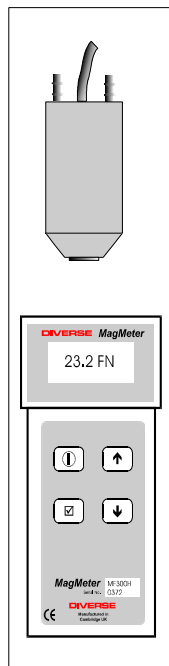


# DIVERSE

## MAGMETER MF300F

### FERRITE MEASUREMENT SYSTEM

#### OPERATING INSTRUCTIONS



2007

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## Preface

Thank you for purchasing MF300F. Before using the unit, please read these instructions carefully. If you are uncertain about any aspect of its operation, please contact Diverse at Cambridge, England CB22 5EG, or email [sales@diverse-technologies.net](mailto:sales@diverse-technologies.net) for clarification.

See our pages on the internet for application information.

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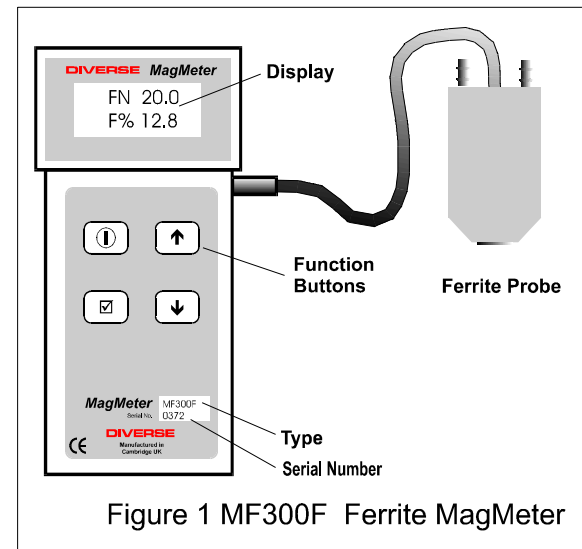
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## Introduction

The MF300F Ferrite meter is shown in figure 1. The meters are calibrated a few days before delivery and a calibration certificate is supplied.



The unit requires 4 AA cells which should be installed in the battery compartment on the rear of the housing.

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The Ferrite probe supplied with the meter is of a robust design suitable for use in an industrial environment. If the probe is subjected to mechanical stresses or forces it can be damaged,

The sensitive region of the Ferrite probe is in the centre of the white disc fitted at the end. When the probe is placed on a surface for measurement of the Ferrite content, the probe senses a region 4mm diameter and penetrates 2mm into the surface.

If you have chosen an air cooled probe, the probe is fitted with manifold and umbilical. Air or other inert cooling gas should be injected into the manifold via the fitting provided and exits through the silencer on the back of the probe. The recommended gas pressure is 2 bar, a relief valve is fitted to the manifold.

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## Operation

The Ferrite meter has four keys:

- ⊖ power to switch on/off
- √ tick, to zero the display
- ↑ up,
- ↓ down

The actions of the ↑ and ↓ keys are described in the calibration section.

### Step 1 Plug in the Ferrite Probe

### Step 2 Power On/Off

Ensure that 4 AA batteries have been placed in the rear battery compartment, and switch the unit on by pressing the power key. The display shows the Ferrite Number and percentage ferrite. To switch the unit off, press and hold the power key for 2 seconds.

### Step 3 Zero

The reading should be set to zero

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immediately before taking every reading. Hold the probe away from any steel or magnetic surface and the display should show 0.0. If not, press the  $\sqrt{\quad}$  key for 2 seconds. The display will change to zero. The probe can now be used to take a measurement. **The probe should be set to zero before each measurement of the ferrite content.**

#### Step 4 Measure the Ferrite Number

Place the white circular probe end flat on the surface of the material where the ferrite is to be measured. The display shows the Ferrite Number and the Ferrite percentage. In practice, the ferrite content of a material is not distributed uniformly and therefore at a microscopic level, the % ferrite varies from point to point. The MF300F probe averages the ferrite content over 4mm diameter and 2mm depth.

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## Hot surfaces

When measuring the ferrite content where the surface has a temperature in the range 40 - 300 °C then an air cooled ferrite probe should be used. See Options section.

The air cooled probe will ensure that the sensors are not damaged when the probe tip is placed in contact with hot surfaces for short periods.

Note that the probe will become warmer and as a result the displayed value of Ferrite Number may change. To avoid errors, the display must be set to zero just before the measurement is taken and the probe should then be placed in contact with the hot surface without delay for a period of about one second to measure the Ferrite Number.

