

# User Guide

## Elcometer 224

### Surface Profile Gauge

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**Android™** 



Made for

 **iPhone** | **iPad** | **iPod**

These operation instructions are a short User Guide only. A copy of both this Instruction Manual and an English language extended version are available for download on our website [elcometer.com](http://elcometer.com). For the avoidance of doubt, please refer to the original English language version.

Gauge Dimensions: Integral: 168 x 73 x 37mm (6.61 x 2.87 x 1.46")  
Separate: 141 x 73 x 37mm (5.55 x 2.87 x 1.46")

Gauge Weight: Integral: 218g (7.69oz) including batteries  
Separate: 161g (5.68oz) including batteries

Applicable Patents: GB2505193, US9261345

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## 1 GAUGE OVERVIEW

- 1 LED Indicators - Red (left), Green (right)
- 2 Colour Screen
- 3 Multifunction Softkeys
- 4 On/Off Key
- 5 Separate Probe Connection
- 6 Internal Probe
- 7 Wrist Strap Connection
- 8 Battery Compartment (¼ turn open/close)
- 9 USB Data Output Socket (below cover)



## 2 BOX CONTENTS

- Elcometer 224 Surface Profile Gauge
- Calibration Test Foils; Nominal Values 125 & 500µm and Glass Zero Tile (Integral gauges)<sup>a</sup>
- Probe Protection Cap (Integral gauges)<sup>a</sup>
- Wrist Harness
- Protective Case (Model B)
- Transit Case (Model T)
- 1 x Screen Protector
- 2 x AA Batteries
- USB Cable & ElcoMaster® Software (Model T)
- Test Certificate
- User Guide

<sup>a</sup> For separate gauges, the test foils, glass zero tile and probe protection cap are supplied with the separate probe.

### 3 USING THE GAUGE

- a Battery Life Indicator
- b Bluetooth On - Grey: not connected; Orange: connected
- c Probe Scale
- d Upper Limit On
- e Measurement Mode<sup>#</sup>
- f Units of Measurement -  $\mu\text{m}$ , mils, mm, inch
- g Batch Type - normal, counted average
- h Menu Softkey
- i Display Softkey
- j Batch Softkey
- k Calibration Softkey
- l Reading Value
- m User Selectable Statistics - 4 rows
- n Batch Name (when in Batching)
- o Bar Graph - highest, lowest & average reading
- p Lower Limit On
- p Run Chart - last 20 readings
- r Upper & Lower Limits On

#### Model

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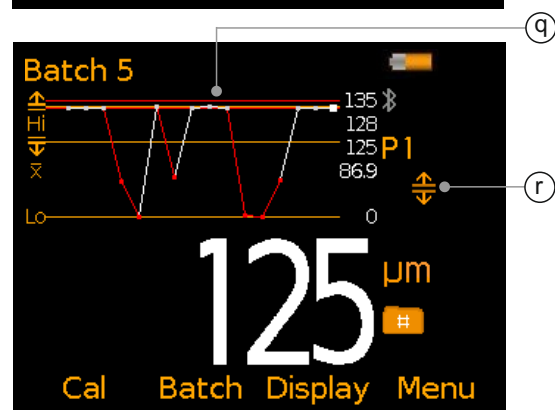
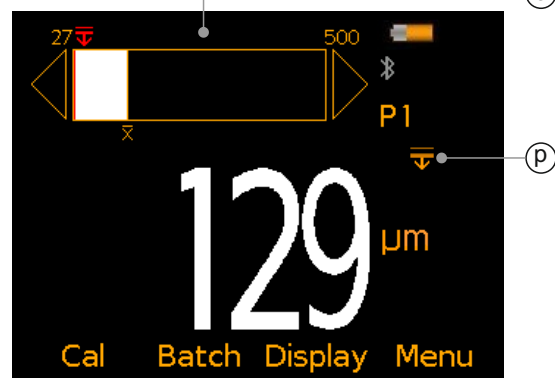
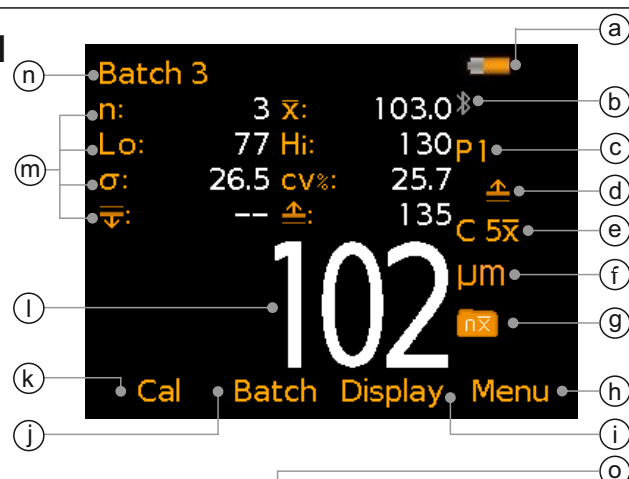
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### 4 GETTING STARTED

