Tempmaster 100

High Accuracy Digital Thermometer

Installation and Operating Instructions

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   Versions 2.1 & 3.0. use Pt100 resistance versus temperature values according to Draft International Standard, Amendment 2 to IEC 751 for ITS 90 and is supplied with TEMPMASTER-100 Corrections Software allowing digital probe matching via the RS232 interface.

Information in this publication may be subject to change; the TEMPMASTER-100 is a microprocessor based, software driven instrument and may therefore be subject to software and hardware changes in line with our policy of continuous product development.

The Tempmaster-100 has been tested for, and complies with the European Electromagnetic compatibility directives and safety requirements.
1. INTRODUCTION

A high precision portable thermometer for metrology and other exacting laboratory applications, the TEMPMASTER-100 is a proven instrument used worldwide as a laboratory and site standard in pharmaceuticals, medical, food, environmental testing, R & D, and general industrial applications. It is particularly suitable as the reference standard for temperature calibration baths.

The TEMPMASTER-100 Digital Thermometer utilises highly advanced microprocessor circuit design to achieve exceptional measuring accuracy, linearisation conformity and stability in a versatile but easy to use configuration.

Based on a high resolution 20 Bit Analogue to Digital converter, all measurement computations are performed digitally without drift. The 5 digit LED display provides a readout to 0.01°C over the entire -199.99 to +849.99°C range; alternatively °F, Kelvin or Ohms values can be displayed up to 999.99 units.

Single or dual Pt100 3 or 4 wire sensors are accepted; the TEMPMASTER-100 will automatically recognise and select 3 or 4 wire mode. Display of input A,B or A-B (differential) can be selected; a differential “zero function” allows sensor accuracy differences to be eliminated for accurate differential readings.

An RS232 interface (remote control and measure) is fitted as standard and isolation is incorporated. An analogue (retransmission) output is also fitted as standard; the 0-IV dc output is programmable between lower and upper set limits.

Calibrated sensors can have their calibration points programmed into the TEMPMASTER-100 via a personal computer using Labfacility software. The instrument then digitally self calibrates to the probe(s) providing corrected temperature readout to give optimum system accuracy.

The non-volatile memory ensures permanent retention of the values until the user wishes to reprogram using the software, preventing unauthorised personnel from changing the values.

Primary power is provided by an internal, rechargeable sealed lead-acid battery which provides in excess of 12 hours operation from a full charge. A mains adaptor is provided for re-charging and for operation directly from the mains.
Front Panel Information at a Glance: when you switch on

To obtain a reading from a temperature sensor, select channel A or B (1) and select the required units (2).

The selected channel and units are indicated by the appropriate indicator LED. The A and/or B LED indicators, according to the channel selected, cycle between a steady on state and a brief off state (occulting) when corrections are stored and applied to measurements. To read differential temperatures from two sensors, select channel A-B (1) and select the required units (2).

To set an A-B reading of zero to “null out” probe differences, press NULL (3).

Error Indications
The TEMPMASTER-100 has several modes of error indication according to internal or external problems. Refer to section 3iv) for details.
2. INSTALLATION

**General**

a) The standard version is for bench-top use. Retractable legs can be extended to provide a convenient viewing angle.

b) The optional version permits the installation of the TEMPMASTER-100 into a suitable panel cutout.

**Supply Connection**

Primary power is provided by the internal, rechargeable sealed lead-acid battery which provides up to 12 hours operation from a full charge. The external supply adaptor is provided for recharging and also allows operation directly from a 220/240V 50/60Hz supply (or 110V 50/60Hz to special order). The output lead with its fitted connector is connected to the appropriate rear panel mating connector.

Internal battery power can provide operation for up to 12 hours from full charge. Low battery charge state is indicated by “bAtt” on the display.

**Input Connections – Sensors**

Platinum Resistance Thermometer(s) (Pt100) must be fitted with a high quality D-plug and connected to INPUT A and/or INPUT B as required. A 3 or 4 wire configuration can be used but they are connected differently as shown. The TEMPMASTER-100 will automatically sense which configuration is employed.

