected local earth field.

   Note: When in a magnetically stable environment the outputs from the sensor should remain stable to within the quoted noise limits. Refer to the product brochure for the expected values.

5. Using the Mag566

5.1. Magnetic Hysteresis

The Mag566 is designed to have an extremely low magnetic hysteresis. However, Bartington Instruments 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.

5.2. Environmental Precautions

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

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

6. Troubleshooting

The 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.

Causes of failure	Solution
Power supply	Check the power supply as detailed in Pre-Installation Tests.
Power input	Check power supply and sensor connections. Refer to the specifications defined in the product brochure.
Mag566	Physical damage or damage to the electronics of the Mag566 is irreparable. Replace with a new unit. For information about disposal of the damaged unit, refer to End of Life Disposal.

7. Care and Maintenance

The Mag566 has potted electronics, meaning that repair or servicing is not possible. For further details refer to Troubleshooting.

7.1. Cleaning the Mag566

Water and mild soap can be used to remove dirt/grime from the Mag566.

Caution: Never use chemicals, such as solvents, when cleaning a Mag566.

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

7.2. Calibration

A calibration check can be performed on the Mag566. Refer to the Calibration Certificate for recommended intervals and further details.

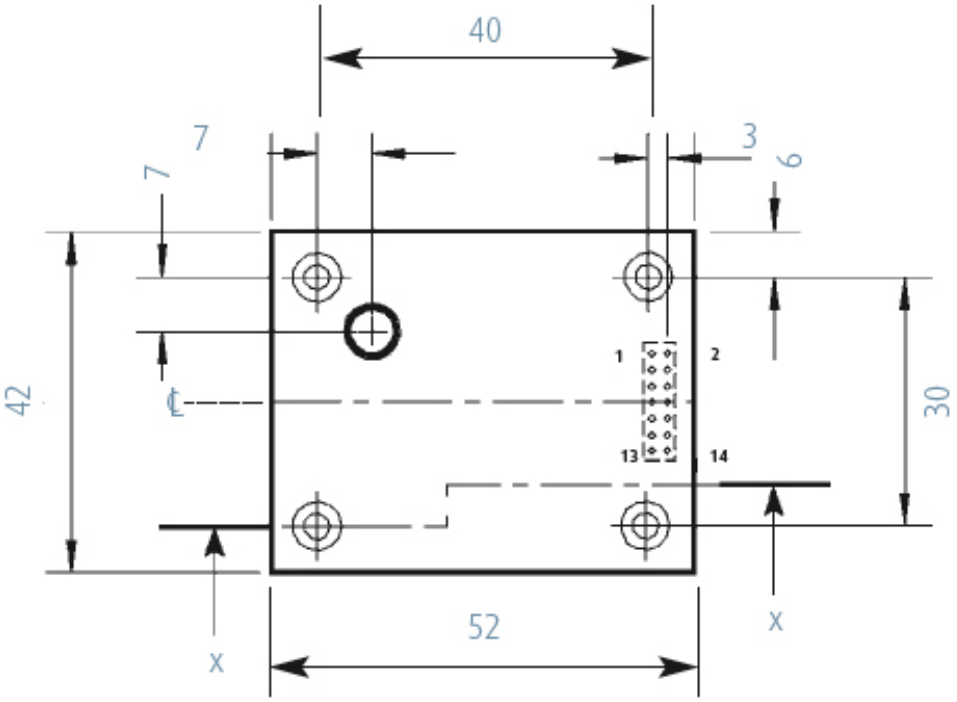
8. End of Life Disposal

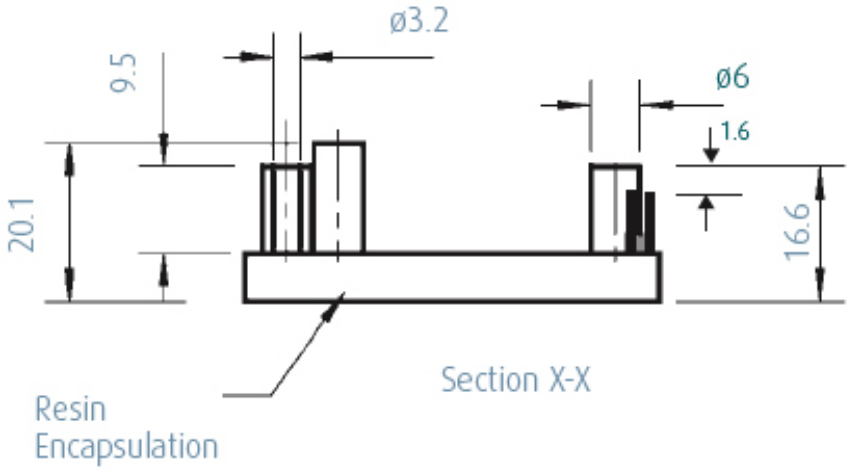
8.1. Waste Electrical and Electronic Equipment (WEEE) Regulations

