

# Mag-13<sup>®</sup>

Three-Axis Magnetic Field Sensors





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## 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.



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## Features

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- Wide range of enclosures; unpackaged and submersible versions available
- Noise levels down to  $<5\text{pT}_{\text{rms}}/\sqrt{\text{Hz}}$  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

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- 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 $\mu\text{T}$
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 Q = Very 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 = A 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<sup>®</sup> 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) Very low noise (Q)	≤10pT rms / √Hz @1Hz <6pT rms / √Hz @1Hz (70 and 100µT range only) <5pTrms/√Hz at 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 & 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

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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
- Decaport Analogue Interface Module
- DAS1 Data Acquisition System
- DecaPSU Power Supply Unit

(Outputs for the test coil 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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