

GEONICS LIMITED

LEADERS IN ELECTROMAGNETICS



GEOPHYSICAL INSTRUMENTATION
FOR EXPLORATION & THE ENVIRONMENT

GEONICS LIMITED

1745 Meyerside Drive, Unit 8

Mississauga, Ontario

Canada L5T 1C6

Telephone: +1 (905) 670 9580

Telefax: +1 (905) 670 9204

E-mail: geonics@geonics.com

Website: <http://www.geonics.com>

Est. 
1962



GEONICS LIMITED

A Canadian-owned company, located in Mississauga, Ontario, Geonics Limited is a world leader in the design, manufacture and service of electromagnetic (EM) geophysical instrumentation.

Incorporated in 1962, Geonics originated with the development of the patented EM16 VLF Receiver, which became an exploration industry standard for ground VLF instrumentation. Equipment manufactured during the first several years included surface, fixed wing and helicopter EM systems, primarily for applications in natural resource exploration.

From an early commitment to specialize in electromagnetic methods, Geonics has since been able to develop a broad range of unique EM instrumentation for an ever-increasingly diverse range of applications. With the introduction of the EM31 Ground Conductivity Meter in 1976, Geonics began to service end-user communities – e.g. geotechnical engineers, environmental professionals, etc. – with a particular interest in near-surface characterization. Subsequent development of the EM34-3 and EM38 series of Ground Conductivity Meters – for relatively deeper and shallower exploration, respectively – expanded the range of application fields to include hydrogeology, agriculture and archaeology.

In 1987, using more than 15 years of experience in the design and development of time domain electromagnetic (TDEM) systems, Geonics introduced the versatile, digital PROTEM TDEM systems. With a single receiver and, now, five interchangeable transmitters, the modular PROTEM systems cover a full range of applications from shallow environmental and groundwater studies, to deep resistivity soundings and three-component surface and downhole exploration for mineral and geothermal targets.

From this long tradition of research and engineering excellence, Geonics continues to move forward with the development of new, more advanced instrumentation: the EM61-MK2 Metal Detector has been recognized by the North American military community as the standard sensor technology for the detection of unexploded ordnance (UXO); the EM61-LX2 provides features to address particular challenges in the detection of unexploded cluster munitions; resource exploration has been further supported by the availability of surface and downhole fluxgate sensors; the PROTEM CM and G-TEM TDEM systems each offer the convenience of receiver/transmitter consolidation; and, in the case of G-TEM specifically, a Windows-based operating system supports new and enhanced in-field functionality, including continuous-reading, mobile data collection.

And, in addition to standard production instrumentation, custom-build solutions are available to address many unique or otherwise unconventional requirements.

Used extensively throughout the world, in varied and demanding survey environments, Geonics instrumentation has earned the field-tested reputation for superior data quality and reliable, cost-effective operation.



EM16 / EM16R / TX27

The EM16 VLF Receiver is the most widely used EM geophysical instrument of all time. Local tilt and ellipticity of VLF broadcasts are measured and resolved into in-phase and quadrature components of VLF response. The EM16 has discovered several base and precious metal ore bodies and many water-bearing faults.

The EM16R Resistivity Attachment uses a pair of electrodes to measure the apparent resistivity of the earth. The combined EM16/16R instrument can detect a second earth-layer if the layer occurs within the VLF skin-depth. In addition, the EM16/16R can map resistive alteration for gold exploration.

The TX27 is a portable VLF transmitter supplying a VLF field for surveying with either the EM16 or EM16/16R if remote broadcasts are weak, intermittent or poorly coupled with the target. For EM16 surveys, the TX27 antenna consists of a long (typically 1 km) grounded wire.

EM16/16R Specifications

MEASURED QUANTITIES	EM16: In-phase and Quadrature components of the secondary VLF field, as percentages of the primary field EM16R: Apparent resistivity in ohm-metres, and phase angle between E_x and H_y
PRIMARY FIELD SOURCE	VLF broadcast stations
SENSOR	EM16: Ferrite-core coil EM16R: Stainless-steel electrodes, separated by 10 m; sensor impedance is 100 M Ω in parallel with 0.5 pf
OPERATING FREQUENCY	15 to 28 kHz, depending on VLF broadcasting station
MEASUREMENT RANGES	EM16: In-phase: $\pm 150\%$; Quadrature: $\pm 40\%$ EM16R: 300, 3000, 30000 Ω -m, Phase: 0-90°
POWER SOURCE	EM16 or EM16/16R: 9 V battery
OPERATING TEMPERATURE	-30° C to +50° C
DIMENSIONS	EM16 or EM16/16R: 53 x 30 x 22 cm
WEIGHT	EM16: Instrument: 1.8 kg; Shipping: 6.2 kg EM16R: Instrument: 1.5 kg; Shipping: 6 kg

TX27 Specifications

PRIMARY FIELD SOURCE	Grounded wire or 500 x 500 m loop, current adjustable, 0 to 2 A
OPERATING FREQUENCY	18.6 kHz
POWER SOURCE	120/220 V, 350 W motor generator
DIMENSIONS	Transmitter and loop: Shipping: 89 x 29 x 39 cm Generator: Shipping: 50 x 27 x 36 cm
WEIGHT	Transmitter and loop: Shipping: 32.5 kg Generator: Shipping: 17 kg

BOREHOLE PROBES



EM39 CONDUCTIVITY

The EM39 Borehole Induction Probe provides measurement of the electrical conductivity of the soil and rock material surrounding a borehole or monitoring well using the inductive electromagnetic technique. The unit employs coaxial coil geometry with an intercoil spacing of 50 cm to provide an effective radius of exploration of 1 m into the formation while maintaining excellent vertical resolution. Measurement is unaffected by conductive borehole fluid or the presence of plastic well casing.

The combination of a large conductivity range, high sensitivity and very low noise and drift, allows accurate characterization of geologic conditions. Typical applications include groundwater contamination monitoring, groundwater and mineral exploration, and geotechnical investigations, to depths of 500 metres.

The 4-conductor EM39 probe can be used with many commercially available borehole logging systems, or with a dedicated winch and console system from Geonics.

Measurements can be viewed and recorded in real-time with an appropriate field computer and third party software.

