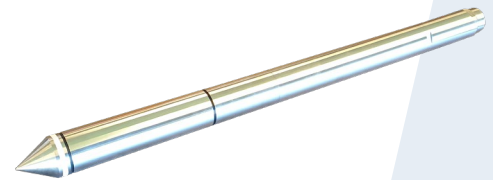


Geomagnetic Module (MagCone)

Introduction

A magnetometer is a scientific instrument used to measure the strength and/or direction of the magnetic field. The Earth's magnetic field varies from place to place for various reasons, such as inhomogeneity of rocks and the interaction between charged particles from the sun and the magnetosphere. A mass of ferromagnetic material creates a detectable disturbance in the magnetic field. This magnetic anomaly produces a weak alternating magnetic field that is picked up by the magnetometer, amplified electronically, and fed to the "GeoLogger" and subsequently recorded on a computer. Magnetometers are typically used in ground-based electromagnetic geophysical surveys (such as magneto-telluric and magnetic surveys) to assist with detecting mineralization and corresponding geological structures and the detection of buried or submerged objects.



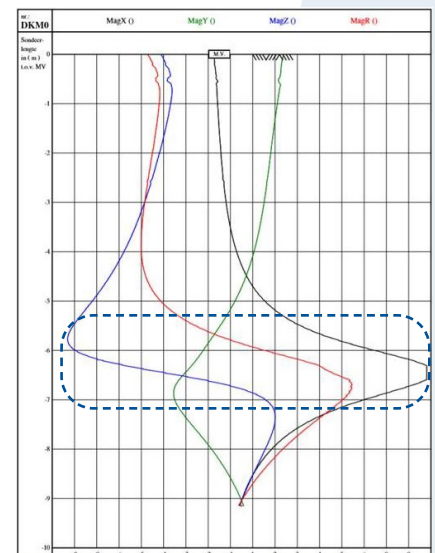
Geomagnetic Module

The Geomagnetic Module can either be equipped with a dummy tip or mounted on top of an electric S15CFI(P) (piezo)cone made of a high-grade non-magnetic steel. Due to its high strength and small diameter (44 mm), the module is capable of penetrating soils up to greater depths with relative ease.

When configured with a (piezo)cone the Geomagnetic Module can also collect CPT(U) data, such as cone tip resistance (qc), lateral sleeve friction (fs) and in-situ pore pressure (p) needed to produce soil profiles and pile designs simultaneously in one operation. This saves the cost of running two operations.

The Geomagnetic Module and (piezo)cone share the same CPT sounding cable for data transmission to the surface and fit directly on the GeoLogger data acquisition unit. The GeoExplorer data acquisition software fully supports the magnetometer and produces magnetometer test results graphed against depth in an Excel-format for further processing.

The Geomagnetic Module allows for tri-axial magnetometer testing for magnetic anomaly modelling. The magnetic field is measured in three orthogonal directions and a resultant is calculated as well. Furthermore, the gradient of the resultant will be calculated, which gives a much better indication of changes in the magnetic field.



As the magnetometer survey begins, the module containing the tri-axial magnetometer and, if mounted, the CPT(U) electric (piezo)cone is pushed into the ground by means of a CPT penetrometer rig. The Geomagnetic Module can detect magnetic anomalies laterally up to 2 metres distance so that each probe position clears a vertical cylinder of land up to 4 metres in diameter.

The Geomagnetic Module generates data from all three directions and transmits these signals separately to the surface, so that the anomalies can be fully modelled using geophysical software helping to define the source and character of any anomaly.

Possibilities and advantages

The Geomagnetic Module has two major advantages over other systems for magnetic anomaly modelling:

- In situ tests are done without pre-drilling or any other preparation
- It obtains both geotechnical and magnetic field data simultaneously in one single push

Since the magnetometer senses variations in the subsurface magnetic field materials and relays these variations to a geophysicist in real time, it is an excellent tool to identify metal targets to depths exceeding 20 metres in soft sediments. This high-resolution method has proved to be very suitable for:

- Unexploded bomb/ordnance surveys (UXB/UXO)
- Determination of the driving depth of foundation piles
- Determination of the length of sheet piles
- Determination of the position of retaining or tieback anchors
- Determination of the position of power cables

Advanced processing provides the option of producing a detailed 3D model of site hazards.

Technical Specifications

- Fluxgate sensor in XYZ direction enables to determine the position and orientation of an object
- Built-in bidirectional inclinometer in line with the XY sensors with a measuring range of +/-25° (accuracy better as 0.1°) for determination of the orientation of the magnetic field
- Non-magnetic housing
- "North" Marking on the exterior of the housing (Y-axis)
- Standard tapered thread on top for connection to the string of CPT sounding tubes

GeoExplorer data acquisition software allows the operator to enlarge/decrease the scale during testing such for optimum presentation of the graph.

Geomagnetic Module	
Measuring range	100,000 nT or 250,000 nT
Sensitivity	1nT
Accuracy	better than 0.5% of the full scale (FS)
Resolution	better than 5nT (10nT for the 250,000 nT version)
Noise level	less than 20 pT
Length of the magnetometer module (excl. cone or dummy tip)	350mm
Length in combination with a dummy tip	500 mm
Length in combination with a non-magnetic S15 type (piezo-)cone	750 mm
Diameter	44mm
Resolution in Z-axis direction	10 mm