The probe can then be removed from the hot surface and any subsequent changes in the displayed value of the Ferrite Number should be ignored.

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The air cooled probe can remain in contact with a surface of 300°C for up to 10 seconds providing that at least 10 lit/min of inert, dry cooling gas is passed through the probe.

The maximum time that the probe can be in contact with hot surfaces is a total of 10 seconds during any 3 minute period.

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## DEFINITIONS

### Ferrite Number and Ferrite Percentage

The term Ferrite Number is defined by the Welding Research Council, (WRC). See “Calibration Procedure for Instruments to Measure the Delta Ferrite Content of Austenitic Stainless Steel Weld Metal, WRC, July 1st , 1972”

The WRC highlight the fact that the volume percentage of ferrite cannot reliably be determined since it depends upon the type and origin of the stainless steel used, the techniques used to etch the ferrite and the microscopic technique used to determine the content. Therefore the WRC Ferrite Number was introduced as a standardised value which related to the ferrite content of an equivalently magnetic weld metal.

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The Ferrite Percentage is lower than the ferrite number although the two values become close for low ferrite percentages below 10%. For common duplex austenitic stainless steel the percentage ferrite content is about 0.7 x the FN. This is the value displayed on the MF300F Ferrite meter.

It should be noted that the ferrite distribution at a microscopic level will be different depending upon the type and source of material. This means that the ferrite content may not be uniformly dispersed and that the Ferrite Number reading will be an average of the microscopic distribution.

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## SPECIFICATION MF300F

### Accuracy:

At temperatures 10°C - 30°C  
FN 0 - 10, +/- 0.5 FN  
FN 10 - 30, +/- 5% of the reading  
FN 30 - 100, +/- 10% of the reading

At temperatures 30°C - 300°C  
FN 0 - 10 +/- 1 FN  
FN 10 - 30 +/- 10% of the reading  
FN 30 - 100 +/- 20% of the reading

**Units:** FN and %Ferrite

**Range:** 0 - 100 FN, 0 - 70% Ferrite

**Resolution:** 0.1FN, 0.1% Ferrite

**Zero:** The Instrument can be automatically zeroed on demand

**Probe:** Size 60mm x 30mm x 20mm

**Operating Temperature:** 0C to +40C

**Gas cooled probe:** 0C - 300 C

**Humidity:** Non-condensing

**Weight in case:** 1.25Kg

**Dimensions:** 210 x 100 x 45mm

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## CALIBRATION & REPAIR

The MF300F and probe is supplied calibrated, and with reasonable use should work without recalibration for up to 5 years. It is recommend that the unit is returned to Diverse after this period for recalibration.

### User Calibration

The user can adjust the gain on the ferrite meter using the reference standard supplied.

To enter the calibration mode, ensure the unit is switched off. Then hold down the  $\sqrt{\quad}$  key whilst pressing the ON key. The display will show a letter C to indicate that calibration mode is selected. Press the  $\sqrt{\quad}$  key again two times to allow calibration.

Zero the probe and then place it on the first step of the reference standard. Use the  $\uparrow$  and  $\downarrow$  keys to adjust the Ferrite Number until it is the same as the value

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given on the calibration sheet for that step of the reference standard. Due to inevitable non-uniformity of Ferrite standards, the value should be adjusted so that it is within  $\pm 0.5$  of the stated Ferrite Number. Switch the unit off to automatically enter the calibration value.

### Reset factory calibration

In order to restore the factory calibration, first ensure that the unit is switched off. Then hold down the  $\sqrt{\quad}$  key whilst pressing the  $\ominus$  key. The display will show a letter C to indicate that calibration mode is selected. Press the  $\sqrt{\quad}$  key again to allow calibration.

Zero the probe and then press the  $\downarrow$  key continuously until the display goes off and then comes on again. This will take about one minute and the  $\downarrow$  key should be held on the whole time.

Switch the unit off to enter the restored factory calibration.

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## OPTIONS

### Air/gas Cooled Probe Option

Where the surface of the ferritic material has a temperature over 30°C then it is recommended that an air-cooled ferrite probe is used. The air cooled version has a manifold and umbilical

Air or other inert cooling gas should be injected into the manifold via the fitting provided and exits through the silencer on the back of the probe. The recommended gas pressure is 2 bar, a relief valve is fitted to the manifold. The gas should be dry and free from oil.