Specifications

MEASURED QUANTITIES	Apparent conductivity in millisiemens per metre (mS/m)
PRIMARY FIELD SOURCE	Self-contained dipole transmitter
SENSOR	Self-contained dipole receiver
INTERCOIL SPACING	50 cm
OPERATING FREQUENCY	39.2 kHz
MEASURING RANGES	± 100, 1000, 10,000 mS/m
DEPTH	200 m (500 m cable optional)
MEASUREMENT RESOLUTION	0.1 % of full scale
MEASUREMENT ACCURACY	± 5 % at 30 mS/m
NOISE LEVELS	<0.5 mS/m
POWER SOURCE	10 disposable "D" cells, or 12 VDC external power source
DIMENSIONS	Probe: 3.6 cm diameter, 163 cm length
WEIGHTS	Probe: 2.2 kg, Console: 7 kg Shipping: 90 kg (2 boxes)

GAMMA39 NATURAL GAMMA

The EM39 Borehole Induction Probe was designed, in part, for rapid, accurate assessment of groundwater contamination in the soil and rock material surrounding monitoring wells. Because clay materials can produce an electrical conductivity response similar to some groundwater contaminants, however, Geonics introduced the Gamma39 Natural Gamma Probe to resolve ambiguity in interpretation. For example: whereas a conductivity high with a coincident high gamma count often indicates the presence of clay materials, a conductivity high without an associated high gamma count can be expected to be due to the contamination of groundwater.

Like the EM39 conductivity probe, the Gamma39 is unaffected by the presence of plastic casing in the well. No special license is required, it can be used anywhere, and is simple to operate. The unit, of course, can also be employed to detect radioactive wastes in the ground.

Specifications

MEASURED QUANTITY	Naturally occurring gamma-radiation, in counts/second
SENSOR	Thallium-activated sodium iodide crystal
COUNTS RANGE	100, 300, 1000 counts/second
DEPTH	200 m (500 m cable optional)
MEASUREMENT PRECISION	one count/second
POWER SOURCE	10 disposable "D" cells, or 12 VDC external power source
DIMENSIONS	Probe: 3.6 cm diameter, 100 cm length
WEIGHTS	Probe: 1.6 kg

EM39S MAGNETIC SUSCEPTIBILITY

The EM39S Magnetic Susceptibility Probe provides measurement of the magnetic susceptibility of the soil and rock material in the vicinity of a borehole or monitoring well. With an intercoil spacing of 50 cm, the EM39S provides good vertical resolution while still achieving a reasonable range of investigation into the surrounding medium. High sensitivity and low noise ensure an excellent range of measurement for most geological applications.

The susceptibility response is unaffected by plastic casing and, unlike conventional magnetometers, is unaffected by variations in either the remnant magnetization of the surrounding soil and rock, or the strength of the earth's magnetic field.

Specifications

MEASURED QUANTITY	Magnetic susceptibility in parts per thousand (ppt)
PRIMARY FIELD SOURCE	Self-contained dipole transmitter
SENSOR	Self-contained dipole receiver
INTERCOIL SPACING	50 cm
OPERATING FREQUENCY	39.2 kHz
MEASURING RANGES	± 30, 300 ppt
DEPTH	200 m (500 m cable optional)
MEASUREMENT RESOLUTION	0.1 % of full scale
MEASUREMENT ACCURACY	± 5 % at 30 ppt
NOISE LEVELS	0.02 ppt
POWER SOURCE	10 disposable "D" cells, or 12 VDC external power source
DIMENSIONS	Probe: 3.6 cm diameter, 163 cm length
WEIGHTS	Probe: 2.2 kg Shipping: 90 kg (2 boxes)

GROUND CONDUCTIVITY METERS



EM31-MK2

Using a patented electromagnetic inductive technique that allows measurement without any requirement for either electrodes or ground contact, the EM31-MK2 Ground Conductivity Meter maps soil materials, groundwater contaminants or any subsurface feature associated with changes in conductivity. With this inductive method, surveys can be conducted over any surface conditions, including those with high-resistivity materials such as sand, gravel, asphalt, permafrost and sea-ice.

Ground conductivity (quad-phase) and magnetic susceptibility (in-phase) measurements are recorded directly onto an integrated Mesa 2 field computer. The field computer provides many features for enhanced data collection including Bluetooth communication, internal GPS receiver, real-time data graphics, and compatibility with third party applications.

The effective depth of exploration is about six metres from the instrument, making it ideal for environmental and engineering site characterization. Important advantages of the EM31-MK2 over conventional resistivity methods include: speed of operation; high-volume, continuous data collection; high spatial resolution of data; and the precision with which small changes in conductivity can be measured. Additionally, the in-phase component is particularly useful for the detection of buried metallic structure and waste material.

EM31-SH

The EM31-SH is a "SHort" version of the standard EM31-MK2 providing an effective depth of exploration of about three metres. With a smaller (2 m) coil separation and lighter weight, the EM31-SH offers improvements in sensitivity to smaller near-surface targets, lateral resolution and portability, while maintaining the high levels of accuracy and stability provided by the standard EM31-MK2.

Specifications

MEASURED QUANTITIES	1: Apparent conductivity in millisiemens per metre (mS/m) 2: In-phase ratio of the secondary to primary magnetic field in parts per thousand (ppt)
INTERCOIL SPACING	3.66 metres
OPERATING FREQUENCY	9.8 kHz
MEASURING RANGES	Conductivity: 10, 100, 1000 mS/m; In-phase: ± 20 ppt
MEASUREMENT RESOLUTION	± 0.1 % of full scale
MEASUREMENT ACCURACY	± 5 % at 20 mS/m
NOISE LEVELS	Conductivity: 0.1 mS/m; In-phase: 0.03 ppt
DATA STORAGE	64 GB flash storage; microSDXC card slot, user accessible
POWER SOURCE	8 disposable "C" cells (approx. 20 h continuous)
OPERATING TEMPERATURE	Instrument: -40° C to +50° C Datalogger: -20° C to +50° C
DIMENSIONS	Boom: 4.0 m extended, 1.4 m stored Shipping Case: 145 x 38 x 23 cm
WEIGHTS	Instrument: 12.4 kg; Shipping: 28 kg



EM34-3

Using the same inductive technique as the EM31-MK2, the EM34-3 Ground Conductivity Meter incorporates three intercoil spacings – 10, 20 and 40 m – to provide variable depths of exploration to 60 metres. With three intercoil spacings, and two dipole modes (horizontal as shown, and vertical) available with each spacing, a total of six measurements can be associated with a single location. With appropriate software (e.g. IX1D, EMIGMA, etc.), multiple measurements can be used to model the geologic profile.

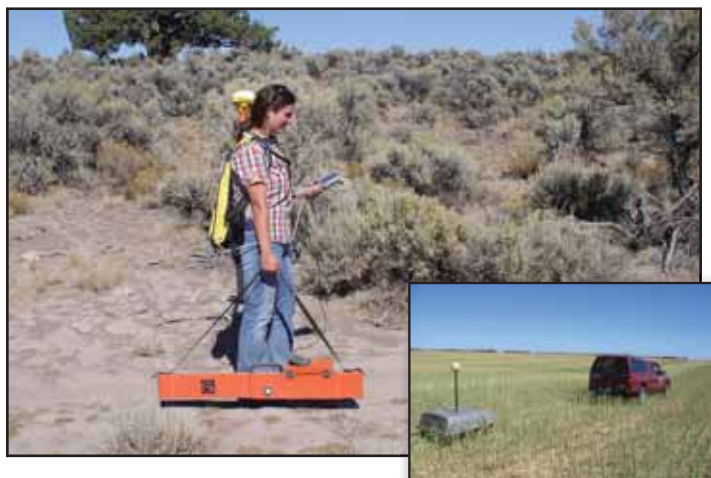
Simple to operate and cost-effective, the EM34-3 is an instrument for the geologist and hydrogeologist alike. Common applications include the detection and delineation of groundwater contamination and the exploration for sources of potable groundwater; in the vertical dipole mode specifically, the EM34-3 is particularly sensitive to vertical geologic structure, and is widely used for applications within fractured and faulted bedrock systems.

