

Grad-03 Three-Axis Magnetic Field Gradiometer

The Grad-03 instrument contains two closely spaced three-axis fluxgate sensors on a stable support beam. It is used for measuring minute variations in the magnetic field that are caused by hidden anomalies in the ground, such as archaeological disturbances, geophysical features, pipes, cables, waste drums, unexploded ordnance, and other signs of human activity.

The three-axis configuration lets the instrument trace the direction of anomalies as well as their strength, providing information that will help characterise the source.



Features

- Land and Marine (operating to depth of 5000m) versions available
- Baseline options: 300, 500, 750 and 1000mm
- Bandwidth >2kHz
- Resolution better than 1nT
- Range: $\pm 100\mu\text{T}$
- Analogue Correction Unit for correction of scaling, offset and alignment errors

Typical Applications

- Geophysical surveys
- Unexploded ordnance detection
- Pipe and cable location

Product Identification

Baseline in mm	Package
300	L = Land
500	M = Marine
750	
1000	

Example: Grad-03-500M is a marine gradiometer with a 500mm baseline.

Grad-03 Specification

Performance	
Number of axes	Three (for each of two sensing elements)
Baseline between sensors	300, 500, 750 or 1000mm
Range	$\pm 100\mu\text{T}$
Bandwidth at-3dB	>2kHz
Measurement noise floor (per sensor)	10 to 20pTrms/ $\sqrt{\text{Hz}}$ at 1Hz
Scaling (total field)	10 $\mu\text{T/V}$
Settling time at power-up: Grad-03L Grad-03M	5 mins 15 mins
Offset error	$\pm 5\text{nT}$ in zero field
Scaling error	$\pm 0.25\%$
Temperature coefficient of offset error	$\pm 0.1\text{nT}/^\circ\text{C}$
Temperature coefficient of scale factor	<10ppm/ $^\circ\text{C}$
Orthogonality error	<0.1 $^\circ$
Z-axis alignment to outer enclosure	<0.5 $^\circ$
Linearity error	<0.001%
Hysteresis	<1nT in 100 μT
Excitation breakthrough (15kHz)	<20mV p-p

Environmental	
Operating temperature range	0 $^\circ\text{C}$ to +70 $^\circ\text{C}$
Storage temperature range	-50 $^\circ\text{C}$ to +70 $^\circ\text{C}$
Environmental protection Grad-03L Grad-03M	IP67 IP68

Mechanical			
	Baseline	Grad-03L	Grad-03M
Dimensions	300 500 750 1000	$\varnothing 38 \times 470\text{mm}$ $\varnothing 38 \times 650\text{mm}$ $\varnothing 38 \times 923\text{mm}$ $\varnothing 38 \times 1175\text{mm}$	$\varnothing 50 \times 526\text{mm}$ $\varnothing 50 \times 738\text{mm}$ $\varnothing 50 \times 1045\text{mm}$ $\varnothing 50 \times 1296\text{mm}$
Weight (approx.)	300 500 750 1000	0.65kg 0.70kg 0.75kg 0.80kg	1.5kg in air, 0.088kg in sea water 1.7kg in air, 0.10kg in sea water 1.9kg in air, 0.11kg in sea water 2.1kg in air, 0.12kg in sea water
Enclosure material		Carbon fibre enclosure Aluminium alloy end caps	Carbon fibre enclosure PEEK end caps
Connector		Amphenol 62GB-51T14-12P	SEACON XSEE-12-BCR
Mating connector		N/A	SEACON XSEE-12-CCP
Gradiometer to ACU cable		$\varnothing 7.5\text{mm} \times 5\text{m}$ length	$\varnothing 12\text{mm} \times 5\text{m}$ length
Operating depth		N/A	5000m

Electrical	
Voltage input	$\pm 12\text{VDC}$ min, $\pm 15\text{VDC}$ max
Power consumption	1W: Typical +50mA (+65mA max), -11mA
Analogue output (all field channels)	$\pm 10\text{V}$
Output impedance	60 Ω typical
Supply current	+ve: 45 to 65mA -ve: 7 to 11mA