

Instruction MFM-1

With the appearance of the book "De magnets" from William Gilbert began around 1600 the scientific investigation of the geomagnetism. The magnetic field is missing in the natural experience treasure of the human. He owns neither sense organ, with which he can perceive magnetic fields, nor influences that him surrounding magnetic field of the earth in any processes in his experience world in similarly striking way, like the electric field during a storm does. The fundamental experiences come all by observations, which we have attained with the help of specifically produced instruments (compass, Magnetometer).

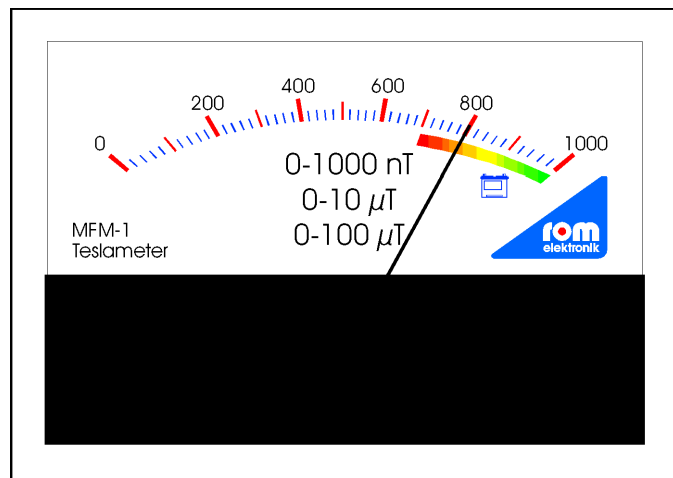
The ROM - Electronic Magnetometer MFM-1 was developed primarily, to record anomalies the magnetic field of the earth. Particular attention was put on the analogous measurement display by means of pointer instrument. It was dispensed consciously with a digital advertisement. Digital advertisements are often heavy to read, especially at not constant measurements and cheating a measuring precision, which is not always available.

In the applied Geomagnetik using Magnetometer for the measurement of the intensity (the amount) of the total field have found F (total intensity) the most extensive dissemination. Determined is the anomaly field

$$\Delta F = F - F_0$$

ΔF is in good approximation the projection of ΔF on F_0 .

The magnetic anomaly field has its causes in local and regional differences of the magnetism of the rocks and other effective materials.

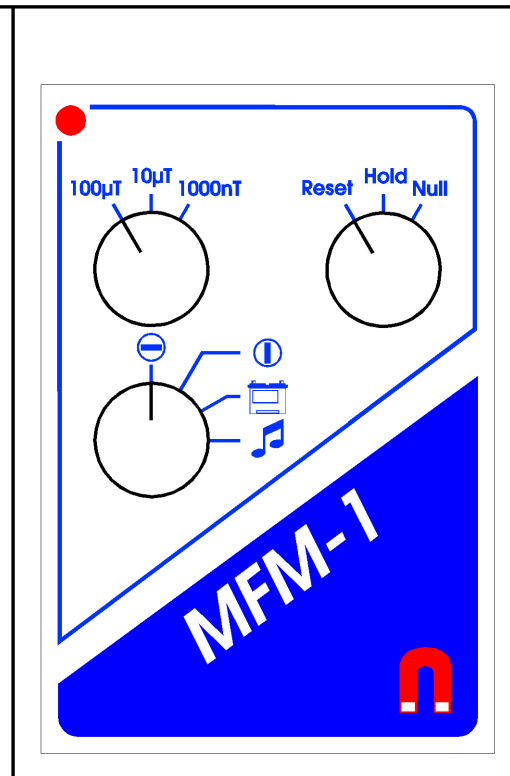


1. The magnetic field

The unit for the magnetic field intensity H is A/m (amp per meter)! After introduction of the SI-Unitsystem and in the daily use has prevailed the statement of the measurements in the magnetic flux density B in "Tesla" (T). The magnetic flux density conducts itself from the magnetic field intensity and the permeability of the medium (air, vacuum, iron):

$$B \approx \mu_0 H$$

In practice, flux densities of some Tesla only are found in the environment of electromagnets (computers tomograph, crane magnets, etc.). magnetic field of the earth for instance has 40 - 60 Mikrottesla (abr. μT), according to geographical place on the globe. In the building biology deviations from 2 μT (=2000 Nanotesla, nT) are just still acceptable anomalies.







2. Preparations

The MFM-1 requires a customary 9 volt battery for the power supply. The battery compartment is found on the reverse. Be certain, that a fresh 9 volt - battery is found in the battery compartment and the connection is correctly.

You join the sensor with the anticipated socket at the front page. The plug has a lock, which prevent the plug for accidental removes.

The MFM-1 is equipped with three buttons. There is a button for the measuring area, the kind of the measurement (absolutely or relatively) and a button for switching on.

Meaning of the Symbols

Symbol	Meaning
	Off
	On
	Batteriy Check
	Sound is changing with measurement

Die Funktionen des Einschaltknopfes sind weitgehend selbsterklärend. Schalten Sie das MFM-1 ein, indem, Sie den Knopf in die entsprechende Position drehen.

