

# **Elcometer 138**

## **Bresle Kit and Patches**

## **Operating Instructions**



**CE** This product meets the Electromagnetic Compatibility Directive.

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

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.

Class B product are 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.

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All other trademarks acknowledged.

A Material Safety Data Sheet for the Elcometer 138 Standard Solution is available to download via our website - [www.elcometer.com/images/MSDS/elcometer\\_138\\_b771\\_calibration\\_solution.pdf](http://www.elcometer.com/images/MSDS/elcometer_138_b771_calibration_solution.pdf).

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A copy of this Instruction Manual is available for download on our Website via [www.elcometer.com](http://www.elcometer.com)

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Thank you for your purchase of this Elcometer 138 Bresle Kit and Patches. Welcome to Elcometer.

Elcometer are world leaders in the design, manufacture and supply of inspection equipment for coatings and concrete. Our products cover all aspects of coating inspection, from development through application to post application inspection.

Your Elcometer 138 Bresle Kit and Patches is a world beating product. With the purchase of this product you now have access to the worldwide service and support network of Elcometer. For more information visit our website at [www.elcometer.com](http://www.elcometer.com)

## **1 ABOUT THIS TEST KIT**

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The Elcometer 138 Bresle Kit and Patches provides all the materials and equipment required to determine the surface chloride contamination level. Chloride salts are extracted from the surface using the Bresle Patch method and the chloride content of the test solution is measured using a Conductivity Meter.

These instructions incorporate two test methods:

- ISO 8502-6/ISO 8502-9
- US NAVY PPI 63101-000 (Rev 10)

The Elcometer 138 Bresle Kit and Patches can also be used in accordance with ISO 8502-11; AS 3894.6-A and SSPC Guide 15.

For IMO PSPC<sup>a</sup>, the surface salts should be measured and recorded. Your Elcometer 138 Bresle Kit and Patches can be used for this.

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a. International Maritime Organisation, Performance Standard for Protective Coatings

The Elcometer 138 Conductivity Meter included in the test kit measures the conductivity of aqueous solutions. The meter is **not** designed to measure solids, organic solvents, surfactant, oil, adhesive, alcohol, strong acids (pH: 0 to 2) or strong alkalis (pH: 12 to 14). **The life of the sensor will be extremely short if these substances are measured.**

### 1.1 WHAT THE BOX CONTAINS

- Elcometer 135 Bresle Patches, box of 25
- Pure Water, 250 ml in clear plastic bottle
- Syringes, 5 ml, 3x
- Needles (blunt), 3x
- Beaker, plastic, 30 ml
- Elcometer 138 Conductivity Meter and Sensor
- Batteries, CR2032 lithium, 2x
- Standard calibration solution 1.41 mS/cm, 14ml
- Moistening solution, 14ml
- Operating instructions
- Carrying Case



The Elcometer 138 Bresle Kit and Patches are packed in a cardboard and foam package. Please ensure that this packaging is disposed of in an environmentally sensitive manner. Consult your local Environmental Authority for further guidance.

**To maximise the benefits of this instrument please take some time to read these Operating Instructions. Do not hesitate to contact Elcometer or your Elcometer supplier if you have any questions.**

## 1.2 CAUTION



The needles supplied for use with this kit are blunt, but care must be exercised when using and disposing of these needles to prevent accidental needle stick injuries. It is recommended that used needles be disposed of as special waste, and not in landfill.



If the standard solution used for calibration of the meter comes into contact with skin, wash the skin with fresh water. If the standard solution comes into contact with eyes, immediately flush the eye with large amounts of fresh water and seek medical advice.

