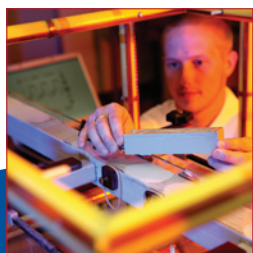


Mag-03

World leaders in high precision magnetic field measurements

Mag-03

Three-Axis Magnetic Field Sensors



Bartington®
Instruments



Mag-03

Three-Axis Magnetic Field Sensors

These compact, high performance fluxgate sensors with integral electronics provide precision measurements of static and alternating magnetic fields in three axes. They are available with measuring ranges of ± 70 , ± 100 , ± 250 , ± 500 or $\pm 1000\mu\text{T}$ in a variety of enclosures. Powered from any $\pm 12\text{V}$ supply, outputs are in the form of three analog voltages from 0 to $\pm 10\text{V}$, proportional to B_x , B_y and B_z .



The sensors are available with three levels of noise performance. The low noise version has a noise level of $< 6\text{pTrms}/\sqrt{\text{Hz}}$ at 1Hz, the standard version between 6 and $\leq 10\text{pTrms}/\sqrt{\text{Hz}}$ at 1Hz, and the basic version between > 10 and $20\text{pTrms}/\sqrt{\text{Hz}}$ at 1Hz. The standard and basic versions can be supplied in all measuring ranges and enclosure types. The low noise version is available with a measuring range of $70\mu\text{T}$ or $100\mu\text{T}$, in all enclosure types.



These sensors have a wide range of applications in physics, bioelectromagnetics, geophysical exploration and defence.

Data acquisition units and accessories include:

- Spectramag-6 Data Acquisition Unit (six-channel spectrum analyser)
- SCU1 Signal Conditioning Unit
- PSU1 Power Supply Unit
- Mag-03MC-BR Mounting bracket for use with the cylindrical range of sensors
- Mag-03-T Tripod
- Mag-03-TA Universal tripod adaptor
- Mag-03-MR Mounting rack
- Mag-03-LP Levelling platform
- Calibration check units can be supplied for the complete range of sensors

A full calibration service is also available.



Mag-03 Enclosures

To suit specific needs, Mag-03 sensors can be supplied in a wide range of enclosures.



Sensor	Enclosure
Mag-03MC	Cylindrical
Mag-03MCES	Cylindrical with environmentally sealed enclosure to IP64
Mag-03MCFL	Cylindrical with connections via flying leads
Mag-03MCT	Cylindrical with titanium shielded enclosure
Mag-03MCUP	Unpackaged: moulded sensor and electronics block with flying leads
Mag-03MCTP	Two-part construction: separate sensor and cylindrical electronics enclosure
Mag-03MS	Square section
Mag-03MSES	Square section with environmentally sealed enclosure to IP64
Mag-03MSS	Square section submersible to 2000 metres
Mag-03IE	Sensor with the three sensing elements on flying leads
Mag-03IEv1	IE sensor with a 9-way 'D' type connector and cable from the electronics enclosure
Mag-03IEv2	IE sensor with a 25-way 'D' type connector and cable from the electronics enclosure
Mag-03IEHV	IE sensor suitable for use in a high vacuum chamber

Mag-03 Product Identification

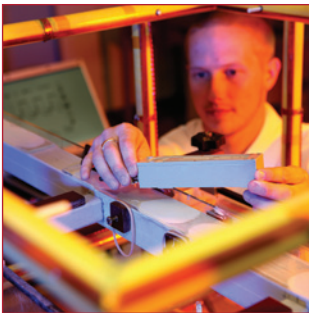
Products are specified as Mag-03 followed by the enclosure code (MC, MCES, MCFL, MS, MSES, MSS, IE, IEv1, IEv2, IEHV, MCT, MCUP, MCTP), followed by L for the low noise version or B for the basic version; if neither L nor B is specified, then this indicates the standard version. The measuring range in μT (70, 100, 250, 500 or 1000) then follows.

