

Magnetic Field Sensor „UNIT“



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Magnetic Field Sensor „UNIT“

For the field of UFO research, we have developed a device that is a compromise between technical feasibility and affordability. It is based on the desire of many involved in field research on UFOs to have a small device that operates both in mobile and stationary mode and that detects and displays, simply and well, magnetic field variations.

Technical Data:

Dimensions:	130 x 65 x 25 mm, with battery compartment for 9V batteries
Voltage:	9V - 18V DC (9V battery life about 12 hours)
Current usage:	20 mA at rest, 40 mA when an alarm message occurs
Power supply jack:	Suitable for standard hollow plug 5.5 / 2.1 mm, regardless of polarity
Display::	LED for operating / data transfer
Switch:	Selection of operating mode; Setting of the alarm sensitivity in 10 control steps
Data interface:	RS232, transmitting only, 9600:8:N:1 (9600 baud, 8 bits, no parity, 1 stop bit) Here in 'crop circle mode' a small speaker or headphones may also be attached - Connection is short-circuit-proof
Alarm:	Alarm: Internal buzzer; alarm relays for the external data message
Alarm contact:	Floating working contact, according to manufacturer loads with 1A Suitable for switching from camera, horn, etc.
Sensor-1:	KMZ10A: the magnetic field measurement is based primarily on magnetic fields with Z-component (vertical).
Sensor-2 (Optional):	optional instead of Sensor-1: fluxgate; the magnetic field measurement is carried out primarily for magnetic fields with Y component.. This sensor is provided only for an additional fee.

What is the difference between sensor-1 and sensor-2?

- Both sensors are approximately equally sensitive to magnetic field changes.
- With the KMZ10A, measurements can only roughly be quantitatively associated with a change in magnetic field, because the component tolerances are relatively large.
- The fluxgate is a precise component, which is absolutely reliable in converting magnetic field changes to voltage values. Therefore an accurate measurement of the magnetic field strength is possible.

Optional Accessories:

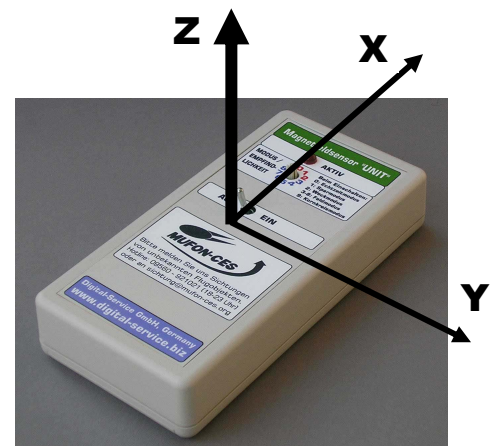
- external battery holder
- car connection cable
- RS232 connection cable (easily done)

Data software for the PC:

The software and further updates are accessible for free download; for the latest information, see:

www.digital-service.biz/Magnetfeldsensor-UNIT.htm

The analogue magnetic field strength is digitalized using an 8-bit A/D converter, which for a device in this price category is quite handy.



Function and operation

- Turns on and off with the **toggle switch**.
- The "active" **LED** indicates whether the device is switched on, and flickers during data transmission.
- The **selector switch** has two different functions:
 1. **Selection of the operating mode:**
The position of the selector switch before switching on sets the operating mode of the device. A detailed explanation of the various modes of operation is given on the next page.
 2. **Regulation of sensitivity:**
0 = lowest sensitivity
9 = highest sensitivity

At position 0 it is possible, even whilst driving a car, to leave the device switched on.
Strong magnetic field changes are still recognized as an alarm, despite the movement of the car in the Earth's magnetic field.



Fig. 2: Front view

Important User Information for sensor type 1:

For sensor-1, due to its functional principle it can happen that close proximity of strong magnetic fields (such as a magnet too close to the housing) may result in a kind of "blockage" of the sensor. I.e., in this state only very strong magnetic field changes are detected.