## 2 TEST PROCEDURE: ISO 8502-6/ISO 8502-9

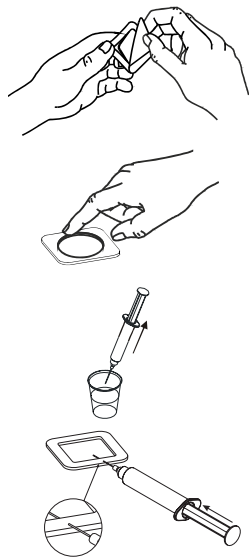
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### 2.1 BEFORE YOU START

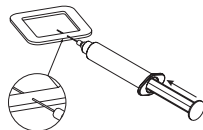
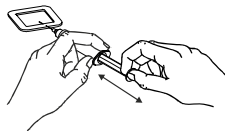
1. Calibrate the conductivity meter - see Section 4.4 “One-Point Calibration” on page 15.
2. Wear gloves during the test. The test is extremely sensitive; wear clean latex or nitrile gloves during the extraction of soluble salts to prevent contamination of the surface.

## 2.2 PROCEDURE

1. Remove protective backing and foam centre from Bresle Patch.
2. Apply patch to surface. Press firmly around perimeter of patch to ensure a complete seal, ensuring that a minimum volume of air is trapped against the test surface.
3. Fill syringe with 3 ml of pure water.
4. Insert syringe into patch through spongy foam perimeter of the patch at an angle of about 30° to the test surface so that it passes through the foam in to the compartment formed by the elastomer film and the test surface. If the patch is positioned in a difficult position bend the needle as required.



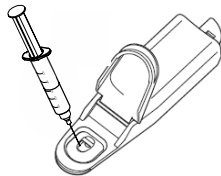
5. Inject 1.5ml of deionised water in to the patch. Do not remove the needle. Reposition the needle to remove any air in the patch.
6. Remove the needle and syringe and hold the syringe with the needle pointing upwards and expel the air.
7. Insert the syringe needle in to the patch and inject the remaining water.
8. After a suitable period of time<sup>b</sup> suck the solution back into the syringe and then immediately re-inject back into the patch.
9. Repeat step 8 until at least four injection/sucking cycles have been completed.
10. At end of last cycle extract as much solution as possible and remove syringe from patch<sup>c</sup>.



11. Measure conductivity of solution using the Elcometer 138 Conductivity Meter - see Section 5 "Measurement" on page 16.

Inject sample directly into sensor cell. Rinse cell several times with solution to be measured before taking reading.

12. After the test is complete:
  - Record temperature of solution.



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b. On un-pitted blast-cleaned areas a period of 10 minutes has been found satisfactory.  
c. During steps 4 to 10 it is essential that no solution is lost. If any solution is lost the test shall be rejected.



- Remove Bresle Patch from surface and clean surface. If required, any adhesive residue from the Bresle Patch left on the test surface can be removed by wiping the surface with a cloth moistened with a suitable solvent. Ensure that the solvent will not damage the surface before use.
- Rinse all components, other than the Bresle patch, of the test kit in fresh water. The components can then be used again.

### 2.3 TO CALCULATE THE SURFACE DENSITY OF SALTS

Multiply the reading by one of these factors:

Surface Density of Salts, Factors <sup>1</sup>					
		ISO Salt Mix		IMO PSPC equivalent NaCl	
Reading	mg/m <sup>2</sup>	µg/cm <sup>2</sup>	mg/m <sup>2</sup>	µg/cm <sup>2</sup>	
µS/cm	x1.2	x0.12	x1.1	x0.11	

<sup>1</sup> Based on an area of 12.5cm<sup>2</sup> and a volume of 3ml.

## 3 TEST PROCEDURE: US NAVY PPI 63101-000

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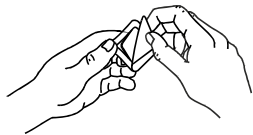
### 3.1 BEFORE YOU START

1. Calibrate the conductivity meter - see Section 4.4 “One-Point Calibration” on page 15.
2. Wear gloves during the test. The test is extremely sensitive; wear clean latex or nitrile gloves during the extraction of soluble salts to prevent contamination of the surface.