In regions of particularly high cultural and / or atmospheric noise, the EM34-3XL – including a larger transmitter coil and increased transmitter power – improves the signal-to-noise ratio by a factor of 10 at the 40 m spacing, and a factor of four at the 10 m and 20 m spacings.

The standard EM34-3/XL provides an analog output signal; a real-time (RT) modification for conversion of the output signal from analog to digital, required for data collection with the DAS70-MESA2 Data Acquisition System, or any computer-based acquisition device, is available as an option.

Specifications

MEASURED QUANTITIES	Apparent conductivity in millisiemens per metre (mS/m)
PRIMARY FIELD SOURCE	Self-contained dipole transmitter
SENSOR	Self-contained dipole receiver
REFERENCE CABLE	Lightweight, 2 wire shielded cable
INTERCOIL SPACINGS & OPERATING FREQUENCY	10 m at 6.4 kHz 20 m at 1.6 kHz 40 m at 0.4 kHz
CONDUCTIVITY RANGES	10, 100, 1000 mS/m
MEASUREMENT RESOLUTION	± 0.1 % of full scale
MEASUREMENT ACCURACY	± 5 % at 20 mS/m
NOISE LEVELS	0.2 mS/m (can be greater in regions of high power line interference)
POWER SOURCE	Receiver: 8 disposable "C" cells; rechargeables optional Transmitter: 8 disposable "D" cells; rechargeables optional
OPERATING TEMPERATURE	-40° C to +50° C
DIMENSIONS	Receiver Console: 19 x 13.5 x 26 cm Transmitter Console: 15.5 x 8 x 26 cm Receiver & Transmitter Coil: 63 cm diameter EM34-3XL Transmitter Coil: 100 cm Shipping Case: 27.5 x 75 x 75 cm
WEIGHTS	Instrument: 20.5 kg; XL: 26.5 kg Shipping: 43 kg; XL: 51 kg



EM38-MK2

The EM38-MK2 provides measurement of both the quad-phase (conductivity) and in-phase (magnetic susceptibility) components within two distinct depth ranges, all simultaneously, without any requirement for soil-to-instrument contact. With a maximum effective depth of exploration of 1.5 m, applications in agriculture, archaeology and general soil sciences are common.

The standard EM38-MK2 includes two receiver coils, separated by 1 m and 0.5 m from the transmitter, providing data from effective depth ranges of 1.5 m and 0.75 m respectively when positioned in the vertical dipole orientation, and 0.75 m and 0.375 m respectively when in the horizontal dipole orientation. The EM38-MK2-1 model includes one receiver coil only, at 1 m from the transmitter.

New coil technology, supported by temperature compensation circuitry, markedly improves temperature-related drift characteristics as compared with the preceding generation of EM38 instruments.

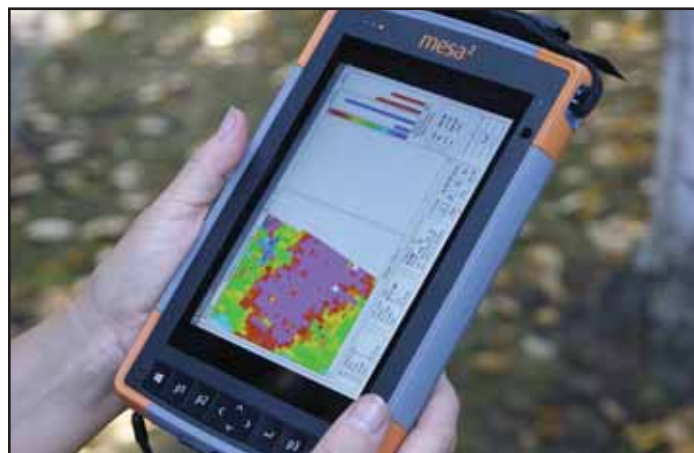
An optional, collapsible calibration stand supports automation of the instrument calibration procedure. Once positioned within the stand, the instrument can be calibrated within seconds, without any requirement for iterative adjustments.

Supporting both walking and trailer-mounted survey methods, external power sources can be connected to the instrument for extended field operations; an optional, lightweight, rechargeable battery pack provides for 25 hours of continuous operation. Also for trailer-mounted operations, a protective capsule, constructed of durable plastic materials, is available as an option.

Data collection is supported by the DAS70-MESA2 Data Acquisition System or other appropriate field computer, connected by either RS-232 serial cable or Bluetooth wireless communication.

Specifications

MEASURED QUANTITIES	1: Apparent conductivity in millisiemens per metre (mS/m) 2: In-phase ratio of the secondary to primary magnetic field in parts per thousand (ppt)
INTERCOIL SPACING	1 and 0.5 metres
OPERATING FREQUENCY	14.5 kHz
MEASURING RANGE	Conductivity: 1000 mS/m In-phase: ± 28 ppt for 1 m separation In-phase: ± 7 ppt for 0.5 m separation
MEASUREMENT RESOLUTION	$\pm 0.1\%$ of full scale
MEASUREMENT ACCURACY	$\pm 5\%$ at 30 mS/m
NOISE LEVELS	Conductivity: 0.5 mS/m; In-phase: 0.02 ppt
DATA OUTPUT	RS-232 serial port, Bluetooth
POWER SOURCE	9 V disposable battery; external rechargeable battery pack
BATTERY LIFE	Up to 5 h continuous for MN1604; 12 h continuous for L522; 25 h for rechargeable battery pack
OPERATING TEMPERATURE	-40° C to +50° C
DIMENSIONS	Instrument: 107 x 17 x 8 cm Shipping Case: 114 x 20 x 26 cm
WEIGHTS	Instrument: 5.4 kg; Shipping: 14 kg



DAS70-MESA2

The DAS70-MESA2 Data Acquisition System is available as an option for any model of Ground Conductivity Meter with a digital output signal, and all models of EM61/-MK2 Metal Detectors; compatibility with first-generation EM61 systems, specifically, requires the purchase of additional third party software.

