elcometer 510s Automatic Adhesion Tester User Guide

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Tester User Guide

User Guide

Elcometer 510 Model S

Automatic Adhesion Tester

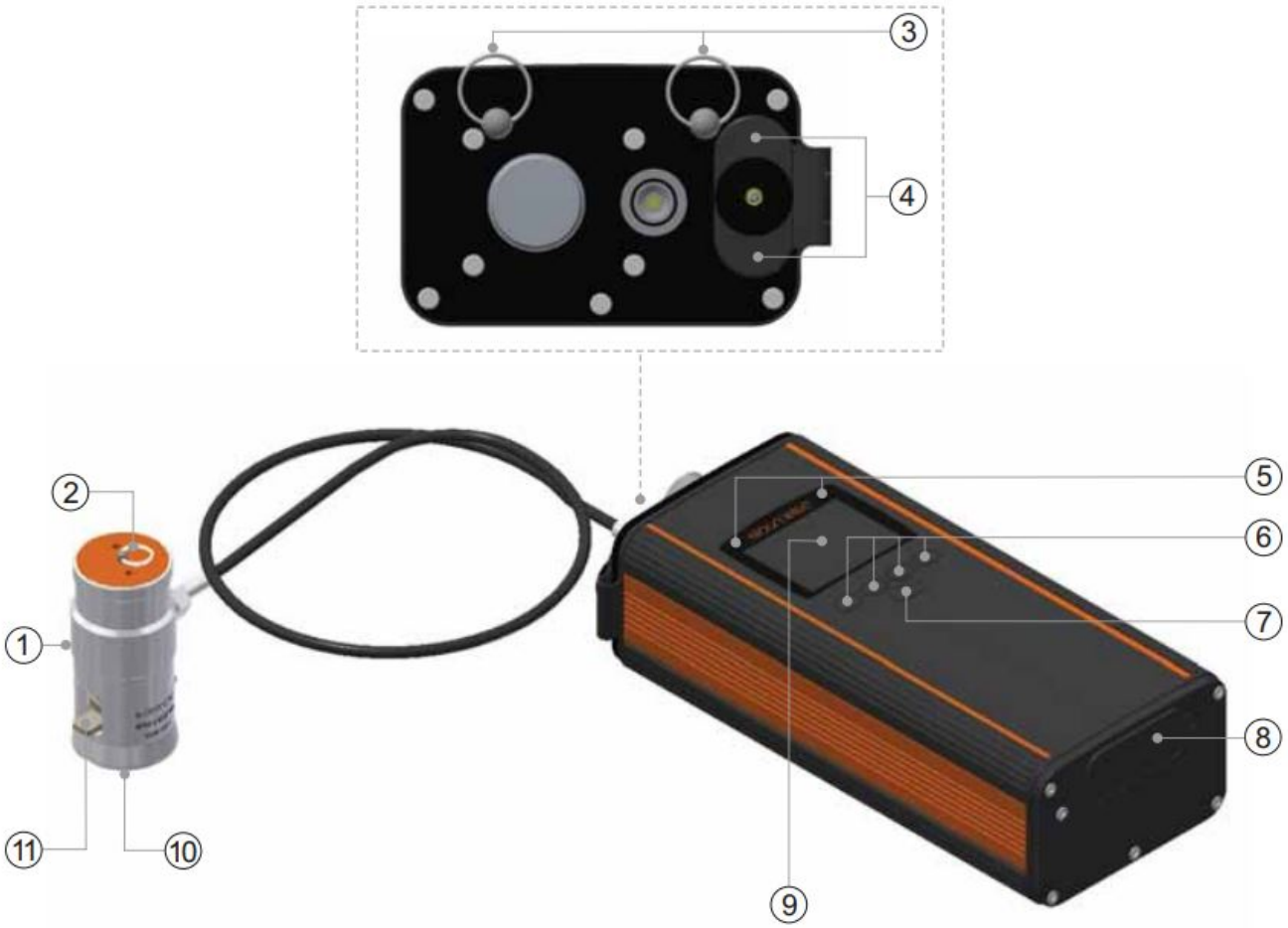
For the avoidance of doubt, please refer to the original English language version.

Gauge Dimensions:	260 x 100 x 66mm (10.3 x 3.9 x 2.6")
Gauge Weight:	With 10mm, 14.2mm & 20mm Standard Dolly Skirt: 2.9kgs (6.4lbs); With 50mm Standard Dolly Skirt: 3.1kgs (8.3lbs)

Note: Compliance can only be assured if approved accessories are used with this product.

Contents

1 GAUGE OVERVIEW



1	Actuator
2	Lanyard Ring
3	Shoulder Strap Connections
4	Battery Compartment
5	LED Indicators - Red (left), Green (right)
6	Multifunction Softkeys
7	On/Off Key
8	USB Data Output Socket (below cover)
9	LCD Display
10	Actuator Skirt[a]
11	Quick Connect Coupling

[a] The Standard Actuator Skirt for 20mm dollies is illustrated above. Skirts for other dolly sizes and thin substrates are also available - see Section 15.3 - "Dolly Skirts" on page en-19 for details.

