English

EnviroMentor

Magnetic Field Meter MM-1

user instructions

CE

Contents

1 Introduction

Measuring instrument MM-1.

Thank you for buying a Magnetic Field Meter MM-1 from EnviroMentor AB.

The equipment comprises:

- MM-1, measuring instrument for triaxial measurement of magnetic alternating fields
- User instructions
- Case
- Calibration document
- Interface cable
- 9/25 pin adapter
- CE certificate

MM-1 measures magnetic alternating fields and presents the reading on an LCD. The reading is updated every second. The instrument measures an RMS value of the magnetic fields in the X, Y and Z directions, irrespective of the direction in which the instrument is pointing in relation to the magnetic fields.

MM-1 transmits the readings via the RS232 port. The values can be received by a computer with communication software for further processing in a calculation program.

You can use MM-1 whenever you want to measure magnetic fields, such as from electrical installations, power cables, VDUs, computers and other electrical equipment in the office, industrial and home environments.

Note that some equipment causes magnetic alternating fields that are outside the instrument's frequency area.

2 Technical data

Measurement range	0.05 µT–100 µT
Accuracy	±10% ± 0.05 µT
Frequency range	30 Hz–2 kHz (-3 dB)
Measurement method	Triaxial, RMS effective value
Dimensions, L x W x H	152 x 83 x 34 mm
Weight	260 g (incl. batteries)
Batteries	2 x 1.5 V LR6
Communication	Serial RS232, 9600 baud, 8 bits, no parity, no handshake
Power consumption	25 mA during measurement and 45 mA during transmission
Temperature range	-10 to +50 °C
Other	Microprocessor, 10 bit A/D-converter, three-dimensional sensor

CE

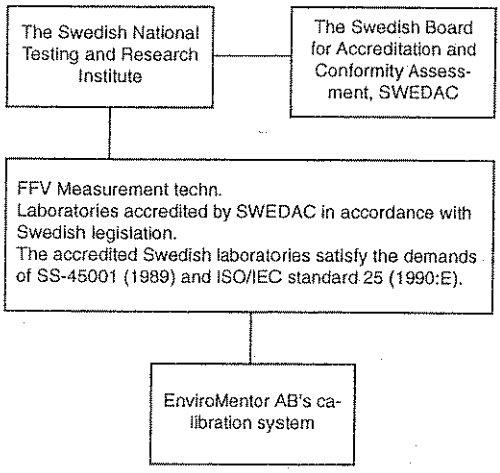
CE assurance

Our product satisfies the demands of the Low Voltage and EMC directive as well as the following EMC standards:

EN 50 081-1:1992	Emissions standard class B
EN 50 082-1	Immunity standard
Manufacturer	EnviroMentor AB Box 5124 SE-402 23 Gothenburg Sweden

Traceability

Traceability means that it should be possible to relate a measurement result to national or international standards via an unbroken chain of comparisons.



Traceability chart.

3 Use

3.1 Measuring magnetic fields

Start up the instrument with the switch. The instrument measures the magnetic fields and displays the effective value in µT. This value is updated at 1 second intervals. MM-1 can be pointed in any direction in relation to the magnetic field source as it has a three-dimensional sensor.

3.2 Transmitting readings

When carrying out measurements, the MM-1 transmits the readings via the RS232 port at 1 second intervals.

Connect the accompanying cable to a computer which has communication software or some similar terminal program. The settings for the communication software are listed in subsection 3.3. When the instrument is switched on, it measures and displays the readings on the LCD. The values are sent to the computer via the cable at the same time. They can then be stored there as a text file on the computer's hard disk. You can import the readings to a calculation program, enabling you to produce diagrams or statistical calculations for the measurement.

Note!
Remember that the power consumption is considerably greater when the RS232 port is in use. Always install new batteries if you are going to carry out long series of measurements.

3.3 Transmission protocol

MM-1 always transmits the readings via the RS232 port. They are transmitted as in the following example: 01.75 01.74 012.0, i.e. MM-1 separates each reading with a space. Most communication programs can receive measurement data, e.g. Terminal in Windows.

