BARTINGTON

MAG-03MC-CU & MAG-03MS-CU

CALIBRATION UNIT

OPERATION MANUAL

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1 *Mag*-03MC-CU CALIBRATION UNIT

1.1 General description - Figures 1 & 2 and 5 & 6

The *Mag*-03MC-CU and *Mag*-03MS-CU calibration units are battery powered units which produce a sinusoidal alternating magnetic field of defined frequency and magnitude.

The unit provides a reference magnetic field for testing the calibration of the *Mag*-03MC cylindrical, *Mag*-03MS-CU square, fluxgate sensors in the field or in the laboratory.

1.2 Construction

The calibration unit comprises a set of coils wound on a cylindrical former which contains the drive electronics and battery. The coils are of the Helmholtz type and produce a very uniform magnetic field along the axis of the cylindrical enclosure. The cylinder possesses two holes into which the magnetometer under test is placed. One hole is along the axis of the enclosure and is used to test the Z axis. The other is through the diameter and is used to test the X and Y axes.

1.3 Checking the battery

The unit should be switched on and the battery level indicator observed. A green light indicates that the battery is satisfactory. A yellow light indicates that the battery should be changed immediately but that the unit is still working. A red light indicates that the battery should be changed immediately as it is below the level at which the calibration unit will operate.

1.4 Using the calibration unit

A suitable test site, well away if possible from known sources of magnetic noise, should be chosen. The test must be carried out in an area at least 0.5 metres away from any large ferrous objects or electrically conductive surfaces. For example, measurements should not be attempted with the calibration unit placed on a metal table top. Consult the table given in Figure 12 for output response voltages.

1.4.1 *Mag*-03MC-CU - Figures 3 & 4

Place the *Mag*-03MC sensor in the axial hole of the calibration unit and position the Z sensor arrow marked on the *Mag*-03MC body midway between the two white coils. The position can be seen by looking through the transverse hole. Measure the Z axis sensor output using a true rms digital voltmeter, oscilloscope or spectrum analyser and adjust the position of the sensor in the calibration unit to obtain a maximum reading. The value should be 50 µT peak-to-peak or 17.7 µT rms ±1.5% taking the tolerance of the sensor and calibration unit into account.

Place the magnetometer in the transverse hole in the calibration unit and select the X axis for measurement. Align the arrow indicating the X axis with the centre of the axial hole and pointing along the axis of the coils. Rotate the *Mag*-03MC slightly to obtain a maximum output voltage. Repeat this for the Y axis.

1.4.2 *Mag*-03MS-CU - Figures 3 & 4

Place the *Mag*-03MS sensor all the way into the axial hole of the calibration unit. This will position the Z sensor arrow marked on the *Mag*-03MS body, midway between the two white coils. The position can be seen by looking through the transverse hole. Measure the Z axis sensor output using a true rms digital voltmeter, oscilloscope or spectrum analyser and adjust the position of the sensor in the calibration unit to obtain a maximum reading. The value should be 50 µT peak-to-peak or 17.7 µT rms ±1.5% taking the tolerance of the sensor and calibration unit into account.

Place the magnetometer in the transverse hole in the calibration unit and select the X axis for measurement. Align the arrow indicating the X axis with the centre of the axial hole and pointing along the axis of the coils. Repeat this for the Y axis.

1.4.3 *Mag*-03MC-CU with IE adaptor - Figures 9, 10 & 11

Locate the *Mag*-03IE sensor in the IE adaptor and slide into the axial hole of the *Mag*-03MC-CU. Slide back and forth to achieve the highest reading. Repeat for all axes

1.5 Changing the battery

This should be done on a table. Remove the three M3 screws which secure the control panel. Carefully remove the panel taking care not to damage the twisted wire connecting the coils to the circuit board. Remove the old battery and replace with a new one. Switch on and check that the new battery has been installed correctly and that the unit is working. Carefully replace the cover and the retaining screws.

1.6 Technical specifications

Mechanical

Dimensions	: MC - 125 mm length, 100 mm diameter MS - 116 mm length, 100mm diameter
Weight	: MC - 1.05 kg MS - 0.98 kg
Environmental	: IP 61 Not suitable for use in wet conditions

Electrical

Battery type	: PP3 9 V alkaline or lithium dioxide fitted internally
Battery life	: Approximately 40 hours continuous use
Battery indicator	: Tri-colour LED Green - charged Yellow - low charge Red - change battery
On/off switch	: Recessed in control panel

Performance

Frequency	: 190 Hz ±2%
Sinewave purity	: approx. 5% distortion
Sinewave magnitude	: 50 µT p-p ±1%

1.7 Fault diagnosis

If the calibration unit fails to produce the expected response then the following should be checked:

(1) that the power supply is switched on

(2) that the magnetometer is not subjected to a large magnetic field and is overloaded

(3) that the connectors are all secure

Faulty cables can be tested using an electrical resistance meter. If the fault cannot be remedied or the sensor is out of calibration it should be returned to Bartington Instruments or your local representative, preferably with an accompanying brief description of the problem.