### 3.2 PROCEDURE

Measurements shall be made randomly over the prepared surface. Take five (5) measurements every 90 m<sup>2</sup> (1000 ft<sup>2</sup>). Areas less than 90 m<sup>2</sup> (1000 ft<sup>2</sup>) shall have five measurements made.

1. Remove protective backing and foam centre from Bresle Patch.



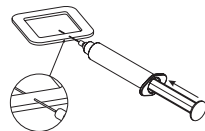
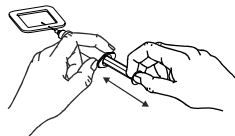
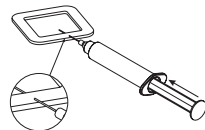
2. Apply patch to surface. Press firmly around perimeter of patch to ensure a complete seal.



3. Fill syringe with 3 ml of pure water.



4. Insert syringe into patch through latex and spongy foam perimeter and inject 1.5 ml of deionised water into patch. Do not remove syringe.
5. With syringe still in patch, reposition needle and evacuate any air in patch.
6. Once air has been removed, inject remaining 1.5 ml of water.
7. Remove syringe from patch.
8. Rub surface of patch gently for 10 to 15 seconds to allow water to dissolve surface contaminants.
9. Insert syringe into patch through spongy foam perimeter and extract solution from patch.

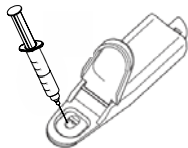


10. Measure conductivity of solution using the Elcometer 138 Conductivity Meter - see Section 5 “Measurement” on page 16.

Inject sample directly into sensor cell. Rinse cell several times with solution to be measured before taking reading.

11. After the test is complete:

- Record temperature of solution.
- Remove Bresle Patch from surface and clean surface. If required, any adhesive residue from the Bresle Patch left on the test surface can be removed by wiping the surface with a cloth moistened with a suitable solvent. Ensure that the solvent will not damage the surface before use.
- Rinse all components, other than the Bresle patch, of the test kit in fresh water. The components can then be used again.



### 3.3 PASS/FAIL CRITERIA

For immersed applications, conductivity due to soluble salts (total ionic) shall not exceed 30  $\mu\text{S}/\text{cm}$ . For non-immersed applications, conductivity due to soluble salts shall not exceed 70  $\mu\text{S}/\text{cm}$ .

**Note:** *The charts produced by the US Navy for the calculation of chloride level are not required for this test method. Please contact Elcometer or your Elcometer supplier if you require a copy of these charts.*

## 4 USING THE CONDUCTIVITY METER

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### 4.1 CAUTION



Do not drop the meter.

Never apply undue force when opening the meter (to change batteries/sensor).

Do not exert undue force on the sensor.

Do not allow utensils (tweezers, pipette etc.) to touch sensor cell.

Do not measure samples hotter than 40°C (105°F).

Do not allow contact with solvents.

Do not subject the meter to high temperature or humidity.

## 4.2 FITTING BATTERIES

The Elcometer 138 Conductivity Meter and Sensor use dry cell batteries only. Two CR2032 lithium batteries are supplied in the kit.

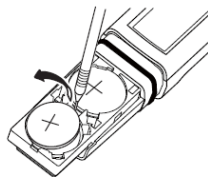
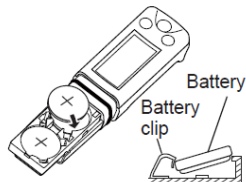
To fit or replace the batteries:

1. Place batteries in battery clips ensuring correct polarity.
2. To reassemble meter, slide sensor onto body of meter and push body and sensor together gently until sensor retaining clip engages.

When battery voltage becomes low, Low Battery Warning Indicator will flash. Replace both batteries immediately.