2 BOX CONTENTS

- Elcometer 510 Adhesion Tester
- Standard Epoxy Adhesive (2x15ml tubes)
- Abrasive Pad
- 16 x AA Rechargeable Batteries
- 8 Cell Battery Charger
- Shoulder Harness
- Actuator Lanyard
- Transit Case
- ElcoMaster® Software & USB Cable
- Calibration Certificate
- User Guide

Additional items in 20mm Kit:

- 20mm Dollies (x10)
- 20mm Dolly Standard Skirt
- 20mm Dolly Cutter & Handle

Additional items in 50mm Kit:

- 50mm Dollies (x6)
- 50mm Dolly Standard Skirt
- 50mm Dolly Cutter with Drill Arbor

3 USING THE GAUGE

a Power: Batteries - including battery life indicator & number of pulls remaining

b Pull Rate - MPa/s, psi/s, N/s, Nmm^{-2}/s

c Dolly Size - 10mm, 14.2mm, 20mm, 50mm

d Measurement Units - MPa, psi, Newtons, N/mm^2

e Start Test (▶)[b]; Stop Test (■)[b]; Menu Softkey

f Load Bar

g Date & Time - when enabled and not in batching

h Batching On

i Last Reading (> [greater than] symbolizes 'Did Not Fail')

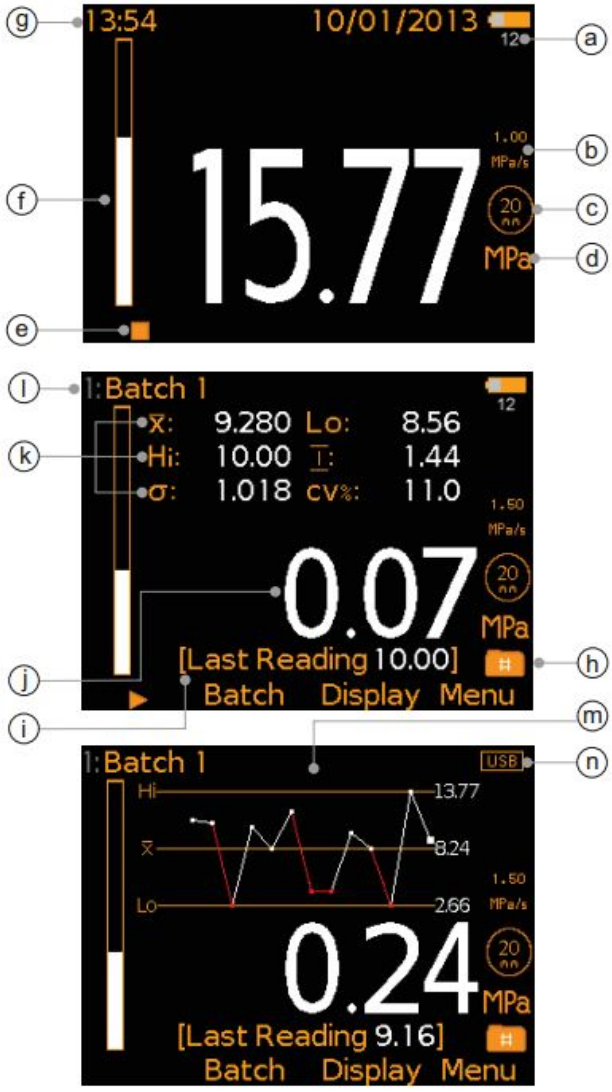
j Actuator Load Value

k User Selectable Statistics - 4 rows

l Batch Name - when in batching

m Run Chart - last 20 readings (user selectable)

n Power: USB



4 GETTING STARTED

4.1 FITTING THE BATTERIES

Each gauge is supplied with 16 x AA NiMH rechargeable batteries and battery charger.

To insert or replace the batteries:

1 Unscrew the battery cap (turning anti-clockwise) and remove the battery cover.

2 Insert 8 batteries taking care to ensure correct polarity.

3 Refit the cover and tighten the battery cap.

Each fully charged set of batteries will last for approximately 200 pulls up to 25MPa (3600psi) at 1MPa/s (145psi/s) using a 20mm dolly.

The battery charger supplied can re-charge a set of 8 cells in approximately 5 hours. Care should be taken to ensure the correct polarity when fitting the batteries into the charger.

⚠ Ensure that the battery charger power supply is connected to the charger before plugging into the mains supply.

The battery condition is indicated by the battery symbol (▭) at the top right of the display. When there is insufficient charge remaining to perform >100 tests, an indication of the approximate number of tests remaining - based on pulls to 25MPa (3600psi), using a 20mm dolly - is also displayed below the battery symbol.

Note: Batteries must be disposed of carefully to avoid environmental contamination. Please consult your local Environmental Authority for information on disposal in your region. **Do not dispose of any batteries in fire.**

The LCD display can be powered via USB. When connected, USB is displayed at the top right of the display allowing various functions to be undertaken including batch setup, review and transfer of data to PC or mobile device. Pull tests can not be performed using USB as it does not provide sufficient power to run the adhesion gauge motor.

4.2 SELECTING YOUR LANGUAGE

1 Press and hold the ON/OFF button until the Elcometer logo is displayed.
2 Press Menu/Setup/Language and select your language using the ↑↓ 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 ↑↓ softkeys.

4.3 SCREEN SETTINGS

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 dim if inactive for more than 15 seconds and will go 'black' if inactive for the period defined. 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.
- **Screen Rotation;** Using the internal accelerometer, the gauge rotates the display to allow the user to easily read the pressure value at 0° or 180° orientation ('Auto Display Rotation').

4.4 SETTING UP THE READING DISPLAY

The colour display is split into two halves; Top Display and Bottom Display. The user can define what information is displayed in each half including: Readings, Selected Statistics and Run Chart.

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 screen. If any other combination of options is selected; the data will be shown in the top or bottom display as specified.

- **Readings (Fig. 1);** The last reading is displayed under the current pressure reading and is only updated when the current reading is saved.

Fig. 1: Readings

- **Selected Statistics (Fig. 2);** As defined by the user via Display/ Statistics/Select Statistics. The user can choose to view only those selected or view all. Select from:
  Number of Readings, Mean, Lowest Reading, Highest Reading, Range, Standard Deviation, Coefficient of Variation.
- **Run Chart (Fig. 3);** A line trend graph of the last 20 measurements which is updated automatically after each reading.

