

DIVERSE

MF300F+

FERRITE METER

OPERATING INSTRUCTIONS



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DIVERSE Ferrite Meter MF300F+

PREFACE

Thank you for purchasing the Ferrite Meter. 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 MF300F+ is the latest version of the Diverse Ferrite Meter. It has a large number of new features:

Robust slimline probe,
Five individual transfer calibration standards
Peak measurement mode

All this in addition to the functionality of the original instrument.

Options include:

1. Air-cooled probe for hot samples
2. Charger and rechargeable cells
3. Serial software for download to PC (RS233/USB)

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INTRODUCTION

Industrial processing and chemical plants work at high temperatures and pressures, with often aggressive media and stainless steel is often the material of choice for these applications. If the ferrite content of the steel is too low, then welding of stainless material may crack at elevated temperature or with high stress or vibration. Alternatively, if the ferrite content is too high, the weld may be weaker and corrode.



To address the need to measure the amount of ferrite in a sample the Welding Research Council introduced the *Ferrite Number* (FN) as standardised value which related to the ferrite content of an equivalently magnetic weld metal.

The volume percentage of ferrite can be estimated as about 70% of the FN but the relationship depends upon the type and origin of the stainless steel used and the measurement technique.

The Diverse Ferrite meter MF300F+ measures the Ferrite number (FN) of austenitic and duplex stainless steel weld material. It has a probe (see image) that is sensitive to ferrite content in a 10 mm area to a depth of approximately 1mm. The instrument is calibrated using the secondary world standards held at The Welding Institute. All 16 standards are used in the calibration giving an instrument with a measurement range from 0 to 115 FN. Transfer standards are supplied with the instrument allowing performance to be verified at any time.

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FIRST TIME/QUICKSTART

The MF300F+ is supplied with five transfer calibration sample in a carry case.



The instrument is calibrated within a few weeks of despatch and a calibration certificate is supplied. Calibration values for the transfer standards can be displayed on the instrument (see detailed operation)

The unit requires 4 AA cells which should be installed in the battery

compartment on the rear of the housing.

The sensitive region of the probe is indicated by the red disc at the probe end.

If you have chosen the serial interface version, you should install the software on your PC. To do this follow the instructions in the software section.

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Quickstart

1. Plug in the ferrite probe.
2. Load the AA batteries in to the battery compartment ensuring that the polarity is correct
3. If you are using hot samples connect a gas/air-line, regulated to 1 bar, to the probe using the fitting provided.
4. Press the \bigcirc power button, the unit will switch on.
5. Hold the probe away from ferritic material and press \boxtimes tick key. This will zero the probe.
6. Move the probe to sample to be measured, FN is displayed.
7. Press and hold the \uparrow up button to toggle between FN and ferrite percentage. Note ferrite percentage is an estimate and is calculated as $0.7 \times \text{FN}$.
8. Pressing the \boxtimes tick key to change the mode or display the log (see later for detail).
9. Press and hold the \bigcirc power button will store the current measurement.
10. Press and hold the \bigcirc power button to switch the instrument off. If the instrument is not used for a period it will automatically switch off to preserve battery life.

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OPERATION

The Ferrite Meter has 4 keys:

- power
- tick
- up
- down

The and keys second meanings if held down for more than 2 seconds. A press and hold for more than 2 seconds will be denoted as e.g. **LONG ↑**

The step by step instructions that follow provide all the key information about operation of the instrument.

Step 1 Plug in the Ferrite Probe

Step 2 Power On/Off

Switch the unit on by pressing the power key. The display shows 'zeroing..' for a second and then the value of the FN. 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 material. The display should show 0.0 FN or 0.1 FN. If not, press tick key. 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. Zeroing the unit also updates the in-built temperature compensation. If in doubt Zero before taking any reading.

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Step 4 Select Display Units

Units are either FN or ferrite percentage. Use the **LONG ↑** up key to toggle between these units,

Step 5 Select Mode

To select the mode press the **LONG** tick. Navigate through menu using either or keys. To select press key, to exit press key.

5.1 Normal

Normal operating mode, FN measured as an average of 64 measurements over a 128 ms period. Bar on the bottom line of the display indicates fraction of full scale.

