

Operation Manual for Mag646/710

Single Axis Unpackaged Magnetic Field Sensors



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1. About this Manual

This manual provides the information necessary to help Mag646 and Mag710 customers connect, install and operate, the Mag646 and Mag710 magnetic field sensors.

Technical specifications of the products, including power supply requirements and analogue output details, can be found in [DS3836](#), while outline drawings of sensor head, electronics board and cable can be found on the [Mag646/710 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.



Indicates a situation in which ESD protection should be used.



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

The Mag646/710 is an unpackaged single-axis fluxgate sensor that provides highly linear magnetic response and low hysteresis. The sensor consists of a single, feedback-stabilised, fluxgate sensing element arranged along one of two directions, in line with the PCB or perpendicular to the long side of the PCB.

The sensor has no power supply or data processing abilities of its own and must always be connected to a power supply to be able to function.

Regulating the power supply internally ensures that the Mag646/710 is suitable for battery-powered operation, over both long and short cables.

4. General Description

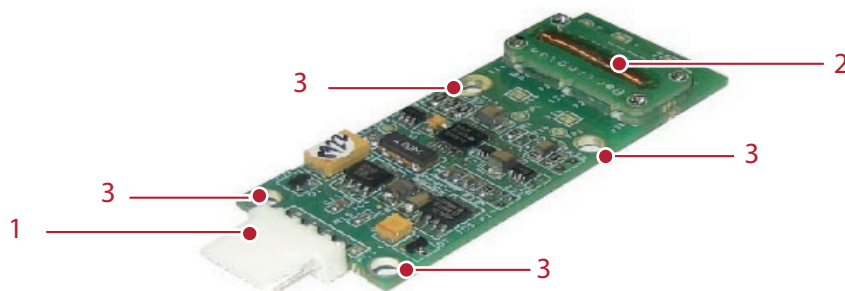


Figure 1. Mag646/710 sensor

Key:

- | | |
|-------------------|--------------------|
| 1. PCB header | 2. Sensing Element |
| 3. Mounting Holes | |

5. Connections

5.1. Cable Recommendations

The Mag646/710 electronics board provides unbalanced output lines for analogue signal transmission. Suitable shielded cables can be supplied.

Cables are particularly prone to wear and damage if twisted, flexed beyond their design limits, or subjected to excessive or repeated movement. All cables should be mounted securely in place.

When designing your own cable, the following recommendations should be followed:

- Ensure that the cables are shielded to prevent them picking up electromagnetic interference.
- The cable shield should be connected to power supply ground at the power supply end (either through the connector body, or by connecting the shield to the power ground wire).
- The connecting cable to the sensor should be a five-core screened cable. Two cores will be used for positive and negative power supply lines, one core for output signal, one core for signal common, and one for power supply ground.

5.2. Connection to Power Supply/Acquisition Unit



Caution: When providing your own power supply, do not exceed the voltage rating, provide sufficient current, and ensure correct polarity is respected, see [DS3836](#).



Caution: Connect the Mag646/710 electronics board before the supply is energized, as this prevents high surge currents which could cause damage.

Note: Apply the positive and negative supplies simultaneously, and avoid leaving the electronics board connected to one polarity only.

The analogue output of the sensors as well as the power supply connectors are available on the outline drawing [DR2945](#).

Where no Bartington power supply or acquisition unit is used, some basic recommendations for integration of the sensor are available in [AN0042](#).

6. Using the Mag646/710

6.1. Mag646/710 Operation

Once the electronics is fully connected to both sensor head and power supply/acquisition unit, the supply can be switched on. The sensor will provide an analogue output which is proportional to the field measured. Please refer to [DS3836](#) for the sensor's scaling factor.

Testing of the sensor's response can be done, as an example, by moving the sensor in the Earth's field and ensuring that the signal varies in relation to orientation. In the horizontal plane, a minimum value is obtained when the axis is in the magnetic East-West direction, and maximum when pointing Magnetic North.

6.2. Electromagnetic Compatibility

Note: The Mag646/710 sensors are not shielded for immunity from, or emission of, electromagnetic fields.

Note: The Mag646/710 sensors are intended for integration into other systems. Ensure these meet the appropriate level of shielding.

7. 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.

Problem	Cause	Solution
There is no analogue output present in Z	Sensor head not connected	Ensure that the sensor head and electronics are connected as per "Cable Recommendations" .
	Power supply not connected or not sufficient to power the sensor	Check that the power supply meets the requirement provided in DS3836 and that the connection is as per "Connection to Power Supply/Acquisition Unit" .
	Broken coil	If the axis is not responding, the fluxgate coil could be damaged. Please return the unit to us for assessment.
	Component damage	If the axis is not responding, one component could be damaged. Please return the unit to us for assessment.
There is an abnormal current draw on the sensor	Faulty component	A faulty component can lead to an abnormal current draw before it fails. Please return the unit to us for assessment.

The amplitude of the Earth's field is abnormal	Erroneous scaling factor	If the scaling factor applied to convert volts into field amplitude is erroneous, the field reading will appear either systematically high or low depending on the error on the scaling factor. Please check the conversion rate used in the acquisition software if applicable.
The noise on the output is much higher than the specified noise at low frequency	Ambient environment is noisy	A noisy environment will be picked up by the sensor. Noise tests should be carried out in a shielded environment.
	Sensor breakthrough not filtered properly	The sensor has a high frequency noise component referred to as breakthrough in the datasheet. This signal at the excitation frequency of the sensor, if unfiltered can be aliased creating apparent low frequency noise. Check that a suitable low pass filter is used or that the signal is sampled at a suitable frequency (at least twice the breakthrough frequency).

8. Care and Maintenance



Surface dirt contamination on the Mag646/710 probe should be removed using a mild detergent solution only. Electronics should be cleaned with an antistatic cloth only. ESD protection should be used when handling the Mag646/710 electronics board, to prevent irreparable damage.



The Mag646/710 electronics board should be treated subject to ESD precautions.

Note: Store only within the temperature range specified in the product brochure.

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

8.1. Calibration

Return the Mag646/710 to Bartington Instruments for calibration at the recommended intervals. Refer to the Calibration Certificate for further details.

9. 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.

Bartington Instruments Ltd
5, 8, 10, 11 & 12 Thorney Leys Business Park
Witney, Oxford, OX28 4GE. England



Telephone: +44 (0)1993 706565

• Email: sales@bartington.com

• Website: www.bartington.com

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