Software settings:

Transfer speed	9600 baud
Data bits	8
Parity	none
Flow regulation/ handshake	none

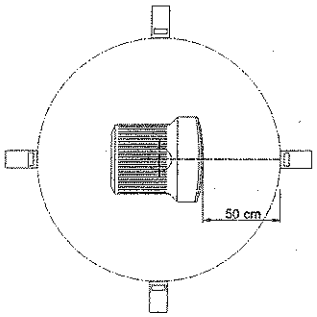
You also have to select the correct serial port in the software (COM1, COM2...).

Battery symbol.

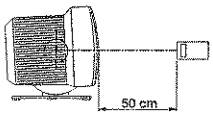
3.4 Changing the batteries

When the battery symbol is displayed to the left of the measurement reading, the batteries should be replaced immediately. Unscrew the cover on the rear of the instrument, remove the old batteries and install new ones (2 x 1.5 V LR6).

4 Measurement examples



Overhead view.



Side view.

4.1 Direct measurements

Below is a suggestion as to how to measure the magnetic field in a room within the frequency range 30 Hz to 2,000 Hz.

1. Start by carrying out a preliminary measurement with all the pieces of electrical equipment switched on and make a rough estimate of what field sources are present in the room. Draw a sketch of the room. Then measure a number of points at 1-3 metre intervals and write down the values measured on the sketch. Measure the magnetic field at floor level as well as at 0.8 and 2 meters above the floor.
2. Then carry out a measurement with all the electrical apparatus in the room switched off to get an idea of the extent of the background fields in the room. Remember that it is probably not sufficient simply to switch off the pieces of apparatus – you will usually need to unplug them in order to completely eliminate the fields. In some cases, the background magnetic fields can be more powerful than the fields from the apparatus in the room.
3. Connect the pieces of apparatus one at a time and measure the magnetic fields in the directions 0°, 90°, 180° and 270° at distances of 30 cm and 50 cm from the outer edge of the piece of apparatus in question or in the direction the operator is facing (see figure). Summarise the measurement readings in a report form. An example of how to fill out a report form can be found on page 10. You must not subtract the background values of the magnetic fields from the measured values. They should always be noted as a comparison.

Cont

4. Analyse the measurement readings and assess the need for remedial action, such as rearranging the furniture in the room and/or moving pieces of electrical apparatus. The sources of the magnetic fields may be located some distance away, and magnetic fields can penetrate almost all building materials.

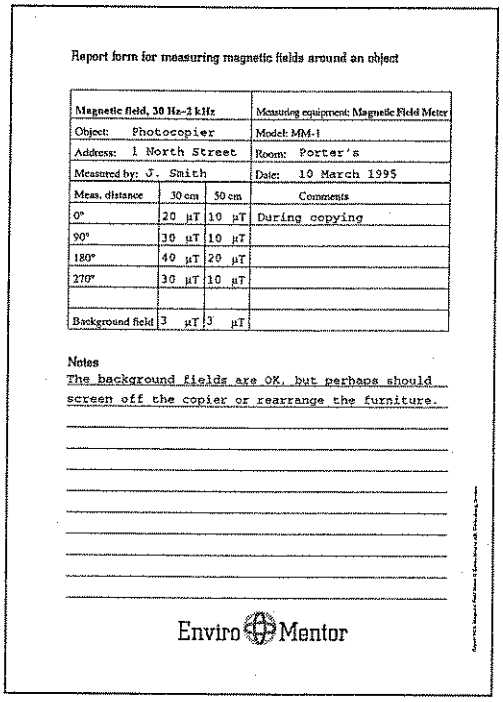
4.2 Measuring and transmitting readings to a computer

To measure the time-related variations at one measurement point:

1. Place the measuring instrument at the measurement point.
2. Connect one end of the interface cable to the instrument's RS232 port and the other end to one of the computer's COM ports (COM1, COM2...etc.).
3. Switch on the computer and start up the communication program.
4. Set the parameters in accordance with the settings on page 7.
5. Create a text file and give it a name to enable you to keep track of when the measurement was taken and the measurement point at a later date.
6. Set the software so that the readings can be entered into the text file.
7. Start the data transfer and start up the instrument. The readings are now transmitted to the computer at one second intervals.
8. Stop the measurement and create a new text file if you want to continue the measurement process at a new measurement point.
9. You can now transfer the readings from the text file to a calculation program, such as Excel, where further processing can take place.