Special care must be taken when connecting 3 wire resistance thermometer terminations to the connector pins. A good crimp must be achieved to avoid Ohmic contacts which would result in reading errors. Only use good quality connectors with gold contact material; the Labfacility D type is recommended.
3. OPERATION

Ensure that the instrument is connected to a suitable supply or has charged batteries and that the required input connections are made.

Switch “on” using the rear mounted rocker switch.

The display will show “Pr 2.1”, or “Pr 3.0” the program designation. There is a short delay while internal checks are carried out, then the input A value will be displayed.

i) To read sensor temperature directly

a) PRT input A is automatically selected at switch-on. Brief repeated key presses will step through the various functions or holding the key depressed will auto repeat (scroll through); this applies to the other functions as well.

Note: If for any selected channel, the sensor is either not connected or has a faulty connection (including sensor open-circuit), the LED display will show: “Err 3”

Press any button to resume normal operation (either select another channel or rectify any fault and continue intended use).

b) Press CHANNEL to select inputs A,B or A-B (differential).

c) Press UNITS to display the desired units °C, °F, K, or Ω

ii) To read Differential Temperature

The difference in temperature between two PRT sensors can be obtained by displaying A-B. Ensure that the necessary sensors are connected to both A and B inputs as required.

Press CHANNEL to select A-B
Press UNITS to display the desired units

The value now displayed is the difference between the input A and input B (A-B) for the sensor type indicated.

Null Feature:
For calorimetry and other applications to optimise the precision of differential measurements, probe tolerances can be nulled by pressing the NULL key when in A-B mode. This gives an A-B reading of zero when pressed regardless of any real difference value.

iii) Matching TEMPMASTER-100 to Calibrated Sensors

It is possible to automatically match the TEMPMASTER-100 Version 2.1 & 3.0 to a Pt100 sensor with up to 10 dedicated calibration values. Such values, published in an associated certificate indicate true Ω versus °C values corresponding to accurately known reference temperatures. Up to 10 sets of values per sensor can be fed into the instrument via the RS232 interface using the associated software supplied with each instrument as standard.

By matching the instrument to a probe on this basis, “corrected” temperature readings are obtained directly without the need for cross-referencing to temperature / resistance tables or to the calibration certificate. This is particularly helpful when taking differential (A-B) readings.

Refer to sections 6 and 7 for details
iv) Error Indications
The TEMPMASTER-100 has several modes of error indication according to internal or external problems as follows:

<table>
<thead>
<tr>
<th>Display</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err 1</td>
<td>Calibration lost (very unlikely)</td>
</tr>
<tr>
<td>Err 2</td>
<td>Software fault</td>
</tr>
<tr>
<td>Err 3</td>
<td>Broken probe connection</td>
</tr>
<tr>
<td>Err 4</td>
<td>RS 232 command error</td>
</tr>
<tr>
<td>bAtt</td>
<td>“Low” battery</td>
</tr>
<tr>
<td>or</td>
<td>Over-range input</td>
</tr>
<tr>
<td>ur</td>
<td>Under-range input</td>
</tr>
</tbody>
</table>

Only Err 1 / Err 2 would require returning the instrument to our factory.

Note: During normal operation, if a selected probe is disconnected from the instrument the display will indicate Err 3 (broken probe indication). If the same probe is re-connected, Err 3 will remain on the display until any key is pressed.

v) 3/4 Wire Recognition
TEMPMASTER-100 requires a minimum of 80mΩ lead resistance (e.g. 1 metre of 7 stranded 0.2mm wire) to recognise a 4 wire probe. Otherwise the instrument will default (perhaps incorrectly) to 3 wire mode.

If a simulator is used to apply resistance values to check or calibrate the TEMPMASTER-100, ensure that at least 80mΩ of lead resistance exists between the simulator and the D plug.

If using a shorter leadout from the probe or thicker gauge cable, please ensure that the TEMPMASTER-100 is in the correct wire recognition mode. This can be checked by pressing the SPAN ▲ button ONCE.

