

Grad-13
Digital Three-Axis Gradiometer

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This digital three-axis gradiometer sensor provides high resolution vector measurements of magnetic fields on land or in water. Scalar measurement is made possible due to the small orthogonality error.

The instrument is available in land, shallow and deep submersible versions. It also provides temperature data, and the integrated accelerometer enables accurate positioning of the sensor.



Features

- Baselines from 500mm to 1000mm
- Land and submersible (200m and 5000m) versions
- Integral accelerometers for positioning of the unit
- Individual sensor and gradient outputs
- Gradiometer can be connected to a computer using readily available RS485 to USB or Ethernet converters

Typical applications

- Archaeological prospecting
 - Pipe and cable location
 - Detection of buried magnetic anomalies by surface or downhole surveys
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Specifications

Gradiometer Performance

Output generated	Digital RS485 output includes: <ul style="list-style-type: none"> • 3-axis magnetic field gradient data • 3-axis magnetic field sensor data • 3-axis accelerometer data • temperature data <p>(Data protocol DP2629 is available from the Bartington Instruments website)</p>
Number of axes	Three (for each of two sensing elements)
Baseline between sensors	500, 750 or 1000mm
Maximum gradient	140 μ T, 200 μ T, 1000 μ T, 2000 μ T
Bandwidth at -3dB	200Hz
Noise	<70pTrms/ \sqrt Hz/m at 1Hz with 500mm baseline
Scaling error	down to noise level after balancing
Scaling (total field)	10 μ T/V
Temperature coefficient of scale factor	<70ppm/ $^{\circ}$ C
Offset error	down to noise level after balancing
Temperature coefficient of offset error	\pm 0.4nT/ $^{\circ}$ C
Settling time at power up	<10mins
Orthogonality error	<0.01 $^{\circ}$
Linearity error	<0.0015%
Hysteresis	<1nT in 1mT

Magnetic Field Sensing Element Performance

Number of axes	Three
Range per sensor	\pm 70 μ T, \pm 100 μ T, \pm 500 μ T, \pm 1000 μ T
Bandwidth at -3dB	250Hz
Noise	Down to <10pTrms/ \sqrt Hz at 1Hz
Scaling error	\pm 0.5%
Offset error	<5nT in zero field
Temperature coefficient of scale factor	<35ppm/ $^{\circ}$ C
Temperature coefficient of offset error	\pm 0.2nT/ $^{\circ}$ C
Settling time at power up	<10mins
Orthogonality error	<0.01 $^{\circ}$
Linearity error	<0.0015%
Hysteresis	<1nT in 100 μ T

Accelerometer Performance

Number of axes	Three
Range per sensor	±2g
Update rate	50Hz
Resolution	1mg
Offset error	±70mg
Scaling error	<±2%
Temperature coefficient of offset error	±0.2mg/°C
Temperature coefficient of scale factor	±0.025%/°C
Orthogonality error	±2°

Temperature Sensor Performance

Range	-40°C to +85°C
Resolution	0.25°C
Temperature accuracy	±1°C (max)
Scaling error	<±2%
Temperature coefficient of offset error	±0.2mg/°C
Temperature coefficient of scale factor	±0.025%/°C
Orthogonality error	±2°

Environmental

Operating temperature range	-30°C to +70°C
Storage temperature range	-40°C to +70°C
Environmental protection Grad-13D Grad-13S Grad-13L	submersible to 5000m submersible to 200m waterproof

Mechanical

	Grad-13L	Grad-13S	Grad-13D
Dimensions (excl. cable tail) for 500mm baseline for 750mm baseline for 1000mm baseline	ø35 x 670mm ø35 x 920mm ø35 x 1170mm	ø35 x 755mm ø35 x 1005mm ø35 x 1255mm	TBA
Weight (incl. cable tail)	1.2kg	1.5kg in air sinking in sea water	TBA
Enclosure material	Carbon fibre & PEEK	Carbon fibre & PEEK	Carbon fibre & PEEK
Connector and tail	5m long tail with 14-way Amphenol 62GB-16J12-08PN	5m long tail with 14-way Impulse MSAJ14CCP	TBA
Mating connector	TBA	14-way Impulse MSAJ14CCR	TBA

Electrical

Voltage input	+9V DC min, +32V DC max
Power consumption	<5W
Digital output standard	RS485 full duplex



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