This condition is recognized as follows:

Without PC: With switch at position 6, lift the device gently on one side. If no alarm is triggered, then repeat the procedure with the switch at its 7th position. If there is still no alarm, then the sensor is in a dysfunctional state.

With PC: This error may be recognized by the value of the magnetic field strength. If there is no magnet in the vicinity of the device, then the quiescent value should be about 100. If this value is significantly different to this, e.g. under 50 or over 240, then this is a clear indication of the "blockage" of the sensor.

This problem is fixed as follows:

- Brush the housing quickly with a magnet.
- Now re-test. If necessary, repeat the procedure several times.

Selection of operating mode

The mode is selected, with **the device initially switched off**, when the switch is set in the desired position and then the device is switched on. When the device is on, the switch may only be used to adjust the sensitivity.

Description of the operating modes

Real-time mode (switch position 0)

In this mode, data is continuously (about 5 times per second) sent. Alarms are only reported via the data interface.

Buzzer and relay contact are disabled, while audible alarm signals may be generated by the PC program.

Usage: When the collated measured data is to be stored, for example in stationary 24-hour operation. A lot of data are, however, produced even without alarm signals.

Saving mode (switch position 1)

In this mode, selective output is delivered:

If no alarm is pending, a line of data is sent once per minute to the PC. At each alarm, a stream of real-time data begins (about 5x per second), which is terminated after a minute, unless there is a new alarm.

Buzzer and relay contact are disabled.

Usage: When only the most important data has to be transmitted and stored, for example, if storage space in the connected data reception equipment is limited.

Wake-up mode (switch position 2)

Here, also, a selective data stream is provided, as in saving mode.

When an alarm occurs, buzzer and relay contact are permanently on, until the device is turned off.

Usage: If one wants a wake-up call from the device, or to permanently switch on an additional external device (video camera, etc.).

Field mode (switch position 3 to 8)

Here, also, a selective data stream is provided, as in saving mode.

Also, the buzzer and relay contact are switched on for 1 second when an alarm occurs.

Usage: During mobile investigation, or when an additional external device (video camera, etc.) should receive a switching pulse.

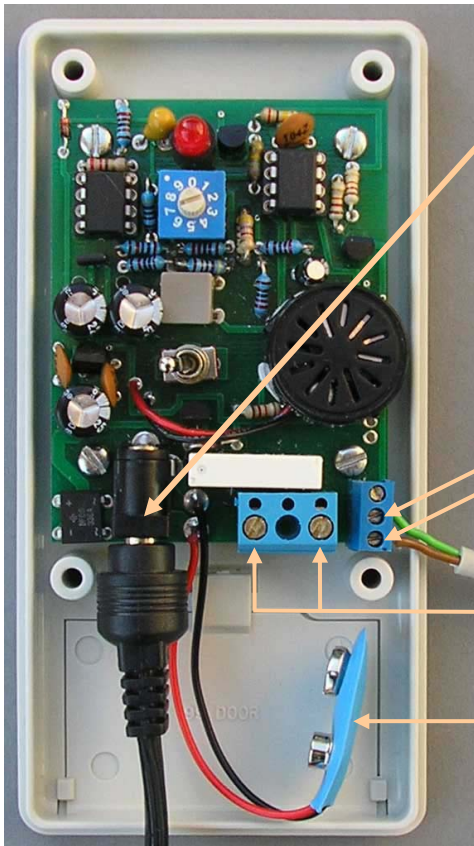
Crop circles mode (switch position 9)

In this mode, the serial output is used to issue an acoustic signal to a headphone or small high ohms speaker. Data can therefore not be transmitted, and the selector switch has no function.

The frequency of the signal changes with the measured magnetic field strength.

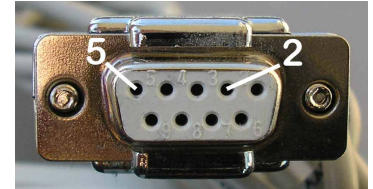
Usage: In mobile deployment, when one must investigate without a PC, to determine if magnetic anomalies are present.

Connectors



Jack for external power supply, 9-18V DC. (AC adapter, car cigarette lighter, battery holder, battery, etc.)