Two numbers will be displayed e.g. 3-4. The first digit being the X parameter (e.g. 3) and the second digit being the Y parameter (e.g. 4). These displayed numbers will only be displayed momentarily. Caution, Pressing the SPAN ▲ button more than once or holding it down continuously will alter the X-Y setting.

X Parameter
This is a user configurable parameter. If the probe configuration is 4 wire but has a lead resistance of less than 80mΩ per leg, the instrument may recognise it as a 3 wire probe (showing 3-3); the SPAN ▲ may be used to force the instrument into a 4 wire measurement mode by pressing SPAN ▲ until X = 4. To verify, allow the TEMPMASTER-100 to read the currently selected channel and press SPAN ▲ once; the display will now show 4-4.

X = 3 3 OR 4 wire mode is allowable on either channel A or B i.e. A4, B3 or A3, B4 or A3, B3 or A4, B4 (if both probes are 4 wire), i.e. 3 or 4 wire auto selected.

X = 4 4 wire mode is mandatory on both channels A & B i.e. A4, B4.
Y Parameter

The Y parameter gives the actual measuring mode of the currently selected channel (except differential).

| Y = 3 | 3 wire measuring |
| Y = 4 | 4 wire measuring |

Differential Mode

In A-B mode the SPAN A figure is not to be relied upon because the values displayed will be for the last channel which has been read by the instrument and this could be A or B.

In order to verify status of each channel, select the Channels A and B individually.

4. INSTRUMENT RE-CALIBRATION

If simulating resistance values to check the accuracy of temperature measurement ensure that the correct resistance versus temperature values are used.

Re-calibration of the TEMPMASTER-100 is unlikely to be required routinely unless specified by user regulations. If this is performed by someone other than the supplier, guarantee of specification compliance may be invalid.

The calibration kit option (two precision resistors) is required to perform re-calibration. No additional instruments are required since the TEMPMASTER-100 self-calibrates as follows:

CAUTION Do not proceed unless specified resistors are available. Failure to do so may invalidate the warranty.

a) With the supply disconnected, remove the instrument case cover by removing the two screws on the rear panel and sliding the cover off the rear of the instrument.

b) Insert the jumper JP1 (shorting connector) – this places the TEMPMASTER-100 into self-calibration mode. Connect the supply and switch on*. Calibration is simply a matter of connecting the precision resistors in sequence. The necessary value of the resistor, together with the input to which it has to be applied is indicated on the display. The steps are as follows (page 8):

* At this point, the existing calibration has been over-written by default values. The procedure should therefore now be completed.
i) Connect 100 Ohm calibration resistor to PRT input A.

ii) Press “SPAN ▲” and display will show a value close to 100 Ohms. If the value shown is wrong by more than 1.00 Ohms, a fault exists and the instrument must be returned for rectification.

iii) Press “SPAN ▲” again and the instrument will compute the average value of 16 readings of the resistor value.

iv) When the display reads “A = 250”, connect the 250 Ohm calibration resistor to input A.

v) Press “SPAN ▲” and display will show a value close to 250 Ohms. If the value shown is wrong by more than 1.00 Ohms, a fault exists and the instrument must be returned for rectification.

vi) Press “SPAN ▲” again and the instrument will compute the average value of 16 readings of the resistor value.

vii) Repeat steps (i) to (vi) for input B. The TEMPMASTER-100 then returns to a normal power-up state, PRT A, degrees C.

Switch Off the Instrument

1) Remove the jumper lead JP1. **This is VITAL.** Should the instrument be switched on with JP1 in position, the calibration is lost.

2) Replace the instrument cover.

The instrument is now ready for normal use. The central processor is software driven and no other adjustments or modifications should be attempted. If it is necessary for the supplier to re-calibrate an instrument in consequence of unauthorised persons so doing, a charge may be made accordingly.
5. ANALOGUE (RE-TRANSMISSION) OUTPUT

This output varies linearly between 0 and 1 Volt dc. The output will be at 0V whenever the reading of the instrument is at or below the zero parameter as set by front panel button pushes or RS232 commands. The output will be at 1 V whenever the reading is at the span parameter as set by the user.