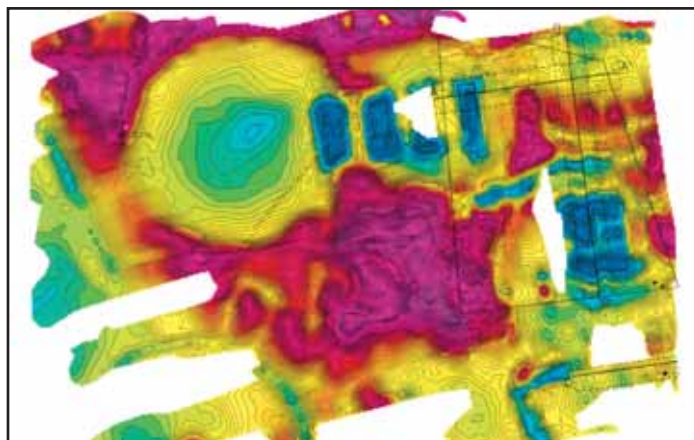
A complete DAS70-MESA2 system includes an ultra-rugged, waterproof Mesa 2 field computer, interface cables, and utility software with programming for data transfer and management. Software for instrument-specific data acquisition and processing is included with the purchase of the relevant instrument; optional third party applications, including real-time colour-scale mapping, can further increase in-field functionality.

The Mesa 2 tablet provides several benefits for in-field operations including: real-time graphic display of collected data; high capacity data storage; internal high-sensitivity GPS receiver; microSDXC card slot and intelligent, rechargeable Li-Ion battery for extended survey time; and multiple communication options.

For survey applications that include the use of multiple sensors within an array configuration (e.g. EM61-MK2A), the DAS70-ML Data Acquisition System, including a Panasonic Toughbook computer, supports simultaneous EM and GPS data collection through eight available input connections.

Specifications

PROCESSOR	Quad-core Intel Atom Z3745
OPERATING SYSTEM	Microsoft Windows 10
DISPLAY	7" (178 mm) WXGA TFT (1280 x 800) touchscreen LCD
DATA STORAGE	64 GB flash storage; microSDXC card slot, user accessible
GNSS	High-sensitivity GPS / GLONASS / SBAS receiver Accuracy: 2 m (SBAS); 5 m autonomous
COMMUNICATIONS	RS-232, Bluetooth, Wi-Fi; docking port connections
POWER SOURCE	Rechargeable Li-Ion battery; up to 10 h on one charge
OPERATING TEMPERATURE	-20° to +50° C
WEIGHT	0.8 kg



METAL DETECTORS



EM61-LX2

For the detection of subsurface cluster munitions and other explosive remnants of war, the EM61-LX2 Metal Detector, as compared with traditional analogue sensors, offers significant improvements in both productivity and, more importantly, the probability of detection. Designed to meet or exceed critical standards for detection, the EM61-LX2 is able to detect a half BLU-26 submunition to a depth of 60 cm below the sensor.

Lightweight system components enable convenient, two-person field operation; the modular sensor design accommodates survey deployment with either a two-meter or one-meter swath.

For survey operations over soils with magnetic properties, proprietary real-time software (patent pending) serves to actively reject the response from magnetic soil and rock materials; effective use of the filter can significantly reduce false-positive alarms, thereby supporting an increase in the probability of target detection.

Real-time data display and multiple visual and audio alarms support real-time anomaly recognition. The long-term benefits of digital data acquisition, including GPS positioning and advanced data processing and presentation, are achievable with the integrated system field computer/controller.

EM61-BLU26 Array

Originally designed for the particular requirements and challenges of survey operations in Southeast Asia, the EM61-BLU26 Metal Detector Array is a simple, two-man portable system providing sensitive detection of small ordnance items within the near surface.

Detection of a half BLU-26 sub-munition is possible to a depth of 65 cm below the sensor; multiple small (0.5x0.5 m) receiver coils help to constrain the determination of target location.

Real-time data presentation and multiple alarm formats, accessible on the system controller, are complemented by LED light-based alarms positioned on each of the receiver coils. Simultaneous collection of GPS data supports real-time navigation and data mapping functionality, and provides the long-term benefits of digitally georeferenced data

EM61-LX2 Specifications

MEASURED QUANTITIES	Two gates of secondary field response, and Filtered response, in mv, from each of two channels
EM SOURCE	Air-cored coil, 2.10 x 0.52 m or 1.03 x 0.52 m in size
CURRENT WAVEFORM	Unipolar pulse with 25% cycle
EM SENSORS	Two air-cored coils, each 1.03 x 0.5 m in size
DYNAMIC RANGE	18 bits
OUTPUT MONITOR	7" (178 mm) WXGA TFT (1280 x 800) touchscreen LCD, and audio tone
DATA STORAGE	64 GB flash storage; microSDXC card slot, user accessible
DATA OUTPUT	RS-232 serial port, Bluetooth
POWER SOURCE	12 V rechargeable battery pack
OPERATING WEIGHT & DIMENSIONS	Sensor 7.5 kg; 210 x 56 x 13cm; Console 2.5 kg Battery Pack 4.5 kg
SHIPPING WEIGHT & DIMENSIONS	35 kg; cm; 115 x 65 x 25 cm



EM61-MK2A

The EM61-MK2A is a high sensitivity, high resolution, time domain metal detector suitable for the detection of both ferrous and non-ferrous metal. Typical target response is a single, sharply defined peak, facilitating quick and accurate determination of location. Achievable depth of detection will depend on several target characteristics, with the surface area and orientation of the target of particular importance. A single 200 litre (55 gal.) drum can be detected at depths greater than three metres.

In comparison with the previous-standard EM61-MK2, the EM61-MK2A provides the same feature and performance specifications. Differences between the two models are ergonomic: because the A-model does not include a backpack for system components, the electronics console is mounted on the U-handle, and the battery is positioned in the centre of the coils.

Data from multiple time gates --three or four, user-selectable-- are recorded to provide a description of the response decay rate, supporting both the characterization and limited discrimination of targets. Data collection is supported by the DAS70-MESA2 Data Acquisition System.

The system can be pushed or pulled as a trailer, by person or vehicle, as either a single unit or an array of multiple units; for multiple unit configurations, options are available to customize component specifications and layout. As may be required, with the addition of a backpack and associated cable set, the system can be carried by a single person with a belt harness.

High Power (HP) Modification

To increase the depth at which any target is detectable, the high power (HP) modification increases the amount of signal received by eight times, resulting in significant improvements in the signal-to-noise ratio. Compared to the standard EM61-MK2A, the depth of detection for any target will increase between 45% and 80%, depending on target characteristics.