Fig. 2: Selected Statistics

Fig. 3: Run Chart

4.5 SELECTING THE MEASUREMENT UNITS

The Elcometer 510 Model S can display pull test results in MPa. psi, Newtons or N/mm2. To select the measurement units, press Menu/Setup/Units.

4.6 SELECTING THE DOLY SIZE & PULL RATE

Prior to performing an adhesion test, the appropriate dolly size and pull rate must be selected. The Elcometer 510 can be used with 10mm, 14.2mm, 20mm and 50mm dollies. As the pull rate is determined by the dolly size, the dolly size must be selected first - refer to the 'Pre-defined Pull Rates' table on page en-8.

To set the dolly size and pull rate:

1 Press Menu/Dolly Size & Pull Rate.
2 Use the ↑↓ softkeys to highlight the required dolly size and press 'Select'. The 'Pull Rate' screen will now appear.
3 Use the ↑↓ softkeys to set the pull rate as required and press 'Ok' to set.

Dolly Size	Pre-defined Pull Rates *(Only the pull-rates listed below are available for selection)*			
	MPa/s	**psi/s**	**N/s**	**Nmm^{-2}/s**
10mm	1.00, 2.00, 3.00, 4.00, 5.00	125, 200, 400, 600, 725	80, 160, 235, 315, 395	1.00, 2.00, 3.00, 4.00, 5.00
14.2mm	0.40, 0.70, 1.40, 2.00, 2.50	60, 100, 200, 300, 360	65, 110, 220, 315, 395	0.40, 0.70, 1.40, 2.00, 2.50
20mm	0.20, 0.30, 0.70, 1.00, 1.20	30, 50, 100, 150, 180	65, 95, 220, 315, 380	0.20, 0.30, 0.70, 1.00, 1.20
50mm	0.04, 0.08, 0.12, 0.16, 0.20	5, 8, 16, 24, 30	80, 160, 235, 315, 400	0.04, 0.08, 0.12, 0.16, 0.20

5 SECURING THE DOLLY

5.1 USING 10mm, 14.2mm OR 20mm DOLLIES

1 Prepare the surface of the dolly and the coating where the dolly is to be applied by roughening with the abrasive pad. Then de-grease and clean both surfaces using a suitable solvent and allow to dry.

2 Mix equal quantities of the two part Araldite® adhesive and apply a thin, even layer to the prepared surface of the dolly.
- Araldite® adhesive is supplied by Elcometer however, other adhesives can be used - see Section 16 ‘Adhesives’ on page en-20.

3 Press the dolly firmly onto the prepared test surface and apply pressure to squeeze out excess adhesive which should then be wiped clean.

4 Allow the adhesive to cure - see Section 16 ‘Adhesives’ on page en-20.
- If testing on vertical surfaces, you may wish to tape the dolly in place during cure.

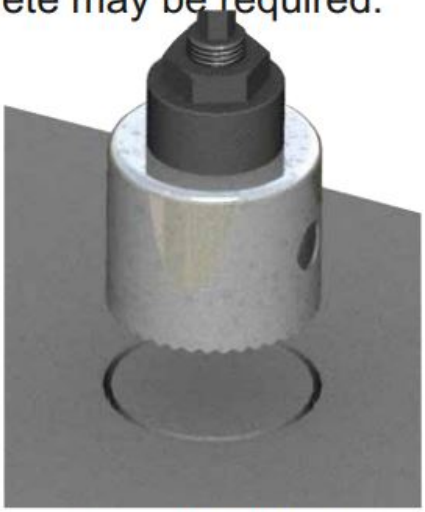
5 If required, score the coating around the dolly using the dolly cutter provided.

5.2 TESTING COATINGS ON CONCRETE USING 50mm DOLLIES

When testing coatings on concrete using 50mm dollies, scoring of the coating down to, or into, the surface of the concrete may be required.

1 If testing on coatings thicker than 0.5mm (20mils) use the 50mm dolly cutter and arbor (mounted in a drill press or hand drill) to cut a “ring” into the concrete.
   - Ensure that the scoring is perpendicular to the coating and that the test area is not subjected to twisting or torque. To minimise heat and suppress dust, water lubrication may be required.

2 Follow steps 1-4 in Section 5.1, making sure the dolly is positioned inside the cut “ring”.



Concrete Substrate

To score coatings thinner than 0.5mm (20mils), a sharp knife may be sufficient to carefully score around the dolly once it has been secured in place by adhesive.

6 ATTACHING THE GAUGE TO THE DOLLY

1 Ensure the quick connect coupling is fully depressed.

2 Pull up the quick connect coupling, place the actuator (with skirt fitted[c]) over the dolly then release the coupling to grip the dolly.
   - The quick connect coupling is not a bayonet fitting. Do not attempt to push the actuator on to the dolly without lifting the quick connect coupling.

When testing at height or on vertical surfaces, in order to prevent damage to the surrounding coating or harm to the user, it may be necessary to use the Magnetic Anchor Clamp accessory, part number T99923797. This connects to the lanyard ring on the top of the actuator to prevent the actuator from falling when the dolly is pulled from the substrate.

[c] Skirts for 10mm, 14.2mm, 20mm and 50mm dollies and thin substrates are available - see Section 15.3 ‘Dolly Skirts’ on page en-19 for details.

7 PERFORMING THE TEST

1 Press and hold the ON/OFF button to switch the gauge on.
2 Ensure that the measurement units, dolly size and pull rate are set as required, see Section 4.
3 Press the start softkey (▸) to begin the test. Load is applied at the rate defined, displayed numerically on the screen and illustrated on the load bar.
4 The load continues to increase at the defined rate until either:
   a) the dolly pulls off;
   b) the gauge maximum pull load / pressure has been reached (eg. 25MPa for a 20mm dolly)

   At this point, the gauge re-winds to 'zero' and the user is asked if they wish to save the reading.
   - '---' indicates a reading outside of range.
   - If the maximum pull load / pressure has been reached, the gauge will not re-wind to 'zero' until the default hold time of 0.5 seconds has elapsed.
   - The gauge re-winds to 'zero' at a set rate of 1.5MPa/s or equivalent.
5 Pull up the quick connect coupling to release the dolly and assess the results, see Section 8.