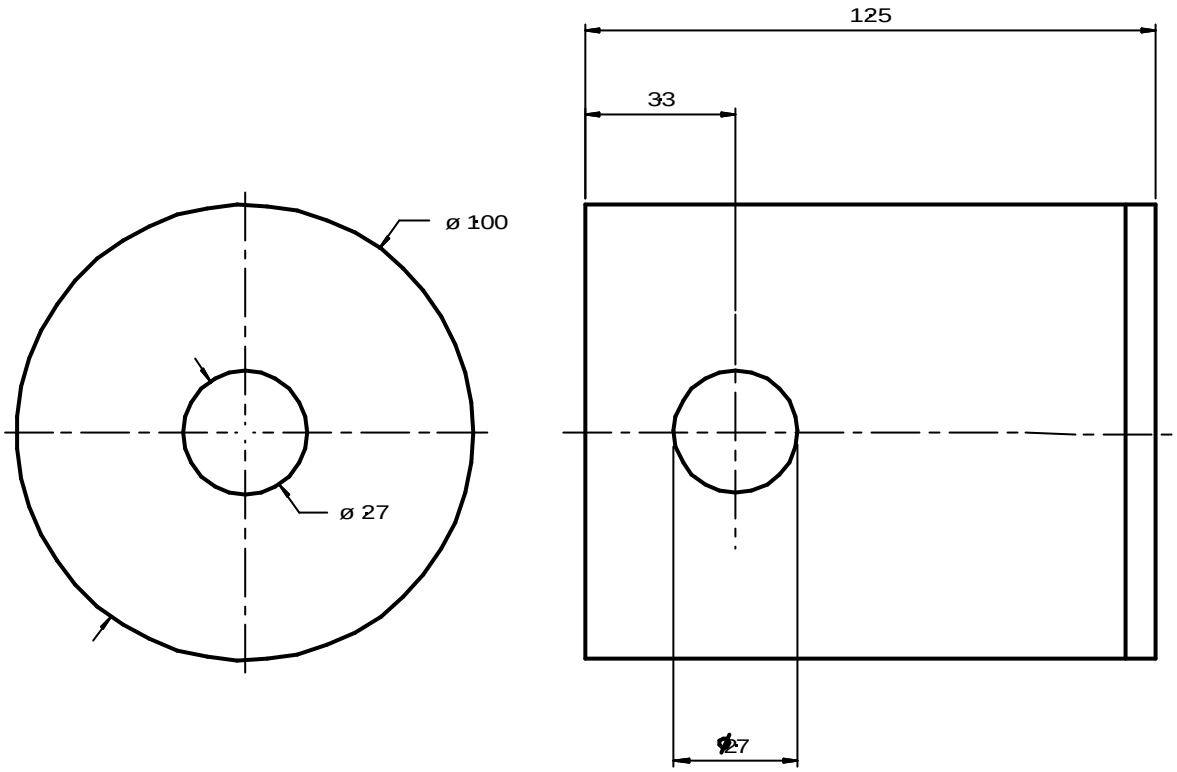

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

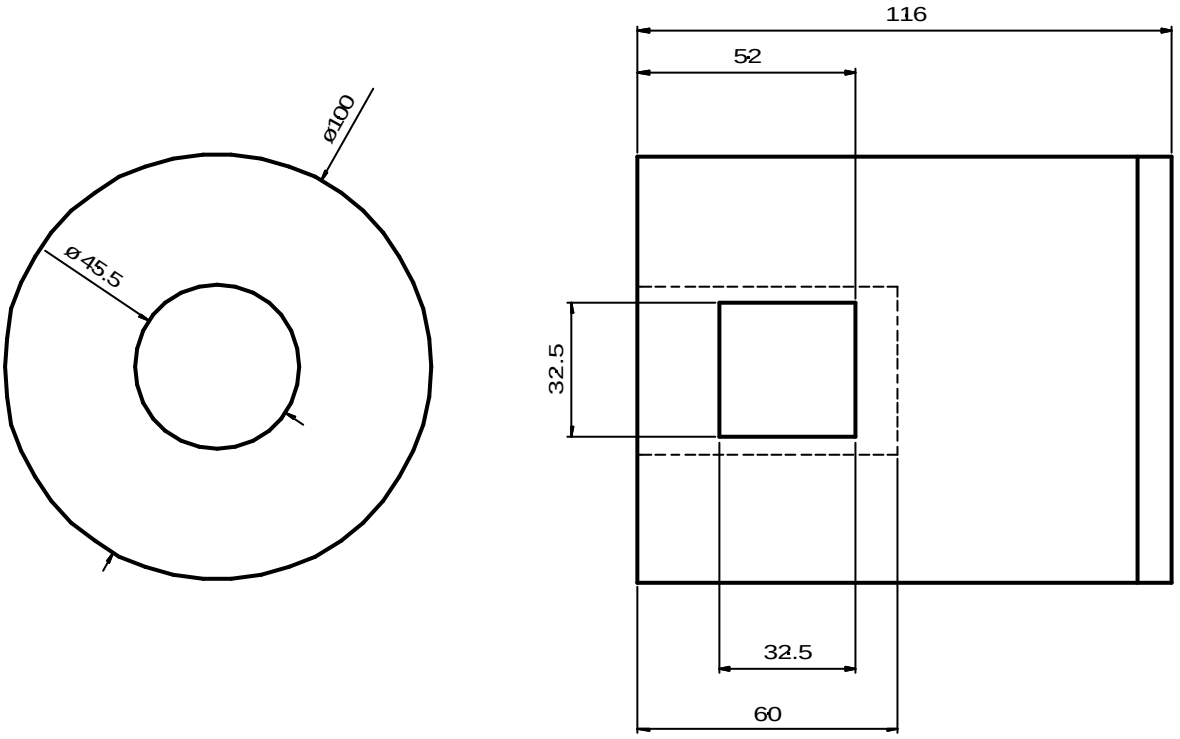

FIGURE 5

FIGURE 6

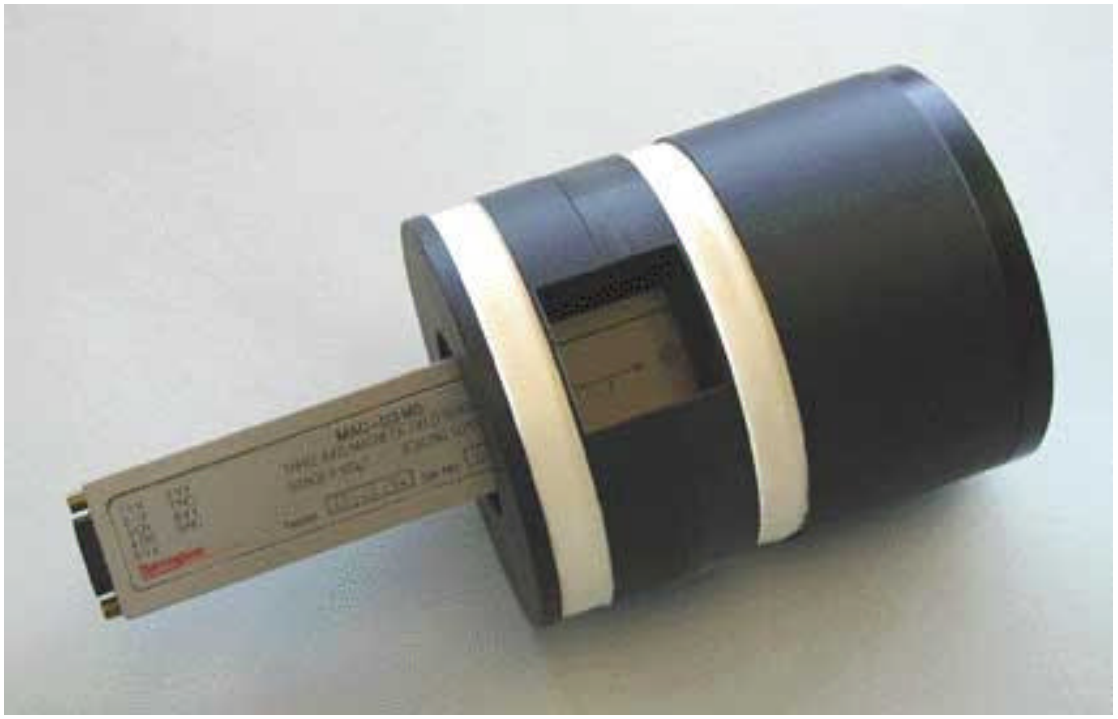

FIGURE 7

FIGURE 8