Specifications

MEASURED QUANTITIES	Four time gates of secondary response in mV
EM SOURCE	Air-cored coil, 1 x 0.5 m size
CURRENT WAVEFORM	Unipolar rectangular current with 25 % duty cycle
EM SENSORS	a) Main: Air-cored coil, 1 x 0.5 m in size, coincident with EM source b) Focusing: Air-cored coil, 1 x 0.5 m in size 30 cm above main coil
DYNAMIC RANGE	18 bits
OUTPUT MONITOR	7" (178 mm) WXGA TFT (1280 x 800) touchscreen LCD, and audio tone
DATA STORAGE	64 GB flash storage; microSDXC card slot, user accessible
DATA OUTPUT	RS-232 serial port, Bluetooth
POWER SOURCE	12 V rechargeable battery for 4 h continuous operation
OPERATING TEMPERATURE	-30° C to +60° C
OPERATING WEIGHT & DIMENSIONS	41 kg in trailer mode; 100 x 50 x 5 cm (bottom), 100 x 50 x 2 cm (top)
SHIPPING WEIGHT & DIMENSIONS	90 kg with trailer-mode components; 106 x 61 x 33 cm (box 1), 54 x 45 x 56 cm (box 2)



EM61S

For applications in marine environments, the EM61S (Submersible) is a submersible coil and cable system capable of operation to depths of more than 60 metres. The feature and performance specifications of the EM61S are the same as the standard EM61-MK2A; the high power (HP) modification is an available option.

The EM61S is available as either a complete stand-alone system, or as an attachment to an EM61-MK2A (or EM61-MK2), to be operated either as a single unit or in multiple unit configurations; customized component specifications and layout are available.

EM61HH-MK2A

The EM61HH-MK2A is a "Hand-Held" complement to the EM61-MK2A, providing greater sensitivity to smaller targets at shallow depths. A single 20 mm projectile can be detected to a depth greater than 0.5 m; a single 200 litre (55 gal.) drum can be detected to depths of greater than two metres.

With a narrower spatial focus than the standard EM61-MK2A, the EM61HH-MK2A is relatively less sensitive to sources of potential interference. As a result, data can be collected in closer proximity to cultural features such as fences and buildings. Additionally, the narrower focus provides for enhanced target resolution and, by consequence, improved discrimination of multiple targets.

The EM61HH-MK2A can be operated either with or without wheels. In either mode of operation, the smaller, more portable design offers improved access to areas of particularly difficult terrain and dense vegetation.

EM61HH-MK2A Specifications

MEASURED QUANTITIES	Four time gates of secondary response in mV
EM SOURCE	Air-cored coil, 17 cm diameter
CURRENT WAVEFORM	Unipolar rectangular current with 25 % duty cycle
EM SENSORS	Air-cored coil, 17 cm diameter
MEASURING RANGES	10,000 mV
DYNAMIC RANGE	18 bits
OUTPUT MONITOR	7" (178 mm) WXGA TFT (1280 x 800) touchscreen LCD, and audio tone
DATA STORAGE	64 GB flash storage; microSDXC card slot, user accessible
DATA OUTPUT	RS-232 serial port, Bluetooth
POWER SOURCE	12 V rechargeable battery for 4 h continuous operation
OPERATING TEMPERATURE	-30° C to +60° C
OPERATING WEIGHT & DIMENSIONS	Sensor Assembly: 2.8 kg (7.5 kg with wheels); 33 x 20 cm
SHIPPING WEIGHT & DIMENSIONS	17.5 kg (36 kg with wheels); 142 x 25 x 25 cm (sensor), 55 x 50 x 55 cm (wheels)



EM63Flex Array

Further enhancing the capabilities of time domain electromagnetic (TDEM) methods for the detection and characterization of unexploded ordnance, the EM63Flex Array is a flexible-configuration system providing continuous full-transient data from each of multiple receiver coils. An integrated real-time filter to address magnetic soil response and multiple tools for advanced data processing support both superior target detection and a significant reduction in false-positive alarms.

A flexible sensor design accommodates survey deployment in multiple configurations, including as many as four receiver coils with a combined survey swath of four meters. Each receiver provides accurate measurement of the full transient electromagnetic response, from as many as 26 geometrically spaced time gates, over a wide dynamic range of amplitude and time.

High-power system components serve to produce a greater response from any metallic target, ferrous or non-ferrous, thereby increasing the probability and/or depth of detection. Detection of a 60 mm mortar shell to a depth of more than 80 cm below the sensor is possible; larger targets can be detected at greater depths, to more than 5 m below the sensor, subject to individual target characteristics.

Data acquisition software includes multiple user-adjustable features in support of real-time data visualization and anomaly recognition. GeoDroid data processing software provides tools for data quality assessment and control; target characterization and the reduction of false alarms are jointly supported by advanced data analysis functions.

Independently, the EM63-MK2 console can be used to support full-transient data collection from a wide-swath array of standard EM61-MK2 receiver coils.

Specifications

MEASURED QUANTITIES	Up to 26 gates of secondary response in mV for all four main channels
TIME GATES	Up to 26 geometrically spaced time gates covering range from 180 µs to 29 ms
BASE FREQUENCY	7.5, 30, 75 and 150 Hz adjusted for 60 Hz or 50 Hz powerline
CURRENT WAVEFORM	Rectangular bipolar current; 12 A max. T/O = 74 µs, 7.5 A max at 150 Hz for large Tx Loop (9.5m) T/O = 94 µs, 9.5 A max at 75 Hz for large Tx Loop (9.5m) T/O = 66 µs, 12 A max at 150 Hz for small Tx Loop (5.45m)
EM SENSORS	Four air-cored coils, each 1.0 x 0.5 m in size
DYNAMIC RANGE	18 bits
SYSTEM CONTROLLER	Panasonic Toughbook (with CF-19) Computer (optional)
ACQUISITION SPEED	Up to 15 full records per second
DATA STORAGE	Solid-state memory with 2000 h capacity (with CF-19)
INTERFACE	RS-232, USB and network connection
OPERATING TEMPERATURE	-20° C to +60° C
SHIPPING WEIGHT & DIMENSIONS	80 kg with four receiver coils, without tow-platform; 111 x 66 x 36 cm

PROTEM TIME DOMAIN EM SYSTEMS



PROTEM RECEIVER

The primary purpose of any time domain electromagnetic receiver is to record the transient signal generated by the decay of induced eddy currents in the subsurface. As the received voltage will span a very large amplitude range, often more than six decades from early to late times, the receiver must accurately record both high amplitude, rapidly changing voltage at early times, and very small amplitude, slowly changing signal at late times.

The PROTEM Receiver divides the transient into time windows, then converts the voltage in each window into a digital value. During this process, to ensure the highest quality of data in all operating environments, PROTEM offers a number of important design benefits:

- A large (270 kHz) input bandwidth to avoid distortion of early time signals
- Seven selectable gain settings in binary steps from 104 to 6,656
- Optimized window specifications for each of seven base frequencies: early time windows, as narrow as 1.6 μ s for accurate measurement of fast-changing signal; wide late time windows to reduce noise levels before stacking
- Stacking of >550,000 transients at 25 Hz base frequency, or >700,000 transients at 30 Hz (incl. repeats) to further reduce any noise
- Up to 99 repeat readings to support "smart stacking" during post-processing of data
- A true, proprietary 24-bit ADC optimized for transient measurements: smaller responses are resolved with less amplification such that very weak signal can be measured in the presence of high amplitude noise

As the principal component of the modular PROTEM system, the receiver can be used with any of five standard TEM transmitters to cover a broad range of exploration depths; both single- and three-component data collection is available with any transmitter, supported by any of several induction coils or fluxgate magnetometers available from Geonics, or compatible SQUID sensors.