Any reading between Zero and Span will result in an Analogue output signal proportional to the position of the reading with respect to the defined zero and span values. To set-up the output values:

1) Zero: Press "SHIFT" and "ZERO ▲" to raise the value (in current units) at which a zero output will occur. Press "SHIFT" and "ZERO ▼" to reduce the value in a similar way.

2) Span: Press "SHIFT" and "SPAN ▲" to raise the value (in current units) at which a SPAN (IV) output will occur. Press "SHIFT" and "SPAN ▼" to reduce the value in a similar way.

The size of the increment is 0.1 Ohm. This is necessary so as to eliminate the requirements of working from degrees of temperature (K, C or F) back to Ohms. If setting up in degrees, some odd looking numbers may occur on the display.

The output falls to 0V in the event of the selected span value being exceeded; this is done to indicate such a condition.
6. RS232 COMMUNICATIONS

General

Remote control will be seized by sending an RS232 character, and relinquished by sending the LOCAL command. While in remote control the front panel buttons will be locked out (inoperative) and the right hand decimal point will indicate remote operation (local lock-out). RS232 parameters will be a fixed baud rate and word length, 9600 Baud, 8 Data, No parity, 1 stop bit.

Remote control of calibration has not been included. (Refer to section 4)

Protocol:

Command strings are limited to a single statement; action will occur on receipt of the “end of line” character. All actions will return a status character followed by data if appropriate. The status will be “0” for a successful transaction; other values indicate syntax error, broken probe etc.

All commands may be abbreviated to their first two letters eg. UNITS OHMS becomes UN OH. Input delimiters will be spaces or commas.

Command set:

<table>
<thead>
<tr>
<th>Display parameters</th>
<th>UNITS</th>
<th>OHMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITS C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNITS K</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNITS F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INPUT A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INPUT B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INPUT A-B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analogue parameters:</th>
<th>SPAN</th>
<th>Value in Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZERO</td>
<td></td>
<td>Value in Ohms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement:</th>
<th>MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to Local:</td>
<td>LOCAL</td>
</tr>
</tbody>
</table>
Output Protocol

Replies will depend on the command implemented, and will be numeric or – with commas and spaces as delimiters. All replies will be terminated by CR and LF. The first number will be an error code.

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No error</td>
</tr>
<tr>
<td>1</td>
<td>Calibration lost. (EEPROM corruption)</td>
</tr>
<tr>
<td>2</td>
<td>Broken probe.</td>
</tr>
<tr>
<td>3</td>
<td>Syntax error</td>
</tr>
</tbody>
</table>

There will be no further numbers if:

a) There is an error

b) The primary command was UNITS, INPUT or LOCAL

Further output will be provided in the case of MEASURE, DUMP (DIAGNOSE)

1. MEASURE
   
   eg. if output is 0, 2351.7

   first number – error code
   second number – value in units set by previous commands

For digital probe matching within the instrument additional commands are used as follows:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORRECTIONS A</td>
<td>(Turns OFF B corrections)</td>
</tr>
<tr>
<td>B</td>
<td>(Turns OFF A corrections)</td>
</tr>
<tr>
<td>AB</td>
<td>(Turns ON BOTH A &amp; B corrections)</td>
</tr>
<tr>
<td>OFF</td>
<td>(Turns OFF BOTH A &amp; B corrections)</td>
</tr>
</tbody>
</table>

Whatever is set by this command is retained during power-down.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA</td>
<td>Lists Ch A corrections</td>
</tr>
<tr>
<td>LB</td>
<td>Lists Ch B corrections</td>
</tr>
<tr>
<td>CA</td>
<td>Enter Ch A corrections</td>
</tr>
<tr>
<td>CB</td>
<td>Enter Ch B corrections</td>
</tr>
<tr>
<td>Query</td>
<td>Says “Not enabled”, “A”, “B”, “AB”</td>
</tr>
<tr>
<td>XX*</td>
<td>Enables corrections</td>
</tr>
<tr>
<td>ENABLE*</td>
<td>Enables corrections</td>
</tr>
<tr>
<td>IC</td>
<td>Initialise corrections (i.e. Erase). Useful after installing new software.</td>
</tr>
</tbody>
</table>