Right:
Pinout of a 9-pin connector for a RS232 cable



Serial Interface
TXD (plug: pin 2)
MASS (plug: Pin 5)
or: Small speakers / headphones
(only useful in mode 9 = Crop circles mode)

Relay switch
Floating contact, switched on when alarm for about 1-2 seconds.

9-Volt battery connector
Such a battery is a continuous operation of at least 12 hours

The serial interface (RS232, V24)

The RS232 interface is used to connect the magnetic field sensor to a PC or another device equipped with this interface for the purpose of transferring the field strength measurements and the amount of field strength changes and alarms. The reception of data or commands with the magnetic field sensor is not foreseen, so only two cores of the data cable need to be provided.

If your PC does not have an RS232 interface, but only a USB port, then you can interpose any USB-RS232 converter.

In Mode 9 (Crop circle mode) this interface also serves to connect a pair of headphones.

Data format

The lines of data transmitted via serial port do always have one of these two formats:

Heading	Format	Example
routine message	MMM CCC S	100 117 04
alarm	MMM CCC S A	100 165 04 A

- MMM (0-255) = Magnetic field strength
- CCC (0-255) = Magnetic field change
- S (0-9) = Selector switch position at the time of measurement
- A („A“) = Alarm signal

Remarks

In each data line, the magnetic field sensor transmits measurement data on two separate channels:

Magnetic field strength:

These values are directly proportional to the strength of the surrounding magnetic field (mainly the Z-component in sensor-1), and so give the actual measurement data. The measurement range of the sensor is mapped to the value range of 0-255. Since the device is not calibrated and the component tolerances of the sensor component are relatively high, though magnetic field changes relative to the earth's magnetic field may be clearly distinguished, the device should not, however, be understood as a measuring device in the strict sense. This is because it has primarily been designed with alarm signalling in mind.

(Calibration in a given magnetic field, e.g. in a Helmholtz coil, would be very expensive and would set the price astronomically high.) A significant increase in accuracy can, however, be achieved using sensor-2 (fluxgate) instead of sensor-1. This has a resolution of 1 μ T. (Sensor-1 has a resolution of about 300 nT, but because of component tolerances this varies from one device to another).

Magnetic field change:

Because the magnetic field sensor "UNIT" uses only an 8-bit resolution D/A converter, it is not possible to use very small magnetic field changes to trigger alarms. Therefore, the device uses an electronic trick for higher sensitivity levels (5-9): The voltage delivered by the sensor is, in addition to direct analysis, used in a second way by additionally amplifying and converting it to an electronic signal which is more proportional to variations in, rather than the absolute strength of the magnetic field (differentiation) - so the faster the magnetic field changes, the stronger the signal. It thus serves only to achieve higher sensitivity and is not intended for quantitative analysis, for which it is thus not particularly suitable. However, it is still provided, as it is possible to use it for qualitative assessment of alarm signals: When considering magnetic field strength and magnetic field change one can make a statement as to whether the alarm is generated by a strong, or a small but fast, magnetic field change. If one sees e.g. a small change in the channel "magnetic field strength", while there is a strong response in the channel "magnetic field change", the alarm indicates in this case a small but fast magnetic field change.

Tips for practical use

General Note: The electronics is temperature-sensitive. This means that rapid changes in temperature (cold draught) cause a false alarm. This effect normally happens, however, only when the housing cover is removed and the electronics is exposed.

Stationary operation in the house

The power supply should be via a mains adapter, or better via rechargeable battery. As a guide, the sensitivity in sensor-1 is set to position 6, and to 2 in sensor-2. In this way, we observed no false alarms for several days (except sometimes at night, but without apparent reason). Movements of iron or magnets in the vicinity are detected.

Mobile applications in the car

The power supply is via the cigarette lighter. The sensitivity is set in sensor-1 to position 3, and to 2 in sensor-2. When crossing bridges or when driving on the motorway, there are sporadic alarm messages. With a lower sensitivity these notifications will also not be evaluated.