#### 4.1 ENSURING YOUR GAUGE HAS THE LATEST FIRMWARE & UPGRADING YOUR GAUGE

To ensure that your gauge has the most up-to-date gauge firmware, allowing you to benefit from the latest features and functionality, we recommend that the gauge is connected to ElcoMaster® on a regular basis and before first use.

Simply connect the gauge via USB to an internet connected computer running ElcoMaster® using the 'Connect Gauge' feature. If a later version of the gauge firmware is available, 'Update Gauge' will be displayed to the right of the gauge details. Click 'Update Gauge' to install the latest firmware.

<sup>#</sup> The icon displayed depends on the measurement mode selected. If 'Immediate' mode is selected, no icon is displayed. See Section 4.4 'Selecting the Measurement Mode' on page en-4 for further information.

4 GETTING STARTED (continued)

4.2 SELECTING YOUR LANGUAGE

- 1 Press and hold the ON/OFF button until the Elcometer logo is displayed.
- 2 Select your language using the  $\updownarrow$  softkeys.
- 3 Follow the on screen menus.

To access the language menu when in a foreign language:

- 1 Switch the gauge OFF.
- 2 Press and hold the left softkey and switch the gauge ON.
- 3 Select your language using the  $\updownarrow$  softkeys.

4.3 CONNECTING THE PROBE - SEPARATE GAUGES ONLY

- 1 Rotate the probe plug to align the pins.
- 2 Screw in the collar - clockwise.

See Section 13 ‘Elcometer 224 Separate Probes’ on page en-13 for details of the probes available.



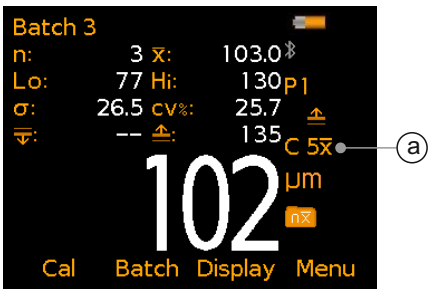
4.4 SELECTING THE MEASUREMENT MODE

The Elcometer 224 has a choice of three measurement modes; ‘Immediate’, ‘Custom’ and ‘Standards’ - see the table below for an explanation of the different modes available. The mode selected depends on which International Standard the user is working in accordance with.

To select the measurement mode:

- 1 Press Menu/Setup/Measurement Mode or when in batching (Model T only), Batch/New Batch/Measurement Mode.
- 2 Use the  $\updownarrow$  softkeys to select the required measurement mode.

The measurement mode selected and in use, is indicated by the icon shown on the right of the display (a). If no icon is displayed, ‘Immediate’ Mode is in use.



Icon Displayed	Measurement Mode
None	<b>Immediate:</b> Allows the users to take single measurements which are displayed on the gauge (Model B & T) and saved into the batch memory (Model T only). Note: This mode allows gauges to be used and measurements to be taken in the same way as older Elcometer 224 models.