Specifications

MEASURED QUANTITIES	Rate of decay of magnetic field along 3 axes, in nV/m ²
CHANNELS	1 channel used sequentially for 3 components; optionally, 3 channels for 3-component simultaneous operation
TIME GATES	20 gates covering 2 time decades, or 30 gates covering 3 time decades
DYNAMIC RANGE	29 bits (175 dB) including all gains
BASE FREQUENCY	0.3, 0.75, 3, 7.5, 30, 75 and 285 Hz, or 0.25, 0.625, 2.5, 6.25, 25, 62.5 and 237.5 Hz
INTEGRATION TIME	0.5, 2, 4, 8, 15, 30, 60 or 120 s
DATA STORAGE	Solid-state memory for 25,000 data records
DATA OUTPUT	RS-232 serial, USB ports
SYNCHRONIZATION	Reference cable or, optionally, highly stable quartz crystal
POWER SOURCE	12 V rechargeable battery for 8 h continuous operation
OPERATING TEMPERATURE	-40° C to +50° C
DIMENSIONS	34 x 38 x 27 cm
WEIGHT	15 kg



TEM47 TRANSMITTER

Small and lightweight, the battery-powered TEM47 transmitter is ideal for rapid resistivity surveys of the near surface. Single turn transmitter loops, from 1 to 100 m on a side, with turn-off times as short as 0.5 μ s can be used to provide maximum near-surface resolution. An output current of 3 A into a 100 x 100 m loop gives a good response and resolution to depths of 150 metres. The PROTEM 47 (incl. PROTEM receiver, TEM47 transmitter) is most commonly used for shallow resistivity sounding applications.

When used as part of a PROTEM 47 system for profiling, the TEM47 supplies 2.5 A to an 8-turn, 5 x 5 m moving transmitter loop to provide a dipole moment of 500 Am². With base frequency of 30 Hz, and 30 gates from 6.0 μ s to 7.8 ms, this configuration is optimal for Slingram (horizontal loop) surveys for mineral exploration to shallow depths, and for groundwater exploration in bedrock fractures. Electrical sounding is performed simultaneously with the search for fault or dike-like targets.

The TEM47 uses a reference cable to achieve the high synchronization accuracy required for shallow sounding. Regardless of application, a high-frequency 1D or 3D induction coil is used with all PROTEM 47 systems – the high-frequency coils have the bandwidth necessary to capture the earliest portion of the transient decay with minimal distortion. For best consideration of structural response within complex geologic environments, the 3D induction coil is recommended.

High Power (HP) Modification

With the addition of the high power (HP) modification, output voltage is increased to as much as 48 V (with external batteries), and maximum current to 10 amps; as a result, achievable exploration depths are increased considerably. An optional battery voltage control unit is available to control the output voltage from external batteries. Common applications for the PROTEM 47 HP system include data collection for static shift correction of magnetotelluric (MT) surveys and, with a small, multi-turn transmitter loop, in-mine mapping of water saturation zones.

Specifications

CURRENT WAVEFORM	Bipolar rectangular current with 50 % duty cycle
BASE FREQUENCY	7.5, 30, 75, or 285 Hz (60 Hz power line frequency) 6.25, 25, 62.5 or 237.5 Hz (50 Hz power line frequency)
TURN-OFF TIME	2.5 μ s at 3 A into 40 x 40 m loop. Faster into smaller loop
TRANSMITTER LOOP	1 x 1 to 100 x 100 m single turn loop, or 5 x 5 m 8-turn loop
VOLTAGE	TEM47: 0 to 9 V, continuously adjustable, with internal 12 V battery TEM47 HP: 12 to 48 V input with external batteries
OUTPUT CURRENT	TEM47: up to 3.5 A with internal 12 V battery TEM47 HP: up to 10 A with external batteries
POWER SOURCE	Internal 12 V rechargeable battery; optionally, up to four external 12 V batteries
BATTERY LIFE	5 h continuous operation at 2 A output
OPERATING TEMPERATURE	-35° C to +50° C
DIMENSIONS	TEM47: 10.5 x 24 x 32 cm; TEM47 HP: 14 x 24 x 32 cm
WEIGHT	TEM47: 5.3 kg; TEM47 HP: 6.5 kg

PROTEM TIME DOMAIN EM SYSTEMS



TEM57-MK2A TRANSMITTER

The design and performance of the TEM57-MK2A, with a power output of 1,650 W from an internal power supply, makes it a highly portable, mid-power time domain transmitter. The internal power supply, with a continuously variable voltage range from 21 to 60 V, can be perfectly matched to the transmitter loop for optimum performance. A practical number of external batteries can increase these specifications to 4,500 W of power output, and a voltage range to 160 volts.

The TEM57-MK2A is an ideal mid-power transmitter for sounding the depth, thickness and conductivity of layers to depths of 500 m or more. Common applications include the mapping of geologic sequence and structure, and the characterization of freshwater resources. In coastal areas, the PROTEM 57-MK2A system (incl. PROTEM receiver, TEM57-MK2A transmitter) can accurately define the depth(s) at which saltwater intrudes into local aquifer systems.

The PROTEM 57-MK2A, with a short reference cable, portable transmitter and 3D receiver coil, can detect and delineate complex ore bodies within 200 m of surface. Deeper conductors can be characterized by profiling with a crystal-synchronized receiver and a large, fixed transmitter loop. Modeling provides conductivity, thickness, dip and extent of the ore body.

For measurements during the turn-off (T/O) ramp, an optional T/O controller, connected externally to the transmitter, can variably increase the turn-off time, typically within the range of 200–1000 microseconds.