4.3 Example of report form for measuring magnetic fields

When you measure magnetic fields, you should produce a report form which can act as a basis for any remedial action. Below is an example of a completed report form. Report form templates which you can copy can be found at the back of these user instructions. Once you have filled out the forms, they should be filed in a folder. You can then go back and make comparisons with previous measurements.



Report form for measuring magnetic fields around an object

Magnetic field, 30 Hz–2 kHz			Measuring equipment: Magnetic Field Meter
Object: Photocopier			Model: MM-1
Address: 1 North Street			Room: Porter's
Measured by: J. Smith			Date: 10 March 1995
Meas. distance	30 cm	50 cm	Comments
0°	20 µT	10 µT	During copying
90°	30 µT	10 µT	
180°	40 µT	20 µT	
270°	30 µT	10 µT	
Background field	3 µT	3 µT	

Notes

The background fields are OK, but perhaps should screen off the copier or rearrange the furniture.

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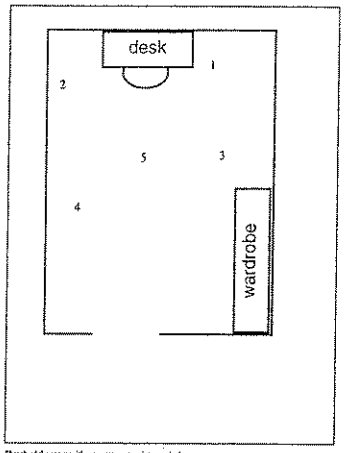
Example of a completed report form for measuring magnetic fields around an object.

Report form A for measuring magnetic fields in a room



Sketch of the room with measurement points marked.

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Report form B for measuring magnetic fields in a room

Magnetic Field, 30 Hz–2 kHz				Measuring equipment: Magnetic Field Meter			
Object:				Model: MM-1			
Address:	3 High Street			Room:	123		
Measured by:	P Jones			Date:	13 May 1998		
	Measurement result µT			Background field µT			
Measurement point / Height above floor	0 m	0.8 m	2 m	0 m	0.8 m	2 m	Comment
1	0.01	0.02	0.01	0	0	0	
2	0.02	0.03	0.01	0	0.01	0	
3	0.2	0.02	0.01	0.2	0.02	0.01	
4	0.3	0.02	0.01	0	0	0	
5	0.02	0.01	0	0	0	0	Fluores-
6							cent-tube in
7							the ceiling
8							
9							
10							
11							
12							

Notes

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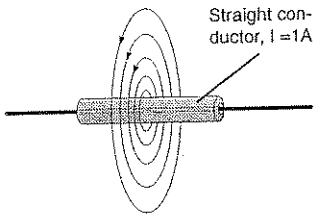
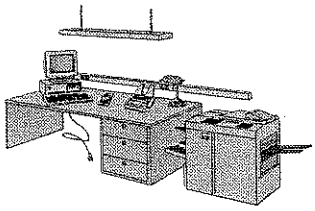
Example of a completed report form for measuring magnetic fields in a room.

5 How magnetic fields arise



At 1 m from the conductor, the magnetic flux density is 0.2 μT.



A modern office has many sources of magnetic fields.

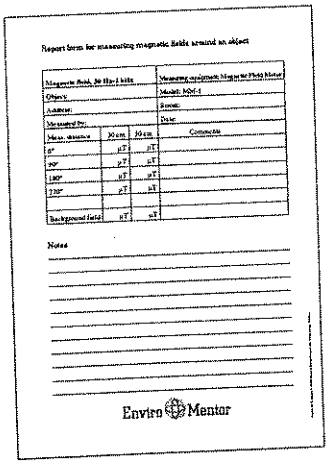
Magnetic fields are caused by electrical currents and always occur in continuous closed paths around the currents that cause them. A live conductor gives rise to a magnetic field, the strength of which is always proportional to the current in the conductor. Magnetic fields are usually depicted with the aid of field lines. The strength of the magnetic field is constant along the conductor in closed paths around the live conductor. In the event of other sources, magnetic fields tend to have a complicated appearance which usually cannot be calculated but have to be measured instead. The unit used to measure the magnetic flux density is called the tesla [T].

Magnetic fields can be caused by electrical devices and installation cables. In certain cases, stray currents can give rise to magnetic fields. In Sweden, for example, the electricity systems generally entail four conductors leading to each building, which can result in major problems with currents of this type. The decay current can pass through the neutral conductor as intended, but it can also pass through the earth conductor and into the plumbing pipework to the transformer's earth point. This increases the magnetic field both along the path of the stray current and along the supply cable. It is also commonplace for stray currents to exist in computer networks. As well as causing magnetic fields, they can also lead to communication problems. In industrial environments, common sources include welding equipment, electric motors and cable clusters.

6 References to authorities and organisations

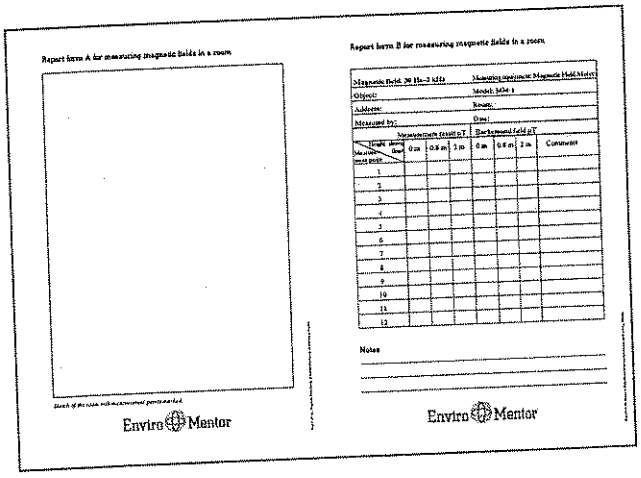
Publication	Publisher/Author	May be ordered from
Magnetic fields and health risks based on what we know	The National Electrical Safety Board	Elsäkerhetsverket Box 1371 SE-111 93 STOCKHOLM SWEDEN Tel. +46 8-519 112 00 Fax. +46 8-519 112 01
Cancer and magnetic fields in workplace	The Swedish Trade Union Confederation	LO-distribution Strömsätragränd 10 SE- 127 35 SKÄRHOLMEN SWEDEN Tel. +46 8-796 25 00
Questions and answers about electric and magnetic fields associated with the use of electric power	National Institute of Environmental Health Sciences and U.S. Dep. of Energy	Superintendent of Documents U.S. Goverment Printing Office WASHINGTON, D.C. 20 402 USA Tel. +1 202-512-1800
A report of non-ionizing radiation	Microwave News	Microwave News Louise Slesin P.O. Box 1799 Grand Central Station NEW YORK, N.Y. 10 163 USA +1 212-517-28000 +1 212-734-0316 mwn@pobox.com

7 Report forms


Report form for measuring magnetic fields around an object.

