

## Grad601 for UXO Surface Clearance

### Objectives

To locate magnetic anomalies in the ground that are associated with the presence of buried features including UXO (unexploded ordnance).

### Instrumentation

Grad601 magnetic gradiometer system, or Grad-01-1000L sensors mounted on a cart with separate data logger.

### Applications

Land clearance prior to development.

### Background

Many areas around the world have been subjected to conflict and heavy bombing. In Europe, UXOs from the first and second world wars are still commonly found in fields or on construction sites.

Before building work can begin on such sites, surveys need to be carried out to ensure safe working conditions and a sound foundation.

Work initially starts in the office, consulting records to establish the likelihood of the site having been subjected to bombing.

A surface survey is then performed. This is carried out using a magnetic gradiometer which will enable the detection of buried magnetic anomalies in the ground (e.g. UXO or archaeological features).

The survey may show that an area is free of obstacles; it may identify underground features that are unimportant or which can immediately be dealt with; or it may reveal features that merit further attention.

Depending on the nature of the development, a further survey for a deep search may be undertaken.

### Method

The Grad601 system is a magnetic gradiometer and requires adequate magnetic hygiene from the user. Once the user is magnetically clean and unlikely to present any risk of contamination of the measurement field, a quiet magnetic spot (a site where magnetic variations are not more than 1nT over a 1m<sup>2</sup> area, with the instrument always facing the same direction) needs to be located in order to set up the equipment. This procedure enables the instrument to be "zeroed", based on the local background magnetic field.

Surveys are conducted based on a grid (up to 40x40m, with spacing down to 0.25m x 0.25m), laid down over the area from which data is going to be acquired. Once acquired, data can be downloaded, processed and visualised by proprietary software as a map of the surveyed area.



Magnetic anomalies will be characterised by readings, either higher or lower than the surrounding field. (Usually it will be a combination of both a high and low over the same anomaly.) The intensity of the anomaly will be mostly dependent on the depth, orientation and size of the object.

Once the locations of the anomalies are determined, clearance work by expert personnel can commence if necessary.

For larger surveys, an alternative method is to mount individual Grad-01-1000L sensors on a mobile platform, pulled by a vehicle. The platform can accept more than two sensors. Here different data logging capabilities are required.