The stop softkey (■) can be pressed at any time during the test. If pressed, the user is asked if they wish to save the reading and the gauge re-winds to 'zero'. If saved, the "stopped" reading is included in the statistics.

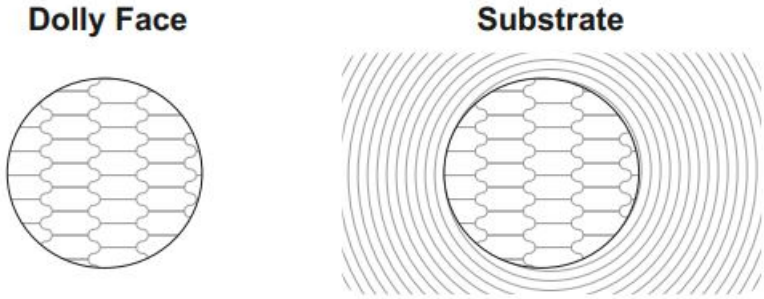
Dollies can be reused after cleaning until either the top of the dolly (where it is held in position by the quick connect coupling) is severely deformed or the dolly surface is no longer flat. Additional dollies are available from Elcometer or your local supplier - see Section 15.1 - 'Dollies' on page en-18 for details.

8 ASSESSING THE RESULTS

Many National and International Standards including ISO 4624 & ASTM D4541, require the user to record not only the pull-off force but also the nature of the fracture by examining the bottom of the dolly and assessing the adhesive / cohesive failure.

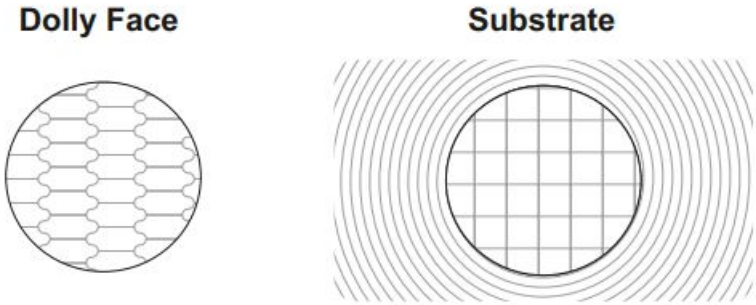
8.1 EXAMINING THE DOLLY

a) ***Cohesive Failure:*** The coating fails within the body of a coating layer leaving the same coating on the surface and on the dolly face.



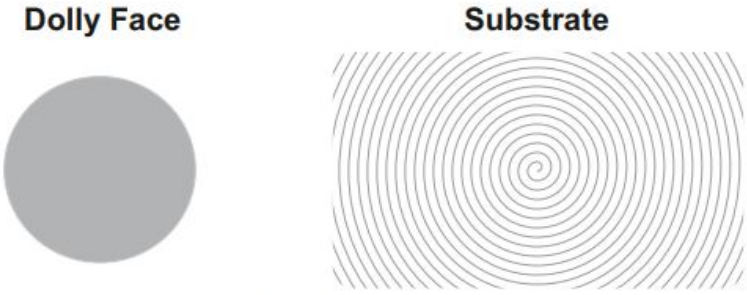
a) 100% Cohesive Failure

b) ***Adhesive failure:*** Is a failure at the interface between layers (intercoat) where one pulls away from the other. The "coating" on the dolly face will not be the same as that on the test area.

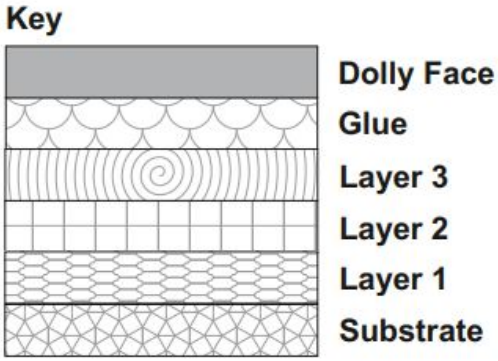


b) 100% Adhesive Failure Between Two Layers

c) ***Glue failure:*** When no coating is present on the dolly it must be recorded as a failure of the glue. This is normally due to incorrect or insufficient mixing of the component parts of the adhesive, incompatibility between the adhesive, the coating, the dolly, and / or the test surface - see Section 5 - 'Securing the Dolly' on page en-8 for more information.



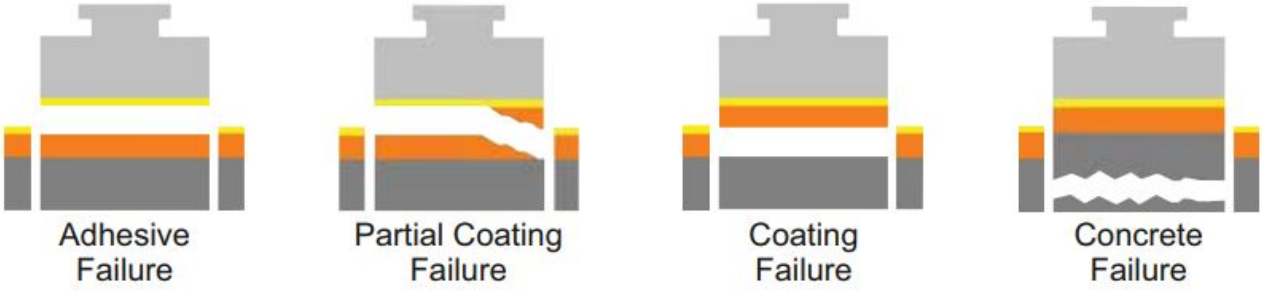
c) Glue Failure



8.2 EXAMINING THE DOLLY (COATINGS ON CONCRETE)

When testing coatings on concrete it is common for the adhesive bond between the coating and the concrete to exceed the strength of the concrete itself. In this case concrete will be removed from the surface and will be seen on the coating on the dolly face.

