

User Guide

Elcometer 480

Single, Dual & Triple
Angle Glossmeters

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Made for



iPod



iPhone



iPad

For the avoidance of doubt, please refer to the original English language version.

The Elcometer 480 is available in two models. This User Guide is written for the Model T. The Model B is referenced where applicable.

Gauge Dimensions: 68 x 155 x 50mm (2.7 x 6.1 x 2"). Gauge Weight: 534g (1.3lbs)

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1 GAUGE OVERVIEW & BOX CONTENTS (B & T)



1.1 Gauge Overview

- a Ambient Light Sensor
- b Dual Red / Green LED
- c LCD Display
- d Multifunction Softkeys
- e Battery Door Release Button
- f Battery Compartment
- g Power On / Measure Softkey
- h Calibration Tile (clips to base of gauge)
- i USB Data Output
- j Wrist Strap Connection

1.2 Box Contents

- Elcometer 480 Glossmeter
- Gloss Calibration Tile
- 2 x AA Alkaline Batteries
- Calibration Tile Cleaning Cloth
- Wrist Strap
- ElcoMaster™ 2.0 Software (Model T only)
- USB Cable (Model T only)
- Gauge Calibration Certificate
- Carry Case
- User Guide

2 USING THE GAUGE (B & T)

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Single gloss angle



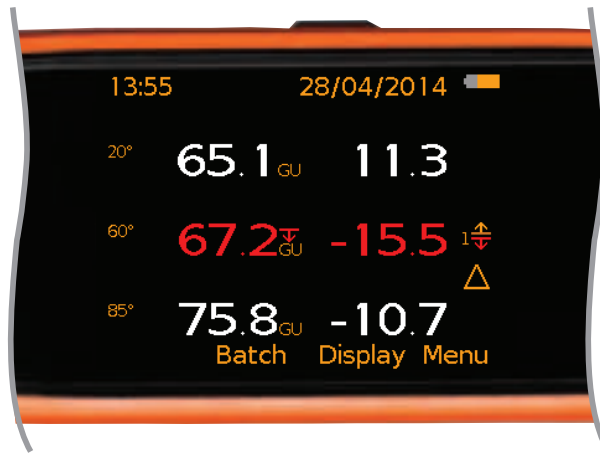
All three gloss angles



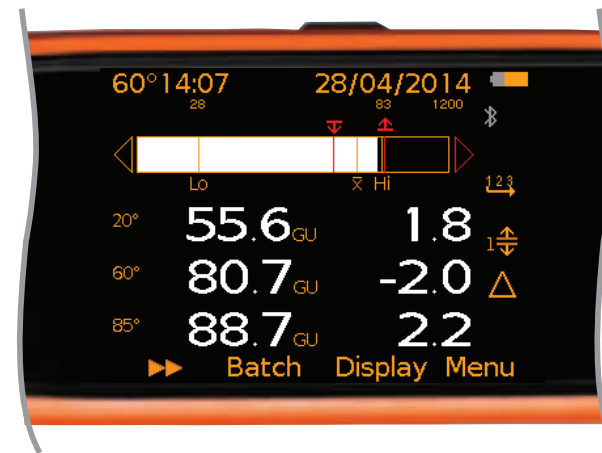
All three gloss angles, in a batch with statistics



Run Chart and statistics

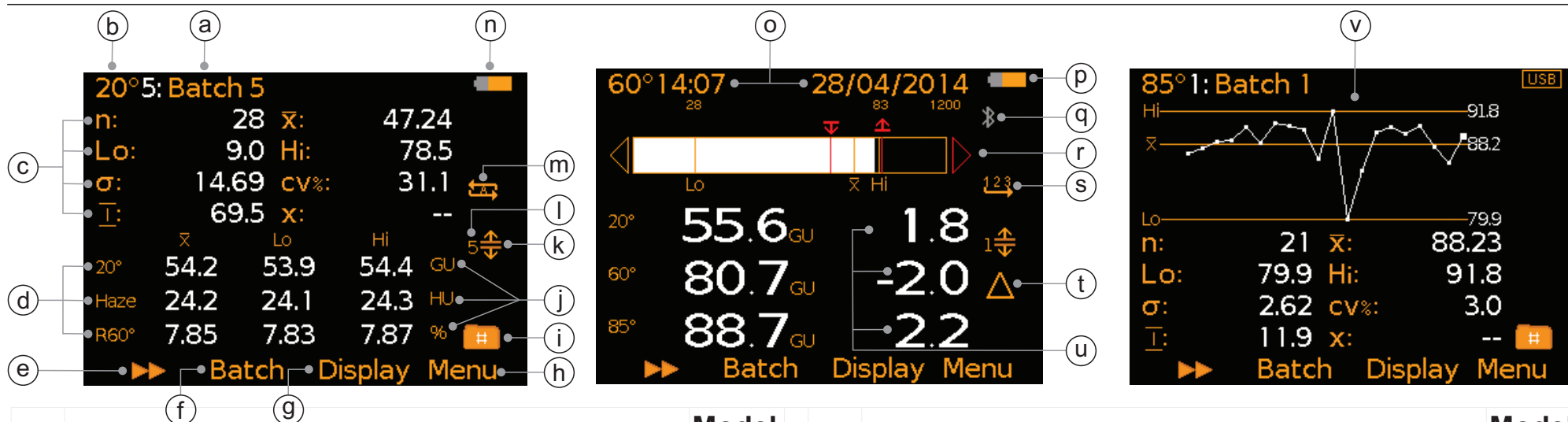


Readings & Differential Mode with one limit failing (outside low limit)



Auto Repeat Mode displaying bar graph and Readings & Differential

2 USING THE GAUGE (B & T) (continued)



		<u>Model</u>			<u>Model</u>
a	Batch Name (when in batching)	T	I	Limit Standard Index Number - Store up to 40 pre-programmed Limit Standards	T
b	Displayed Geometry - For Statistics, Run Chart or Bar Graph	T	m	Measurement Mode: Scan Mode (‘A’ signifies ‘Auto Save’ is enabled)	T
c	User Selectable Statistics - Maximum of 8	B, T	n	Power: Batteries (including battery life indicator)	B, T
d	Reading Values - Maximum of 3 geometries	B, T	o	Date & Time (when enabled and not in batching)	B, T
e	Scroll Softkey - View Statistics, Run Chart or Bar Graph for each geometry selected	T	p	Power: USB	B, T
f	Batch Softkey	T	q	Bluetooth On - Grey: Not Paired; Orange: Paired	T
g	Display Softkey	B, T	r	Bar Graph	T
h	Menu Softkey	B, T	s	Measurement Mode: Auto Repeat	T
i	Batching On	T	t	Differential Mode (displayed when ‘Readings & Differential’ and a Limit Standard are selected)	T
j	Measurement Units - Model B: Gloss (GU) Model T: Gloss (GU), Haze (HU), % Reflectance (%)	B, T	u	Measurement Differentials (variation from the Limit Standard nominal values)	T
k	Limit Standard On - Red: Limit Exceeded	T	v	Run Chart - Last 20 readings	T

3 GETTING STARTED

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3.1 FITTING THE BATTERIES (B & T)

Each gauge is supplied with 2 x AA alkaline batteries.