For example:

- Mag-03MSL70 is a low noise sensor with a square section enclosure and a range of $\pm 70\mu\text{T}$
- Mag-03MC1000 is a standard sensor with a cylindrical enclosure and a range of $\pm 1000\mu\text{T}$
- Mag-03MSESB250 is a basic sensor with a square section enclosure environmentally sealed to IP64 and a range of $\pm 250\mu\text{T}$

Note: For some Mag-03 magnetometers (Mag-03 MCFL, MCTP, MCUP, IE), it will be necessary to specify the lead lengths. For example, Mag-03MCFL250-1000 is a Mag-03MCFL with a range of $250\mu\text{T}$ and flying leads of 1000mm.



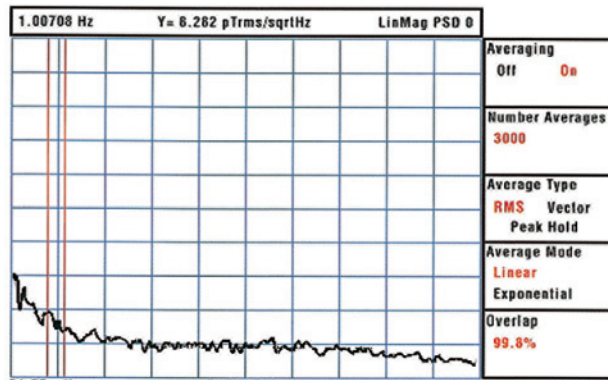


Performance Specification

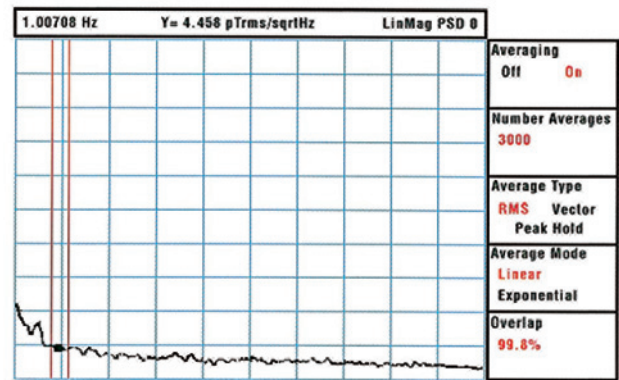
Number of axes	3
Bandwidth	0 to 3kHz at 50 μ T peak (5kHz for Mag-03IEv1&2 on request)
Internal noise:	
basic version	>10 to 20pTrms/ \sqrt Hz at 1Hz
standard version	6 to \leq 10pTrms/ \sqrt Hz at 1Hz
low noise version	<6pTrms/ \sqrt Hz at 1Hz
Scaling error (DC)	< \pm 0.5%
Orthogonality error	<0.5° (<0.1° for Mag-03MS and Mag-03MSES)
Alignment error (Z axis to reference face)	<0.1° (Mag-03MS and Mag-03MSES only)
Linearity error	<0.0015%
Frequency response	0 to 1kHz maximally flat, \pm 5% maximum at 1kHz
Input voltage	\pm 12V to \pm 17V
Supply current	+30mA, -10mA (+1.4mA per 100 μ T for each axis)
Power supply rejection ratio	5 μ V/V (-106dB)
Analog output	\pm 10V (\pm 12V supply) swings to within 0.5V of supply voltage
Output impedance	10 Ω
Single sensor axis to body	<3.5° (Mag-03IE sensors only)

Scaling Dependent Parameters

Measuring range (μ T)	\pm 70	\pm 100	\pm 250	\pm 500	\pm 1000
Offset error (nT)	\pm 5	\pm 5	\pm 12	\pm 25	\pm 50
Scaling (mV/ μ T)	143	100	40	20	10
Offset temperature coefficient (nT/ $^{\circ}$ C)	\pm 0.1	\pm 0.1	\pm 0.2	\pm 0.33	\pm 0.6
Scaling temperature coefficient (ppm/ $^{\circ}$ C)	+15	+20	+50	+100	+200