Ist der Meßbereich "100 μ T" gewählt, so sollte jetzt der Zeiger im Instrument zwischen "300" und "500" stehen. Dies entspricht ca. 30 μ T bis 50 μ T. Sie müssen sich bei den angezeigten Zahlen ein Komma vor der letzten Null denken.

3. Sensor

As sensor is used a one-dimensional highly sensible fluxgate - sensor. The measurement transducer in the sensor has the task to convert the magnetic field in an electrical signal. The sensor is only sensitively to magnetic fields in direction of the longitudinal axis. Usually the sensor is held at floor measurements like a perpendicular at the cable. Pay attention to it, that during the measurement the sensor does not move. Movements of the sensor will be registered as changes in measurements.

4. Measuring areas

With the button for the measuring areas you select it for your aims. There are three areas at the disposal: 0-100 μ T, 0-10 μ T and 0-1 μ T (and/or 0-1000 nT). It is recommended beginning always by the largest measuring area and then the next smaller to avoid a possible damage of the sensor or Instrument.

The scale of the instrument extend from 0 to 1000! This is correct for the smallest measuring area 0-1000 nT. At the other measuring areas you must yourself always think a comma before the last zero or two zeroes, so that your reading is correct.

Example:

Range	Reading	Value
100 μT	440	44 μT
10 μT	820	8,20 μT
1000 nT	260	260 nT

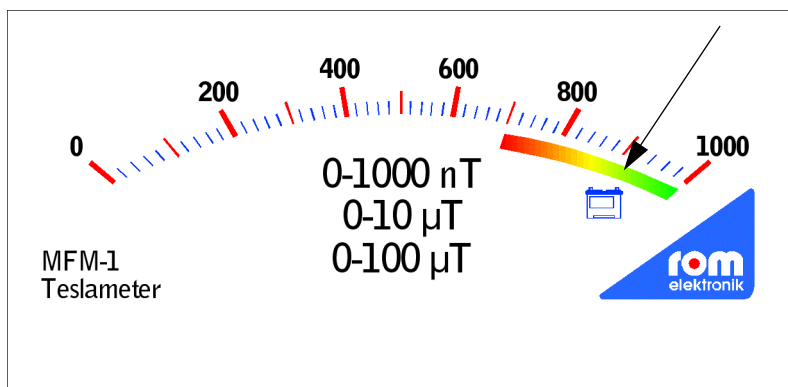
5. Measuring kind

With the button for the measuring kinds measurement can be chosen between absolutely and relatively. For measuring the absolute value the button must stand in the position "Reset".

Measuring relatively are meaningful, if you would like to measure only the deviations of the magnetic field. To this the desired measuring area is chosen first. In the measuring areas 10 μT and 1000 nT the pointer will be at that argue plot of the instrument. Now the measuring kind switch is brought in the position "Null". The pointer of the instrument should return on the value 0. If the pointer and the sensor has calmed down, one controls in the position "Hold". Now the deviations of the magnetic field are measured only. These "zeroeing" can be necessary to repeat, since it can come with the time to inevitable drifts. These lead to it, that the pointer with the time takes in a position diverging from zero, although the sensor is not moved.

6. Battery control

Frequently the condition of the battery should be checked. If energy is too little in the battery available, can be larger measuring error the consequence. To the battery control one controls the on button in the position "battery". The pointer of the gauge should indicate between 800 to 1000 (accordingly 80% to 100%, yellow - green area). If the pointer indicates essentially less, the battery should be exchanged for a fresh.



7. Recommendations

	no Anomaly	weak Anomaly	strong Anomaly	extreme Anomaly
Flux density deviations in μT	<1	1-2	2-10	>10

8. Technical data Daten

Meßbereiche:	0-100 μ T, 0-10 μ T und 0-1 μ T (\pm 5% bei 20 °C)
max. Meßbereich:	100 μ T
Nullpunktdrift:	< 2 nT/K
Temperaturbereich	-40 - +85 °C
Stromversorgung:	9 Volt-Blockbatterie
Maße und Gewicht:	Anzeigegerät 250 x140 x 60 mm; ca. 640 g Sensor 135x25 mm; ca. 170 g

1 gamma equals 10^9 Tesla = 1 Nanotesla = 1 nT

$$\begin{aligned}
 1 \text{ nT (Nanotesla)} &= 1 \gamma (\text{gamma}) \\
 1 \text{ G (Gauß)} &= 10^5 \gamma = 100000 \gamma \\
 1 \text{ A/m} &= 4\pi \times 10^{-3} \text{ Oe (Oerstedt)} \\
 1 \text{ T (Tesla)} &= 10\,000 \text{ G (Gauß)} \\
 1 \text{ mG (Milligauß)} &= 0,1 \mu\text{T} = 100 \text{ nT}
 \end{aligned}$$

Measuring	Symbol	Unit
Magnetic force	H	A/m
Magnetic flux density or Induction	B	Tesla (T)=Vs/m ² ; 1T = 1 Wb/m ²
Magnetic Permeability in Vakuum	μ_0	$\mu_0 = 4\pi \times 10^{-7} \text{ Vs/Am}$