To insert or replace the batteries:

- 1 Press the battery compartment release button (a) to open the cover.
- 2 Insert 2 batteries taking care to ensure correct polarity.
- 3 Close the battery compartment cover.



The battery condition is indicated by a symbol in the top right of the display ():

- ▶ Full symbol (orange) = batteries at full capacity
- ▶ Empty symbol (red, flashing) = batteries at lowest sustainable level

3.2 EXTERNAL POWER SUPPLY

The Elcometer 480 can be powered via a computer's USB port using the cable provided (T), sales part number T99925002.

3.3 SWITCHING THE GAUGE ON AND OFF (B & T)

To switch on: Press the measure softkey for approximately 3 seconds until the Elcometer welcome screen is displayed.

To switch Off: Press 'Menu' and use the   softkeys to select 'Power Off'. The gauge can also be set to switch off automatically after a user defined period of inactivity via Menu/Setup/Gauge Auto Off. The default setting is 5 minutes.

3 GETTING STARTED (continued)

3.3 SELECTING YOUR LANGUAGE (B & T)

- 1 Press Menu/Setup/Language and select your language using the **↑↓** softkeys.
- 2 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 **↑↓** softkeys.

3.4 SCREEN SETTINGS (B & T)

A number of screen settings can be defined by the user via Menu/Setup/Screen Settings including:

- **Screen Brightness;** This can be set to 'Manual' or 'Auto' - the brightness is adjusted automatically using the gauge's ambient light sensor.
- **Screen Timeout;** The display will go 'black' if inactive for 15, 30, 45 or 60 seconds as defined by the user. Press any key, or tap the gauge to awaken it.
- **Screen Rotation;** Using the internal accelerometer, the gauge rotates the display to allow the user to measure or read values at 0° or 180° orientation as selected. If 'Auto Display Rotation' is selected, the gauge will automatically rotate the display.

3.5 SETTING UP THE READING DISPLAY (B & T)

The colour LCD display is split into two halves; Top Display and Bottom Display. The user can define which information is displayed in each half including:

- **None (B & T);** No information is displayed.
- **Readings (B & T);** Sometimes referred to as 'Simple Mode', the measurement readings are displayed for the geometries selected - see Section 3.6 'Geometry Selection' on page 8.

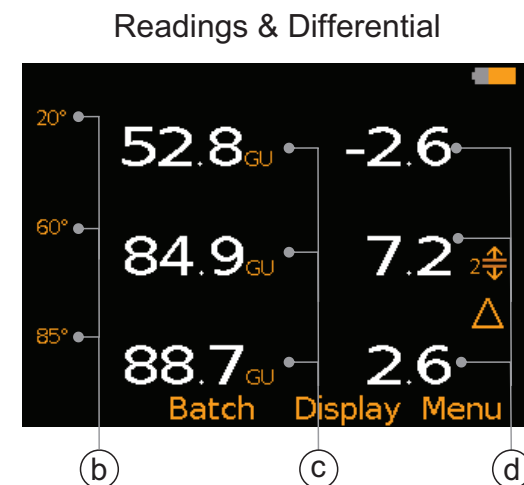
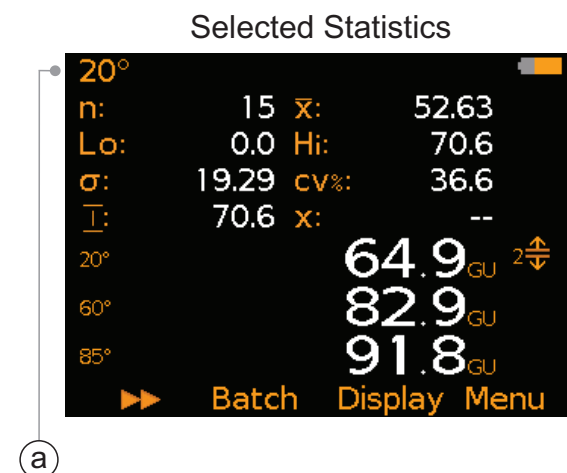
3 GETTING STARTED (continued)

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- **Selected Statistics (B & T);** As defined by the user via Display/Statistics/Select Statistics. Select from:
 B & T: Number of readings, Mean, Standard Deviation;
 T: Highest Reading, Lowest Reading, Range, Coefficient of Variation, Nominal Value, High Limit Value, Number Above Limit, Low Limit Value, Number Below Limit

The user can choose to view only those selected or view all. The statistics are displayed for the geometry indicated at the top left of the display (a). Pressing the ► softkey scrolls through the statistics for the different geometries selected - see Section 3.6 'Geometry Selection' on page 8.

- **Run Chart (T);** A line trend graph of the last 20 measurements which is updated automatically after each reading. Pressing the ► softkey scrolls through the chart for the different geometries selected - see Section 3.6 'Geometry Selection' on page 8.
- **Bar Graph (T);** an analogue representation of the current gloss, haze[†] or % reflectance value together with the highest (Hi), lowest (Lo) and average ($\bar{X}$) reading. The graph is updated automatically when each reading is taken. Pressing the ► softkey scrolls through the bar graph for the different geometries selected - see Section 3.6 'Geometry Selection' on page 8.
- **Readings & Differential^a (T);** The last readings (c) are displayed for the geometries selected (b) - see Section 3.6 'Geometry Selection' on page 8, together with the variation from the nominal values set against the Limit Standard (d) - see Section 4 'Limit Standards' on page 9.



[†] Model dependent: Dual and Triple Angle models only.

^a Not available in 'Scan Mode' - see Section 7.1 'Selecting the Measurement Mode' on page 16.

3 GETTING STARTED (continued)

To setup the display:

- 1 Press Display/Setup Display/Top Display (or Bottom Display as required).
- 2 Use the **↑↓** softkeys to highlight the required option and press 'Select'.

If 'None' is selected for one half and 'Readings' or 'Run Chart' for the other half, the readings or run chart will fill the whole the screen. If any other combination of options is selected; the data will be shown in the top or bottom display as specified.

3.6 GEOMETRY SELECTION

The Elcometer 480 Model B measures gloss at 60° only. The Elcometer 480 Model T measures gloss at 20°[‡], 60° and 85°[‡], Haze[‡] and % Reflectance at 20°[‡], 60° and 85°[‡]. For an explanation of terms - see Section 16 'Glossary' on page 31.

Readings for a maximum of three geometries can be displayed at any one time however, readings for all geometries are stored in the batch / statistics and are transferred to ElcoMaster™ 2.0 for further analysis.

To select which geometries are displayed:

- 1 Press Display/Display Geometry.
- 2 Use the **↑↓** softkeys to highlight the required option(s) and press 'Select'.

If three options are already selected, one must be de-selected before another can be chosen.

[‡] Model dependent: Dual and Triple Angle models only.

3 GETTING STARTED (continued)

3.7 REMOVING THE CALIBRATION TILE

The Elcometer 480 Calibration Tile has been designed to fit tightly to the base of the gauge, ensuring that it is held firmly in place during the calibration process. To remove, simply unclip the calibration tile using the lip along the top edge.