### Software Option

The serial version of the MF300F is supplied with software to run on a PC compatible running Windows 3.1/95/98/2000/XP. Insert the software disc and run TERM.EXE either by installing its icon into a group in

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program manager/start run, or running it directly with file manager/explorer. First time you should identify the communications port you wish to use and select this in the 'Ports' menu. This is then stored in the configuration file, and will be automatically selected next time it's run.

Options available are shown in the File menu:

**Start logging.** This allows values to be transferred from the Ferrite meter to the PC whenever the  $\sqrt{\quad}$  key is pressed.

**Stop logging.** Indicates that data logging is completed and allows the user to provide a filename to save the data.

**Time stamp.** This can be toggled on or off to allow the time to be recorded with each of the stored ferrite readings. The time will be taken from the current setting on the PC.

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**Timed sampling.** Allows the user to select a set of readings which will be taken automatically. Select the time between readings and the number of readings. The user is also asked for a file name where the data will be stored. Select Activate to commence taking the samples.

### MF300F with Serial link

This version of the Diverse Ferrite Meter is capable of storing ferrite readings. These can then be transferred to a PC at a later time. Alternatively readings can be taken which are transferred directly into the PC.

### Notes on operation when not connected to a computer.

- 1 Connect the ferrite probe to the socket on the monitor.
- 2 Press the ⊖ key until the display illuminates. The display will show the following legends:

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WRITE 000  
X.X FN  
Y.Y F%

The unit is in the WRITE mode where the display indicates the current value being recorded by the probe.

The number 000 refers to the current memory location where the next reading will be stored.

X.X FN is the ferrite number and Y.Y F% is the estimated ferrite content.

- 3 Zero the reading by holding the √ key down until the Ferrite number is zero. This should be done whilst the probe is held at least 300 mm away from any metal object.
- 4 Values of the ferrite number can be saved to memory. The next available memory location is shown at the top right hand corner of the display. There are 100 memory locations which are labelled 0 - 99. To record a value in memory, press the ↑ key.

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This saves the ferrite number at the displayed memory location and increments the location by 1. Up to 100 values can be stored in this way. If more values are recorded, they will overwrite previously recorded ferrite numbers.

- 5 To read the values recorded in memory, press the  $\ominus$  key momentarily so that the following legends are displayed.

READ            000  
X.X FN  
Y.Y F%

The value of the ferrite number shown of the display refers to the reading which had been stored previously in the memory location indicated in the top right hand corner of the display. To observe the readings stored in memory, use the  $\uparrow$  and  $\downarrow$  keys to scroll to the required memory locations.

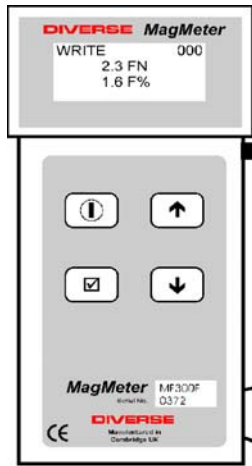
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- 6 To switch off, hold the  $\ominus$  key down until the display is turned off.

### Use of the MF300F connected to a computer.

- 1 Connect the Ferrite Meter to a PC using the lead provided. See the figure below. The lead should be connected to one of the communication ports on the computer. Note the number of the port which is required when the software is run on the PC.
- 2 Install and run the software from the disc supplied with the MF300F as described earlier in the user manual.
- 3 The MF300F operates in the same way when connected to the PC as when it is operated as a stand alone unit but with the following additional facilities.
- 4 To transfer a reading directly to the PC, select 'Start Logging' and press  $\surd$  or press the Space bar on the

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Ferrite Probe Socket.

Charger Socket

Serial Socket

Connections for the MF300F with serial output and rechargeable batteries.

computer. The value of the reading will be displayed on the monitor as X.X,Y.Y,LL where X.X is the Ferrite number, Y.Y is the Ferrite %, and LL is the memory location number.

- To transfer stored data to the PC, put the MF300F into read mode, select 'Start Logging' and press the  $\sqrt{\quad}$  key. All the readings stored in the 100 memory locations will be transferred.

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## Recharging the MF300F

For MF300F units fitted with rechargeable batteries and a charging socket, the meter may be recharged using the battery charger supplied with the equipment. If the display becomes faint, then the meter needs recharging.

The charger should be connected to the socket in the side of the meter and the power switched on to the charger for 8 - 12 hours.

Note that the chargeable version of the MF300F is supplied with 4 rechargeable AA cells. Only rechargeable batteries should be used with the Ferrite meter when the battery charger is 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 a period of 12 months following purchase. This does not include damage resulting from incorrect operation of the unit.

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