

# The Applications of Bartington BSS-02B Sonde

## Introduction

Magnetic susceptibility is an important characteristic of rocks and minerals. It changes according to the materials' magnetic properties (dia-, para-, ferromagnetic...) and will range from negative to highly positive values.

Bartington Instruments' MS2 system allows susceptibility measurements of soils to be made, either in a laboratory or in the field. We also provide core-logging sensors that permit sediment and stratigraphic correlation on cores.

However, in mineral exploration, boreholes are usually drilled in a destructive manner, and therefore it becomes difficult to do any correlation from the cuttings. A borehole susceptibility log will thus provide useful information regarding the stratigraphic layout of the rock formation. Several geophysical tools are available for borehole logging, including magnetic susceptibility probes that will provide information regarding the type of material present, its quantity, and in some cases its quality.

## The Bartington BSS-02B

The BSS-02B sonde provides the possibility of borehole logging. It is a highly sensitive tool that can resolve susceptibilities down to  $1 \times 10^{-5}$  CGS ( $10^{-4}$  SI) and can operate to depths of up to 6000 meters. The probe is calibrated for 50 mm boreholes, which suits the small diameter wells drilled for mineral exploration, but can also operate in larger holes, provided that the sonde is decentralised within the hole. The sonde can resolve strata down to 25 mm with a rate of 20 measurements a second, giving a theoretical maximum logging rate of 0.5 m/s. The sonde is fitted on the logging system and requires a pressure enclosure for the circuitry part, as well as a data acquisition system for collection of data.

## BSS-02B applications

The BSS-02B sonde is aimed at the mineral exploration market. Magnetic susceptibility measurements are used to discriminate layers of economical importance for several key ores.



- **Iron oxide exploration:** due to the relatively high susceptibility of iron ore and some iron oxides, layers containing large quantities of iron ore will display extremely high magnetic susceptibility. Magnetic susceptibility can also allow an assessment of the iron content of the ore.
- **Uranium exploration:** Uranium has an extremely low positive susceptibility. Abundant quantities of uranium ore will be displayed by an extremely low susceptibility in a susceptibility log. However, other methods need to be used in combination with magnetic susceptibility to discriminate the nature of the rocks present.
- **Prospecting for Diamonds:** Diamonds are found in magmatic rocks, either Kimberlite or Lamproite. These rocks can present a wide range of geometrical structures such as pipes, sills or dykes. Due to their mineralogy (very high quantities of magnetite and titanomagnetite crystals), they will display a high magnetic susceptibility. Once an area of interest has been delimited, drilling and

well-logging will provide the information regarding the exact location of the rocks in the ground. Magnetic susceptibility using the BSS-02B will be among the tools used for the delineation of the strata containing diamonds.

- **Metals associated with iron oxides (Ti, Al, Co, Ni, Zn, Mn, Co...):** a wide range of metal ores are found with iron ore deposits.

As an alternative, for more general purposes, the BSS-02B sonde can be used as a stratigraphic tool and enables detection of redox front or alteration front, important in mineral exploration. Some ore deposits are associated with alteration and weathering of the existing material.

The BSS-02B is a useful tool with great potential for use in mineral exploration. It is used by several world leading manufacturers of borehole logging systems, but can also be easily adapted for a custom-made logging system, giving the customer adaptability with their existing tools.