4 LIMIT STANDARDS (T)

Limit standards are acceptable tolerance levels as defined by the user allowing the user to compare readings to pre-defined values or approved samples (standards). Limit Standards can be created manually or automatically and saved in the gauge memory for future selection. The Elcometer 480 Model T can store up to 40 pre-programmed limit standards. These Limit Standards can be saved to a PC (within ElcoMaster™ 2.0) and transferred to any other Elcometer 480 Model T gauge.

Each 'Limit Standard' can consist of a nominal or target value (x) - required for 'Readings & Differential' - a low (↯) and / or high (↱) limit value for gloss and / or Haze[‡] measurements.

A 'Limit Standard' can be created in the gauge manually, automatically using the gauge's scanning function or via PC using ElcoMaster™ 2.0.

- **Manual;** the nominal, high and low limits for each angle of gloss and / or haze value are manually entered into the gauge by the user.

[‡] Model dependent: Dual and Triple Angle models only.

4 LIMIT STANDARDS (T) (continued)

- **Automatic;** an approved surface or surfaces are scanned using the gauge's scanning function. The Limit Standard is created automatically setting the average of the scanned 20°[†], 60°, 85°[†] gloss and Haze[†] values as the nominal values for each individual geometry together with the lowest and highest reading for each geometry.
- **ElcoMaster™ 2.0 and PC;** Limit Standards can be created within ElcoMaster™ 2.0 manually and transferred to any Elcometer 480 Model T. Similarly, Limit Standards created on a gauge can be saved to PC and transferred to any other Elcometer 480 Model T.

Limit Standards can be created for individual readings when in live reading mode or for each batch when in Batching.

To create a manual Limit Standard:

- 1 Press Menu/Limit Standard/Create Limit Standard/Manual/Create.
- 2 The 'Setup 20°[†]' screen will appear. Press 'Yes' to create the limit standard for the 20°[†] geometry.
- 3 Use the **↑↓** softkeys to set the required nominal gloss value at 20°[†] and press 'Ok'.
- 4 Use the **↑↓** softkeys to set the required low limit value at 20°[†] and press 'Ok'.
- 5 Use the **↑↓** softkeys to set the required high limit value at 20°[†] and press 'Ok'.
- 6 Repeat step 3 - 5 to set the required values for 60°, 85°[†] gloss and Haze[†] as required.
 - ▶ Values do not have to be set for all geometries. If not required, simply press 'No' to move to the next geometry.
 - ▶ A low and / or high limit value can be set. If not required, use the **↑↓** softkeys to set the value to 'Off'.
- 7 Press 'Save' to save the values entered or 'Amend' to adjust.
- 8 The limit standard will be saved in the gauge memory (T) as 'n: STANDARD n' where 'n; equals 1-40.

[†] Model dependent: Dual and Triple Angle models only.

4 LIMIT STANDARDS (T) (continued)

To create an automatic Limit Standard:

- 1 Press Menu/Limit Standard/Create Limit Standard/Automatic/Create.
- 2 Place the gauge on an approved surface, press the measure softkey to start scanning and move the gauge across the surface.
- 3 Press the measure softkey again to stop scanning.
- 4 If required, place the gauge on a second sample and press the measure softkey again. Repeat as required.
- 5 Press 'Save' to store the average of the scanned 20[‡], 60, 85[‡] gloss and Haze[‡] values as the nominal values for each individual geometry together with the lowest and highest reading for each geometry as a 'Limit Standard'. Alternatively, press 'Amend' to adjust the scanned values before saving or 'Rescan' to disregard the last scan and scan the surface again.

Limit Standards can be renamed and the values can be amended at any time.

To rename a Limit Standard:

- 1 Press Menu/Limit Standard/Edit Limit Standard/Rename Limit Standard.
- 2 Use the **↑↓** softkeys to highlight the Limit Standard to be renamed and press 'Select'.
- 3 Use the **←→** softkeys to rename the Limit Standard.
- 4 Select 'Ok' to save the changes or 'Escape' to exit and disregard any amendments made.

To amend or alter a Limit Standard:

- 1 Press Menu/Limit Standard/Edit Limit Standard/Amend Limit Standard.
- 2 Use the **↑↓** softkeys to highlight the Limit Standard to be amended and press 'Select'.
- 3 Press 'Amend' to adjust the values then 'Save' to save the changes or 'Escape' to exit and disregard any amendments made.

[‡] Model dependent: Dual and Triple Angle models only.

4 LIMIT STANDARDS (T) (continued)

Once saved, stored Limit Standards can be selected for future measurements.

To select a saved Limit Standard (T):

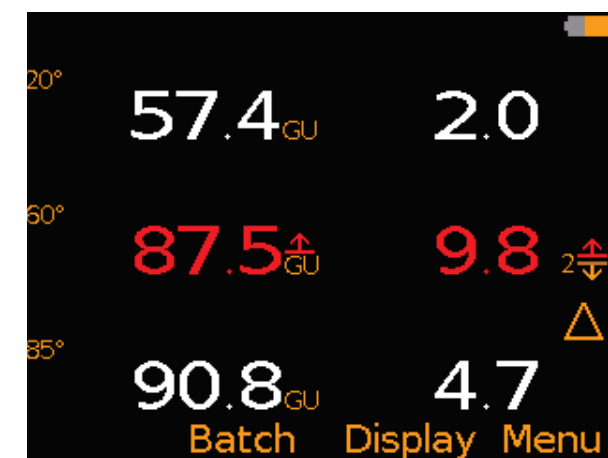
- 1 Press Menu/Limit Standard/Select Limit Standard or when in Batching, press Batch/New Batch/Select Limit Standard.
- 2 Use the $\uparrow\downarrow$ softkeys to highlight the Limit Standard required and press 'Select'.
 - ▶ $\boxed{A}$ displayed to the right of the Limit Standard name indicates that the limit standard was created automatically scanning the approved surface(s) rather than manually.

When a limit standard is in use, $n\updownarrow$ is displayed to the right of the measurement screen, where n = the limit standard index number.

If a measurement is outside the set limits, the appropriate limit icon, the reading value and the reading differential (if enabled) turn red.

If the Limit Standard selected has a high and low limit set, the high or low limit icon is displayed next to the appropriate reading to indicate which limit has been exceeded.

- ▶ If a measurement falls outside a defined limit for an angle which is not displayed on the reading screen, then the red LED and appropriate limit icon will turn red.



5 CALIBRATION (B & T)

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5.1 SETTING THE CALIBRATION TILE VALUES

Each gauge is supplied with a high gloss calibration tile. Other certified or un-certified calibration tile values are available as optional accessories - see Section 13.1 'Calibration Tiles' on page 28.

All Elcometer 480 calibration tiles have a pre-programmed RFID^b tag which allows automatic identification of the tile's serial number and tile values for all angles when the tile is attached to the base of any Model T gauge, allowing automatic calibration.

To enable / disable automatic calibration tile recognition (T):

- 1 Press Menu/Setup/Calibration/Tile Setup.
- 2 Use the **↑↓** softkeys to highlight 'Auto Identify' and press 'Select'.
- 3 To disable, press 'Select' again to un-check the 'Auto Identify' radio button.