Observing the test area will give additional information about the type of failure; adhesion and cohesion between different layers of the coating.



9 BATCHING

9.1 BATCH FUNCTIONS

The Elcometer 510 Model S gauge can store up to 60 readings in one batch and has the following batching functions:

- **Batch/New Batch**; Create a new batch - see Section 9.2 for further information.
- **Batch/Open Existing Batch;** Open an existing batch.
- **Batch/Edit Batch/Clear Batch;** Clear all readings within the batch - but leaving all batch header information.
- **Batch/Review Batch;** Review the readings, statistics and batch information - see Section 10 for further information.
- **Batch/Edit Batch/Delete Batch;** Delete the batch entirely from the gauge.
- **Batch/Deleted Reading/Delete without Tag;** Delete the last reading entirely.
- **Batch/Deleted Reading/Delete with Tag**; Delete the last reading but mark it as deleted in the batch memory.

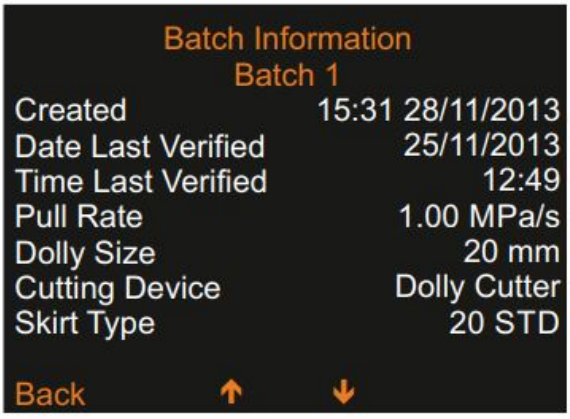
9.2 CREATING A NEW BATCH

Many Standards require the user to record not only the pull-off force and the nature of the fracture but also details of the test equipment used; if a support ring was used and its dimensions, if, and by what means, the coating was cut around the dolly.

This additional information is recorded within the batch header and transferred to PC to be included on any report within ElcoMaster®. For further information on ElcoMaster® visit www.elcometer.com.

To create a new batch select Batch/New Batch and add the following criteria as required:

- Dolly Size & Pull Rate;
  (Batch/New Batch/Dolly Size & Pull Rate)
- Cutting Device; the type of cutting device used, if any, to score the coating around the dolly;
  (Batch/New Batch/Cutting Device)



- The dolly skirt type; *(Batch/New Batch/Skirt Type)*
  - Select '20mm Standard' for Standard Skirt for 10, 14.2 and 20mm dollies;
  - Select '50mm Standard' for Standard Skirt for 50mm dollies;
  - Select '14.2mm Thin Substrate' for Thin Substrate Skirt for 14.2mm dollies;
  - Select '20mm Thin Substrate' for Thin Substrate Skirt for 20mm dollies

Note: A new batch can not be created if a batch already exists. The existing batch must be deleted first.

Note: The Elcometer 510 dolly skirt has an integrated support ring, therefore identifying the dolly skirt used records the use of a support / bearing ring as required by some standards, together with the support ring dimensions - see Section 15.3 'Dolly Skirts' on page en-19 for dimensions.

These details can be added and amended until the first reading has been stored in the batch after which no changes can be made.

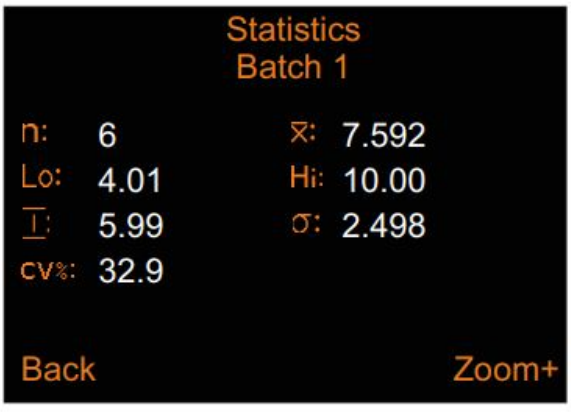
This information is saved in the batch header and can be viewed at any time via Batch/Review Batch/Batch Information.

10 REVIEWING BATCH DATA

10.1 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 lowest reading in the batch
- Standard Deviation (σ)
- Coefficient of Variation (cv%)

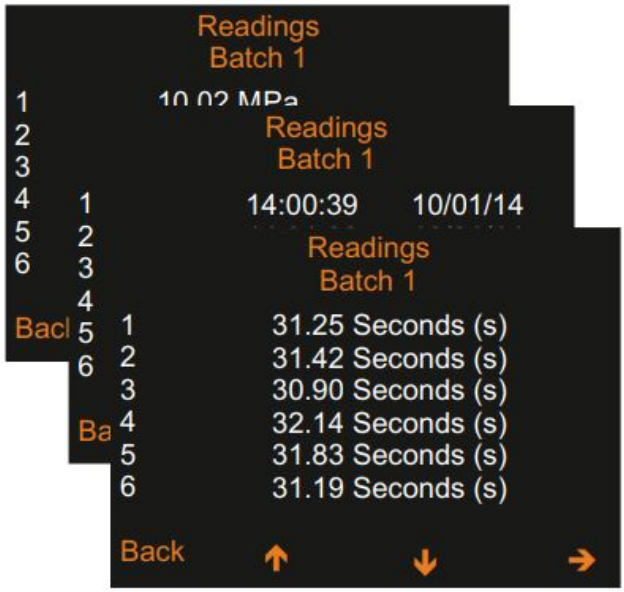


Note: The calculation of standard deviation is based on the distribution of individual fracture strength values being normal, that is forming a normal curve when plotted as a frequency chart. If adhesion values for pulls that are not completed are included in the calculation, i.e. pulled to a limit value or maximum and not to fracture, the distribution will not be normal and the standard deviation calculation will not be mathematically correct. For the purpose of assessing the distribution of values in this case, however, the calculation will be included as though all the dollies were pulled to coating failure and it should be noted that the resulting calculation is for guidance only.