Specifications

CURRENT WAVEFORM	Bipolar rectangular current with 50 % duty cycle
BASE FREQUENCY	0.3, 0.75, 3, 7.5, or 30 Hz (60 Hz power line frequency) 0.25, 0.625, 2.5, 6.25, or 25 Hz (50 Hz power line frequency) Rates below 1 Hz available through cable reference; through crystal reference with modification
TURN-OFF TIME	20 to 115 μ s, depending on size, current and number of turns in transmitter loop
TRANSMITTER LOOP	Single turn: any dimension; minimum resistance is 0.7 ohms, up to 300 x 600 m 8-turn: 5 x 5 or 10 x 10 m
OUTPUT VOLTAGE	21 to 60 V continuously adjustable; up to 160 V (4,500 W) with external power source
OUTPUT CURRENT	28 A maximum
SYNCHRONIZATION	Reference cable or, optionally, highly stable quartz crystal
POWER SOURCE	1,800 W, 110/220 V, 50/60 Hz single-phase motor-generator or, optionally, multiple 12 V batteries
OPERATING TEMPERATURE	-35° C to +50° C
TRANSMITTER PROTECTION	Electronic and electromechanical protection
TRANSMITTER SIZE	43 x 25 x 25 cm
TRANSMITTER WEIGHT	15 kg



TEM67A TRANSMITTER

For applications at greater depths, the TEM67A and TEM67APlus transmitters provide the power necessary for exploration to 1,000 m or more, with a component-based flexibility not previously available with time domain transmitters.

The standard TEM67A transmitter is comprised of two components: a complete TEM57-MK2A transmitter; and a single TEM67A power module (with the requirement for a larger (4,500 W) generator). Such modular design allows for easy upgrade of a TEM57-MK2A transmitter, when required, by the addition of a TEM67A power module and generator only. Conversely, when the full (4,200 W) power of the TEM67A is not required for a particular application, the system can be conveniently scaled down to make use of the TEM57-MK2A only.

With a 1D low frequency induction coil, the PROTEM 67A system (incl. PROTEM receiver, TEM67A transmitter) is ideal for soundings to 1,000 m or more for applications in regional groundwater and geologic research. When used with a 3D induction coil or 3D fluxgate sensor, it is then ideal for profiling deeply buried conductive ore bodies to depths in excess of 500 m. With the BH43-3D induction borehole probe or MAG43-3D fluxgate probe, mineral exploration to depths of 2,500 m is possible.

TEM67APlus

To further increase the depth of exploration, the addition of a second power module increases the maximum output voltage and power to 240 V and 6,700 W, respectively. The PROTEM 67APlus is the high-power system needed for deep mineral exploration under conductive cover: with the 1,000 m² rigid coil, resistivity sounding for deep geologic mapping or geothermal exploration is possible to depths well in excess of 1,500 metres.

Specifications

CURRENT WAVEFORM	Bipolar rectangular current with 50 % duty cycle
BASE FREQUENCY	0.3, 0.75, 3, 7.5 or 30 Hz (60 Hz power line frequency) 0.25, 0.625, 2.5 or 25 Hz (50 Hz power line frequency) Rates below 1 Hz available through cable reference; through crystal reference with modification
TURN-OFF TIME	20 to 750 μ s, depending on transmitter loop size, current and number of turns
TRANSMITTER LOOP	Up to 2,000 x 2,000 m maximum
OUTPUT VOLTAGE	TEM67A: 21 to 150 V continuously adjustable TEM67APlus: 21 to 240 V continuously adjustable
OUTPUT CURRENT	28 A maximum
SYNCHRONIZATION	Highly stable quartz crystal and reference cable
POWER SOURCE	TEM67A: 4,500 W, 115 or 110/220 V, 50/60 Hz, single phase motor generator TEM67APlus: 6,700 W, 115 or 110/220 V, 50/60 Hz, single phase motor generator
OPERATING TEMPERATURE	-35° C to +50° C
TRANSMITTER PROTECTION	Electronic and electromechanical protection
TRANSMITTER SIZE	TEM57-MK2A: 43 x 25 x 25 cm; TEM67A Power Module, each: 42 x 20 x 31 cm
TRANSMITTER WEIGHT	TEM57-MK2A: 15 kg; TEM67A Power Module, each: 12 kg



PROTEM CM

By consolidating the PROTEM receiver and TEM47 transmitter components into a single console, the PROTEM CM system offers significant improvements in portability and convenience: As compared to the individual receiver and transmitter components, the PROTEM CM is both smaller in size, and less in weight by about half. The increase in component portability will be of particular benefit for surveys in more demanding environments, both in-mine and over rugged terrain.

Available with cable reference synchronization only, for either single component or sequential three-component data collection, PROTEM CM otherwise offers the same functions and performance characteristics as the standard PROTEM 47 components, and is compatible with all other Geonics transmitters.

For greater depth of exploration, a high power (HP) modification to increase the output current from the transmitter section is available as an option.

PROTEM CMX

To address the requirements for survey operations in certain high-risk environments, modified PROTEM CM components have been certified to North American standards by the Canadian Standards Association (CSA) for operation in hazardous locations. Certified as a complete and specific set of components, the PROTEM CMX system includes a CMX console, 1 x 1 m rigid transmitter loop and HF-MK2 mid-frequency receiver coil.

Specifications

RECEIVER SECTION

TIME GATES	20 or 30 geometrically spaced gates for each base frequency; range from 6 μ s to 800 ms
DYNAMIC RANGE	29 bits (175 dB) including all gains
SYNCHRONIZATION	Internal; terminals provided for cable reference with external transmitters
DATA OUTPUT	RS-232 serial, USB ports
TRANSMITTER SECTION	
BASE FREQUENCY	30, 75, or 285 Hz (60 Hz power line frequency) 25, 62.5 or 237.5 Hz (50 Hz power line frequency)
TURN-OFF TIME	2.5 μ s at 2 A into 40 x 40 m loop; faster into smaller loop
VOLTAGE	CM: 0 to 9 V continuously adjustable (at 1 A load), or 24 V CM HP: 12 to 48 V input with external batteries
OUTPUT CURRENT	CM: 3.5 A maximum (7 A pp) with internal battery CM HP: 11 A maximum (22 A pp) with external batteries

GENERAL

POWER SOURCE	Internal 12/24 V rechargeable lithium-ion battery
BATTERY LIFE	8 h continuous operation with 2 A transmitter current at 12 V output voltage
OPERATING TEMPERATURE	-30° C to +50° C
DIMENSIONS	40 x 35 x 24 cm
WEIGHT	CM: 10.5 kg; CM HP: 11.7 kg



G-TEM

With the objective to reduce cost while both maintaining the core performance characteristics of the more advanced PROTEM systems and adding several new performance-enhancing features, the new G-TEM system represents exceptional value in time domain electromagnetic (TDEM) instrumentation for both academic and commercial applications alike.

Supported by a continuous recording function and recording rates as fast as 0.5 s, G-TEM components can be platform-mounted behind a tow vehicle to collect continuous measurements along survey transects.

Designed as a complete system for exploration of the geologic near-surface, the modular G-TEM components are also compatible with all PROTEM system components, in cable reference mode only, supporting exploration to greater depths and a wider range of applications.