To calibrate the Elcometer 480 Model B or to calibrate the gauge using an independent gloss tile, the calibration tile data can be manually entered into the gauge. The Elcometer 480 Model B does not have automatic tile recognition therefore, the calibration tile data must be entered manually.

To manually enter the calibration tile data (B & T):

- 1 Press Menu/Setup/Calibration/Tile Setup/Manual Setup
- 2 Use the **↑↓** softkeys to highlight 'Set 20°[‡]' and press 'Select'.
- 3 Use the **↑↓** softkeys to enter the required value and press 'Set' to save or 'Escape' to exit and disregard any amendments made.
- 4 Repeat steps 2-3 to enter the calibration data for 60° and 85°[‡] angles.

[‡] Model dependent: Dual and Triple Angle models only.

^b Patent Applied For

5 CALIBRATION (B & T) (continued)

- 5 Use the **↑↓** softkeys to highlight 'Set Tile Serial Number' and press 'Select'.
- 6 Use the **←→** softkeys to enter the tile serial number.
- 7 Select 'Ok' to save the changes or 'Escape' to exit and disregard any amendments made.

The calibration tile information can be viewed at any time via Menu/About/Tile Information.

5.2 CALIBRATING THE GAUGE

The Elcometer 480 will calibrate automatically on switch on (if enabled) and/or calibration can be performed at any time.

To enable auto calibration (T):

- 1 Press Menu/Setup/Calibration.
- 2 Use the **↑↓** softkeys to highlight 'Auto Calibrate' and press 'Select'.

The calibration procedure will now commence automatically each time the gauge is switched on and a calibration tile is attached to the base of the gauge.

To manually calibrate the gauge (B & T):

- 1 Attach the Elcometer 480 calibration tile to the base of the gauge or place the gauge on to an independent gloss tile.
- 2 Press Menu/Calibrate (B & T) or Batch/New Batch/Calibrate when in Batching (T).

Calibration details for each individual batch can be viewed at any time via Menu/Batch/Review Batch/Calibration Information (T).

5 CALIBRATION (B & T) (continued)

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If the gauge is unable to take a reading on the calibration tile, the user will be prompted to clean the tile - see Section 15.1 'Taking Care of your Calibration Tile' on page 30. If the gauge continues to fail to read the tile successfully, the user will be prompted to replace the tile - see Section 13.1 'Calibration Tiles' on page 28.

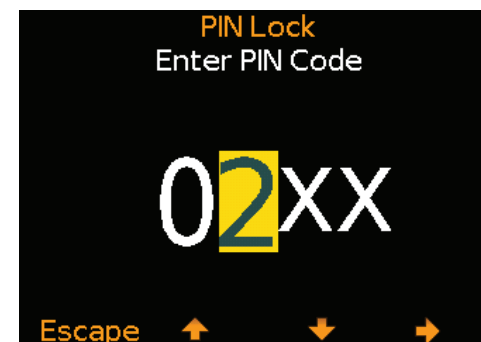
 Changes to the ambient temperature and humidity, such as moving from a cold to warm environment (outside to indoors for example) can affect the gauge calibration. The gauge should therefore be re-calibrated, after allowing sufficient time for the measurement optics to adjust, if ambient conditions have changed.

6 PIN LOCK (T)

The 'PIN Lock' feature prevents the user from accidentally adjusting the gauge settings.

To set a PIN code:

- 1 Press the Menu softkey and select Setup/PIN Lock.
- 2 Set the four digit PIN Code using the   softkeys to select 0 to 9 and the  softkey to move from the first to the fourth digit^c.
- 3 Press 'Ok' to set, 'Escape' to cancel or 'Amend' to amend the PIN code.



When enabled, the following features are disabled and can not be adjusted:

Menu/Limit Standard/Create Limit Standard
Menu/Limit Standard/Edit Limit Standard
Batch/Deleted Reading

Menu/Setup/Calibration
Menu/Reset
Batch/Edit Batch/Delete Batch

^c The  softkey will appear when the "X" changes to a number.

6 PIN LOCK (T) (continued)

To unlock the PIN code:

- 1 Press the Menu softkey and select Setup/PIN Lock
- 2 Enter the four digit PIN Code, using the $\uparrow\downarrow$ softkeys to select 0 to 9 and the $\rightarrow$ softkey to move from the first to the fourth digit^c
- 3 Press 'Ok' or 'Escape' to cancel
 - ▶ Should the user forget or lose the PIN Code, it can be disabled via ElcoMaster™ 2.0. Using the USB cable, simply connect the gauge to a PC with ElcoMaster™ 2.0 Version 2.0.46 or higher installed and select Edit/Clear PIN

7 TAKING A READING (B & T)

The Elcometer 480 has been designed to accurately measure gloss on flat, uniform surfaces. Any distortion to the surface finish/flatness (scratches), any contaminations on the surface (dirt) or particulates in the coating (ie metallic paints) will result in invalid readings.

Note: Elcometer do not recommended that the user looks directly into the optical elements (LED light sources) of the gauge while it is in operation.

7.1 SELECTING THE MEASUREMENT MODE

The Elcometer 480 has a choice of measurement modes.

- **Standard Mode (B & T);** readings^d are taken, statistics calculated but individual readings are not stored into memory.
- **Scan Mode (T);** the user slides the gauge over the area under test and readings^d are taken at a rate of 10 per second. At the end of each scan, the average ($\bar{X}$), lowest (Lo) and highest (Hi) readings are displayed.
- **Auto Repeat Mode (T);** the gauge takes readings^d at a rate of between 10 and 180 per minute, as defined by the user.

^d Readings are taken for all geometries (20°[†], 60° and 85°[†], Haze[†] and % Reflectance at 20°[†], 60° and 85°[†]) but only readings for the geometries selected are displayed. The user can change this selection at any time.

[†] Model dependent: Dual and Triple Angle models only.

^c The $\rightarrow$ softkey will appear when the "X" changes to a number.

7 TAKING A READING (B & T) (continued)

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To select the measurement mode (T):

- 1 Press Menu/Measurement Mode.
- 2 Use the $\uparrow\downarrow$ softkeys to highlight 'Standard Mode', 'Scan Mode' or 'Auto Repeat Mode' as required and press 'Select'.

7.2 TAKING A READING: STANDARD MODE (B & T)

- 1 Press and hold the measure softkey for approximately 3 seconds to switch the gauge on.
- 2 Perform the calibration procedure if required - see Section 5 'Calibration' on page 13.
- 3 Place the gauge on the test surface and press the measure softkey to take a reading^d. A reading is displayed on screen (for each geometry selected via Display/Display Geometry - see Section 3.6 'Geometry Selection' on page 8).
 - ▶ If the user has chosen to view 'Selected Statistics', 'Run Chart' or 'Bar Graph' - see Section 3.5 'Setting Up the Reading Display' on page 6, pressing the $\blacktriangleright$ softkey displays the statistics, run chart or bar graph for each individual geometry.