10.2 BATCH READINGS (Batch/Review Batch/Readings)

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

- The reading value;
- Date and time stamp for each test;
- Test duration.



Note: The test duration includes the hold time but does not include the time it takes for the gauge to re-wind to 'zero'.

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

11 VERIFYING THE GAUGE CALIBRATION

The Elcometer 510 is factory calibrated. The calibration of the gauge can be verified in the field using the Elcometer Adhesion Verification Unit (AVU), part number T99923924C and the Elcometer 510 Verify Calibration wizard, Menu/Verify Calibration.

To verify the calibration:

1 Select Menu/Verify Calibration.

2 Switch on the Elcometer AVU and ensure that the appropriate dolly adaptor is fitted and the measurement units are the same as the Elcometer 510 *(refer to the instructions supplied with the Elcometer AVU)*.

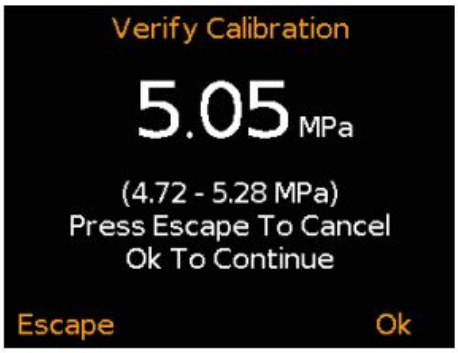
3 Connect the Elcometer 510 actuator (with skirt fitted) to the Elcometer AVU dolly adaptor.

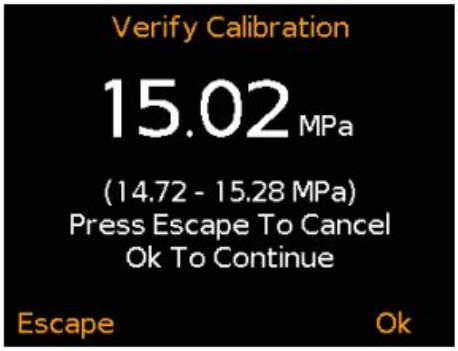
4 Press 'Ok' on the Elcometer 510 when connected. The Elcometer 510 automatically starts to apply pressure until the first test load is reached.

5 Compare the test load with the reading on the Elcometer AVU display. If the Elcometer AVU reading is within the acceptable range, displayed in brackets underneath the test load, press 'Ok' to proceed to the next test pressure and repeat step 4. (If outside the acceptable range, re-calibration is recommended. Press 'Escape' to exit the calibration verification procedure and contact Elcometer or your local supplier for further information).

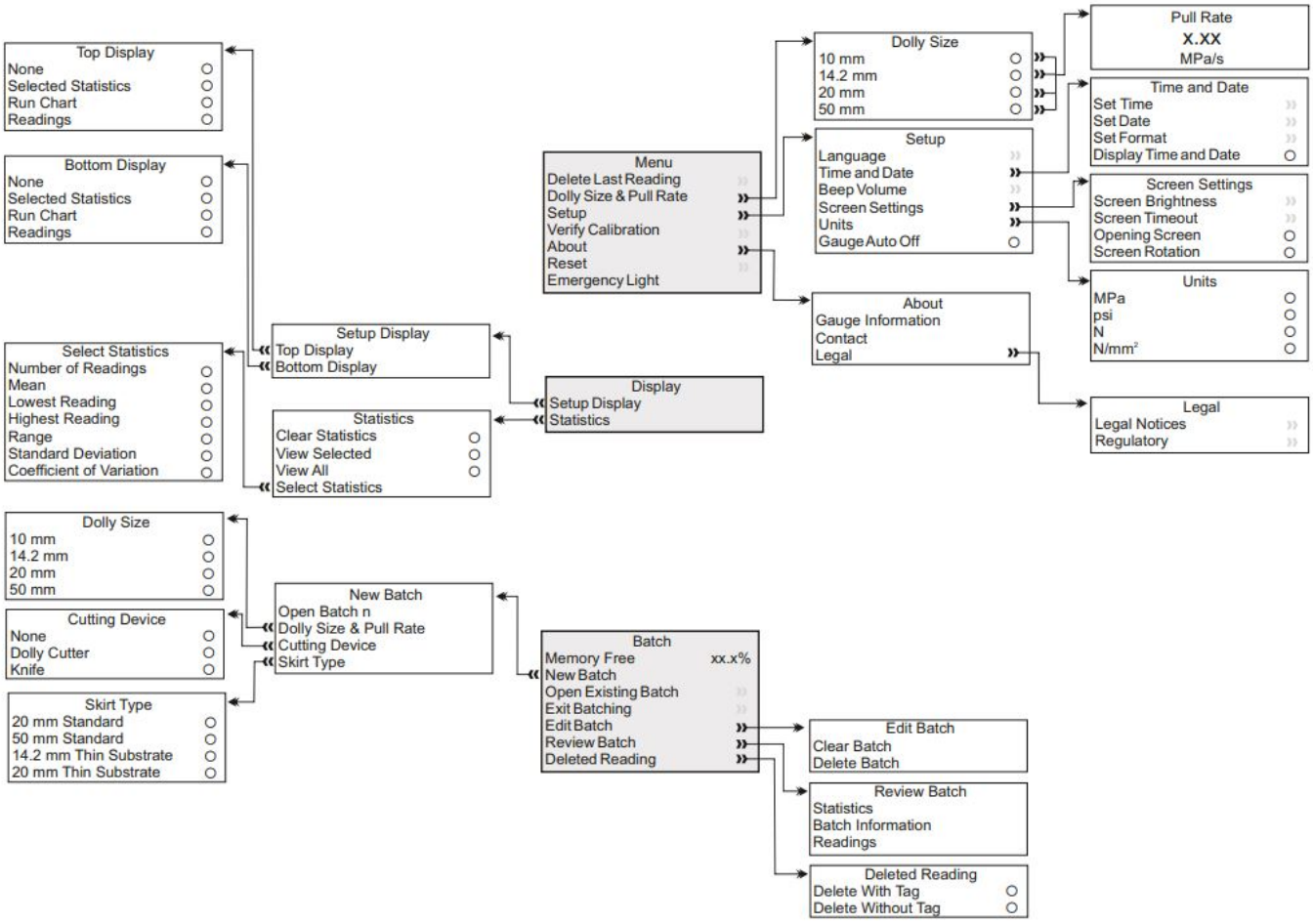
6 When the final test load has been reached, if it is within the acceptable range, press 'Verify' to update the gauge or 'Escape' to cancel. The date and time of the last verification procedure is recorded against each batch and can be viewed via Batch/Review Batch/Batch Information.

