DIVERSE

MF300F+

FERRITE METER

USER MANUAL

DIVERSE
CAMBRIDGE
ENGLAND
CB22 5EW

www.diverse-technologies.net

Contents

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 features including:

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

Options include:

1. Air-cooled probe for hot samples
2. Charger (for rechargeable cells - not supplied)
3. Serial software for download to PC (RS232/USB)

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 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 1 mm. The instrument is calibrated using the secondary ferrite number standards prepared by the National Institute of Standards and Technologies (NIST) in USA. Sixteen standards are used ranging from 0.5 to 111.9 FN 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.

The MF300F+ Ferrite Meter is supplied in a red carry case with 5 transfer calibration standards. The Meter is calibrated within a few weeks of despatch and a calibration certificate will be supplied typically valid for 12 months from the date of purchase. However, the veracity of the instrument can be checked at any time using the transfer standards. 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 RS232/USB interface version, you should:

- Load the USB driver onto your computer using the CD supplied
- Download the serial software from: http://www.diverse-technologies.net/software/setupserial.exe
- The serial software option can be extracted by clicking on "Extract". You will be prompted for the destination directory, and then asked for the password, which is "diverse magmeter mf300".

1. Plug in the ferrite probe.
2. Load four AA batteries in to the battery compartment ensuring that the polarity is correct.
3. If you have the gas cooled option and are using hot samples connect a gas/air-line, regulated to 2 bar, to the probe using the fitting provided.
4. Press the power key ⓘ, the unit will switch on.
5. Hold the probe away from magnetic material and press the tick key ✓ . This will zero the probe.
6. Move the probe to sample to be measured, the FN is displayed.
7. Press and hold the up key ▲ to toggle between FN and ferrite percentage. Note that the ferrite percentage displayed is an estimate and is calculated as 0.7 x FN.
8. Pressing the tick key ✓ to access the menu (including user calibration, transfer standard mode and logging, see later for details).
9. Press the power key ⓘ to store the current measurement.
10. Press and hold the power key ⓘ to switch the instrument off. If the instrument is not used for a period of about 5 minutes it will automatically switch off to preserve battery life.

The Ferrite meter has 4 keys:

    ⓘ power   ✔ tick   ▲ up   ▼ down

The ⓘ power, ✔ tick and ▲ up keys have a 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.

Step 1 Plug in the Ferrite Probe

Step 2 Power On/Off

Switch the unit on by pressing the ⓘ power key. The display shows a splash screen followed by 'zeroing..' for a second and then then the value of FN. This should be 0.0 FN. To switch the unit off press and hold ⓘ power key for 2 seconds. The screen will show 'Power off' before going blank

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. If not, press ✔ tick. The display will indicate 'zeroing..' then the display should show 0.0 FN. The probe can now be used to take measurements. The reading can be zeroed in this way at any time.

Step 4 Display Options

4.1 Top line

4.1.1 Record number

On the top line the
number of the next
available record in
the database is
displayed on the left.

There are 52 available records and the current measurement
value can be saved by pressing the ⓘ power key. The
oldest record is overwritten.

4.1.2 Mode

On the top line, at the right, the mode is displayed. There are
three options, AVG, PEAK and TRAN. In AVG the value of
FN (or F%) will continuously be updated. In PEAK mode the
largest measured value will be displayed, press ✓ tick to start
a afresh. Press the ▾ down key to toggle between the AVG
and PEAK modes. For TRAN see section 4.3

4.1.3 Calibration

If the user calibration is being used then a 'U' will be
displayed on the top line to the right of the record number.
When the 'U' is not displayed the factory calibration is being
used. For details on user calibration see section 5.2

4.2 Second line

On the second line the current measured value is displayed.

Operation - Display Options continued

This value will be displayed as FN or F%, to toggle between these units press and hold the ▲ up key. Note that the instrument is calibrated using FN standards and that the reported F% is

calculated as 0.7 multiplied by the measured FN. In many cases this is a good approximation.
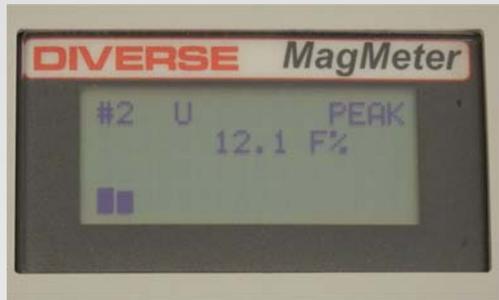
4.3 Third line

The third line will be empty unless the transfer calibration mode has been selected (See section 5.3). In this mode the

value (FN) will be displayed on the second line (as usual) but the expected value for one of the transfer standards will be shown on the third line. To cycle through the

transfer standards use the ▲ up or ▼ down keys. This mode facilitates checking the veracity of the instrument.

