

Mag-13[®]

Three-Axis Magnetic Field Sensors





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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.



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Features

- Wide range of enclosures; unpackaged and submersible versions available
- Noise levels down to $<6\text{pTrms}/\sqrt{\text{Hz}}$ at 1Hz
- Measuring ranges from $\pm 70\mu\text{T}$ to $\pm 1000\mu\text{T}$
- Bandwidth of up to 3kHz
- Environmentally sealed and shielded from electrical interference

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	MC = Circular enclosure MS = Square enclosure MCD = Deep submersible circular enclosure U = Unpackaged U-TPU = Unpackaged 2-part MSS = Submersible square enclosure	No code = Standard noise L = Low noise	70 = $\pm 70\mu\text{T}$ 100 = $\pm 100\mu\text{T}$ 250 = $\pm 250\mu\text{T}$ 500 = $\pm 500\mu\text{T}$ 1000 = $\pm 1000\mu\text{T}$

Example: Mag-13U-TPUL100 = An low noise unpackaged 2-part Mag-13 with a measuring range of $\pm 100\mu\text{T}$.

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 when pointing North				
Full Scale Measuring Ranges	±70µT	±100µT	±250µT	±500µT	±1000µT
Scaling	143mV/µT	100mV/µT	40mV/µT	20mV/µT	10mV/µT
Scaling error	±0.5%				
Scaling Temperature Coefficient	<±60ppm				
Linearity error	0.0015% (least squares fit)				
Frequency response at 50µT peak	DC to 1kHz (±5%)				
Max Bandwidth at 50µT peak	3400Hz	3100Hz	3000Hz	3000Hz	3000Hz
Max Bandwidth at full scale	3000Hz	2500Hz	1100Hz	700Hz	300Hz
Primary Resistance	10Ω ±1.5Ω				
Primary Inductance	1000µH typical				
Secondary Resistance	36Ω ±4Ω				
Secondary Inductance	5600µH typical				
Noise: Standard Low noise (L)	≤10pT rms / √Hz @1Hz <6pT rms / √Hz @1Hz (70 and 100µT range only)				
Zero Field Offset	≤±30nT			≤±40nT	≤±50nT
Offset Temperature Coefficient	≤±0.6nT/°C			≤±1nT/°C	
Perming (Magnetisation Hysteresis)	<2nT (at 1 x Full-scale, when powered)				
Orthogonality error between axes	<±0.1° (<±0.2° for MCD)				
Alignment to datum face/s	<±0.1° (Mag-13MS only)				
Excitation Breakthrough	<5mV pk-pk 15.625kHz typical				
Start-up/Settling time	<100ms				
Warm-up drift time	15 minutes to meet specifications for scaling <60 minutes to meet specifications for noise				

Electrical	
Supply Voltage	±12 to 17V
Current Consumption – Positive	35 to 41mA in zero-field
Current Consumption – Negative	13 to 17mA in zero-field
Power Supply Rejection Ratio	120dB
Power-on Surge	+90mA, -25mA, 20ms
Analogue Output	±10V
Output Impedance	10Ω
Test function field in each axis	-1µT ±10%
Maximum cable length	1.5km

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Environmental

Operating temperature range	-40 to +70°C
Storage temperature range	-40 to +70°C
Compliance (CE, etc.)	EMC BS EN 61326:2013 & RoHS
Additional environmental qualifications	Mag-13MCD 550bar hydrostatic pressure test
Environmental protection / sealing	
MC	IP67
MS	IP67
MCD	IP68 (5000m)
U	N/A (unpackaged)
U-TPU	N/A (unpackaged)
MSS	IP68 (200m)

Mechanical

Package options	Cylindrical (MC)	Square (MS)	Square Submersible (MSS)	Cylindrical Deep Submersible (MCD)	Unpackaged (U)	Unpackaged 2-part (U-TPU)
Dimensions	Ø 25.4 x 203mm	32 x 32 x 203mm	30 x 30 x 251mm	Ø 60 x 301mm	Ø 23.2 x 150mm	Probe: Ø23.2 x 43mm Electronics: 19.5 x 129mm Harness length max 5m
Weight	82.5g	222.6g	300g	950g	23.5g	157g (max cable length)
Enclosure material	Acetal & PEEK	Acetal	Acetal	PEEK	n/a	n/a
Connector	Fischer AL-1731-DEU-1031-A010-SR-11-11-G-12		SubConn MCBH10FNM (under-water mateable)	SubConn MCB-H10F (under-water mateable)	Molex 53047-0810	Molex 53047-0810
Mating connector	Fischer AL1731-S-1031-A010SR11-11 with E3-1031.2/6.2		SubConn MCOM10M or MCIL10M (underwater mateable)		Molex Pico-blade 51021-0800	Molex Pico-blade 51021-0800

MTBF

MTBF – MIL-HDBK-217F:	
Ground Fixed - 70°C	60,000 hours
Ground Fixed - 50°C	86,000 hours
Ground Benign - 70°C	95,000 hours
Ground Benign - 50°C	157,000 hours

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, 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



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

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