Depending on the setup of the car's electronics, there occur during the journey or when power consumers are switched on or off spikes in the electrical system, which can lead to false alarms. If you want to exclude these, operate the device with a 9V battery, rechargeable battery or external battery holder.

Mobile use in crop circle mode

In this mode, the magnetic field sensor is used just as a metal detector is used. Any change in the magnetic field causes a frequency change. Since the device could not yet be tested in real crop circles, as yet no statement can be made as to whether the device works better horizontally or vertically. In any case, a change of direction of the magnetic field vector will give a stronger or weaker change in pitch. Field reports are always welcome!

Walking through a crop circle

- Connect speakers or headphones, switch to position 9, and then switch on.
- Hold the sensor horizontally and steady at waist height; neither tilt nor rotate.
- Walk slowly, in a straight line, from the edge to the centre of the crop circle. Curved paths are to be avoided - changes in the Earth's magnetic field direction always generate a pitch change!
- If there's a pitch change to be heard, then this implies a magnetic field change, and it is useful to connect a laptop instead of the speaker.
- Turn device off, set switch to position 0 (real-time mode), and then turn the device on again.
- Repeat walking through the crop circle as indicated above, but with a laptop.
- Repeat, starting ideally from several different points on the edge of the crop circle.



Introduction

The program **MagSensUNIT** was created in order to incorporate measurement data, sent by magnetic field sensor "UNIT" via the RS232 interface, on a PC running Windows in order to visualize it and to save it in text format (log files) or image files (screenshots).

The software is intentionally very simple and kept easy to maintain, yet it retains the most important functions for optimal operation with the magnetic field sensor.

This program is freeware and may, in its unmodified form, be disseminated as one wishes. A guarantee that the program is error-free or suited to a specific purpose may not be given. No liability can be accepted for damage resulting from use of the program.

Installation

- Open a **new folder** (name not important) on your PC.
- Unzip the ZIP archive file **MagSensUNIT-V1.01.zip**, detaching the files to the new folder.
- The program **MagSensUNIT-V1.01.exe** in this folder is now ready to run!

Operation

Commissioning:

- Connect the magnetic field sensor to a free COM port.
- The software requires the availability of at least one V.24 or RS232 port. If your PC does not have one, you can also buy a RS232-to-USB converter and install this in advance.
- Start the program **MagSensUNIT-V1.01.exe** by double-clicking.
- Select in the drop-down menu (bottom right) the COM port on your PC, to which the magnetic field sensor is connected, and click on the option "INIT". The drop-down menu and button then disappear.
- The program is now active and evaluates the incoming data.

Windows:

- The incoming data is graphically displayed in the **graphics window** (black background region). The X-axis (0-2000) shows the measured values and the y-axis (0-255) the signal strength. The data from Channel 1 (magnetic field strength) are yellow and the data from Channel 2 (magnetic field change) red.
- The **data window** (above right) shows the received data records in their original format. (A counter which counts incoming records from program start is located in the lower right hand corner of the program window.)
- In the **alarm window** (bottom right) appear date and time of the alarms reported by the magnetic field sensor.

Controls:

Löschen (Clear): With this button located above the alarm window, alarms shown in this window may be deleted. The alarm log file, however, remains intact.

Screenshot: With this button you can create a screenshot file, i.e. a picture (JPG format) that shows the measurement data window of the program. This file is stored in the directory in which the program is located. The name of the file consists of date and time of production time.

Example: 20080625_164011.jpg: This screenshot was created on 25.06.2008 at 16:40:11 o'clock.

Alarm tone: With this function, the program gives an alarm signal for each alarm reported by the magnetic field sensor. For this, the **alarm.wav** file in the program folder is played. There are other *.wav files in the package that you can use. To change the sound to suit your preference, you need only replace file alarm.wav by any other wav file - either by one from the package or by, e.g., a self-made one or one from some other source. The files should not be too long as they are loaded with each alarm, which may produce delays whilst playing.

Auto Screenshot: Enabling this feature means that whenever the graphics window is completely filled with new data (this is the case after 2000 records), an automatic screenshot file is saved in the program directory. The name of the file is as in manual screenshot.