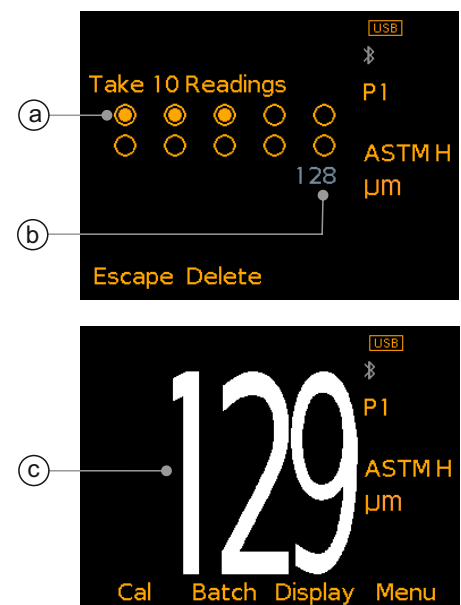
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## 4 GETTING STARTED (continued)

Icon Displayed	Measurement Mode
C 5 $\bar{x}$ , C 10 $\bar{x}$ C 5H, C 10H C 5L, C 10L	<b>Custom:</b> The user can choose to take either 5 or 10 readings and can choose to display on the gauge (Model B & T) and save into the batch memory (Model T only), the mean/average, highest or lowest measurement of each set of readings.
AS	<b>Standards:</b> Select from AS 3894.5, ASTM 4417-B or SANS 5772
ASTM $\bar{x}$ ASTM H	<b>AS 3894.5 (Australian Standard):</b> The user is prompted to take 10 readings. The lowest 5 readings are discarded and the mean/average measurement of the remaining 5 readings is displayed on the gauge (Model B & T) and saved into the batch memory (Model T only).  <b>ASTM 4417-B (American Society for Testing &amp; Materials):</b> The user is prompted to take 10 readings and can choose to display on the gauge (Model B & T) and save into the batch memory (Model T only), the mean/average or highest measurement of each set of 10 readings.
SANS	<b>SANS 5772 (South African National Standard):</b> The user is prompted to take 5 readings and the mean/average measurement of each set of 5 readings is displayed on the gauge (Model B & T) and saved into the batch memory (Model T only).
Note: When using 'Custom' or 'Standards' mode, only the mean/average, highest or lowest measurement as specified for each set of 5 or 10 readings is saved in the batch memory. The individual readings are not stored. This also applies when using 'Live Readings' mode in ElcoMaster® to transmit readings from a gauge to a PC to be stored in a batch within ElcoMaster®.	

When 'Custom' or 'Standards' measurement mode is selected:

- ▶ The circles indicate the number of readings out of the set of predefined readings which are to be taken (a). In this example, 3 out of the 10 readings have been taken.
- ▶ The value of the last reading taken is displayed on screen in grey, below the reading circles (b).
- ▶ When the last of the predefined number of readings has been taken, the mean/average, highest or lowest measurement (as selected by the user) is displayed (c).



## 5 TAKING A READING

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- 1 Hold the probe by its sleeve
- 2 To take a reading, bring the probe down onto the surface whilst holding it perpendicular
- 3 For subsequent readings, lift the probe off and then replace it onto the surface
- 4 To accurately assess the surface profile 5-10 readings should be taken over a surface area of 150mm<sup>2</sup> (6 sq. in.). The average of these readings will indicate the surface profile peak-to-valley height of that area.

- ▶ When using 'Immediate' mode, users can pre-define the number of readings using the counted average function. When in batching (Model T), press Batch/New Batch/Batch Type, select "Counted Average" and set the number of readings as required. The average of this pre-defined number will be saved into the batch, but the individual readings within the counted average are not saved. When not in batching (Model B & T), press Display/Statistics/Counted Average and set the number of readings as required. When using counted average, the gauge switches between displaying statistics based on individual readings to statistics based on the counted average, as each set of reading are taken.

### ✓ DO

- Hold the probe by the probe sleeve.
- Firmly place the probe onto the surface
- Allow the sleeve to make contact with the surface - to improve accuracy.

### ✗ DO NOT

- Drag the probe over the surface
- Bang the probe down hard onto the surface
- Swing the probe by its cable
- ▶ The display will dim if inactive for more than 15 seconds and will go 'black' if inactive for the period defined in Menu/Setup/Screen Settings/Screen Timeout. Press any key or tap the gauge to awaken it.
- ▶ The gauge will switch off automatically after 5 minutes of inactivity.
- ▶ - - - indicates reading outside range of probe.