7.3 TAKING A READING: SCAN MODE (T)

- 1 Press and hold the measure softkey for approximately 3 seconds to switch the gauge on.
- 2 Perform the calibration procedure if required - see Section 5 'Calibration' on page 13.
- 3 Place the gauge on the test surface, press the measure softkey twice to begin the scan, slide the gauge across the test surface.
- 4 Press the measure softkey again to stop taking readings and complete the scan.

^d Readings are taken for all geometries (20°[†], 60° and 85°[†], Haze[†] and % Reflectance at 20°[†], 60° and 85°[†]) but only readings for the geometries selected are displayed.
The user can change this selection at any time.

[†] Model dependent: Dual and Triple Angle models only.

7 TAKING A READING (B & T) (continued)

- 5 Repress the measure softkey to continue scanning or press 'Save' to save the scanned readings. The scanned lowest, average and highest reading^d will be displayed on screen for each geometry selected via Display/Display Geometry - see Section 3.6 'Geometry Selection' on page 8. Press 'Clear' to disregard the last scan and start again.
 - ▶ If the user has chosen to view 'Selected Statistics', 'Run Chart' or 'Bar Graph' - see Section 3.5 'Setting Up the Reading Display' on page 6, pressing the ► softkey displays the statistics, run chart or bar graph for each individual geometry.
 - ▶ The gauge will automatically save the scanned readings without prompting the user, if enabled via Menu/Measurement Mode/Scan Mode/Auto Save.

7.4 TAKING A READING: AUTO REPEAT MODE (T)

- 1 Press and hold the measure softkey for approximately 3 seconds to switch the gauge on.
- 2 Perform the calibration procedure if required - see Section 5 'Calibration' on page 13.
- 3 Press Menu/Measurement Mode/Auto Repeat Mode
- 4 Use the ↑↓ softkeys to set the number of readings per minute, between 10 and 180, press 'Set' to save.
- 5 Place the gauge on the test surface, press the measure softkey twice to begin taking readings, slide the gauge across the test surface. A reading^d is displayed on screen for each geometry selected via Display/Display Geometry - see Section 3.6 'Geometry Selection' on page 8.
 - ▶ If the user has chosen to view 'Selected Statistics', 'Run Chart' or 'Bar Graph' - see Section 3.5 'Setting Up the Reading Display' on page 6, pressing the ► softkey displays the statistics, run chart or bar graph for each individual geometry.
- 6 Press the measure softkey again to stop taking readings.

^d Readings are taken for all geometries (20°[†], 60° and 85°[†], Haze[†] and % Reflectance at 20°[†], 60° and 85°[†]) but only readings for the geometries selected are displayed. The user can change this selection at any time.

[†] Model dependent: Dual and Triple Angle models only.

8 BATCHING (T)



The Elcometer 480 Model T gauge can store 40,000 readings^d in up to 2,500 batches and has the following batching functions:

- **Batch/New Batch;** Create a new batch
- **Batch/New Batch/Fixed Batch Size;** Pre-define the number of readings which are stored in a batch. The gauge will notify the user when the batch is complete and ask if another batch is to be opened, these batches are then linked when transferred to ElcoMaster.
- **Batch/Open Existing Batch;** Open an existing batch.
- **Batch/Review Batch;** Review the readings, statistics, batch information, Limit Standard information, a graph of all readings - see Section 9 'Reviewing Batch Data' on page 20 for further information.
- **Batch/Review Batch/Batch Graph;** View the readings within the batch as a column bar graph - see Section 9 'Reviewing Batch Data' on page 20 for further information.
- **Batch/Edit Batch/Rename Batch;** Rename an existing batch.
- **Batch/Edit Batch/Clear Batch;** Clear all readings within a batch - but leaving all batch header information.
- **Batch/Edit Batch/Delete Batch;** Delete a batch or all batches entirely from the gauge.
- **Batch/Copy Batch;** Copy a batch including the batch header information; Limit Standard information and calibration details.
- **Batch/Deleted Reading/Delete without Tag;** Delete readings entirely.
- **Batch/Deleted Reading/Delete with Tag;** Delete readings but mark them as deleted in the batch memory.

^d Readings are taken for all geometries (20°[†], 60° and 85°[†], Haze[†] and % Reflectance at 20°[†], 60° and 85°[†]) but only readings for the geometries selected are displayed. The user can change this selection at any time.

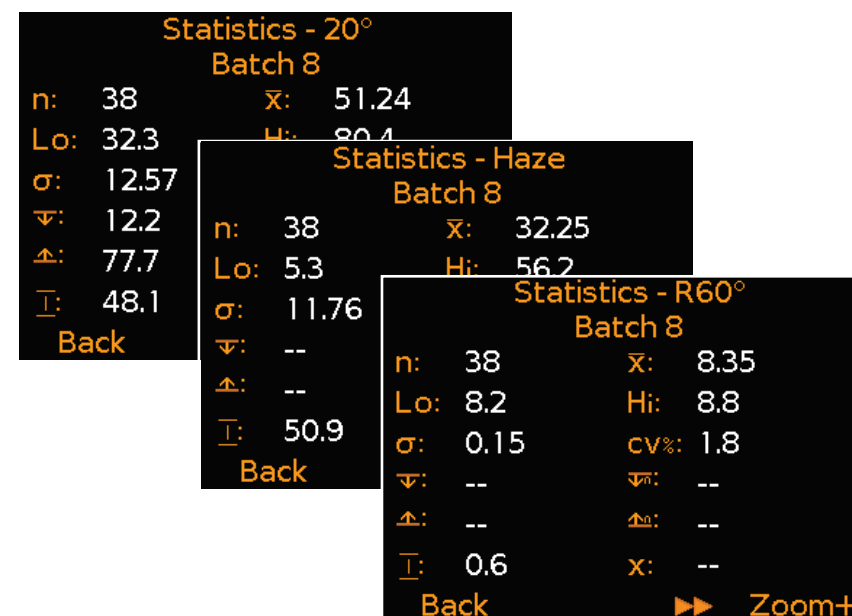
[†] Model dependent: Dual and Triple Angle models only.

9 REVIEWING BATCH DATA (T)

9.1 BATCH STATISTICS (Batch/Review Batch/Statistics)

Displays statistical information for the batch including:

- Number of readings in the batch (n :)
- Average reading for the batch ($\bar{x}$:)
- Lowest reading in the batch (Lo :)
- Highest reading in the batch (Hi :)
- Range ($\bar{I}$:); the difference between the highest and the lowest reading in the batch
- Standard Deviation (σ :)
- Coefficient of Variation ($cv\%$:)
- Low Limit ($\bar{\nabla}$:); if set
- High Limit ($\bar{\Delta}$:); if set
- Number of readings below the low limit ($\bar{\nabla}_n$:); if set
- Number of readings above the high limit ($\bar{\Delta}_n$:); if set
- Nominal value (X :)



Press the ►► softkey to view the statistics for the each individual geometry.