Mag-03 Noise Plot Standard Version



Mag-03 Noise Plot Low Noise Version

Specifications

	Mag-03MC	Mag-03MCES
Operating temperature range: continuous intermittent	-40°C to +70°C -40°C to +85°C	-40°C to +70°C -40°C to +85°C
Environmental protection	IP51	IP64
Dimensions (ø x L)	25 x 202mm	25 x 207mm
Weight	85g	100g
Enclosure material	Reinforced epoxy	Reinforced epoxy
Connector	Hirose RM15TRD10P	Amphenol 62GB-51T10-7P
Mating connector	Hirose RM15TPD10S	Amphenol 62GB-16J10-7S ⁴
Mounting	Mag-03MC-BR bracket available	Mag-03MC-BR bracket available
	Mag-03MCFL	Mag-03MCT
Operating temperature range: continuous intermittent	-40°C to +70°C -40°C to +85°C	-40°C to +70°C -40°C to +85°C
Environmental protection	IP51	IP51
Dimensions (ø x L)	25 x 211mm	25 x 207mm
Weight	80g	95g
Enclosure material	Reinforced epoxy	Titanium
Connector	Flying leads 500mm length ^{2,3} (Up to 5000mm length to order)	Hirose RM15TRD10P
Mating connector		Hirose RM15TPD10S
Mounting	Mag-03MC-BR bracket available	Mag-03MC-BR bracket available
	Mag-03MCTP	Mag-03MCUP
Operating temperature range: continuous intermittent	-40°C to +70°C -40°C to +85°C	-40°C to +70°C -40°C to +85°C
Environmental protection	IP51	
Dimensions (mm)	Electronics: ø25 x 115 length Sensor: ø20 x 54 length Sensor-electronics cable: 1000 length ³ (up to 5000 length to order)	Electronics: 21 x 12 x 80 Sensor: ø20.9x56 length Sensor-electronics cable: 610 length ³ (up to 5000 length to order)
Weight	80g	80g
Enclosure material	Sensor: machined epoxy Electronics: aluminium alloy	Sensor: machined epoxy Electronics: moulded silicone
Connector	Hirose RM15TRD10P	Flying leads 500mm length ^{2,3} (up to 5000mm length to order)
Mating connector	Hirose RM15TPD10S	
Mounting	Mag-03MC-BR bracket available ¹	
	Mag-03MS	Mag-03MSES
Operating temperature range	-40°C to +70°C	-40°C to +70°C
Environmental protection	IP51	IP64
Dimensions (W x H x L)	32 x 32 x 152mm	32 x 32 x 166mm
Weight	160g	160g
Enclosure material	Reinforced epoxy	Reinforced epoxy
Connector	ITT Cannon DEM-9P-NMB	Amphenol 62GB-12E10-7P
Mating connector	ITT Cannon DEM-9S-NMB	Amphenol 62GB-16J10-7S ⁴
Mounting	2 x M5 fixing holes	2 x M5 fixing holes

	Mag-03MSS	
Operating temperature range	-10°C to +50°C	
Environmental protection	IP68 (submersible to 2000m)	
Dimensions (W x H x L)	30 x 30 x 208mm	
Weight	185g	
Enclosure material	Polyacetal	
Connector	Impulse IE XSJ-7-BCR	
Mating connector	Impulse IE XSJ-7-CCP ⁴	
Mounting	3 x M3 clearance holes	
	Mag-03IE	Mag-03IEHV
Operating temperature range: continuous intermittent	-40°C to +70°C -40°C to +85°C	-40°C to +70°C -40°C to +85°C
Environmental protection	IP51	For use in high vacuum chambers
Dimensions (mm)	Electronics: ø25 x 115 length Sensor: ø8 x 30 length Sensor-electronics cable: 750 ³ length (up to 5000 length to order)	Electronics: ø25 x 115 length Sensor: ø8 x 30 length Inner cable: 1100 ³ length (up to 5000 length to order) Outer cable: 140 length Inner and outer cable joined by re-solderable terminal block
Weight	80g	80g
Enclosure material	Sensors: alumina cylinder Electronics: aluminium alloy	Sensors: glass tube with epoxy filling Electronics: aluminium alloy
Connector	Hirose RM15TRD10P	Hirose RM15TRD10P
Mating connector	Hirose RM15TPD10S	Hirose RM15TPD10S
Mounting	Mag-03MC-BR bracket available ¹	Mag-03MC-BR bracket available ¹
	Mag-03IEv1	Mag-03IEv2
Operating temperature range: continuous intermittent	-40°C to +70°C -40°C to +85°C	-40°C to +70°C -40°C to +85°C
Environmental protection	IP51	IP51
Dimensions (mm)	Electronics: ø25 x 105 length Sensor: ø8 x 30 length Sensor-electronics cable: 750 length ³ (up to 5000 length to order)	Electronics: ø25 x 105 length Sensor: ø8 x 30 length Sensor-electronics cable: 750 length ³ (up to 5000 length to order)
Weight	80g	80g
Enclosure material	Sensors: alumina cylinder Electronics: aluminium alloy	Sensors: alumina cylinder Electronics: aluminium alloy
Connector	9-way 'D' type on a 5m cable	25-way 'D' type on a 5m cable
Mating connector	9-way 'D' type	25-way 'D' type
Mounting	Mag-03MC-BR bracket available ¹	Mag-03MC-BR bracket available ¹