## 6 CALIBRATING AND TESTING THE GAUGE CALIBRATION

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### 6.1 CALIBRATING THE GAUGE

Adjusting the calibration of the gauge is the process of zeroing the gauge on a smooth glass zero tile. Calibration foils can be used to check the accuracy of the gauge across its measurement range.

The Elcometer 224 Model T has a choice of calibration methods as detailed below. The Elcometer 224 Model B uses the Zero calibration method.

- ▶ **Zero Calibration:** A simple method for calibrating on the smooth glass zero tile. Simply place the probe on the glass tile and the gauge will adjust the calibration accordingly.
- ▶ **2 Point Calibration:** This is a more accurate method of calibrating the gauge than the Zero method as it requires the user to calibrate the gauge using a foil and the smooth glass zero tile.
- ▶ **Tip Change Calibration:** The precision manufactured probe tip will wear after continued use. Re-calibration is required after a tip replacement to ensure the continued accuracy of the gauge - see Section 6.2 on page en-8 for further information.

#### To calibrate the gauge:

- 1 Press the Cal softkey.
- 2 Use the **↑↓** softkeys to select the required calibration method (Model T only).
- 3 Follow the on-screen instructions.

After continued use, the surface of the glass zero tile will begin to wear. If a repeatable zero can not be obtained the tile should be replaced.

**Description**  
Glass Zero Tile

**Part Number**  
T22420072

## 6 CALIBRATING AND TESTING THE GAUGE CALIBRATION

### 6.2 CALIBRATING THE GAUGE AFTER PROBE TIP REPLACEMENT

The precision manufactured probe tip will wear after continued use. This is a consumable item which can be replaced by the user.

#### Description

Replacement Probe Tips (x2) with Fixing Tool  
Replacement Probe Tips (x5)

#### Part Number

T22420053  
T22420095

Re-calibration is required after a tip replacement to ensure the continued accuracy of the gauge.

#### To re-calibrate after tip replacement:

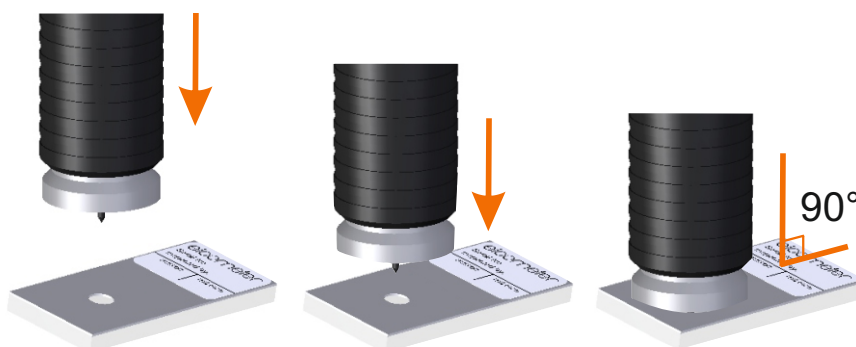
- 1 Press the Cal softkey.
- 2 Select “Tip Change Calibration” (Model T only).
- 3 Follow the on-screen instructions.

### 6.3 TESTING THE GAUGE CALIBRATION (MODEL T)

The calibration can be checked at any time without affecting any statistics or batch memory by following the procedure below and comparing the reading value displayed with the glass zero or measured foil value.

#### To test the gauge calibration:

- 1 Press the Cal softkey.
- 2 Select “Test Calibration” and follow the on-screen instructions.
- 3 When prompted, either place the probe on to the glass zero tile or on the centre of the foil resting on the glass tile, making sure the pin goes through the hole in the centre of the foil.