Note: The acceptable range is based on the 'system' accuracy - the accuracy of the Elcometer 510 and Elcometer AVU unit combined. Measurement verification points: 5, 10, 15, 20 & 25MPa (or equivalent units).





12 MENU STRUCTURE



13 DOWNLOADING DATA

Using ElcoMaster® - supplied with each gauge, and available as a free download at elcometer.com - gauges can transmit readings via USB to a PC for archiving and report generation. For more information on ElcoMaster® visit www.elcometer.com

www.elcometer.com

14 UPGRADING YOUR GAUGE

Gauge firmware can be upgraded to the latest version by the user via ElcoMaster®, as it becomes available. ElcoMaster® will inform the user of any updates when the gauge is connected to the PC with an internet connection.

15 SPARES & ACCESSORIES

15.1 DOLLIES

The Elcometer 510 can be used with a range of dollies, also referred to as test elements or stubs. 10, 14.2, 20 and 50mm diameter dollies are available to purchase as an optional accessory[d].

10mm:	ideal for testing up to 100MPa (14400psi) on very small surface areas.
14.2mm:	ideal for testing on small surface areas, for measurements over 25MPa (3600psi) and suitable for use on some curved surfaces.
20mm:	suitable for use on a variety of coatings / substrates.
50mm:	Coatings on concrete, cementitious layers and uneven surfaces can be tested more effectively with the larger 50mm dolly. Our 50mm dollies are also available in stainless steel as required for testing in accordance with DIN 1048 part 2 and BS EN 12636.

Description	**Part Number**
Aluminium Dolly 10mm (x10)	T5100010AL-10
Aluminium Dolly 10mm (x100)	T5100010AL-100
Aluminium Dolly 14.2mm (x10)	T9990014AL-10
Aluminium Dolly 14.2mm (x100)	T9990014AL-100
Aluminium Dolly 20mm (x10)	T9990020AL-10
Aluminium Dolly 20mm (x100)	T9990020AL-100
Aluminium Dolly 50mm (x4)	T9990050AL-4
Stainless Steel Dolly 50mm (x4)	T9990050SS-4

[d] Please ensure the appropriate dolly skirt is fitted. See Section 6 - 'Attaching the Gauge to the Dolly' and Section 15.3 - 'Dolly Skirts' on pages en-9 and en-19 for further information.

15.2 DOLLY CUTTERS

Standards or test methods will determine if the Inspector should cut / score around the dolly prior to test to separate the test area from the rest of the coating; information which should be recorded with the results.

The Elcometer 510 is supplied with a dolly cutter and handle appropriate for the dolly size included in the kit. Spare / replacement cutters are available to purchase using the sales part numbers below.

Description	For Dolly Sizes (mm)	Part Number
Dolly Cutter	14.2mm	T9990014CT
Dolly Cutter	20mm	T9990020CT
Dolly Cutter	50mm	T9990050CT

Dolly cutter handles must be ordered separately - a handle is not supplied with the dolly cutter accessory.

Description	For Dolly Cutter	Part Number
Dolly Cutter Handle	T9990014CT	T9991420H
Dolly Cutter Handle	T9990020CT	T9991420H
Dolly Cutter Arbor	T9990050CT	T9990050H

15.3 DOLLY SKIRTS

Standard skirts are available for 10mm, 14.2mm and 20mm dollies as well as 50mm dollies. Special skirts are also available for testing on thin substrates to even out the load, as using a standard skirt on a thin substrate may cause the substrate to bend or flex during test.

Description	For Dolly Sizes (mm)	Part Number
Standard Skirt	10, 14.2 & 20mm	T999101420S
Thin Substrate Skirt	14.2mm	T9990014T
Thin Substrate Skirt	20mm	T9990020T
Standard Skirt	50mm	T9990050S

Part Number	Integrated Support Ring Dimensions	
	I/D†	O/D‡
T999101420S	30mm	40.4mm
T9990014T	16.3mm	40.4mm
T9990020T	21mm	40.4mm
T9990050S	52mm	72mm

† I/D: Inner Diameter ‡ O/D: Outer Diameter

15.4 MAGNETIC ANCHOR CLAMP

Ideal when testing at height or on vertical surfaces to prevent damage to the surrounding coating or harm to the user, the magnetic anchor clamp connects to the lanyard ring on the top of the actuator to prevent the actuator from falling when the dolly is pulled from the substrate.