* For these commands to be actioned the SPAN ▲ key must be pressed as the command is typed.
Corrections entered as Follows

<table>
<thead>
<tr>
<th>Type</th>
<th>TM Sends</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA &lt;CR&gt;</td>
<td>How Many Points</td>
</tr>
<tr>
<td>2 &lt;CR&gt;</td>
<td>Entry =/0 Ohms?</td>
</tr>
<tr>
<td>100.000 &lt;CR&gt;</td>
<td>DegC?</td>
</tr>
<tr>
<td>0.000 &lt;CR&gt;</td>
<td>0100.000 Ohms 0000.0000 DegC ok?</td>
</tr>
<tr>
<td>Y &lt;CR&gt;</td>
<td>Entry =/1 Ohms?</td>
</tr>
<tr>
<td>138.510 &lt;CR&gt;</td>
<td>DegC?</td>
</tr>
<tr>
<td>100.000 &lt;CR&gt;</td>
<td>0138.5100 Ohms 0100.0000 DegC ok?</td>
</tr>
<tr>
<td>Y &lt;CR&gt;</td>
<td>Done</td>
</tr>
</tbody>
</table>

This would repeat for more points.

Pressing N at the ok? prompt will allow re-entry of the point. Once entered, type LA or LB to see/confirm contents.

Rules of entry.

1) Ohmic values must always increment from point to point
2) All values must be entered to THREE decimal places i.e.:-.001 0.001 10.001 are all OK.

Note: Use of the “TEMPMASTER-100 CORRECTIONS PC SOFTWARE” supplied with the instrument facilitates the correction procedure by means of a much simplified, user-friendly approach described on the following page.
7. USE OF CORRECTIONS PC SOFTWARE for Digital Probe Matching (from version 2.1)

Instrument set-up and software installation

PC Requirements: A PC having a 3½” disk drive and/or CD Rom drive and mouse.

Using TEMPMASTER-100 Version 2.1 or 3.0 software & RS232 interface lead.

i) Connect the RS232 interface lead to the TEMPMASTER-100 and to the PC according to the pin configuration shown in section 6.

ii) Switch on the instrument and PC.

iii) Select the instrument and PC.

Copy all the files from the distribution medium to the same directory/folder on the computer and run TM100.exe from there.

Files:

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>README.PDF</td>
<td>this file</td>
</tr>
<tr>
<td>TM100.EXE</td>
<td>main program</td>
</tr>
<tr>
<td>PCOMM.DLL</td>
<td>data link library for the serial port</td>
</tr>
<tr>
<td>Standard.cor</td>
<td>Standard correction table</td>
</tr>
</tbody>
</table>

Note 1: These instructions are included in the software as the “text file” and can be viewed or printed out as required.

Note 2: Prior to despatch the TEMPMASTER-100 and PC software should be “enabled” for normal operation. In the unlikely event of a communications problem between the two items, please perform the following procedure: With all set-up actions completed and the Main Menu on the PC screen, press the SPAN ▲ key on the TEMPMASTER-100 whilst simultaneously clicking on to the enable button on the Main Menu. To check, click the Query button and the status box should confirm enabled. Normal operation can now be carried out.

Note 3: To prevent corrections being programmed into the TEMPMASTER-100 click on disable button. See Note 2 to re-enable.
THE TM100 SOFTWARE PROGRAM

The program will detect the presence of a Tempmaster-100 automatically if connected, and display the Tempmaster-100 corrections setting.

The user interface consists of a window DISPLAY and COMMAND menu.

DISPLAY

The display shows both Channel A and Channel B corrections tables, controls for Units, Channel, Logging and Corrections settings.

Corrections tables

The corrections tables show the current values of Ohms/Deg.C relationships for channel A and channel B separately.