9 REVIEWING BATCH DATA (T) (continued)

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9.2 BATCH READINGS (Batch/Review Batch/Readings)

Displays all measurement data for each individual reading within the batch including:

- Gloss values at 20°[†], 60° and 85°[†] angles
- Haze[†] value
- % Reflectance at 20°[†], 60° and 85°[†] angles
- Date and time each reading is taken

Press the   softkeys to scroll through the readings and  to move to the next information screen.

Readings outside any applied Limit Standard for a batch (if set) are displayed in red with the appropriate limit icon to the right of the reading, () if the reading is below the low limit and () if above the high limit.

Details of the Limit Standard set for the batch can be viewed at any time via Batch/Review Batch/Limit Standard Information.

Readings Batch 8			
	20°	60°	85°
6	55.0	83.5	92.9
7	58.1	84.3	92.4
8	51.7	82.1	93.7 
9	55.3	83.3	93.3 
10	60.1	85.1	94.3 
Back   			

Readings Batch 8	
	Haze
6	28.5
7	26.2
8	30.4
9	28.0
10	25.0
Back   	

Readings Batch 8			
	R20°	R60°	R85°
6	2.70	8.35	57.5
7	2.85	8.43	57.2
8	2.54	8.21	58.0
9	2.71	8.33	57.8
10	2.95	8.51	58.4
Back   			

Readings Batch 8		
	Time	Date
6	15:09:16	30/04/2014
7	15:09:17	30/04/2014
8	15:09:17	30/04/2014
9	15:09:19	30/04/2014
10	15:09:19	30/04/2014
Back   		

[†] Model dependent: Dual and Triple Angle models only.

9 REVIEWING BATCH DATA (T) (continued)

9.3 BATCH GRAPH (Batch/Review Batch/Batch Graph)

Allows the users to view the readings within the batch as a column bar graph. Up to five horizontal axes are displayed representing different values / statistics as follows:

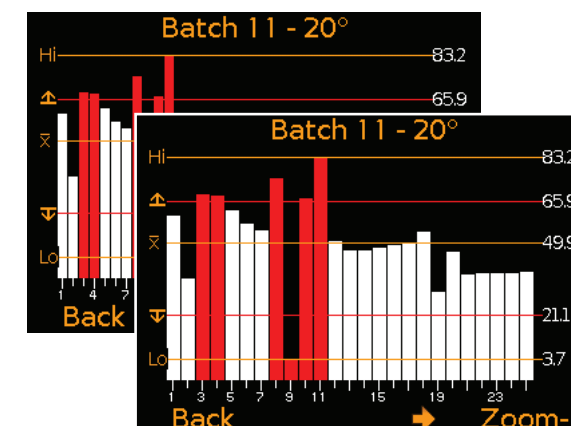
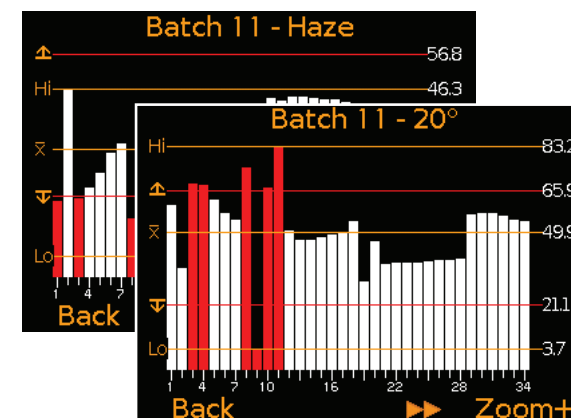
- Highest reading in the batch (H_i)
- Lowest reading in the batch (L_o)
(for batches of more than one reading)
- Average reading for the batch ($\bar{X}$)
(for batches of more than one reading)
- High Limit ($\uparrow$) (if a Limit Standard was used)
- Low Limit ($\downarrow$) (if a Limit Standard was used)

Press the **▶▶** softkey to view the batch graph for the each individual geometry.

If a Limit Standard was not used, the readings are displayed as white vertical bars. If a Limit Standard was used, readings are displayed as white bars if within set limits or red; if outside set limits.

If there are more readings in the batch than can be displayed on a single screen, multiple readings will be combined into one bar. Should a single reading within the 'combined bar' be outside the set limits, the whole bar will be red.

Pressing the 'Zoom+' softkey, allows each individual reading to be displayed, thereby showing the individual readings outside the set limits.



9 REVIEWING BATCH DATA (T) (continued)

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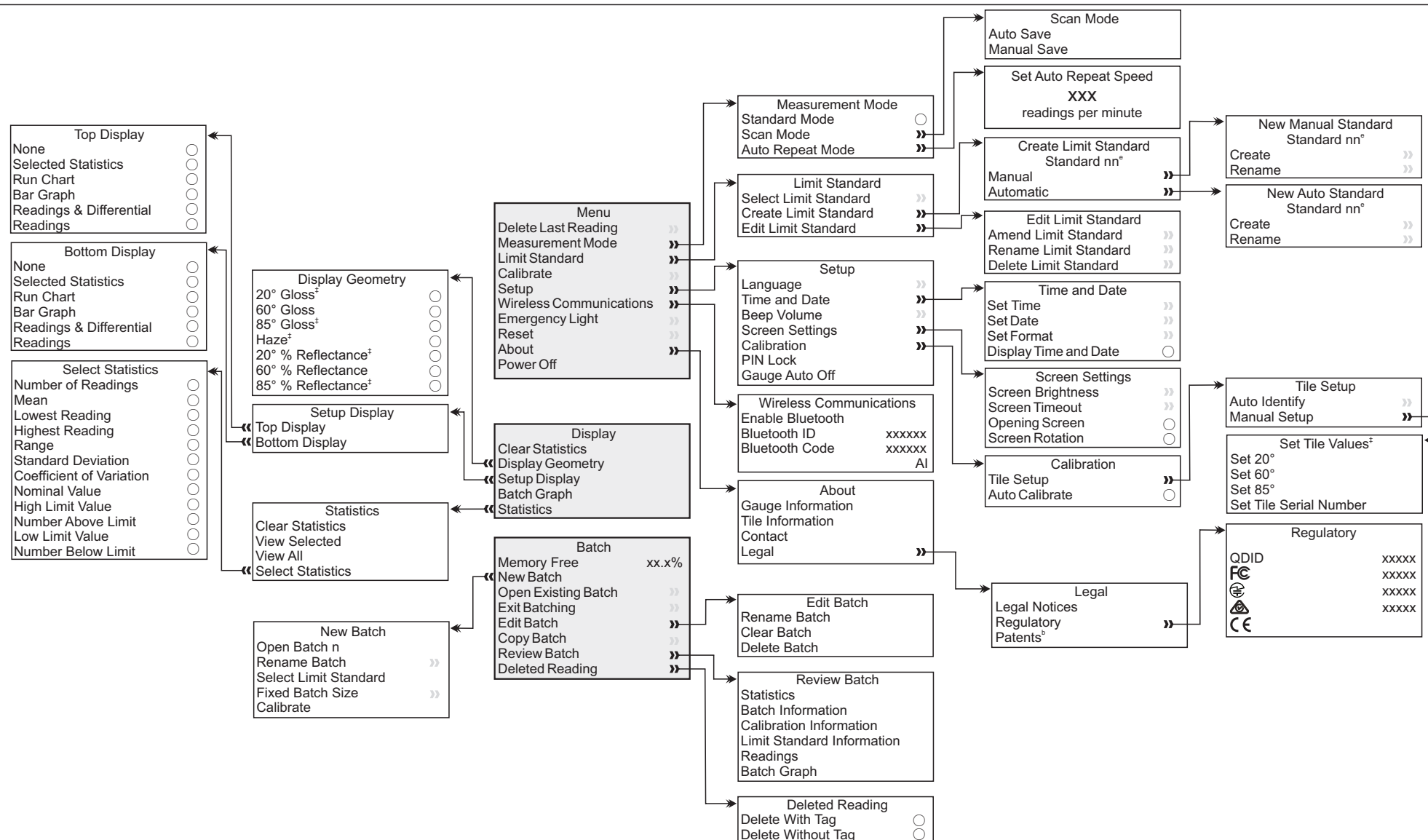
When zoomed in, the graph will always display the first 25 readings. Pressing the ← softkey will display the last 25 readings taken.

