

Operation Manual for

UAS-Mag

High Performance DroneCAN Magnetometer

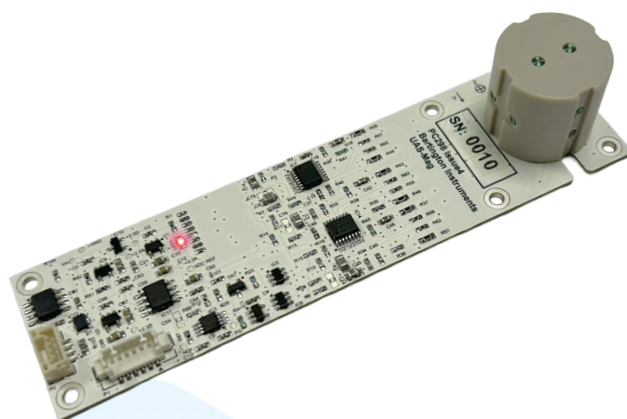


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1. About this Manual

This manual describes the installation, operation and maintenance of the UAS-Mag Magnetic Field Sensor. It should be read in conjunction with product brochure DS4952 and outline drawings.

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.



This symbol 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 UAS-Mag

The UAS-Mag is a magnetic field sensor consisting of three fluxgate sensing elements in an orthogonal configuration along X, Y and Z axes. This sensor is not provided with an enclosure. Therefore, an enclosure will need to be developed if environmental protection is required.

This sensor is designed to interface with flight controllers such as the Holybro Pixhawk, or 3DXR CubeOrange. Power is taken straight from the CAN connector on the flight controller.

3.1. Vector Measurements and Conventions

The three axes of the sensor are concurrent and arranged following a 'right-hand rule' (Figure 1). Details of the axes position and orientation can be found in the outline drawing and on the sensor's label. The arrow indicates the direction for which a positive field will provide a positive output.

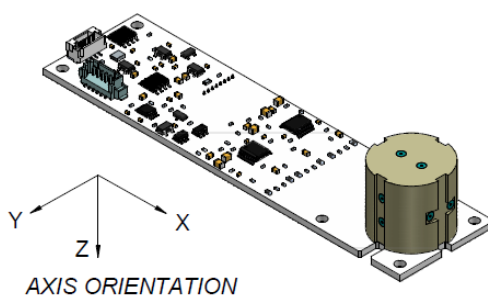
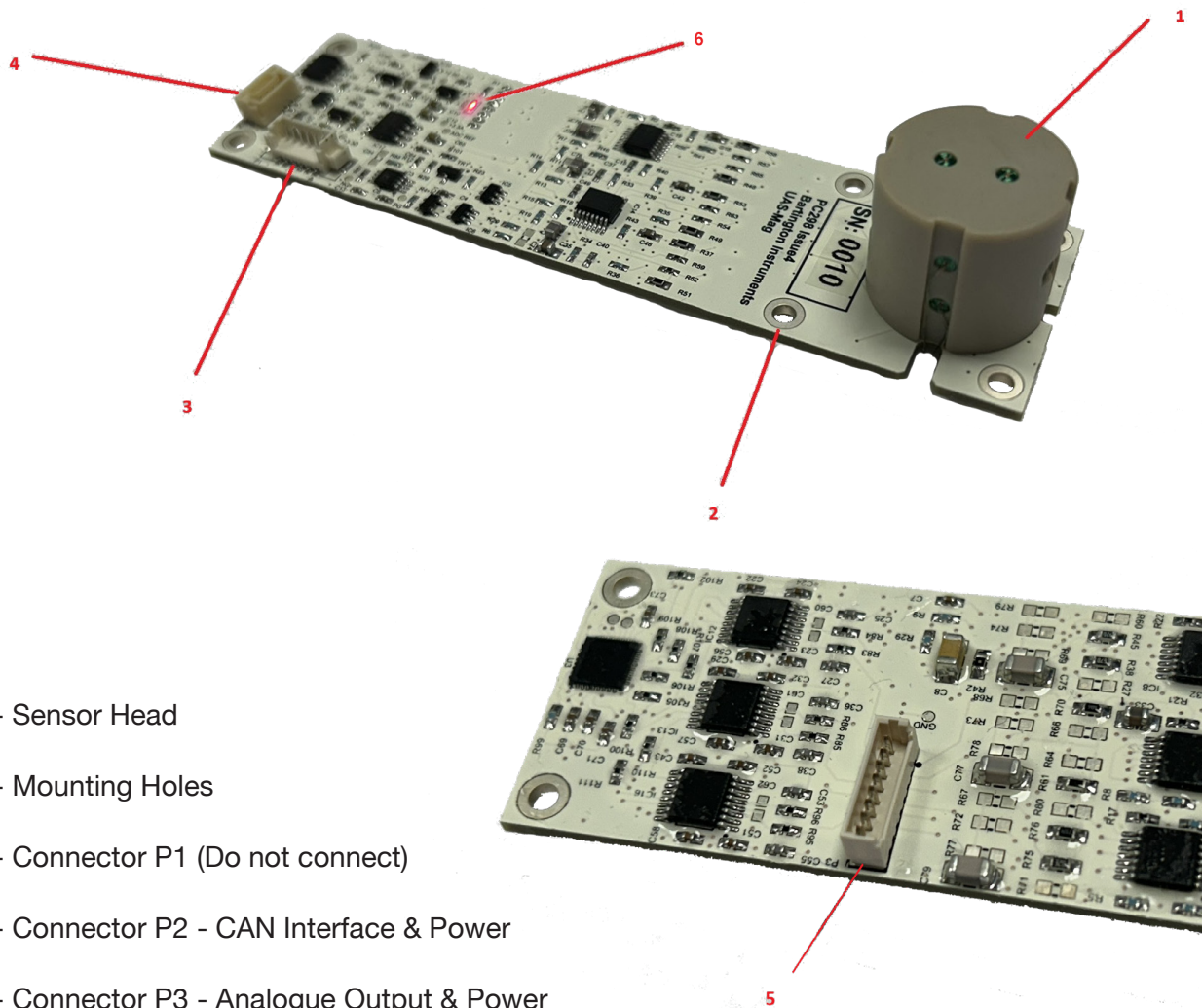


Figure 1. Illustration of the Right Hand Rule

The axes of the UAS-Mag are orientated to match the reference frame of a typical flight controller. Where the sensor X-axis is the Roll axis, Y-axis is the Pitch axis, and Z-axis is the Yaw axis.

