

Mag-13[®]

Three-Axis Magnetic Field Sensors





Mag-13® Three-Axis Magnetic Field Sensors

The Mag-13 range of sensors provide high precision measurements of static and alternating magnetic fields. Different combinations of noise level, measuring range, and a range of enclosures, make the sensors suitable for use in many applications. These include defence, physics, geophysics, bioelectromagnetics and mineral exploration.

All sensors have an integral test coil that removes the need for a separate calibration unit, and a temperature sensor.



Bartington® is a registered trademark of Bartington Instruments Limited in the following countries: Argentina, Australia, Brazil, Canada, Chile, China, European Union, Iceland, India, Israel, Japan, Mexico, New Zealand, Norway, Russia, Singapore, South Korea, Switzerland, Turkey, United Kingdom,

Mag-13® is a registered trademark of Bartington Instruments Limited in the United Kingdom

Features

- Wide range of enclosures; unpackaged and submersible versions available
- Noise levels down to $<4\text{pTrms}/\sqrt{\text{Hz}}$ at 1Hz
- Measuring ranges from $\pm 60\mu\text{T}$ to $\pm 1000\mu\text{T}$
- Bandwidth of 3kHz
- Environmentally sealed and shielded from electrical interference
- Integrated test coil and temperature sensor
- Tail option available for the Mag-13MSS

Typical Applications

- Magnetic field monitoring
- Use as feedback sensors in active magnetic field cancellation systems
- Magnetic signature measurements
- Electromagnetic surveys



Product Identification

Product name	Package	Noise	Range in μT
Mag-13	MS = Square MSS = Square, submersible MC = Cylindrical MCD = Cylindrical, deep submersible U = Unpackaged	no code = Standard L = Low noise Q = Very low noise Z = Ultra low noise	± 60 ± 70 ± 100 ± 250 ± 500 ± 1000

Sensors with ranges $\geq 250\mu\text{T}$ are only available in standard noise option.

Mag-13 Specifications

Performance	
Number of axes	Three
Polarity	+ve non-inverting output when pointing North
Bandwidth (-3dB)	>3kHz (-11dB/octave roll-off)
Measurement noise floor: Standard L (low) Q (very low) Z (ultra low)	6 to $\leq 10\text{pTrms}/\sqrt{\text{Hz}}$ at 1Hz <6pTrms/ $\sqrt{\text{Hz}}$ at 1Hz (60, 70 and 100 μT range only) <5pTrms/ $\sqrt{\text{Hz}}$ at 1Hz (60, 70 and 100 μT range only) <4pTrms/ $\sqrt{\text{Hz}}$ at 1Hz (60, 70 and 100 μT range only)
Start-up time	150 ms
Warm-up time	15 min to meet specifications for scaling <60min to meet noise specification
Scaling error	$\pm 0.5\%$
Orthogonality error between axes	$< \pm 0.1^\circ$ ($< \pm 0.2^\circ$ for MCD)
Alignment error (Z axis to reference face)	$< \pm 0.1^\circ$ (Mag-13MS only)
Linearity error	0.0015% (least squares fit)
Frequency response	DC to 1kHz ($\pm 5\%$)
Hysteresis	<2nT (1 x full scale, when powered)
Overload hysteresis	<2nT (2 x full scale, when powered)
Excitation breakthrough	<5 mV pk-pk at 15.625kHz typical
Mean Time Before Failure (MIL217F)	Target 12 years

Scaling Dependent Performance Parameters						
Measuring range (μT)	± 60	± 70	± 100	± 250	± 500	± 1000
Scaling ($\text{mV}/\mu\text{T}$)	166	143	100	40	20	10
Scaling Temperature coefficient ppm/°C	± 15		± 20	± 100	± 100	± 200
Offset in zero field (nT)	± 5 (0.83mV)	± 5 (0.71mV)	± 5 (0.5mV)	± 12 (0.5mV)	± 25 (0.5mV)	± 50 (0.5mV)
Offset temperature coefficient (nT/°C)	± 0.3	± 0.3	± 0.3	± 0.5	± 1	± 1.8

Environmental	
Operational temperature range	-40 to +70°C
Storage temperature range	-40 to +85°C
Humidity	Up to 90%, non condensing
Environmental protection / sealing MC MS MSS MCD U	IP67 IP67 IP68 (200m) IP68 (5000m) N/A

Mechanical					
Package options	Cylindrical (MC)	Square (MS)	Square Submersible (MSS)	Cylindrical Deep Submersible (MCD)	Unpackaged (U)
Dimensions	$\varnothing 25.4 \times 203\text{mm}$	$32 \times 32 \times 203\text{mm}$	$30 \times 30 \times 250\text{mm}$	$\varnothing 60 \times 286\text{mm}$	$\varnothing 23.2 \times 150\text{mm}$
Weight	82.5g	222.6g	250g	950g	23.5g
Enclosure material	Acetal & PEEK	Acetal	Acetal	PEEK	n/a
Connector	Fischer AL-1731-DEU1031-A010-SR-11-11-G-12		SubConn MCBH-10FNM (under-water mateable)	SubConn MCB-H10F (under-water mateable)	Molex 53047-0810
Mating connector	Fischer AL-2211-S1031-A010-SR-11-11 with E3-1031.2/6.2		SubConn MCOM10M or MCIL10M (underwater mateable)		Molex Picoblade 51021-0800 and crimp terminal 50079-8000 with wire 26-28 AWG recommended
Fixing points	1 x M5 with 3 points	2 x M5	3 x M4	None	2 x M2

Electrical	
Supply voltage	± 12 to $\pm 17\text{V DC}$
Current consumption	+65mA, -30mA $\pm 1.4\text{mA}/100\mu\text{T}$ (typical)
Analogue output	$\pm 10\text{V}$ single-ended (0V = zero-field)
Output impedance	10 Ω
Maximum load capacitance	>1 μF
Maximum cable length	1.5km (with a minimum of $\pm 12\text{V}$ supplied to the magnetometer)

Mag-13® Three-Axis Magnetic Field Sensors

Temperature Sensor	
Temperature sensor measurement range	-40 to + 85°C, subject to operational range stated above
Temperature sensor output type	Voltage
Temperature sensor offset	3.5V at 0°C
Temperature sensor scaling	-10mV/°C
Temperature accuracy	±4°C (over operating range), ±3°C at 25°C

Mating Connectors

Mating connectors for the Mag-13MC and Mag-13MS models are supplied free of charge. Submersible mating connectors are not supplied.

Cables

The standard cable length is 5m; alternative lengths are available on request.

All cables are terminated with a Hirose RM15TPD10S, suitable for connection to Bartington Instruments' range of data acquisition and power supply units.

Mag-13MC, Mag-13MS	
Conductors	7/0.2 PVC insulated conductors, overall braided screen and PVC sheath
Type no.	7-2-8C Black to Def Stan 61-12, part 4
Conductor resistance	0.092Ω/m
Capacitance	100pF/m core to core 170pF/m core to screen

Mag-13MCD submersible cable	
Conductors	4 shielded twisted pairs individually screened, with polyurethane sheath
Conductor resistance	0.026Ω/m
Weight	0.17kg/m (in air) / 0.057kg/m (in seawater)
Cable bending radius	95mm (static) 142mm (dynamic)

Mag-13MSS submersible cable	
Conductors	8 conductors, 3x shielded twisted pairs, 2x untwisted, overall screen and polyurethane sheath
Conductor resistance	20.5Ω/km at 20°C
Weight	0.2kg/m (in air) 0.075kg/m (in seawater)
Cable bending radius	95mm (static) 130mm (dynamic)

Compatibility

The Mag-13 range is compatible with the following data acquisition and power supply units from Bartington Instruments.

- PSU1 Power Supply Unit
- Magmeter-2 Power Supply and Display Unit
- Spectramag-6 Data Acquisition Unit
- SCU1 Signal Conditioning Unit
- Mag-03DAM Data Acquisition Module (adaptor cable required)
- Decaport Analogue Interface Module
- DAS1 Data Acquisition System
- DecaPSU Power Supply Unit

(Outputs for the test coil and temperature sensor are presently only available with the DecaPSU).

Mounting Accessories

A range of mounting accessories are available.

Specification	
Mag-BR	Mounting bracket for use with the Mag-13MC
Mag-T	Tripod
Mag-TA	Tripod adaptor
Mag-LP	Levelling platform for use with the Mag-T, Mag-TA and Mag-MR
Mag-MR	Mounting rack for the installation of Mag-LP and Mag-13 sensors, available in lengths of 1 metre and multiples



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

The specifications of the products described in this brochure are subject to change without prior notice.