Log files

All data received will always be automatically written into text files in the program folder and are then there for future evaluation. They may be viewed with any available text editor.

IMPORTANT: In order to later assign an exact date to events, you should check whether the system date and time on your PC or laptop are set correctly!

Alarm log file:

The file **alarm.txt** is created at the first alarm detected by the magnetic field sensor. All succeeding alarms are also stored in this file. The storage of the alarms is in plain text. Date and time of the alarm are filed with an accuracy of one second, as in the alarm window. Sample line:

23.06.2008 18:13:35

Data Logs:

For each program start, a new data log file will be created in the program folder in which the incoming magnetic field sensor data is written, for as long as the program runs. To be able to assign the measurement periods to the Logs, the file name includes the date of creation, in the following format: **LOG_YYYYMMDD_hhmm.txt** with YYYY = year, MM = month, DD = day, hh = hour, mm = minute.
Example: LOG_20080625_1737.txt was created on 25.06.2008 at 17:37 clock.
To ensure that the logs do not become arbitrarily large, every hour a new one is begun.

Format of the data log files:

Each line of the log contains a floating point number, which contains the recording time in coded form, as well as the data received by the magnetic field sensor. Here is a sample line:

39528.6232614 160 97 7 0

In general:

D.T M1 M2 P A

D.T date and time:

D the part before the comma is the uniformly increasing day number (1 is the 1/1/1900)

T the part after the comma contains the time as a fraction of a day:

E.g. 0.0000000 = 00:00 a.m., 0.500000 = midday, 0.750000 = 06:00 p.m., etc.

The purpose of this format is to associate every record with a point on a decimal timeline, which with our usual sense of time ordering is difficult to associate (365 days per year, 24h per day, 60 minutes per hour...). The floating point format allows the data to be directly transformed by standard software (eg Excel) into charts, because Excel stores dates and times in the same format. Date and time can therefore be easily calculated:

Date: Copy D to an Excel cell and format it as a "date".

Time: Copy "0.T" in an Excel cell and use the cell format "time".

The second value is rounded off. This rounding can unfortunately not be turned off - whether the seconds are rounded up or down can thus not be determined. If one wants to know exactly, multiply 0.T by 86400 (86400 is the number of seconds a day) and then one has the total number of seconds in the time value. From the part before the decimal point, determine the number of hours, minutes and seconds (left as an exercise to the user ☺). The decimal part is the fraction of a second.

The above example, after this conversion, gives: 21.03.2008, 14:57:29.78496 o'clock..

M1 measurement magnetic field strength (0 to 255)

M2 measurement magnetic field change (0 to 255)

P position of the selector switch on the magnetic field sensor (0 to 9)

A Alarm (0 or 1)

Instructions for Use

For a continuous data recording, select **mode 0 ("real-time mode")** on the magnetic field sensor, since the sensor makes no alarm sounds or switching signals in this mode, (which otherwise interrupt the data transfer for about 1 second each, to hide the resulting disturbances) . To nevertheless receive audible alarm signals, select the "alarm tone" option of the program.

If one wishes to significantly reduce the amount of data recorded, select **mode 1 ("low data mode")** in which only the most important data is transmitted. The remaining modes are less suitable working on a PC. (For details see documentation on the magnetic field sensor).

Are the price quotation in €

The conversion into foreign currency is carried out to the current price.

On a delivery to the EU area €20 are charged to transportation costs in addition.

On a delivery in the rest of the world €30 are charged to transportation costs in addition.



Magnetic field UNIT with sensor KMZ 10 A and plug-in ac-adaptor **140.-- €**

Data CD with Program for the data note and current documentation

Magnetic field UNIT with sensor Fluxgate and plug-in ac-adaptor **260.-- €**

Data CD with Program for the data note and current documentation



RS 232 data cable **20.-- €**



Piezo loudspeaker **20.-- €**



USB power supply **50.-- €**



Motor vehicle power supply **9.-- €**



Battery holder stand type **20.-- €**



Battery holder great **20.-- €**

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