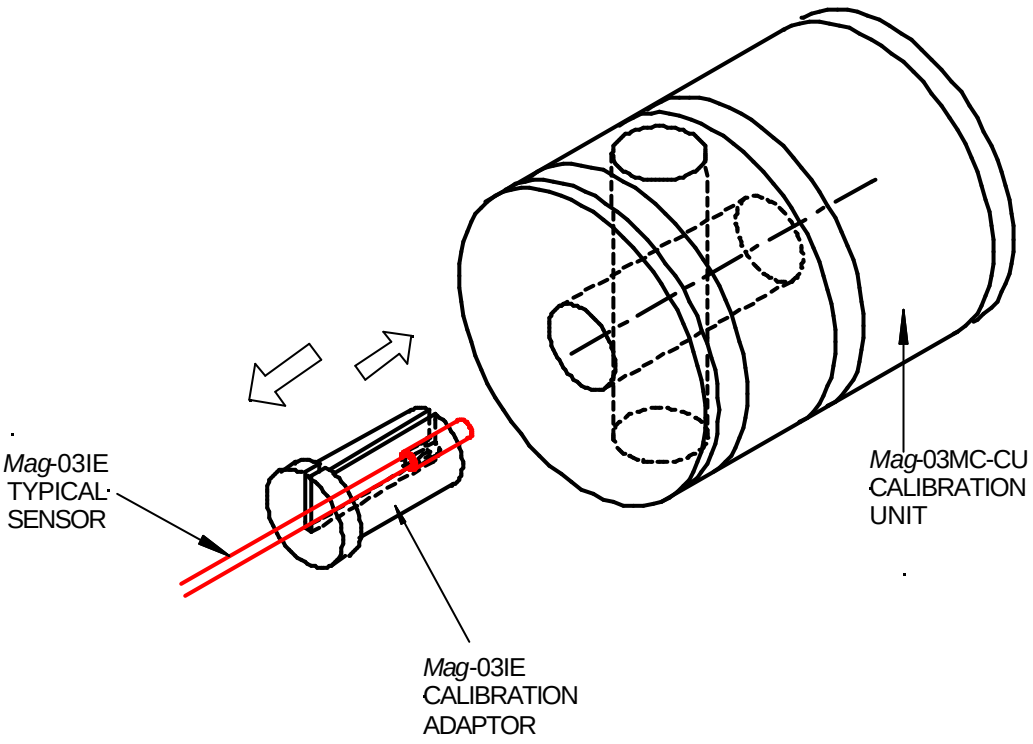
Mag-03IE
TYPICAL
SENSOR
Mag-03MC-CU
CALIBRATION
UNIT
Mag-03IE
CALIBRATION
ADAPTOR

FIGURE 9

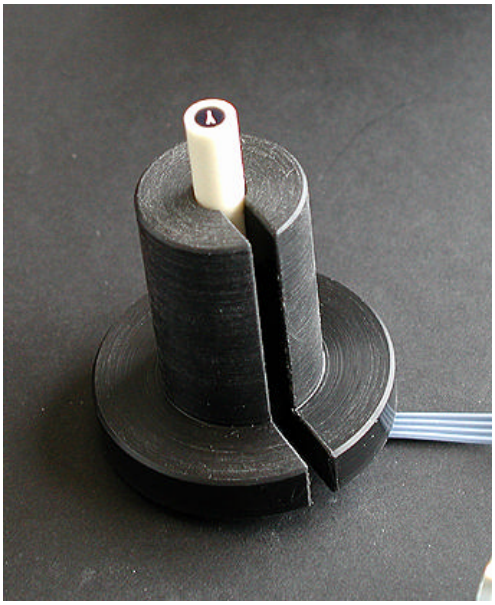

FIGURE 10

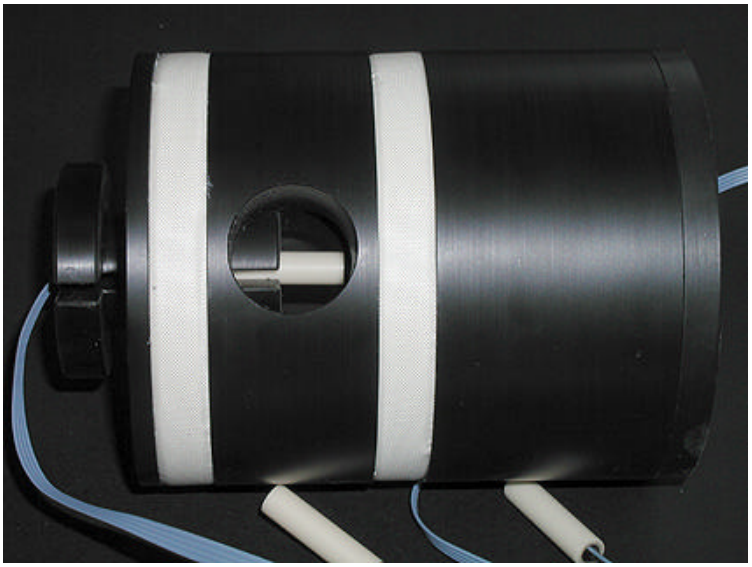

FIGURE 11

OUTPUT RESPONSE OF *Mag*-03 FOR 50µT P-P (17.7µT RMS) SINEWAVE TEST SIGNAL

CALIBRATION RANGE / 10V	**V_{OUT} P-P**	**V_{OUT} RMS**
70µT	7.14	2.53
100µT	5	1.77
250µT	2	0.708
1000µT	0.5	0.177

FIGURE 12