OPERATIONS MANUAL

JH-8a Magnetic Susceptibility Meter

Issue 2.0 May 2003

CONTENTS

Principles of Operation

The function of the JH-8a is based on electromagnetic induction. There are two coils placed orthogonally to each other in the detector head, which is mounted in the bottom of the instrument case. In non-magnetic environment the voltage induced from the transmitter coil to receiver coil is zero. When a sample is brought near the coils, a voltage, which is proportional to the magnetic susceptibility of the sample, is induced into the receiver coil. A phase-locked amplifier detects this signal and after rectification it is used to drive an analogue panel meter, which is thermally compensated and directly calibrated for susceptibility.

Operation Instructions

To make a susceptibility measurement using the JH-8a, the procedure is as follows:

1. Switch the instrument on by turning the rotary switch on the right hand side clockwise. Battery voltage can be checked in "B" position where the needle of the panel meter should rise above the red mark on the scale. Choose the most suitable of the four measuring ranges.
2. Check zero setting while the instrument is kept away from metal objects. Sufficient distance is 30 –50 cm. Adjust the panel meter to zero by turning the potentiometer on the left hand side of the unit. Zero adjustment is usually needed only when range 1 or 2 has been selected.

WARNING

Care should be taken to avoid errors caused by metal objects in user's clothes eg. buttons, belts, etc., especially when using ranges 1 and 2.

3. Press the bottom of the JH-8a against the material to be measured and the susceptibility value can be read from the scale of the panel meter. The location of the most sensitive point of the detector head is marked by a red dot.

WARNING

The low signal frequency (1000 Hz) and phase sensitive receiver circuit usually eliminates the influence of electric conductivity in the sample. However, very good conductors, such as ***Aluminium Core Trays****, can give erroneous values (negative readings).*

4. To replace the battery, the aluminium cover with the range information needs to be removed by unscrewing the two screws.

Calibration

Calibration is done for a half-space, which is convenient when measurements are done on outcrop. When other samples are measured, readings should be multiplied by the following approximate correction factors:

Sample	Multiplier
Ø 42 mm. Drill core	2.0
Ø 37 mm. Drill core	2.1
Ø 32 mm. Drill core	2.3
Ø 22 mm. Drill core	3.0
Rock Sample (fist size)	2

The length of drill cores should be 10 cm. or more.

Application Hints

1. Because of the continuous display of susceptibility, JH-8a units can be moved on the surface of an outcrop or along drill-cores to detect magnetized zones or to choose measuring points representing typical susceptibility values.
2. The red dot area can be used to observe susceptibility differences between mineral grains in coarse-grained rocks.
3. Setting the zero to the right end of the meter scale and observing the negative meter deflection can make qualitative conductivity comparisons between very conductive rock samples.
4. Because of the high sensitivity of the instrument, magnetite-hematite alteration zones can be followed even in weakly magnetized rocks.

Susceptibility

For an isotropic substance, susceptibility is a quantity that depends on the substance itself and on the magnetized field. The susceptibility of an anisotropic substance is a symmetric tensor.

The JH-8a is designed to measure the magnetic susceptibility of rock samples. Rocks are mixtures of different minerals, and hence, their magnetic properties depend on those of the component minerals.

The mineral that largely governs the magnetic behaviour of a rock, and which accounts for most of the susceptibility observed, is magnetite. The susceptibility of the magnetite depends on several factors, such as the intensity of the magnetizing field, the chemical composition of the magnetite and the grain size. Susceptibility can, however, be applied to determine the magnetic abudance, provided that local dependence between susceptibility and magnetic abudance is know.

In the JH-8a the sample to be measured is placed in a weak source field that does not saturate the sample. The so-called initial susceptibility obtained is independent of the magnetic field.

Susceptibility is a dimensionless quantity. The different systems of units are related to each other as follows:

$$K\,[SI] = 4\,\prod K\,[c.g.s.]$$

Technical Specifications

Control Knobs

1. 10-turns, long life potentiometer for zero adjustment on the left side of the instrument case.
2. 6-position range switch.

Position

0	Off	
B	Battery test	
1	Measurement range 0-100	x 10^{-5} SI
2	Measurement range 0-1,000	x 10^{-5} SI
3	Measurement range 0-10,000	x 10^{-5} SI
4	Measurement range 0-100,000	x 10^{-5} SI

Resolution

The scale of the panel meter is divided into 20 parts, which gives 5 x 10^{-5} SI resolution on the most sensitive range.

Current Drain

8 mA

Battery

9V battery, which is located behind the aluminium cover containing the range information. This can be either carbon-zinc, alkaline or rechargeable.

Dimensions	190 x 93 x 31 mm
Weight	0.4 kg.
Accessories	Leather Carrying Case
Optional Accessories	Hard Plastic Carrying Case

The above Technical Specifications could change without notice.

Further Information

For further information regarding this product, either technical or sales, please contact: