MAGMETER MF300H+

MAGNETIC FIELD STRENGTH METER

USER MANUAL

Version 1.2 11/14

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Contents

Preface

Thank you for purchasing MagMeter. Before using the unit, please read these instructions carefully. If you are uncertain about any aspect of its operation, please contact Diverse our contact details are at the end of this manual.

The serial interface version of this product is provided with software to run on a PC.

The MF300H+ is our latest version of our popular MF series offering wide dynamic range, excellent autoranging, a wide selection of magnetic units and a robust stainless steel probe that can be used with confidence in industrial environments.

The MF300H+ is the tool of choice for measuring magnetic fields steel pipes and welding preparations. With its robust stainless steel probe It is able to capture average or peak fields with confidence in situations where conventional delicate probes cannot be used.

Introduction

The MF300H+ Magnetic Field Meter is used to measure the intensity and the direction of magnetic fields. The meter can be used to show the actual value of the intensity of the magnetic field as an average, peak or RMS value. The measured values can be presented in a range of units and the chosen options can be selected from a menu displayed on the meter.

The MF300H+ is supplied with a Hall probe which is sensitive to magnetic fields. Flat, tangential probes measure the field through the flat surface. On special order, we can supply round, axial probes to measure the field along the axis of the probe (see Fig 1).

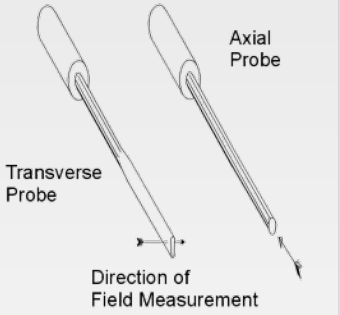


Fig. 1 MF300H+ probes

Magnetic fields can be measured in a range of units. The preferred unit can be selected from the menu displayed on the meter.

A serial output for connection of the Magmeter to a computer either through RS232 or USB is available as an option.

Software is included with this option which enables the magnetic field measurements to be recorded and input to a spreadsheets.

The MF300H+ Magnetic Field Meter is supplied in a carrying case together with a Hall probe. Versions which use the serial output are supplied with a lead for connection to a computer.

The MF300H+ Magnetic Field Strength Meter is shown in Figure 2. The Meter is calibrated within a few weeks of despatch and a calibration certificate will supplied will be valid for 12 months from the date of purchase. The unit requires 4 AA cells which should be installed in the battery compartment on the rear of the housing.

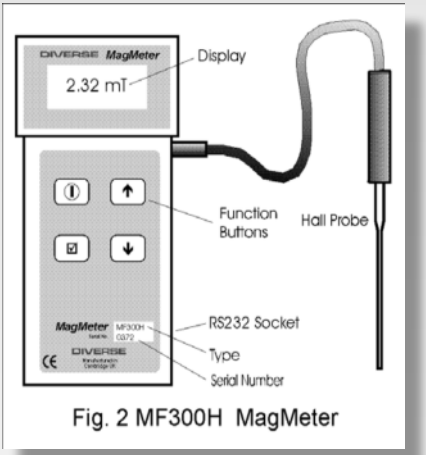


Fig. 2 MF300H MagMeter

The Hall probe supplied with the meter is of a robust design suitable for the measurement of magnetic fields in workshops and laboratories. The probe will, however, be damaged, if it is subject to mechanical stresses or forces. The sensitive region of the Hall probe is in the centre, two millimetres from the tip. Fig. 1 shows the location of the sensitive region and the direction in which the magnetic field is measured.

If you have chosen the serial interface version, you should install the software on your PC. To do this place the CD in your drive. To install on Windows:
Use Program Manager: *run file*
Select drive A:
Double click on INSTALL.BAT.
The software will be copied to your hard disc C:\diverse.

1. Plug in the field probe.
2. Load the AA batteries in to the battery compartment ensuring that the polarity is correct
3. Press the ⓘ power button, the unit will switch on.
4. Press the ▼ down button and select the mode displayed at the top right hand side of the display.
5. Press the ▲ up button till auto mode is selected, this is shown by the 'A' symbol in the top left hand corner of the display.
6. Press tick key once to select the step up menu, use ▼ down button or ▲ up button to choose the units required, then press tick key to select.

Your Magmeter is now ready to measure. Move the probe to the magnetic field and its value will be displayed.

Zeroing

The MF300H+ has 2 zeroing modes:

1. Press and hold the ✓ tick key to instigate a simple offset zero for the current range. This would be used in operation to null small ambient field offsets.
2. Press and hold the ▼ down key to instigate a full hardware zero for all ranges. This happens automatically at switch on. During the process which takes about 3 seconds, the calibration due date is displayed.

The Magmeter has 4 keys:

ⓘ power ✔ tick ▲ up ▼ down

The ⓘ power and ✔ tick keys second meanings if held down for more than 2 seconds. The step by step instructions that follow provide all the key information about operation of the instrument. Note that unless otherwise specified, any readings referred to are in Gauss.

Step 1 Plug in the Field Probe

Step 2 Power On/Off

Switch the unit on by pressing the power key. The display shows ‘zeroing..’ and calibration due date for a few seconds and then the value of the magnetic field. This will be based on the last used settings of mode and units. To switch the unit off press and hold the power key for 2 seconds.

Step 3 Zero

The zero reading of the meter should be adjusted before taking readings. Hold the probe away from magnetic fields. The display should show 0.0 Gauss within +/-0.5 Gauss. If not, press ✔ tick key for 2 seconds. The display will indicate ‘zeroing..’ then change to read approximately zero. The probe can now be used to take measurements. The reading can be zeroed in this way at any time.

Step 4 Select Reading Options

The MF300H+ can display the Average, Peak or RMS value of the magnetic field. To go from one to the another, press the ▼ down key each time. The nature of the current display is shown on the top right hand corner of the screen. The options are as follows:

Average (AVG): The unit averages 480 readings taken over a period of 300mSecs. The display of the averaged value is updated every 0.33 seconds.

APk: Absolute peak: The maximum value of the magnetic field recorded since the meter was last zeroed without regard to the direction of the field. Note that this is not the peak value of an alternating field; it is the maximum value sensed for alternating, static or combined magnetic fields.

Peak: The maximum values of the magnetic field recorded since the meter was last zeroed. Both directions of the field are displayed.

RMS: The true Root Mean Square value of a varying magnetic field will be displayed.

Step 5 Set up Menu

At the main display press the ✔ tick key to see the Set up menu. This has 6 options:

5.1 Select units

To Select the Units of measurement, press the ✔ tick key to get to the setup menu, then press the ✔ tick key again and the units menu will be displayed. The units available are mT (milliTesla), T (Tesla), G (Gauss), kA/m (kiloamps metre), Oe (Oersteds) and kA (kiloamps) at distance. To select a new system of units, press the ▲ up or ▼ down keys until the required units are indicated. Then press ✔ tick to confirm the units and display the value of the magnetic field in the selected units. In selecting kA (kiloamps) at distance, you will be prompted to enter the distance from the conductor at which the measurement will be made.

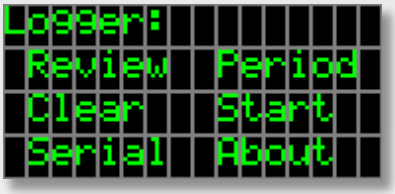
5.2 Average

This allows the number of samples to be selected for averaging. This is normally set to 64, but any number in powers of 2 can be used between 2 and 128. The choice of this value controls the time response of the instrument in average mode. A small number will result in a fast response but with greater reading uncertainty. A large number will make the display update sluggish, but will improve display resolution.

5.3 Samples

This allows the number of samples to be selected for RMS mode. In this mode, samples are taken, squared and summed. Finally they are averaged and square rooted. The normal setting is 64, but options are 4,16, 64 and 256 available. The number of samples controls time response of the instrument in RMS mode. A small number will result in a fast response but with greater reading uncertainty. A large number will make the display update sluggish, but will improve display resolution.

5.4 Logger



The logger feature allows you to sample the field over an extended time period. See step 7.

5.5 Serial

This switches on and off the serial access facility. With this mode on, data can be requested from the instrument via the serial interface.

5.6 Bar

At the bottom of the main display is a bar graph. This is built from small horizontal bars that are stacked vertically and fill as the reading increases. The bar has two modes: firstly, it can be an indicator of the absolute reading working from the far left to the far right providing a resolution of 1:128. Alternatively, the bar can be run from the centre of the bottom line of the display, moving to the right to indicate positive sign and to the left to indicate negative. This option switches between the two modes.

Step 6 Autoranging

The letters in the top left hand corner of the display indicate if the instrument is set to autoranging or manual range selection. The possible letters and their meanings are as follows:

AL = Autoranging with range on the lowest most sensitive setting.
AM = Autoranging with the display on the mid range.
AH = Autoranging with the display on the high range.
ML = Manually set to the low range.
MM = Manually set to the mid range.
MH = Manually set to the high range.

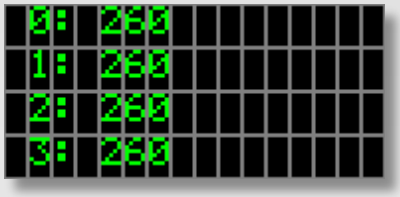
In the peak and autoranging modes of operation, the unit will reset the peak if the range is changed. The autoranging mode can be switched on and off using the ▲ up key. If Manual ranging is selected in this way, then the Low, Medium or High ranges can be selected by pressing the power key briefly.
Auto Power off: The instrument will automatically power off after 3 minutes of no key presses. This is feature is overridden in the logging mode or characters coming in from the serial port.

Step 7 Serial Output

Readings from the instrument can be output to a computer via a serial link. This can be RS232 or USB. Connect the instrument to the PC using the cable provided. Values can be output from any of the display options by pressing the ✔ tick key for less than two seconds.

Step 8 Logging mode

From the set up menu select Logger.



8.1 Review

This presents the logged data in groups of 4 to the extent of the logger database. You can scroll through the data with the up/down keys. Any other key exits.

8.2 Clear

This zeros the complete logging database.

8.3 Serial

This outputs the complete database to the serial interface.

8.4 Period

The time period between samples is set here between 1 and 120 seconds. The adjustment is done using the up and down keys. Note pressing and holding these keys advances in increments of 10.

8.5 Start

This starts logging with auto power down disabled during logging. During logging the normal display screen is presented showing the sample number # on the left hand side and the time period at the top of the display. Logging can be stopped by a double click of the ✔ tick key. A single press of the ✔ tick key advances the sample number. When logging is complete the unit returns to normal operation.

8.6 About

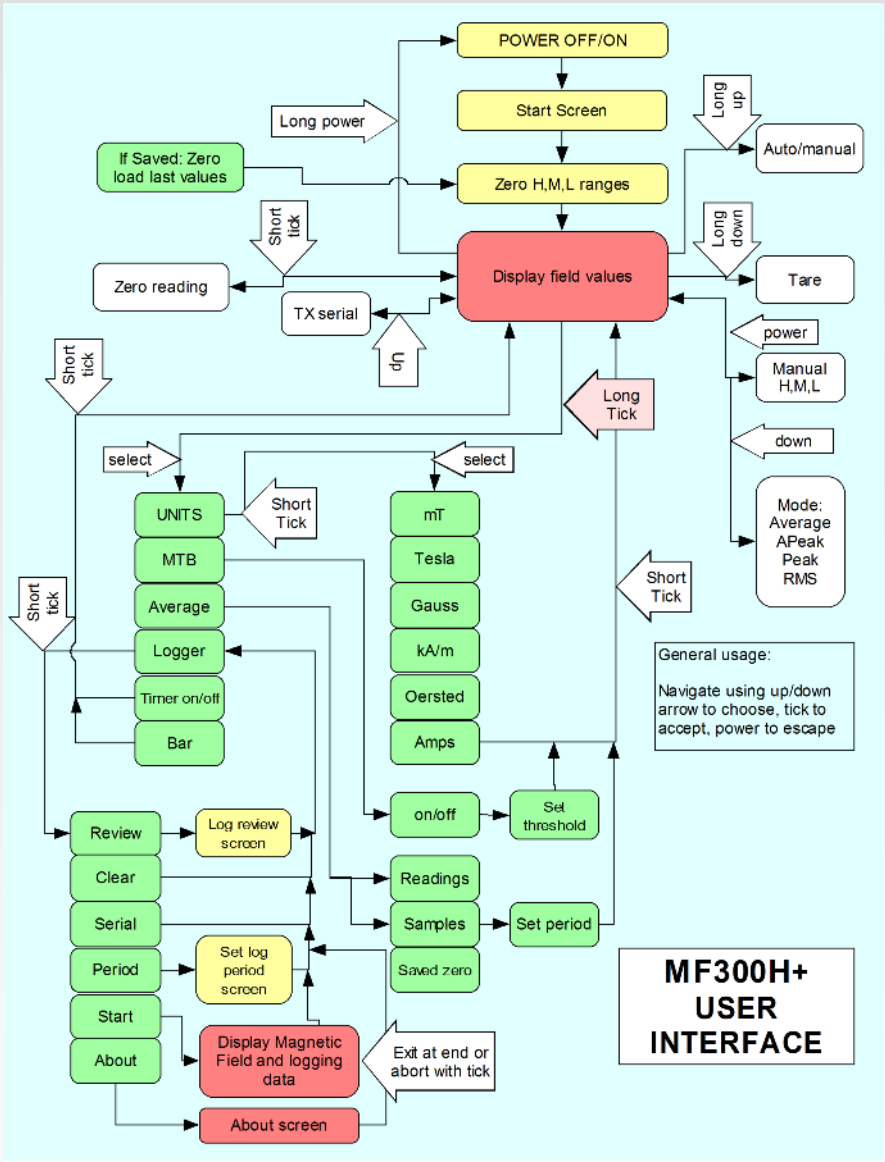
Please contact us for support, calibration, updates and repair.

Magnetic Particle Inspection

A wide range of magnetising systems are used for Magnetic Particle Inspection. The value of the magnetic flux density required is specified in BS4069 as 0.72 Tesla. This is produced when the magnetising coils generate a magnetic field of 2.4kA/m which is applied to a component made from material with a relative permeability of 240.

The MF300H+ has a facility to provide simple pass/fail test for the status of the applied field. To put the unit in this mode, press tick to get to the menu, select MTB (Magnetic Test Bench), you will then be prompted to switch test bench on or off. If you select on, then press tick and you will be presented with the value of the required threshold field, nominally 2400 A/m. Pressing the up arrow advances the threshold by 10A/m, press and hold the up arrow for 2 seconds and the threshold will advance by 100 A/m. Use up/down arrow to set the value you require, then press tick to accept.

You will then be taken to the normal screen which will identify the field size in RMS mode and an indicator to say whether the field level is below the threshold (“Lo”) or above (“Ok”). To check the magnetising system, switched it on and in the absence of the component to be measured, the field should be measured. If the value is greater than 2.4kA/m then the magnet meets BS4069. When the magnet is used to magnetise a steel component it will have a flux density of over 0.72Tesla.


POWER OFF/ON
Start Screen
Long power
If Saved: Zero load last values
Zero H,M,L ranges
Long up
Auto/manual
Short tick
Long down
Zero reading
Display field values
Tare
TX serial
Up
power
Short tick
Manual H,M,L
Long Tick
down
select
select
UNITS
Short Tick
mT
MTB
Tesla
Mode: Average APeak Peak RMS
Short Tick
Short tick
Average
Gauss
Logger
kA/m
General usage:
Navigate using up/down arrow to choose, tick to accept, power to escape
Timer on/off
Oersted
Bar
Amps
Review
Log review screen
on/off
Set threshold
Clear
Readings
Serial
Samples
Set period
Period
Set log period screen
Saved zero
Start
About
Display Magnetic Field and logging data
Exit at end or abort with tick
About screen
MF300H+ USER INTERFACE

Software

The serial version of the MF300H+ is supplied with software to run on a windows (7/Vista/XP/2000) PC, see First Time for information about installation. The program name is: MAGW.EXE. Its operation is as follows:
Download the files from our website. Copy all the files to the directory in which you want to work (there is no separate installation file). Generate an icon for the program on your desktop by right clicking the desktop, then select New, Shortcut and navigate to where your placed the .exe file. Run the program by either clicking it on the desktop icon, or selecting it in file manager.

The first time you use it, you should identify the communications port you wish to use, the program provides you with a list of possible ports. The chosen port is stored in the configuration file and will be automatically selected next time it's run. Connect the MF300H+ to the computer serial port. If your computer only has USB ports you will need the USB to serial adapter cable supplied. Ensure the MF300H+ is switched on. On the MF300H+, select start: this will open the communications port and get the MF300H+ to identify itself on the listbox on screen. Pressing the Enter key, or the up key on the MF300H+ will cause the current reading to be transmitted to the PC and it will be displayed. Use file save to save the results to a CSV file which can be directly imported into Excel or Open Office.

Once you have completed the data collection, select Stop, and the system will inform you that the communication port is closed. If you do not want to use the logging software provided, then you can use any serial terminal software such as Hyperterminal supplied free with Windows. Free updates to the logging software are placed on our web site:

http://www.diverse-technologies.net

Accuracy:

Transverse probe +/- 1% of full scale

Axial Probe +/- 2% of full scale

Operating Temperature:

0C to +40C. The instrument has temperature compensation for the Hall probe.

Units: mT, T, G, kA/m, Oe, kA at distance

Range:

0 - 1.99T, autoranging. Manual ranging is also available in three decade switches.

Resolution: 10uT, 100uT, 1mT.

Zero: The instrument can be zeroed in any field up to 50G.

Modes:

Average: Normal reading over 10ms.

Peak: Peak value , 10ms samples

RMS of the signal taken as averaged samples computed in real time.

Probe: Stainless steel, active area 0.2x0.2mm

Power:

4x AA (R150) Cells (Alkaline, NiCAD or NiMH may be used).

Auto power off after 3 minutes, user override

	Symbol	cgs	SI
Magnetic Flux	*phi*	Maxwell	Weber
Flux Density	B	Gauss	Tesla
Magnetising force	H	Oersted	A-T/m
Permeability of free space	*mu*	1	4*pi() E-7

A-T/m is Ampere-Turns/m

Conversion Factors

	Multiply by	To Obtain
Gauss	1E-4	Tesla
Oersted	79.577	A-T/m

In a vacuum or air then B= H, then mu0=1 so:

Flux density B in Gauss = Magnetising Field H in Oersteds.

Flux density B in Tesla = 4 .1E-7 x H in A-T/m

Low battery

If the MF300H+ displays the legend "Low Battery" on the bottom row of the display when the batteries are low. When the batteries are low the bar graph facility is not available.

If you are using rechargable cells then recharge them using a suitable charger. If you are using dry cells replace with 4xAA alkaline cells.

Never use a battery charger with conventional dry cell batteries.

Liability

Diverse Technologies accepts no responsibility for the consequential losses arising from the ability or inability to use the equipment supplied. The limit of warranty is the repair or replacement of any faulty components, directly attributable to manufacturing defects, arising during the period of 12 months following purchase. This does not include damage resulting from incorrect operation of the instrument.

Designed and manufactured by:-
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http://www.diverse-technologies.net

Calibration and repair

The MF300H+ and probe is supplied with a calibration certificate. It is recommend that the unit is returned to Diverse annually for recalibration.

IMPORTANT

Although the calibration can be checked by any competent institution, the complex computer arrangements required to change or correct the calibration can only be undertaken at Diverse Technologies. The cost for this is the same or less than that charged by institutions such as BSI or NPL.

If the MF300H+ requires repair, the unit should be returned to Diverse, there are no user serviceable parts.

Disposal and Recycling

This instrument should be deposed of in a responsible manner to allow the components within it to be recycled. The wheelie bin symbol shown here and on the product means that the product is classed as Electrical and Electronic Equipment and should not be disposed with other household or commercial waste at the end of its working life.

The Waste of Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) has been put in place in the EU to recycle products using the best recovery and recycling techniques to minimise the impact on the environment, treat any hazardous substances and avoid landfill. Business users should ensure that this product is not mixed with other commercial waste for disposal.