The two Tables are operated separately through sets of Read, Send and Clear buttons. This allows the current values to be read from the Tempmaster-100 and sent to the Tempmaster-100, or clear in the display window.

The following buttons are implemented on the Display window.

Units – to cycle the Units between C, F, K and Ohms. First click on the Units button will bring up the Units display and set the Units to C.

Measure – to get a measurement from the current channel.

Channel – to cycle the channel between A, B and A-B. First click on the Channel button will bring up the Channel display and set the Channel to A.

Start/Stop – to start or stop logging to a file. The Log Rate is settable between 5s to 300s. The total number of points is settable between 1 to 65000. While logging, all other buttons are disabled.

Query – to query the Corrections setting; Not Enable, none, A, B, or A & B.

Correction – to cycle the corrections setting between A, B, and A & B.

Enable – to enable the corrections. This is only functional when the SPAN ^ key on the Tempmaster-100 is held down.

Disable – to disable the corrections. This is only functional when the SPAN ^ key on the Tempmaster-100 is held down.

Initialise – to erase the corrections table of both channel A and B.

COMMANDS

The TM100 program supports the following commands on the command menu:

File

Load – The corrections tables from the disk.

Save – The corrections tables to the disk.

Exit – the program.
Options

Port 1 to Port 2 – The TM100 program supports serial port 1 to 4. The port number is set to 2 by default.

Local – in the unlikely event where the communication between the TM100 program and Tempmaster-100 is interrupted, it is possible to leave the Tempmaster in remote control. This command can be used to put the Tempmaster-100 back to local mode. If this fails, switch the Tempmaster-100 Off and On after which it should work.

The TM100 program uses the following files:

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>README.PDF</td>
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<td>PCOMM.DLL</td>
<td>data link library for the serial port</td>
</tr>
<tr>
<td>*.cor</td>
<td>corrections files as saved by the TM100 program</td>
</tr>
<tr>
<td>*.csv</td>
<td>log files as saved by the TM100 program</td>
</tr>
</tbody>
</table>

This ReadMe.pdf file can be accessed under Help.

Note: Although the TEMPMASTER-100 stores only one set of corrections for each channel, the number saved in the software is limited only by available external data storage space. Data for many probes can thus be stored.

When using corrections the TEMPMASTER-100 channel annunciation lights (A or B) will occult at 4 second intervals according to the channel selected. In A-B mode channel A and/or B annunciation lights occult at 8 second intervals.

It is important to note that the TEMPMASTER-100 will only apply corrections within the minimum and maximum temperatures programmed. Outside this range the TEMPMASTER-100 will revert to its standard resistance versus temperature values for Pt100 sensors and the channel annunciation light will illuminate normally. i.e. the instrument interpolates only and will not extrapolate to extend corrections outside the range entered.

When calibrating probes alone, prior to programming corrections into the TEMPMASTER-100, we recommend calibrating at a point slightly higher and a point slightly lower (e.g. by 5°C) than the maximum and minimum temperatures expected for the probe in use. This ensures corrections are always applied during normal operation. We recommend a minimum of three correction values are programmed. The TEMPMASTER-100 corrects only in temperature (°C, °F, K). The Ohms value is not affected. Therefore, when measuring in Ohms in corrected mode channel annunciation lights will not occult.
8. SPECIFICATIONS

All values are valid for a nominal 240V 50Hz supply and 20°C ambient temperature (±2°C).

**General**

Range/Sensor type  Pt100 to IEC 751 (ITS 90 refers). -199.99 to 849.99°C. Ro=100Ω. Two input channels, each 3 or 4 wire connection with automatic recognition (with manual override).

Overall instrument accuracy (4 wire)  ±0.02°C ±1 digit for range -200°C to +500°C.

Overall system  Better than ±0.04°C with TM-L250 precision probe accuracy (4 wire) from -50°C to +250°C with TM-COR.CAL 5 point UKAS calibration.

Linearisation conformity  ±0.01°C.

Stability (vs ambient temperature)  0.0025°C/°C ambient change.

Warm-up time  Negligible under normal ambient conditions. Allow 5 to 10 minutes for full stability unless stored at low temperature, then allow 30 minutes minimum.