Description	Part Number
Magnetic Anchor Clamp Accessory	T99923797

16 ADHESIVES

The adhesive supplied with the Elcometer 510 is Araldite® Standard, a two-pack epoxy paste which is mixed from approximately equal volumes of the two components. Measurement by eye is sufficient. When mixed it should be used within one hour. Curing Times: 24 hours at 25°C (77°F); 3 hours at 60°C (140°F)

Araldite® is suitable for warm and hot environments. Lower temperatures can require extended curing times of up to 3 days or more. The expiry date of the adhesive should be checked before use. Adhesive which has expired should not be used.

Unused adhesive must be disposed of as special waste unless it has been fully cured. To dispose of excess adhesive at the end of its shelf life simply mix the remaining material and allow it to cure before disposal.

Description	Part Number
Araldite® Standard Two Part Epoxy Adhesive; 2x15ml Tubes	T99912906

A Material Safety Data Sheet for adhesive supplied by Elcometer can be downloaded via our website:

Araldite® Standard Two Part Epoxy Adhesive:
www.elcometer.com/images/stories/MSDS/araldite_epoxy_adhesive.pdf

Note: Other suitable adhesives include Loctite® Hysol® 907 and 3M™ Scotch-Weld™ Epoxy Adhesive.

The suitability of any adhesive should be determined by the user. Some coatings can be adversely affected by adhesives. Some adhesives can be contaminated by coating environments, solvents etc.

17 WARRANTY STATEMENT

The Elcometer 510 is supplied with a 12 month warranty against manufacturing defects, excluding contamination and wear. The warranty can be extended to two years within 60 days of purchase via www.elcometer.com.

www.elcometer.com

18 TECHNICAL SPECIFICATION

Dolly Diameter	10mm	14.2mm	20mm	50mm
Operating Range	8 - 100MPa (1200 - 14400psi)	4 - 50MPa (600 - 7200psi)	2 - 25MPa (300 - 3600psi)	0.3 - 4.0MPa (50 - 580psi)
Operating Temperature Range	-10 to 50°C (14 to 122°F); Humidity: 0 - 95% RH			
Pressure Rating	26MPa (3800psi)			
Pressure Resolution	0.01MPa (1psi)			
Pressure Accuracy	±1% of full scale			
Pull Rate Range	1.0 - 5.0MPa/s (125 - 725psi/s)	0.4 - 2.5MPa/s (60 - 360psi/s)	0.2 - 1.2MPa/s (30 - 180psi/s)	0.04 - 0.20MPa/s (5 - 30psi/s)
Pull Rate Setting Resolution	0.1MPa/s (1psi/s)	0.1MPa/s (1psi/s)	0.1MPa/s (1psi/s)	0.01MPa/s (0.1psi/s)
Pull Rate Display Resolution	0.01MPa (1psi)			
Pull Rate Accuracy	± (2.5% + 0.3 seconds) over time of test			
Gauge Memory	Up to 60 readings in one batch			
Power Supply	8 x AA NiMH batteries[e]			
Battery Life	200 pulls per charge up to 25MPa (3600psi) at 1MPa/s (150psi/s)			

[e] The number of pulls remaining with a battery charge is calculated using the NiHM batteries supplied. Alternative AA batteries (alkaline for example), can be used but will affect battery performance and the accuracy of the “pulls remaining” indication.

Dolly Diameter	**10mm**	**14.2mm**	**20mm**	**50mm**
Instrument Weight	2.9kg (6.4lb)	2.9kg (6.4lb)	2.9kg (6.4lb)	3.1kg (8.3lb)
Kit Weight	n/a	n/a	6.1kg (13.5lb)	7.3kg (16.1lb)
Instrument Length	260mm (10.3")			
Actuator Height	85mm (3.4") *(10mm skirt fitted)*	85mm (3.4") *(14.2mm skirt fitted)*	85mm (3.4") *(20mm skirt fitted)*	110mm (4.3") *(50mm skirt fitted)*
Can be used in accordance with: ASTM C1583, ASTM D4541, ASTM D7234-12, AS/NZS 1580.408.5, BS 1881-207, DIN 1048-2, EN 1015-12, EN 12636, EN 13144, EN 1542, EN 24624, ISO 16276-1, ISO 4624, JIS K 5600-5-7, NF T30-606, NF T30-062 Note: The Elcometer 510 Adhesion Tester is a Type V adhesion tester as defined by ASTM D4541				

19 LEGAL NOTICES & REGULATORY INFORMATION

Declaration of Conformity: This product complies with the requirements of the following EU Directives:
2014/30/EU Electromagnetic Compatibility
2006/42/EC Machinery Directive, as amended by 2009/127/EC
2011/65/EU Restriction of the use of certain hazardous substances
The Declaration of Conformity is available to download via:
www.elcometer.com/images/stories/PDFs/Datasheets/Declaration_of_Conformity/English/DoC_510_S.pdf
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
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.
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.

Modifications not expressly approved by Elcometer Limited could void the user's authority to operate the equipment under FCC rules.
This Class B digital apparatus complies with CAN ICES-3 (B)/NMB-3(B).
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All other trademarks acknowledged.

The Elcometer 510 is packed in cardboard packaging. Please ensure that this 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.

Documents / Resources

	elcometer 510s Automatic Adhesion Tester [pdf] User Guide 510s Automatic Adhesion Tester, Automatic Adhesion Tester, Adhesion Tester