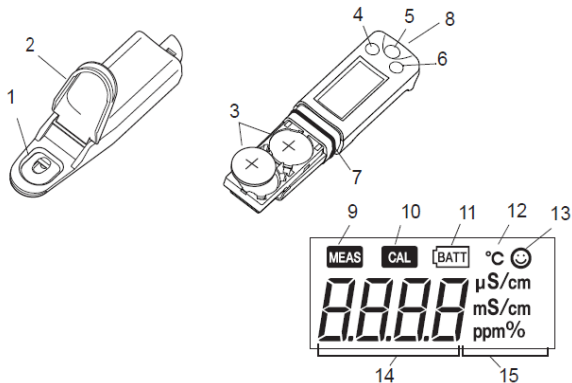
**Note:** *Lithium batteries must be disposed of carefully to avoid environmental contamination. Please consult your local Environmental Authority for information on disposal in your region.*

**Do not dispose of any batteries in fire.**



### 4.3 CONTROLS AND DISPLAY

The meter is operated using 3 buttons and displays readings and other information on the LCD screen.



### GUIDE TO CONDUCTIVITY METER & DISPLAY INDICATORS

1	<b>Measurement Cell</b>	Place a liquid sample in this cell to measure it with the electrode located on the bottom of the cell.
2	<b>Protection cover</b>	Protects the measurement cell and flat sensor in storage.
3	<b>Lithium batteries</b>	CR2032 x 2.

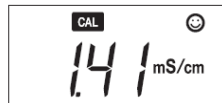
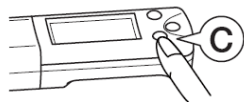
<b>4</b>	<b>MEAS button</b>	Switches the calibration mode to the measurement mode, activates/deactivates the reading locking function in the measurement mode and starts/applies settings in the special setting mode.
<b>5</b>	<b>ON/OFF button</b>	Turns the meter ON/OFF.
<b>6</b>	<b>CAL button</b>	Starts calibration and switches items/settings in the special setting mode.
<b>7</b>	<b>Waterproof gasket</b>	Makes the meter waterproof.
<b>8</b>	<b>Strap eyelet</b>	A strap can be attached here.
<b>9</b>	<b>MEAS icon</b>	Flashes until the measured value is stabilised and illuminates steadily when the measured value is settled, while the reading locking function is active.
<b>10</b>	<b>CAL icon</b>	Flashes during calibration and illuminates steadily when calibration is finished.
<b>11</b>	<b>Battery alarm icon</b>	Illuminates when the batteries are low and need to be replaced.
<b>12</b>	<b>Temperature alarm icon</b>	Flashes when the measuring environment temperature does not meet the specified operating temperature (5°C to 40°C).
<b>13</b>	<b>Stability icon</b>	Illuminates when measured value is stabilised.
<b>14</b>	<b>Measured value display</b>	Displays a measured, set and status value.
<b>15</b>	<b>Measurement unit display</b>	A unit symbol illuminates corresponding to the value displayed on the measured value display (14). The default setting is 'S/cm'.



**Note:** The above is an extract of the full Elcometer 138 Operating Instructions. For a copy of the full Elcometer 138 Operating Instructions contact Elcometer Limited or your local Elcometer Distributor.

#### 4.4 ONE-POINT CALIBRATION

- To set 'One-point calibration', switch the meter on, press and hold the **MEAS** button for 3 seconds. Press the **CAL** button until **CAL** appears.
- Press the **MEAS** button again for 0.5 seconds and the calibration type will be displayed (1 or 2). Press the **CAL** button to change the setting to 1 as required and press **MEAS** again to apply the setting.
- Open the protection cover and place some drops of the 1.41 mS/cm standard solution into the measurement cell.  
Washing the sensor with standard solution beforehand may provide more accurate calibration.
- Close the protection cover and press the CAL button for over 2 seconds.  
**CAL** and ☺ flash and the calibration value is displayed.  
After the calibration is completed, **CAL** and ☺ stop flashing and illuminate steadily.
- Clean the sensor with tap water and remove moisture.
- Press the MEAS button for 0.5 seconds to enter the measurement mode and prepare for measurement.



**Note:** The Elcometer 138 Conductivity Meter has a two-point calibration mode. For details see the full Elcometer 138 Operating Instructions (Part Number 24276). The two-point calibration mode requires two standard solutions.