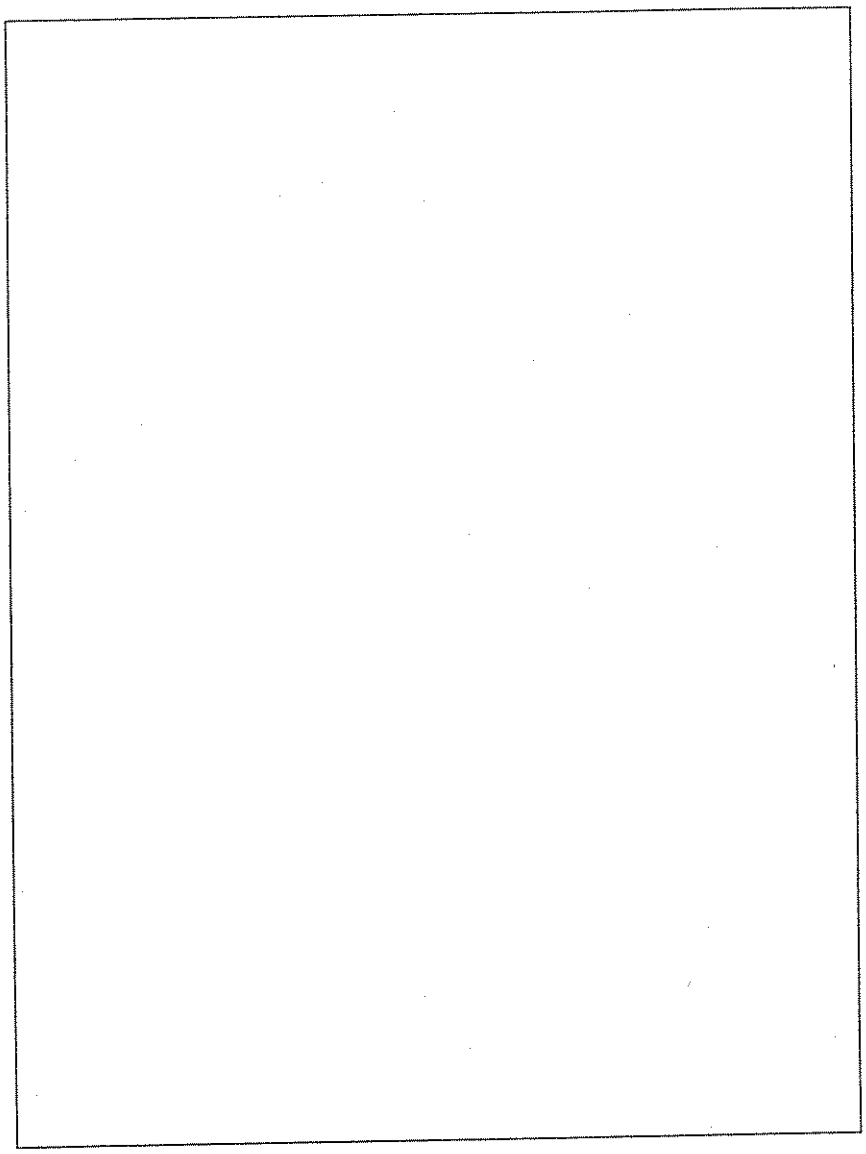
On the following pages you will find report form templates for measuring electric and magnetic fields. Copy the templates, fill them out and then file them in a folder. You can then go back and make comparisons with previous measurements.

Section 4 gives examples of how to carry out measurements, while subsection 4.3 details how to fill out the report forms.


Report form for measuring magnetic fields in a room.

Notes

Report form A for measuring magnetic fields in a room



Sketch of the room with measurement points marked.

Report form B for measuring magnetic fields in a room

Magnetic field, 30 Hz–2 kHz	Measuring equipment: **Magnetic Field Meter**
Object:	Model: MM-1
Address:	Room:
Measured by:	Date:

	Measurement result µT			Background field µT			
Measurement point \ Height above floor	0 m	0.8 m	2 m	0 m	0.8 m	2 m	Comments
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Notes