## 7 BATCHING - MODEL T

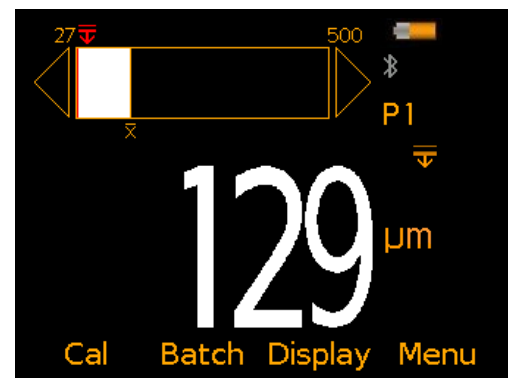
- 1 To use the Batching memory facility, press the Batch softkey
  - 2 Select “New Batch” or “Open Existing Batch” to add readings
  - 3 Copy and review batch data
  - 4 Select “Edit Batch” to rename, clear readings from or delete a batch
  - 5 Fixed Batch Size allows users to pre-define the number of readings to be stored in a batch.  
Once all readings have been taken the gauge automatically opens a new batch with a link to the original batch name. For Example *NewBatch\_1* becomes *NewBatch\_2*, *NewBatch\_3*, etc.
- Save each reading into memory or store the average of a pre-defined number of readings using the Counted Average function.

## 8 DISPLAYING GRAPHS

### 8.1 BAR GRAPH (MODEL B & T)

The Bar Graph displays an analogue representation of the thickness value together with the highest, lowest and average reading as measurements are taken. To display the Bar Graph:

- 1 Press the Display softkey and select “Readings & Bar Graph”

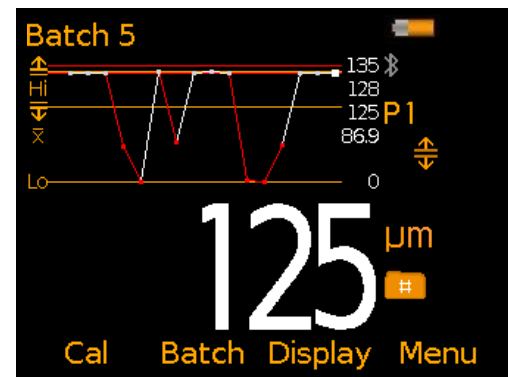


- If a reading is outside set limits, the white bar and the reading value turn red.

### 8.2 RUN CHART (MODEL T)

To display the Run Chart of the last 20 readings:

- 1 Press the Batch softkey
- 2 Select “New Batch” or “Open Existing Batch”
- 3 Press the Display softkey and select “Readings & Run Chart”.



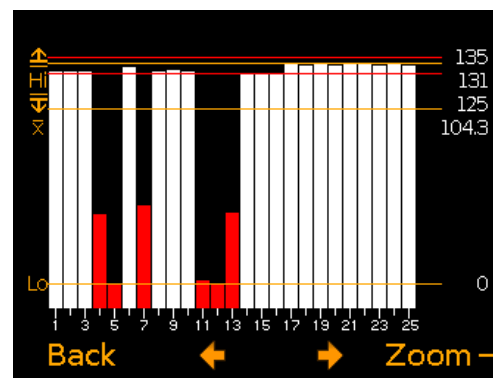
- Red points signify a reading outside the batch's limits (if set).