5.2 Peak

Peak operating mode, largest FN displayed, value updated once previous value is exceeded. The peak value is reset by zeroing or changing display units. Bar on the bottom line of the display indicates fraction of full scale (regardless of whether peak is being exceeded)

5.3 Trans

Similar to normal mode but transfer calibration value displayed on the third line of the screen. Five transfer calibration samples are supplied, identified as T0 to T4 (T0 is the highest value sample, and T4 the lowest). Use the or key to cycle through the transfer calibration values. Take probe to selected transfer standard to verify the meter performance. In this mode the units will be FN (F% can not be selected)

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5.4 Viewlog

Storage of 52 measurement records (record number and ferrite number) is provided. View log will display 4 records at a time, use the ↑ or ↓ keys to navigate through records.

5.5 Clrlog

Zero all log records.

5.6 Serial

Outputs store records over the serial link.

Step 6 Storing a record

To store a value to the next available record press Opower key in either normal, peak or trans mode. Confirmation of the record number and stored value are given on the bottom line of the screen. After 2 seconds the instrument will return to providing live measurements. The next available record number where the next sample is stored is displayed at the top left corner of the screen as #nn.

Auto Power off

The instrument will automatically power off after 3 minutes of no key presses.

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.

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Database values are output using the serial menu (see Step 5.6) or press ↑ to transmit the current value over the serial link.

To interface with a PC, a program is supplied, one for Windows, see the software section.

Gas Cooled Probe Option

For measurements on hot samples (>30C) use the air-cooled version. Instruments with this option have a 4mm in-line pneumatic fitting on the probe. Connect a gas line regulated to 1 bar to this fitting. Gas will flow through the probe and exit from the 3 small holes towards the end of the probe (some gas will escape from the front of the probe). This gas cools the sensitive area within the probe and will allow measurements on hot samples. It is particularly important that the instrument is zeroed before each measurement when used on hot samples.

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SOFTWARE

The serial version of the MF300F+ is supplied with software to run on a PC compatible running Windows XP, see First Time for information about installation.

Windows

The program name is: MAGW.EXE. Its operation under windows XP/2000 is as follows:

Copy the files from the CD supplied or download 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 you placed the .exe file. Run the program by either clicking it on the desktop icon, or selecting it in file manager.

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, but the selection of what is available may need to be identified by your systems administrator. The chosen port is stored in the configuration file, and will be automatically selected next time it's run.

Connect the MF300F+ to the computer serial port. If your computer only has USB ports you will need a USB to serial adapter cable.

Ensure the MF300F+ is switched on. Select *Start*. This will open the communications port and get the MF300F+ to identify itself on the listbox on screen. Pressing the Enter key, or the up arrow key on the MF300F+ 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 file. The file format is CSV, so it can be directly imported into Excel or Open Office.

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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.

Valid commands from the PC are single key presses, as follows:

V	Meter type
I	Software version
D	Download database (52 records)
B	Battery voltage
Enter	Get current reading

Free updates to the logging software are placed on our web site:

<http://www.diverse-technologies.net>

Low Battery

If the MF300F+ 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 rechargeable 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.

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SPECIFICATION MF300F+

Units:

Ferrite Number (FN)

Ferrite percentage (F%)

Range: 0 to 115 FN

Resolution: 0.1FN

Zero: The instrument can be zeroed on demand

Modes:

Normal: Normal reading over 2ms, average of 64 readings.

Peak: Peak value , 2ms samples averaged over 64 readings

Storage: 52 records (record number and FN stored)

PC download: RS232 or USB

Probe: Pencil style, 15mm diameter by 12cm length. Active volume 10mm diameter by ~ 1mm

Temperature compensation: automatic built-in

Sample operating temperature:

0°C - 40°C

Air cooled 0°C - 300°C

Humidity: Non-condensing

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

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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.

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Calibration and repair

The MF300F+ and calibration samples are supplied with a calibration certificate. If the MF300F+ requires repair or calibration, the unit should be returned to Diverse, there are no user serviceable parts.

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Disposal and Recycling



This instrument should be disposed of in a responsible manner to allow the components within it to be recycled.

The wheeled 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. 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. Business users should ensure that this product is not mixed with other commercial waste for disposal.