To ensure a correct heading, it is recommended to mount the UAS-Mag in the same orientation as your flight controller.

3.2. UAS-Mag Features



1 - Sensor Head

2 - Mounting Holes

3 - Connector P1 (Do not connect)

4 - Connector P2 - CAN Interface & Power

5 - Connector P3 - Analogue Output & Power

6 - Power Status LED

4. Installing the UAS-Mag

4.1. Positioning the Magnetometer

It is recommended to keep the sensor away from strong sources of AC and/or DC magnetic fields which may distort the readings from the sensor. Due consideration should also be given in the position of the sensor in respect of ferromagnetic objects (application dependent).

For the best performance, it is recommended to keep the sensor away from your vehicle's motors, and power lines. High DC currents from a battery can cause local magnetic field distortions.

Note: Avoid placing the sensor in contact with electrically conductive material in order to prevent the generation of eddy currents. These may create additional offsets.

4.2. Mounting Recommendations

The UAS-Mag has 6 x 2.65mm diameter holes for mounting purposes. These are sized for M2.5 machine screws.

It is recommended to use non-magnetic materials for mounting screws such as titanium, PEEK, or glass-filled nylon such as RENY.

4.3. Connectors

4.3.1. Connector Pin Allocation

Connector pin-out can be found on the outline drawing available on the website product page.

Connector P1: No connection should be made to this connector.

Connector P2: Flight Controller CAN interface connector (data and power).

Connector P3: Differential analogue magnetometer outputs (X, Y and Z). These signals are provided prior to digitisation. Power can also be applied here if necessary.



Caution: Do not connect power to both P2 and P3 connectors simultaneously.

5. Using the UAS-Mag

5.1. Connecting Power



Caution: Check that the polarity of the supply is correct. The power supply should be connected to the sensor before the supply is energised as this prevents high surge currents which could cause damage. Apply the positive and negative supplies simultaneously, and avoid leaving the sensor connected to one polarity only.

Connect the UAS-Mag to your flight controller's CAN connector, using a suitable harness, using UAS-Mag connector P2.

Once power is supplied to your flight controller, the red power status LED on the UAS-Mag should illuminate, confirming power is supplied to the compass.

5.2. Response

The analogue (and digital) output of any channel, will be proportional to the magnetic field present in the direction of the fluxgate sensing element. The proportionality factor (scaling factor) can be found in the product brochure.

Please note that the ground control station software you may be using, such as QGround Control, or MissionPlanner, will only display heading on the main display.

Monitoring the individual X, Y and Z axis outputs of the magnetometer may be possible, depending on the software you are using.

5.3. Electromagnetic Compatibility

Note: The UAS-Mag is not shielded for immunity from, or emission of, electromagnetic fields. Any shield placed around the sensor will limit the bandwidth of the sensor response. The emissions generated are at a low level at the excitation frequency - refer to the product brochure Breakthrough entry for the excitation frequency.

Note: When operating the sensor in environment where electromagnetic fields are present, ensure to use a suitable sampling frequency so as to avoid aliasing.

Note: Do not place the sensor near to any equipment which may be affected by the AC fields produced by the sensor's excitation.

5.4. Performance

Optimum performance of the sensor will be obtained after warm up of the sensor (please refer to product brochure).

The sensor's breakthrough, the amount of excitation signal at the excitation frequency (please refer to product brochure) is typically filtered when using Bartington Instruments power supplies or data acquisition units.

5.5. Magnetic Hysteresis

The UAS-Mag 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.

5.6. 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

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.

Cause of failure	Solution
Power supply	Check the power supply as detailed in Pre-Installation Tests .
Cables	Check cables continuity using a ohmmeter.
Power Input	If no fault can be found in the power supply or cables, ensure the cable length is not too long, causing excessive voltage drop between the power supply and magnetometer. Refer to the specifications defined in the product brochure.
Magnetometer	No physical damage to the UAS-Mag can be repaired. Replace with a new unit. For information about disposal of the damaged unit, refer to End of Life Disposal .

7. Care and Maintenance

No repair or servicing is possible with the UAS-Mag. For further information, refer to [Troubleshooting](#).

7.1. Cleaning the UAS-Mag



Caution: Never use chemicals, such as solvents, when cleaning the UAS-Mag.



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

Return the UAS-Mag to Bartington Instruments for calibration at the recommended intervals. Refer to the Calibration Certificate for further details.

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

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

Note: If the instrument is left to stand for a long period of time, move it to prevent magnetisation of the cores.

8. End of Life Disposal



This product should not be disposed of in domestic or municipal waste. For information about disposing of your sensor safely, check local regulations for disposal of electrical / electronic products.

For details of when to dispose of your magnetometer refer to [Troubleshooting](#).

8.1. Waste Electrical and Electronic Equipment (WEEE) Regulations

This sensor complies fully with Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) and WEEE Regulations current at the time of printing.

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