## 8 DISPLAYING GRAPHS (continued)

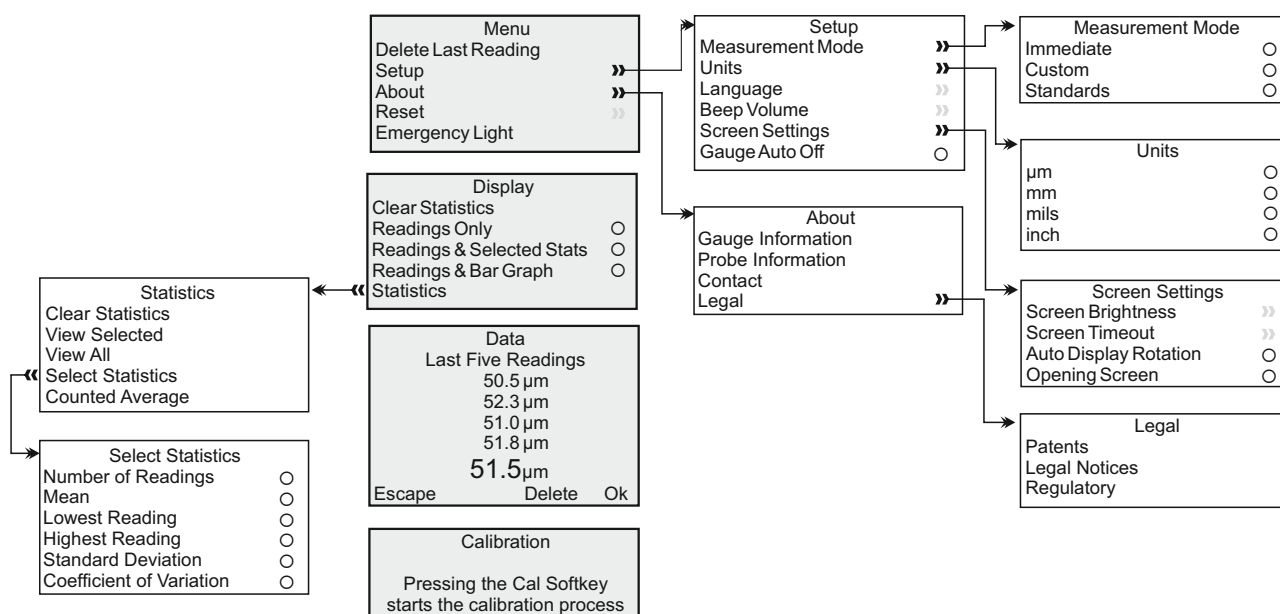
### 8.3 BATCH GRAPH (MODEL T)

To display the Batch Graph:

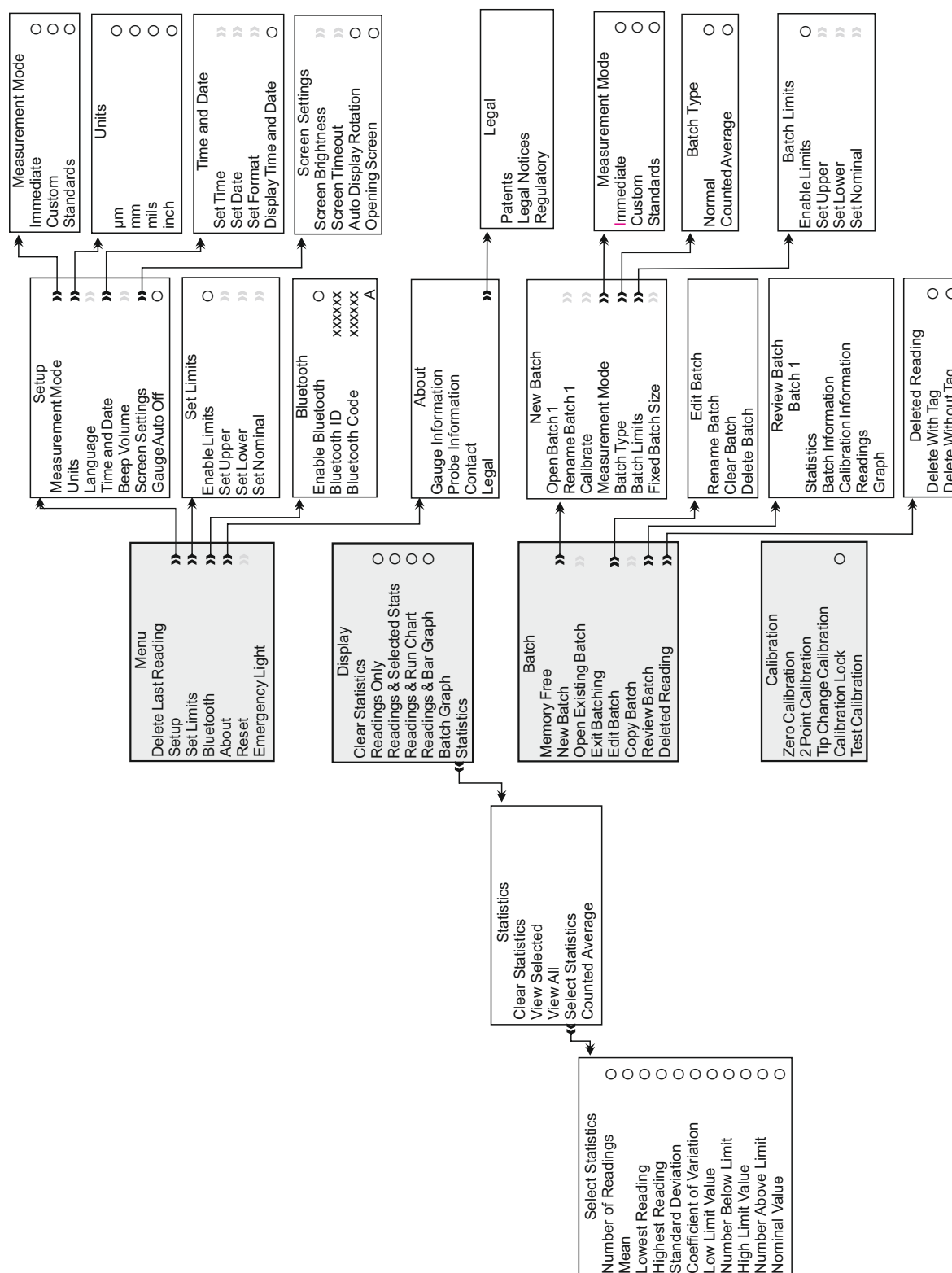
- 1 Select the appropriate batch name from Batch/Review Batch
  - 2 Select "Batch Graph".
- ▶ Red columns signify a reading outside the batch's limits (if set).
  - ▶ Press the Zoom softkey followed by ← or → to review individual readings as required.