Subsequent presses of the ← softkey will scroll backwards, pressing the → softkey will scroll forwards through the readings, 25 readings at a time.

Pressing the 'Zoom-' softkey returns to the original overview graph of all readings in the batch.

Pressing the 'Back' softkey returns the gauge to the Batch Review menu.

10 MENU STRUCTURE (T)



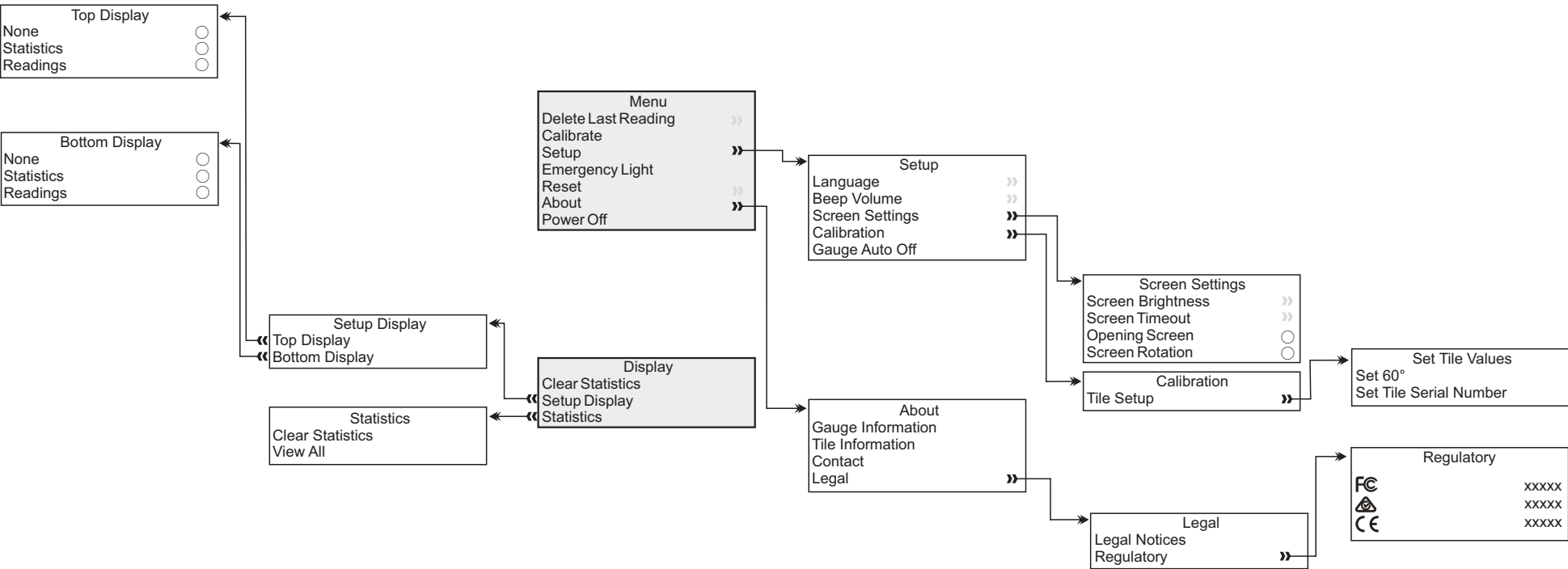
^b Patent Applied For

^e where n = Limit standard index number (1, 2, 3,40)

[‡] Model dependent: Dual and Triple Angle models only.

11 MENU STRUCTURE (B)

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12 DOWNLOADING DATA & UPGRADING YOUR GAUGE

12.1 DOWNLOADING DATA USING ELCOMASTER™ 2.0 (B & T)

Using ElcoMaster™ 2.0 - supplied with the Model T, and available as a free download at elcometer.com - gauges can transmit live readings (B & T), batch data (T) and Limit Standards (T) to a PC for archiving and report generation. Data can be transferred via USB (B & T) or Bluetooth® (T). For more information on ElcoMaster™ 2.0 visit www.elcometer.com

12.2 DOWNLOADING DATA USING ELCOMASTER™ MOBILE APPS (T)

Ideal when out in the field or on-site, using the ElcoMaster™ Mobile Apps users can;

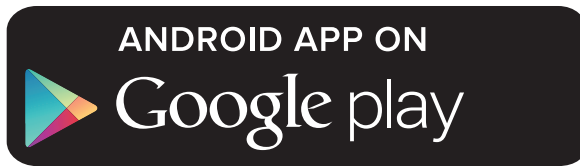
- Store live readings directly onto a mobile device and save them into batches together with GPS coordinates.
- Add photographs of test surface to each individual batch reading at the click of a button.
- Chart readings on to a map, photograph or diagram.
- Inspection data can be transferred from mobile to PC for further analysis and reporting.

For more information on ElcoMaster™ Mobile Apps visit www.elcometer.com



12 DOWNLOADING DATA & UPGRADING YOUR GAUGE (continued)

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



Made for iPhone 5S, iPhone 5C, iPhone 5, iPhone 4S, iPhone 4, iPad (4th generation), iPad mini, iPad 2, and iPod touch (4th and 5th generation). To install, download via www.elcometer.com or the App Store, and follow the on screen instructions.

12.3 UPGRADING YOUR GAUGE

Gauge firmware can be upgraded to the latest version by the User via ElcoMaster™ 2.0, as they become available. ElcoMaster™ 2.0 will inform the User of any updates when the gauge is connected to the PC with an internet connection.

13 SPARES & ACCESSORIES

13.1 CALIBRATION TILES

Each gauge is supplied with a high gloss calibration tile as standard. Certified and un-certified low gloss (matt) to high gloss and mirror finish calibration tiles are available to purchase as optional accessories.



All Elcometer 480 calibration tiles have a pre-programmed RFID^b tag which allows automatic identification of the tile's serial number and calibration data when the tile is attached to the base of any Model T gauge.