## 5 MEASUREMENT

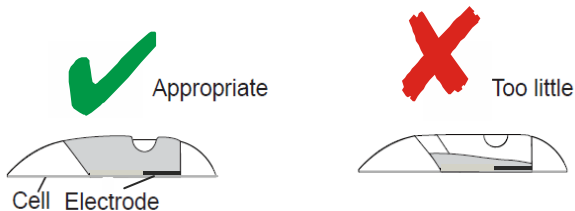
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1. Open the protection cover.
2. Put some drops of sample into the measurement cell.



**Note:** Although this product is waterproof, avoid immersing it completely. If the product is accidentally dropped into water, take it out of the water and remove the moisture on it.

**Note:** Put an appropriate amount of the standard solution or test sample into the measurement cell avoiding the inclusion of bubbles. Bubbles in the solution may cause the conductivity measurement to be inaccurate.



**Cross-Section of the measurement cell**

## 5.1 MEASUREMENT OPERATIONS

- **Without using the reading locking function**

1. Switch the meter on and place drops of the sample on the sensor.
2. Read the displayed value when 😊 appears.



- **When using the reading locking function<sup>d</sup>** (*Provides a steady value in the display*)

1. Switch the meter on and place drops of the sample on the sensor.
2. After ☺ appears, press the **MEAS** button for 0.5 seconds.

The reading locking function is activated. **MEAS** flashes until the measured value is stabilised.

When the measured value is stable **MEAS** stops flashing and the displayed value is locked with **MEAS** and ☺ illuminated steadily.



3. Read the displayed value.
4. Press the **MEAS** button for 0.5 seconds.

The reading locking function is deactivated and **MEAS** disappears.

**Note:** *If a measurement result is out of the specified measurement range the displayed measure value flashes.*

**Note:** *Ambient air may cause the measure values to fluctuate. To reduce environmental interference close the protection cover.*

## 5.2 AFTER MEASUREMENT

1. Press ON/OFF button to switch off the meter.
2. Wash sensor with tap water and wipe away any residual water using a clean tissue.
3. Replace the sensor protection cap.

**Note:** *If the meter is to remain unused for a long period of time use purified (deionised) water instead of tap water.*

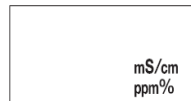
- d. When using the reading locking function, deactivate the function before starting every measurement.

### 5.3 MEASUREMENT UNIT SETTING

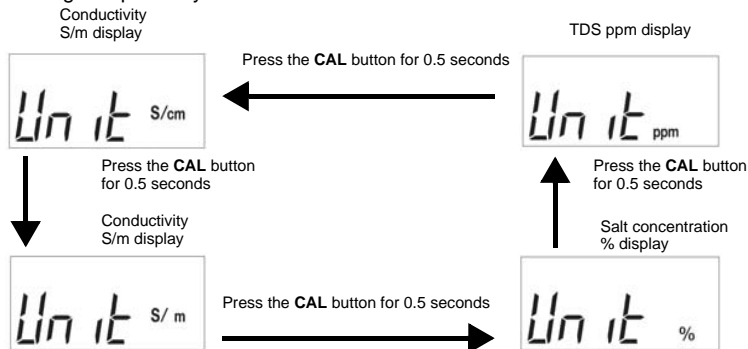
Used to select measurement unit.

1. Press and hold the **MEAS** button for over 3 seconds in the measurement mode to enter the special setting mode.

All items appear on the LCD and then the display changes as shown.



2. Press the **MEAS** button for 0.5 seconds. The current setting is displayed.
3. Press the **CAL** button for 0.5 seconds to change the setting. Pressing the **CAL** button continuously changes the settings sequentially.



4. Press the **MEAS** button to apply the setting. The instrument is returned to measurement mode.

## 6 MAINTENANCE

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The Conductivity Meter is designed to give many years reliable service under normal operating and storage conditions.