## 9 MENU STRUCTURE - MODEL B



# 10 MENU STRUCTURE - MODEL T



## 11 DOWNLOADING DATA & UPGRADING YOUR GAUGE

### 11.1 USING ELCOMASTER®

- 1 Using ElcoMaster® - supplied with the Elcometer 224 Model T, and available as a free download at [elcometer.com](http://elcometer.com) - all gauges can transmit readings to a PC for archiving and report generation. Data can be transferred via Bluetooth® (Model T) or USB. For more information on ElcoMaster® visit [www.elcometer.com](http://www.elcometer.com).
- 2 All Elcometer 224 gauge firmware can be upgraded to the latest versions, as they become available. Elcometer 224 B & T models can be upgraded by the User via ElcoMaster®.
- 3 ElcoMaster® will inform you of any updates when the gauge is connected to the PC with an internet connection.

### 11.2 USING ELCOMASTER® MOBILE APPS (MODEL T)

Ideal when out in the field or on-site, live readings can be stored directly onto a mobile device and saved into batches. Inspection data can be transferred from mobile to PC for further analysis and reporting.



Compatible with smart phones and tablets running Android 2.1 or above. To install, download via [www.elcometer.com](http://www.elcometer.com) or using the Google Play™ Store app, and follow the on screen instructions.



Made for iPhone 6 Plus, iPhone 6, iPhone 5s, iPhone 5c, iPhone 5, iPhone 4s, iPhone 4, iPad Air 2, iPad mini 3, iPad Air, iPad mini 2, iPad (3rd and 4th generation), iPad mini, iPad 2, and iPod touch (4th and 5th generation). To install, download via [www.elcometer.com](http://www.elcometer.com) or the App Store, and follow the on screen instructions.

## 12 TECHNICAL SPECIFICATION

<b>Battery Type</b>	2 x AA batteries, rechargeable batteries can also be used
<b>Operating Temperature</b>	-10 to 50°C (14 to 122°F)
<b>Relative Humidity</b>	0 to 95%
<b>Gauge Dimensions</b>	Integral: 16.8 x 7.30 x 3.70cm (5.61 x 2.87 x 1.46") Separate: 14.1 x 7.30 x 3.70cm (5.55 x 2.87 x 1.46")
<b>Gauge Weight</b> (with supplied batteries)	Integral: 218g (7.69oz) Separate: 161g (5.68oz)
Can be used in accordance with: ASTM D 4417-B, SANS 5772, US Navy NSI 009-32, US Navy PPI 63101-000	

## 13 ELCOMETER 224 SEPARATE PROBES

A choice of flat or convex surface profile probes, ideal for measuring profile on external curved surfaces such as pipelines etc, are available for Elcometer 224 Separate Gauges, with either standard or armoured metal reinforced heavy duty cables.