Description	Nominal Value	Sales Part Number
High Gloss Calibration Tile (un-certified)	97 GU @ 60°	T48024798-H ^f
High Gloss Calibration Tile with Calibration Certificate	97 GU @ 60°	T48024798-HC
Low Gloss Calibration Tile with Calibration Certificate	22 GU @ 60°	T48024798-LC
Mid Gloss Calibration Tile with Calibration Certificate	55 GU @ 60°	T48024798-MDC
Mirror Gloss Calibration Tile with Calibration Certificate	1900 GU @ 20°	T48024798-MRC

13.2 SOFT MATERIAL SPECIMEN HOLDER

Supplied with three sample trays, ideal for measuring soft, powder or viscous materials.

Description	Sales Part Number
Soft Material Specimen Holder, complete with 3 sample trays	T48024798-SH
Soft Material Sample Trays (Pack of 3)	T48025004

^b Patent Applied For

^f Supplied as standard with each gauge.

14 TECHNICAL SPECIFICATION

Measurement Range	20°: 0 - 2000 GU	60°: 0 - 1000 GU	85°: 0 - 161.4 GU
Measurement Area	10 x 10mm	5 x 15mm	50 x 60mm
Repeatability	0 to 10 GU: ±0.1 GU; 10 to 100 GU: ±0.2 GU; 100 to 2000 GU: ±0.2%		
Reproduceability	0 to 10 GU: ±0.2 GU; 10 to 100 GU: ±0.5 GU; 100 to 2000 GU: ±0.5%		
Resolution	Gloss: 0 to 100 GU: 0.1 GU; >100 GU: 1 GU % Reflectance: 0 to 10%: 0.01%; 10 to 100%: 0.1% Haze: 0 to 100 HU: 0.1 HU; >100 HU: 1 HU		
Operating Temperature	-10°C to 50°C (14°F to 122°F); Relative Humidity: 0 - 85% RH		
Power Supply	2 x AA Batteries		
Battery Life	~50,000 readings		
Dimensions	68 x 155 x 50mm (2.7 x 6.1 x 2.0")		
Weight (including batteries)	534g (1.3lb)		
Can be used in accordance with: AS/NZS 1580.602.2, ASTM C 584, ASTM D 523, ASTM D 1455, ASTM D 2457, ASTM D 4039, ASTM D 4449, ASTM D 5767, ASTM E 430, ASTM E2387, BS3900 D5, DIN 67530, ECCA T2, EN 12373-11, EN 13523-2 ISO 2813, ISO 7668, ISO 13803, ISO 17025, JIS K 5600-4-7, JIS Z 8741, TAPPI T 653 [‡]			

[‡] Model dependent: Dual and Triple Angle models only.

15 CARE & MAINTENANCE

15.1 TAKING CARE OF YOUR CALIBRATION TILE

Using dirty, scratched or damaged calibration tiles will affect the accuracy and performance of the Elcometer 480. If the gauge is unable to take a reading on the calibration tile, the user will be prompted to clean the tile.

Calibration tiles should be cleaned using a lint free cloth, supplied with each gauge and available as an optional accessory, sales part number T99923535. Do not use chemicals or materials which may scratch the tile. Wipe the tile applying only light pressure, using excess pressure may damage the surface of the calibration tile.

A lint free cloth with an optical cleaning solution can be used to remove stubborn dirt. Clean the tile with the wet cloth then wipe the surface with a dry lint free cloth to remove any streaks.

Scratched or damaged tiles should be replaced, see Section 13.1 'Calibration Tiles' on page 28.

15.2 TAKING CARE OF YOUR GLOSSMETER

 Dirt or dust on the measurement optics will affect the gauge performance. The optics can be cleaned using an air blower. DO NOT touch or attempt to clean the optics with cloths or liquids as this will cause damage.

 The gauge incorporates a Liquid Crystal Display (LCD). If the display is heated above 50°C (120°F) it may be damaged. This can happen if the gauge is left in a car parked in direct sunlight.

The gauge does not contain any user-serviceable components. In the unlikely event of a fault, the gauge should be returned to your local Elcometer supplier or directly to Elcometer. The warranty will be invalidated if the gauge has been opened.

16.1 GLOSS

Gloss is the visual sensation associated with the brightness of direct light reflected in a surface. Surfaces with high reflectance are determined as glossy; less reflective surfaces are semi-gloss or matt. Glossmeters quantify this effect by measuring light reflection from a sample at defined angles.

The measurement angles most commonly used for gloss are 20°, 60° and 85°. The most appropriate angle should be selected dependent on the glossiness of the sample surface. Using the correct measurement geometry increases resolution and improves the correlation of results with human perception of quality.

To determine the correct measurement angle the surface should be assessed with the 60° geometry:

- Matt surfaces which measure below 10 GU at 60° should be assessed with the 85° angle.
- High gloss surfaces which measure above 70 GU at 60° should be assessed using the 20° angle.

The 60 degree angle is best employed on mid gloss samples measuring between 10 and 70 GU.

16.2 HAZE

Haze describes the milky halo or bloom seen on the surface of high gloss finishes. It is caused by microscopic surface texture which diffuses light adjacent to the main component of the reflected light.

Surface haze can be problematic in most coating applications including automotive manufacture, powder coatings and other high gloss coatings. It can be attributed to a number of causes including incompatible materials in a formulation, poor dispersion and problems encountered during drying/curing/stoving.

Coatings without haze can be seen to have a deep reflection and have high reflected contrast. Those with haze exhibit a slight “milky” finish which can be seen over the highly glossy surface.

When measuring haze values, higher numbers indicate a lower quality surface. A high gloss surface with zero haze has a deep reflection image with high contrast.

16 GLOSSARY (continued)

16.3 % REFLECTANCE

% Reflectivity compares the amount of light energy transmitted and received by a glossmeter and expresses the value as a percentage. The shinier a surface is, the closer the value will be to 100%.

Whilst the Gloss Unit (GU) scale is linear, each angle of incidence (20, 60 or 85°) has a different measurement range; 0 – 2000GU (20°), 0 – 1000GU (60°), 0 – 160GU (85°).

%Reflectivity displays the measurement value as a percentage relative to the selected angle of incidence. For example, a value of 1000GU at 20° would be expressed as 50%₂₀ and 500GU would be expressed as 25%₂₀, but at 60° this would be expressed as 50%₆₀.

17 LEGAL NOTICES & REGULATORY INFORMATION

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The Elcometer 480 Model T meets the Radio and Telecommunications Terminal Equipment Directive.

The Elcometer 480 Model B meets the Electromagnetic Compatibility Directive.

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 radiofrequency 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.

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

Elcometer 480 Model T: The Giteki mark, its ordinance number and Bluetooth SIG QDID can be accessed via: Menu/About/Legal/Regulatory

Elcometer 480 Model T: 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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Changes or modifications not expressly approved by Elcometer Limited for compliance could void the user's authority to operate the equipment.

Elcometer 480 Model B: 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.

Elcometer 480 Model T: Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with Industry Canada licence-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.

Elcometer 480 Model B: This Class B digital apparatus complies with Canadian ICES-003.

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

Elcometer 480 Model T: Made for iPhone 5S, iPhone 5C, iPhone 5, iPhone 4S, iPhone 4, iPad (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.

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

Google Play is a trademark of Google Inc.

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