Pt100 sensor current  0.5mA nominal.

Display resolution  0.01°C, °F, K, Ω.

Measurement units  °C, °F, K, Ω (user selectable).

Measurement modes  Input A or B or A-B (differential). Null facility in A-B mode.

Custom calibration (via PC software)  Up to 10 calibration values can be allocated to (via PC software) channels A and B. Values are retained in non-volatile memory until replaced by user.

Null function  Corrects differential temperature readout between the two sensors to zero.

Sensor lead resistance  25Ω each lead maximum.

Supply  Internal rechargeable batteries. Mains 220/240V 50/60Hz, adaptor included. Battery charge life up to 12 hours with full charge dependent on pattern of usage. Charger requirement 10 -11.5V d.c. 1A.

Power consumption  10W nominal. Max. 20W when battery is charging.

Series mode rejection  60dB @ 50Hz (50mV rms applied).
<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common mode</td>
<td>30V rms applied between input and earth produces no measurable effect.</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>0 to 50°C non-condensing. Ensure stable temperature range for best accuracy. Allow adequate warm-up time if moved from region of low ambient temperature prior to use.</td>
</tr>
<tr>
<td>EMC compliance</td>
<td>Meets EMC regulations. RFI to BS EN 61000-6-3: 2001 and immunity to BS. EN 61000-6-1: 2001.</td>
</tr>
<tr>
<td>CE compliance</td>
<td>CE marked and compliant to current regulations.</td>
</tr>
<tr>
<td>Display</td>
<td>14mm LED, 5 digit, 999.99 range.</td>
</tr>
<tr>
<td>Front panel controls</td>
<td>5 x membrane keys for user functions.</td>
</tr>
<tr>
<td>Input connections</td>
<td>2 x Pt100 via “D” connectors</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Metal bench-top. Optional panel mounting kit.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>145 x 66 x 240mm deep.</td>
</tr>
<tr>
<td>Weight</td>
<td>1.5kg approximately</td>
</tr>
<tr>
<td>Communications</td>
<td></td>
</tr>
<tr>
<td>RS232 (standard)</td>
<td>Remote control and measure. Isolated, 9600 Baud, 8 data, no parity, 1 stop bit.</td>
</tr>
<tr>
<td>PC software (standard)</td>
<td>PC software running in Windows serves as a real time monitor, control &amp; corrections tool for the instrument. ASCII protocol interface.</td>
</tr>
<tr>
<td>Analogue output</td>
<td>Analogue 0 to 1 Volt d.c. between programmable lower and upper set limits representing channel A,B or A-B. Accuracy 0.5% of reading. Non-isolated.</td>
</tr>
</tbody>
</table>
Accessories and Order Codes

TM-100  Tempmaster-100 (bench-mounting) supplied complete with battery charger, two Pt100 “D” connectors, operating manual and PC software.

TM-100-P  Tempmaster-100 (panel mounting) supplied with panel mounting brackets, battery charger, two Pt100 “D” connectors, operating manual and PC software.

Precision Pt100 Probes

Stainless steel probes, 6mm diameter with 2m screened PTFE lead and “D” connector.

TM – L250  250mm long, 250°C maximum.

TM – H450  350mm long, 450°C maximum.

NAMAS Calibration

TM – NAMAS  UKAS calibration of instrument alone.

TM – SYS.CAL  5 point UKAS certification of Tempmaster-100 with one probe. Please specify five temperatures.

TM – COR.CAL  5 point UKAS certification of Tempmaster-100 with one probe, after initial calibration of probe alone and programming of corrections. Please specify five temperatures.

Accessories

TM – Case  Carrying / storage case.

TM – TBLK3  Terminal block for connection of 3 wire Pt100s.

TM – TBLK4  Terminal block for connection of 4 wire Pt100s.
SOUTHERN UK & EXPORT DIVISION: Units 5,6 & 7, Block K, Southern Cross Industrial Estate, Shripney Road, Bognor Regis, West Sussex PO22 9SD

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