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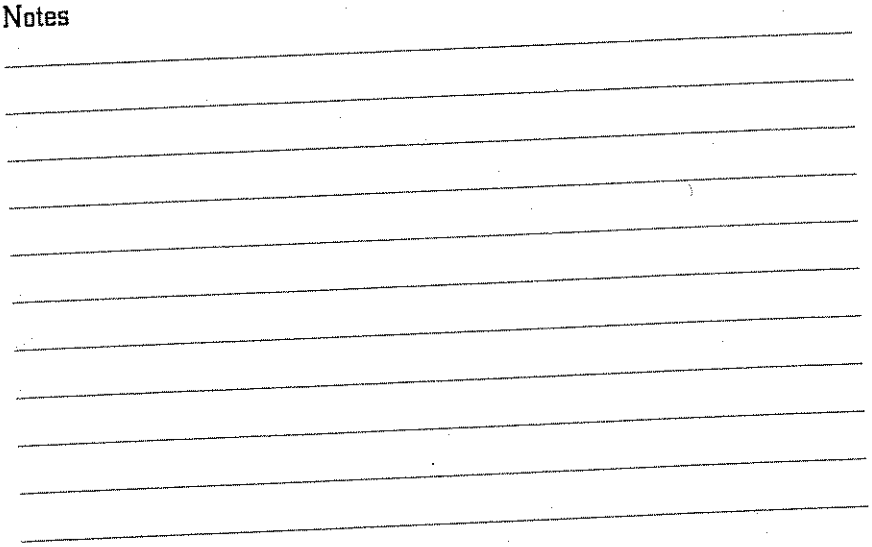
Report 98:41, Magnetic Field Meter © EnviroMentor AB, Göteborg, Sweden

Report form for measuring magnetic fields around an object

Magnetic field, 30 Hz–2 kHz			Measuring equipment: **Magnetic Field Meter**
Object:			Model: MM-1
Address:			Room:
Measured by:			Date:
Meas. distance	30 cm	50 cm	Comments
0°	µT	µT	
90°	µT	µT	
180°	µT	µT	
270°	µT	µT	
Background field	µT	µT	

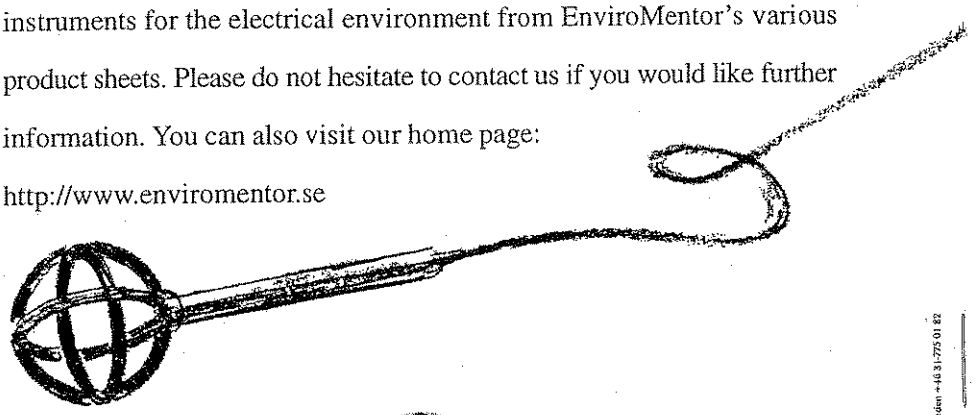
Notes



EnviroMentor has both the measuring instruments and the expertise

EnviroMentor AB is a young, skills-based company, yet is also one of the oldest in its field. All of our measuring instruments have been developed in extremely close cooperation with researchers at Chalmers Institute of Technology in Göteborg. EnviroMentor AB is wholly owned by Radians Innova AB, a company which in turn is owned by two of Sweden's most powerful financial institutions. This combination of excellent skills and good financial resources provides us with the potential to carry on continual product development, keeping pace with the latest discoveries made by researchers. You can find out all about our current range of measuring instruments for the electrical environment from EnviroMentor's various product sheets. Please do not hesitate to contact us if you would like further information. You can also visit our home page:

http://www.enviromentor.se



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New address

EnviroMentor AB

Drottninggatan 9

SE-411 14 Gothenburg, SWEDEN

Phone: +46 31 703 05 30

Fax: +46 31 703 44 33

Postal address: eborg, Sweden.

Address (visitors): Gamla Al 1 30. Fax: +46-31-703 44 33.

E-mail: jorgen nviromentor.se

Karlssons Språkservice AB, Göteborg, Sweden +46 31-775 01 82