### 6.1 CARE OF THE CONDUCTIVITY METER SENSOR

- Prolonged periods of non-use may cause the sensor to dry out. This can result in malfunction or unstable readings. Pour moistening solution into the sensor cell and leave for a few minutes to allow the sensor to become saturated. Wash the sensor with water prior to use.
- If the measuring surface of the sensor is contaminated or if air bubbles are regularly present in the sample, clean the sensor using a diluted neutral detergent (diluted 100 times).

### 6.2 FAULTS

The Elcometer 138 Conductivity Meter does not contain any user-serviceable components. In the unlikely event of a fault, the Elcometer 138 Conductivity Meter should be returned to your local Elcometer supplier or directly to Elcometer. The warranty will be invalidated if the instrument has been open.

Contact details can be found at [www.elcometer.com](http://www.elcometer.com).

## 7 STORAGE

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The Elcometer 138 Conductivity Meter incorporates a Liquid Crystal Display. If the display is heated above 50°C (120°F) it may be damaged. This can happen if the conductivity meter is left in a car parked in strong sunlight.

Always store the components of the Elcometer 138 Bresle Kit and Patches in the carrying case when the kit is not being used.

## 8 TECHNICAL SPECIFICATION

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### 8.1 BRESLE PATCH

Patch Size:	5.2 cm x 5.2 cm
Test Area:	12.5 cm <sup>2</sup>
Sample Volume:	2.6 ± 0.6 ml

### 8.2 CONDUCTIVITY METER

Measurement principle:	2 AC bipolar method
Measurement mode:	Conductivity
Range - conductivity:	[ 0 -199 μS/cm ± 5 μS/cm 0.2 -1.99 mS/cm ± 0.05 mS/cm 2 -19.9 mS/cm ± 0.5 mS/cm
Repeatability:	
Display:	
Measurement temperature:	5°C to 40°C (41°F to 105°F)
Dimensions:	164 mm x 29 mm x 20 mm (6.5" x 1.1" x 0.79")
Weight (incl. dry batteries):	47 g (1.7 oz)
Case:	ABS
Battery Type:	2 x CR2032 lithium <sup>e</sup>

### 8.3 CARRYING CASE

Overall Case Dimensions:	345 mm x 290 mm x 85 mm (13.6" x 11.4" x 3.3")
Weight:	1.1 kg (2 lb 7 oz)
Material:	Polypropylene foam-lined with cutouts for Bresle Patches, Water, Conductivity Meter and accessories

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- e. When exhausted these lithium 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.



## 9 SPARE PARTS AND ACCESSORIES

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The Elcometer 138 Bresle Kit is complete with all the items required to get started and take measurements, however over the life of the kit replacements may be required. The following items are available from Elcometer, or your local supplier.

### 9.1 CONSUMABLE ITEMS

Bresle patches, box of 25:	E135----B
Syringes, 5 ml, 3x:	T13818517
Needles, 3x:	T13818518
Beaker, plastic, 30 ml:	T13818519
Calibration standard solution, 6x14ml:	T13823926
Pure water, 250 ml:	T99911344

### 9.2 REPLACEMENT ITEMS

Elcometer 138 Conductivity Meter:	T13823925
Sensor for conductivity meter:	T13823928

## 10 RELATED EQUIPMENT

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In addition to the Elcometer 138 Bresle Kit and Patches, Elcometer produces a wide range of other equipment for testing and measuring the characteristics of coatings. Users of the Elcometer 138 Bresle Kit and Patches may also benefit from the following Elcometer products:

- Elcometer 134A Chloride Ion Test Kit for Abrasives
- Elcometer 134S Salt Detection Kit for Blast Cleaned Surfaces
- Elcometer 134W Chloride Ion Test Kit for Water/Liquids
- Elcometer 130 Salt Contamination Meter

For further information contact Elcometer, your local supplier or visit [www.elcometer.com](http://www.elcometer.com).