The integration of a Panasonic Toughbook computer as the system controller has provided the opportunity to introduce several new operating features, including:

- User-programmable receiver gate positions
- Single, multiple or continuous records during each measurement cycle; continuous recording facilitates mobile data collection
- Standard and smart integration (stacking) for low-noise data acquisition
- Multiple data presentation formats, including profile and colour pseudo-section
- Optional data inversion software providing in-field forward and inverse modelling capabilities
- Fast Fourier transform (FFT) function enabling characterization of data noise
- 320 GB data storage on internal hard drive; memory stick connectivity for data redundancy
- GPS compatibility, supporting GPS-assisted transmitter loop layout and graphical display of loop layout and receiver position; optional integrated GPS antenna

Specifications

RECEIVER SECTION

DISPLAY	10" colour touchscreen LCD
CHANNELS	1 channel
BASE FREQUENCY	0.3, 0.75, 3, 7.5, 30, 75 and 285 Hz, or 0.25, 0.625, 2.5, 6.25, 25, 62.5 and 237.5 Hz
DYNAMIC RANGE	16 bits minimum
SYNCHRONIZATION	Reference cable
DATA OUTPUT	RS-232 serial, USB and RJ45 ports
TRANSMITTER SECTION	
OUTPUT VOLTAGE	0 to 9 V, continuously adjustable, with internal 15 V battery
OUTPUT CURRENT	3.5 A with internal 15V battery

GENERAL

POWER SOURCE	Rx/Tx: Internal 15 V rechargeable lithium-ion battery Tx: optionally, up to four external 12 V batteries
BATTERY LIFE	8h continuous operation at 2 A output
OPERATING TEMPERATURE	-20° C to +50° C
DIMENSIONS	Rx: 10 x 32 x 40 cm; Tx: 8 x 32 x 40 cm
WEIGHT	Rx: 8 kg; Tx: 5 kg



3D-3M

INDUCTION COILS

Six induction coils are available, each most appropriate for certain depths and applications. For shallow resistivity soundings, the high bandwidth of the high frequency coils is needed for the rapidly changing early-time signal. Comparatively, for deeper soundings, or for measuring late-time signal from conductive ore bodies, the larger effective area of the low frequency coils amplifies the very low amplitude late-time signals to measureable levels.

When the stratigraphy of the survey environment is effectively flat-lying, a single component coil is generally appropriate. The response from sub-vertical structure, however, is three dimensional; in these environments, the measurement of all three components will result in an easier and more accurate interpretation. Both high and low frequency coils are available in both single component (1D) and three component (3D) versions.

Geonics induction coils are air-cored, rather than ferrite-cored, offering two significant advantages: most ferrite materials exhibit some self-response when subject to strong primary magnetic fields, which can unnecessarily add noise to the data. Second, ferrite-cored coils are long and thin in design which tends to make them sensitive to noise from wind-induced vibration; air-cored coils with "flat" geometry are much less sensitive to this effect.

FLUXGATE SENSORS

Some ore bodies can be so conductive that induced eddy currents decay exceedingly slowly, in which case voltage induced in an induction coil may be too small to measure. The actual magnetic field amplitude associated with such ore bodies, however, will be quite high. Overburden or other lesser conductors will produce relatively weak magnetic fields that decay rapidly leaving, by late time, only fields from the more conductive targets. For such circumstances, a three component (3D) fluxgate magnetometer sensor is available.

Specifications

EFFECTIVE AREA	HF Coil: 31.4 m ² HF-3D Coil: 31.4 m ² for each sensor LF Coil: 100 m ² 3D-3 LF Coil: 200 m ² 1,000 m ² (rigid) Coil: 1,000 m ² 10,000 m ² (flexible) Coil: 10,000 m ²
BANDWIDTH	HF Coil: 800 kHz HF-3D Coil: 500 kHz for each sensor LF Coil: 32 kHz 3D-3 LF Coil: 30 kHz 1,000 m ² (rigid) Coil: 3 kHz 10,000 m ² (flexible) Coil: 3 kHz 3D-3M Fluxgate Sensor: 3 kHz for each sensor
MEASURING RANGE	3D-3M Fluxgate Sensor: +/- 100 microTesla (μ T)



BH43-3D TDEM PROBE

In conjunction with a ground-based PROTEM system, the BH43-3D provides three-dimensional time domain electromagnetic data from boreholes. With a 500 x 500 m transmitter loop at surface, data can be received from boreholes to depths of 2.5 kilometres. (At developed mines, the transmitter loop can be laid out within the underground workings.)

The BH43-3D probe has three sensors that measure orthogonal components of decay. Measurement intervals are determined by the resolution required; along the hole, spatial resolution as fine as 1 m can be obtained.

The wide bandwidth of the probe, coupled with the excellent temporal resolution and large dynamic range of the PROTEM system, provides maximum diagnostic information and a high degree of rejection of powerline and other sources of noise.

The BH43-3D probe is available separately, or as a complete borehole system with cable, main winch, dummy probe, test cable and winch, and retrieval tools.

MAG43-3D FLUXGATE PROBE

MAG43-3D probe is an ideal tool for the survey of highly conductive targets such as nickel sulphide ore bodies. While such targets may produce very little decay to measure with an induction coil, strong secondary magnetic fields can be readily detected with a fluxgate sensor. As with the BH43-3D, measurements from depths to 2.5 km are achievable.

Specifications

SENSOR	BH43-3D: three orthogonal coils (one axial and two radial) MAG43-3D: three orthogonal low-noise fluxgate sensors
SENSOR AREA-TURNS PRODUCT	BH43-3D: 5,000 m ² for axial coil and 1250 m ² for radial coils (with amplification)
SENSOR BANDWIDTH	BH43-3D: 10 kHz for all coils MAG43-3D: 3 kHz for all sensors
PROBE ROTATION CORRECTION	Two orthogonal tilt meters with range from $\pm 1^\circ$ to $\pm 80^\circ$ (from vertical)
MEASURING RANGE	MAG43-3D: +/- 100 microTesla (μ T)
CONTROL BOX	Channel selection, impedance and gain matching network between probe and PROTEM receiver (normalizes sensor effective area to 100 m ² for all three sensors); includes VLF filter
POWER SOURCE	Rechargeable nickel cadmium battery sealed pack for 20 h continuous operation
CABLE	Two-conductor shielded; polyurethane jacket; Kevlar strength membrane; 5.6 mm diameter; weight: 40 kg/km; breaking strength: 500 kg
OPERATING TEMPERATURE	-30° C to +80° C
WEIGHT	BH43-3D: 9.5 kg; MAG43-3D: 4.7 kg Control Box: 1.5 kg
DIMENSIONS	BH43-3D: 3.8 x 234 cm; MAG43-3D: 3.8 x 138 cm Control Box: 22 x 13.5 x 8 cm



GEONICS LIMITED

1745 Meyerside Drive, Unit 8, Mississauga, Ontario, Canada L5T 1C6

Tel: + 1 (905) 670-9580 • Fax: +1 (905) 670-9204 • E-mail: geonics@geonics.com • Website: <http://www.geonics.com>