¹Bracket is only suitable for the electronics enclosure

²Flying leads are susceptible to EM interference and should be screened wherever possible

³Standard length if not specified in order

⁴Modified to be non-magnetic

Mag-03 Mating Connectors

With the exception of the Mag-03MSS, non-magnetic mating connectors are provided free of charge for all Mag-03 sensors purchased without cables.



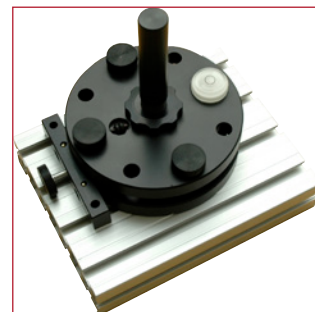
Mag-03 Cables

Cables can be supplied for most Mag-03 sensor versions. The standard cable length is 5m. Other lengths up to 500m can be supplied on request. All cables terminate with a Hirose RM15TPD10S, suitable for connection to the Bartington Instruments range of data acquisition and power supply units.

Mag-03 Mounting Accessories

A range of accessories are available:

Specification	
Mag-03MC-BR	Mounting bracket for use with the cylindrical range of Mag-03 sensors
Mag-03-T	Tripod
Mag-03-TA	Tripod adaptor for mounting the Mag-03 sensor
Mag-03-LP	Levelling platform for use with the Mag-03TA and Mag-03MR mounting rack
Mag-03-MR	Mounting rack for the installation of Mag-03LP and Mag-03 sensors Available in lengths of 1 metre and multiples



Mag-03 Calibration Unit

These units provide a fast and convenient facility to test the accuracy and functionality of a Mag-03 sensor. They consist of a battery powered Helmholtz coil, generating an alternating magnetic field, with guides to align each of the sensor axes in turn.

Note that these units are not intended as a full calibration facility. It is recommended that sensors are returned to Bartington Instruments for full recalibration.

Specification	
Sinewave magnitude	50 μ T p-p (17.5 μ T rms) \pm 1% (distortion 5% typical)
Frequency	190Hz \pm 2%
Environmental	IP60 not suitable for use in wet conditions
Dimensions (mm)	ϕ 100 x 125 length
Weight	990g
Enclosure material	Polyethylene terephthalate
Battery	PP3 9V alkaline or lithium dioxide (20 hours' continuous use) with tri-colour LED indicator



Calibration Unit	
Ordering code:	Suitable for use with:
Mag-03MS-CU	Mag-03MS, Mag-03MSES
Mag-03MSS-CU	Mag-03MSS
Mag-03MC-CU	Mag-03MC, Mag-03MCES, Mag-03MCFL, Mag-03MCT, Mag-03MCUP, Mag-03MCTP
Mag-03IE-CU	Mag-03IE





Mag-03

Data Acquisition and Power Units

A range of peripheral units for use with Mag-03 sensors are available.
Latest details can be found at www.bartington.com

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