All Elcometer 224 Surface Profile Probes have an accuracy of  $\pm 5\%$  or  $\pm 5\mu\text{m}$  ( $\pm 0.2\text{mil}$ ) and are supplied with a glass zero plate, calibration test foils; nominal values  $125\mu\text{m}$  (5.0mils) &  $508\mu\text{m}$  (20mils) and an Elcometer test certificate.

### Description

Flat Surface Probe; Standard Cable  
Flat Surface Probe; Armoured Cable  
Convex Surface Probe<sup>^</sup>; Standard Cable  
Convex Surface Probe<sup>^</sup>; Armoured Cable

### Part Number

T224C500US  
T224C500UARM  
T224C500UX  
T224C500UXARM

<sup>^</sup> Applicable Patents: GB2505193, US9261345

## 14 LEGAL NOTICES & REGULATORY INFORMATION

### Declaration of Conformity:

Elcometer 224 Model B complies with the requirements of the following EU Directives:

- 2014/30/EU Electromagnetic Compatibility
- 2011/65/EU Restriction of the use of certain hazardous substances

Elcometer 224 Model T complies with the requirements of the following EU Directives:

- 2014/53/EU Radio Equipment
- 2011/65/EU Restriction of the use of certain hazardous substances

Declarations of Conformity are available to download via:

Model B: [www.elcometer.com/images/stories/PDFs/Datasheets/Declaration\\_of\\_Conformity/English/DoC\\_224C\\_B.pdf](http://www.elcometer.com/images/stories/PDFs/Datasheets/Declaration_of_Conformity/English/DoC_224C_B.pdf)

Model T: [www.elcometer.com/images/stories/PDFs/Datasheets/Declaration\\_of\\_Conformity/English/DoC\\_224C\\_T.pdf](http://www.elcometer.com/images/stories/PDFs/Datasheets/Declaration_of_Conformity/English/DoC_224C_T.pdf)

Operational Frequency Band: 2,402 - 2,480 MHz

Maximum Transmitted Power: <4 dBm

This product is Class B, Group 1 ISM equipment according to CISPR 11.

Class B product: Suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Group 1 ISM product: A product in which there is intentionally generated and/or used conductively coupled radio-frequency energy which is necessary for the internal functioning of the equipment itself.

The USB is for data transfer only and is not to be connected to the mains via a USB mains adapter.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The ACMA compliance mark can be accessed via: Menu/About/Legal/Regulatory

Elcometer 224 Model T: The Giteki mark, its product identification code, the FCC ID and Bluetooth SIG QDID can be accessed via: Menu/About/Legal/Regulatory

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.


To satisfy FCC RF Exposure requirements for mobile and base station transmission devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Modifications not expressly approved by Elcometer Limited could void the user's authority to operate the equipment under FCC rules.

This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This Class B digital apparatus complies with CAN ICES-3 (B)/NMB-3(B).

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 Bluetooth® are trademarks owned by Bluetooth SIG Inc and licensed to Elcometer Limited.

Elcometer 224 Model T: Made for iPhone 6 Plus, iPhone 6, iPhone 5s, iPhone 5c, iPhone 5, iPhone 4s, iPhone 4, iPad Air 2, iPad mini 3, iPad Air, iPad mini 2, iPad (3rd and 4th generation), iPad mini, iPad 2, and iPod touch (4th and 5th generation).

"Made for iPod," "Made for iPhone," and "Made for iPad" mean that an electronic accessory has been designed to connect specifically to iPod, iPhone, or iPad, respectively, and has been certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards.

Please note that the use of this accessory with iPod, iPhone, or iPad may affect wireless performance.

iPad, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries.

App Store is a trademark of Apple Inc., registered in the U.S. and other countries.

Google Play is a trademark of Google Inc.

All other trademarks acknowledged.

The Elcometer 224 is packed in a cardboard package. Please ensure that all packaging is disposed of in an environmentally sensitive manner. Consult your local Environmental Authority for further guidance.

Head-Office: Elcometer Limited, Edge Lane, Manchester, M43 6BU, United Kingdom.