4.4 Bottom line

The bottom line has a bar graph which shows the current value graphically where a full bar corresponds to full scale (115 FN).

Step 5. Menu

To access the menu press and hold the ✓ tick key. Use the ▲ up or ▼ down keys to move between the options and ✓ tick key top access a particular option.

5.1 Select factory/user calibration (Cal F/U)

The instrument can be operated with the factory calibration or a user calibration. Press the ✓ tick key to select between these two options. Press the ▲ up or ▼ down keys to toggle between the two options, ✓ tick selects and ⓘ power to abandon

5.2 New user calibration (New cal)

This option allows a user calibration to be performed. A user may opt for this if the transfer calibration standards are not measuring accurately. If the transfer standards do not read accurately after a user calibration then the instrument should be returned to Diverse for factory calibration. Press ✓ tick key to select user calibration. The screen will show 'zeroing..' and then request user to place probe onto the centre of T0 sample and press tick. The instrument will display the factor used for user calibration (a factor of 1.0 indicates no change from factory calibration).

5.3 Transfer calibration mode (Trans)

This allows selection of the transfer calibration mode (for description see 4.3 Third line).

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5.4 View data log (Viewlog)

This displays the log of saved ferrite records, 4 records per screen. To cycle through the records use the ▲ up or ▼ down keys, any other key to leave.

5.5 Clear data log (ClrLog)

This option will set all of the records to 0.0 FN and the next saved record will start at record #1.

5.6 Serial download (Serial)

If you have the serial option 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. Use this function to download the log (52 records). See the following section for operating the serial software.

Software

The serial version of the MF300F+ 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 files from 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.

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 MF300F+ to the computer serial port. If your computer only has USB ports you will need the USB to serial adapter cable supplied. Ensure the MF300F+ is switched on. On the software, select start: this will open the communications port and get the MF300F+ to identify itself on the listbox on screen. Pressing the ▲ up 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 CSV file which can be directly imported into Excel or Open Office.

From the computer the following functions are available:

Key	Function
Enter	Download current reading
Spacebar	Download current reading
B	Display battery voltage
D	Download database
E	Download EEPROM
I	Display meter type
V	Display meter software version

NB Letter keys must be uppercase

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

http://www.diverse-technologies.net

MF300F+ Specification

Units	Ferrite Number FN Ferrite percentage F%
Range	0 - 115 FN 0 - 80.5% F%
Resolution	0.1 FN 0.1 F%
Standard: Accuracy (10°C -30°C) FN 0 - 10 FN 10 - 30 FN 30 - 100	 ± 0.5 FN ± 5% of the reading ± 10% of the reading
Air cooled: Accuracy (30°C - 300°C) FN 0 - 10 FN 10 - 30 FN 30 - 100	 ± 1 FN ± 10% of the reading ± 20% of the reading
Transfer standards	Five transfer standards Range typically 3 FN to 115 FN
Zero	Automatic on demand
Mode	Average or peak
Storage	52 records
PC Download	RS232 or USB
Probe	Pencil style, 15mm diameter length 120mm. Sensing area 10mm diameter
Operating temperature	Standard 0°C - 40°C Air cooled 0°C - 300°C
Air cooled operation	Air line supply regulated to 1 bar maximum Oil filtered supply desirable Air temperature: ambient (10°C - 30°C)
Humidity	Non-condensing
Weight in case	1.25 kg
Case dimensions	210 x 100 x 45 mm
Support	Call/email Diverse for support for use of the instrument or assistance with unusual application.

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. Do not use the instrument when the batteries are low as the accuracy may be compromised.

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.

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:-
Diverse Technologies & Systems Ltd.
Zeromag House
46-48 Whittlesford Road
Shelford
Cambridge CB22 5EW
UK

Tel: +44 (0) 1223 84 44 44
Email: sales@diverse-technologies.net
http://www.diverse-technologies.net

The MF300F+ and probe is supplied with a calibration certificate and transfer calibration standards. If the transfer standards do not read accurately, and this is not rectified by a user calibration (section 5.2), then the instrument should be returned to Diverse for factory calibration.

If the MF300F+ requires repair, the unit should be returned to Diverse, there are no user serviceable parts.

IMPORTANT

Instruments returned to Diverse for calibration or repair, from outside the EU, must be imported into the UK using simplified IPR customs procedure. If this is not carried out then duties will be incurred that Diverse will have to pass on. If in doubt contact Diverse.

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.