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

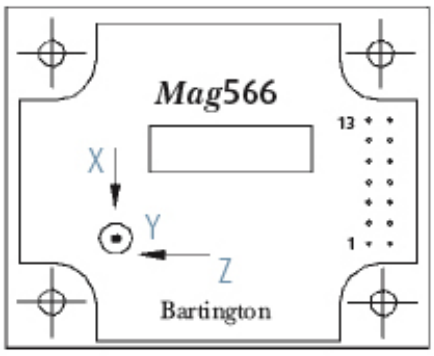
Notes

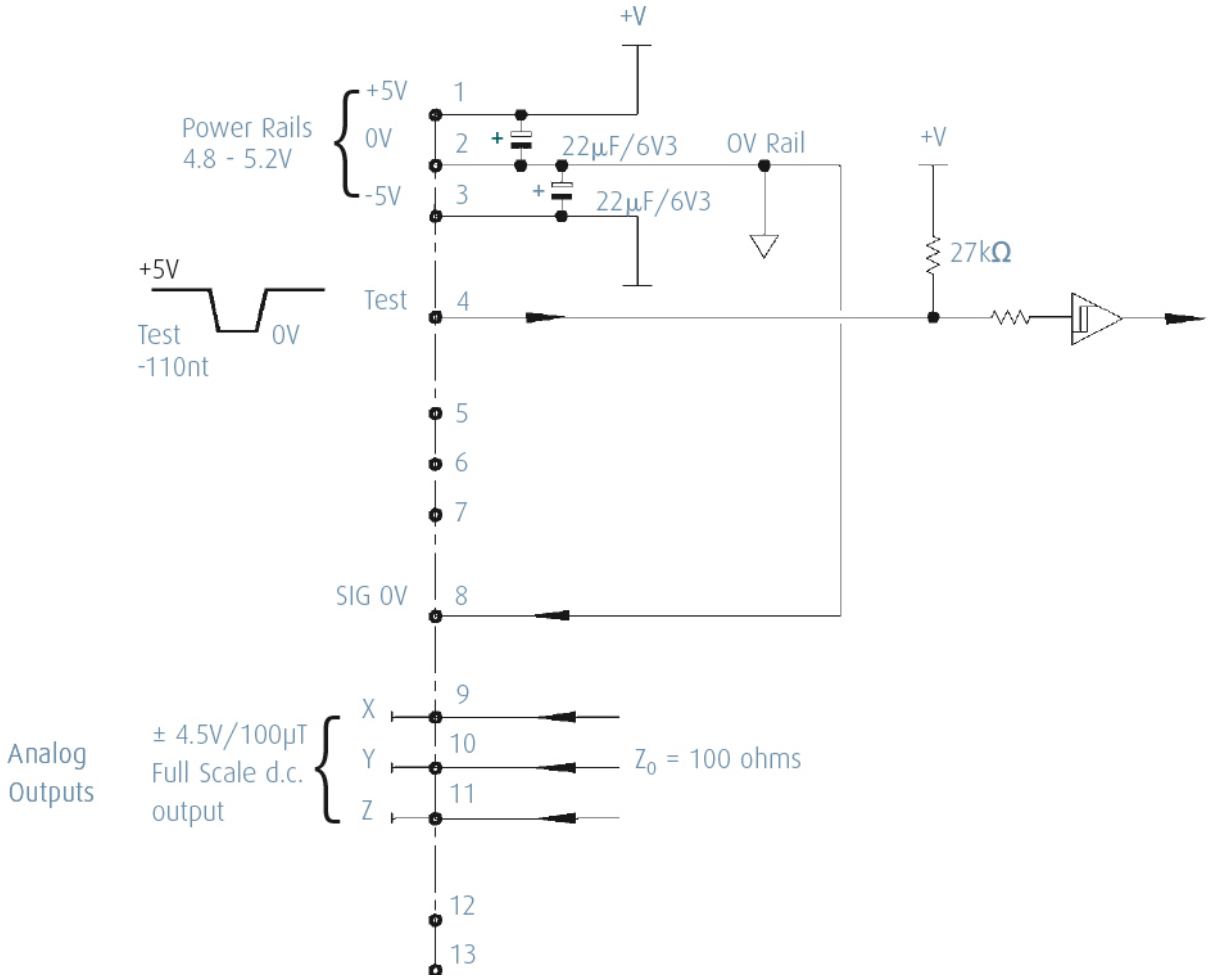
Appendix - Mag566 Outline Drawing and Electrical Interface





Top View




+V
Power Rails
4.8 - 5.2V
+5V
0V
-5V
1
2
3
22µF/6V3
22µF/6V3
0V Rail
+V
27kΩ
+5V
Test
0V
Test
-110nt
4
5
6
7
SIG 0V
8
9
10
11
12
13
Analog
Outputs
± 4.5V/100µT
Full Scale d.c.
output
X
Y
Z
Z_0 = 100 ohms

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