

IPC-TM-650 TEST METHODS MANUAL

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| Number 2.3.43.3 | |
| Subject Exposure to Water and Saltwater for E-Textiles | |
| Date 02/2025 | Revision |
| Gage R&R: <input type="checkbox"/> Complete <input checked="" type="checkbox"/> In Progress <input type="checkbox"/> Available <input type="checkbox"/> NO | |
| Originating Task Group: D-74b E-Textiles Exposure and Durability Test Methods Task Group | |

1 SCOPE

This test method is used for determining the change of one or more functionally relevant parameters in e-textiles as a result of exposure to water and salt water.

1.1 Principles of Test The e-textile is exposed to water or salt water for an extended amount of time while observing a change of one or more relevant functional parameters throughout testing or at regular intervals.

1.2 Terms and Definitions

1.2.1 Critical Area The areas of e-textiles that have a higher tendency of failure compared to other areas (e.g., joints, connection points, textile electrodes) or that if affected will negatively affect product functionality or the ability for the product to operate as intended.

1.2.2 Data Recorder A measuring device used to record electrical resistance or electrical continuity.

1.2.3 Liquor Ratio The ratio of the volume of liquid in L to the weight of a textile in kg.

2 APPLICABLE DOCUMENTS

2.1 International Organization for Standardization (ISO)¹

ISO 139 Textiles — Standard atmospheres for conditioning and testing.

3 SPECIMENS

3.1 Specimen Preconditioning

All test specimens **shall** be conditioned for ≥ 24 hours according to ISO 139. If other conditions are specified, they should be reported with the test results.

3.2 Specimen Description

If the testing equipment is large enough, the entire e-textile **shall** be tested. Otherwise, cut specimens containing at least one type of critical area from the e-textile to a size that fits the testing equipment

If applicable, remove insulation from conductive structures for data recorder attachment.

3.3 Number of Specimens

The number of test specimens **shall** be defined to respect the statistical treatment (at least five / at least five per affected critical area).

4 APPARATUS AND MATERIAL

4.1 Glass rod, with a rounded end

¹ www.iso.org

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4.2 Protective equipment

4.3 Flat-bottom glass dish large enough to contain specimen

4.4 Sodium chloride solution at room temperature

- Saline water (more commonly known as salt water) is water that contains a high concentration of dissolved salts (mainly sodium chloride).
- Seawater has a salinity of roughly 35,000 ppm, equivalent to 35 g of salt (mainly sodium chloride per L (or kg) of water).

4.5 Grade 3 water

4.6 Data recorder for functionality testing

5 PROCEDURES

5.1 Using the data recorder, measure the initial value of the relevant functional parameter(s). Conduct a visual inspection of the specimen prior to testing.

5.2 Method A – Water

5.2.1 Lay out the specimen smoothly in a flat-bottomed dish and cover it with grade 3 water at room temperature.

5.2.2 Thoroughly wet the specimen in the water at an approximate liquor ratio of 50:1 (liquor:specimen) and allow it to remain in the water at room temperature for the requested time in minutes. Press and move it from time to time using the glass rod to ensure good and uniform penetration of the water.

5.2.3 Pour off the water and wipe the excess water off the specimen.

5.2.4 Visually assess the wet specimen for color modifications after 10 minutes.

5.2.5 Place the specimen on a flat surface and allow it to completely dry at room temperature for at least six hours.

5.2.6 Evaluate the functionality using the data recorder.

5.2.7 If necessary repeat the procedure until the target total exposure time.

5.3 Method B – Salt Water

5.3.1 Lay out the specimen smoothly in a flat-bottomed dish and cover it with sodium chloride solution at room temperature.

5.3.2 Thoroughly wet the specimen in this solution at an approximate liquor ratio of 50:1 (liquor:specimen) and allow it to remain in the solution at room temperature for the requested time in minutes. Press and move it from time to time using the glass rod to ensure good and uniform penetration of the liquor.

5.3.3 Pour off the solution and wipe the excess solution off the specimen.

5.3.4 Visually assess the wet specimen for color modifications after 10 minutes.

5.3.5 Place the specimen on a flat surface and allow it to completely dry at room temperature for at least six hours.

5.3.6 Evaluate the functionality using the data recorder.

5.3.7 If necessary repeat the procedure until the target total exposure time.

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6 TEST REPORT

The test report **shall** include the following information:

- Date and time of test
- Testing location and name of tester
- Environmental test conditions (if differing from ISO 139)
- Number of test specimens
- Description of test specimens (if smaller specimen are cut from the e-textile, include size, cutting direction (warp/weft (wovens), course/wale (knits)), type of critical area, location of critical area within specimen, etc.)
- Description/Specifications of testing equipment
- Testing parameters/specifications if variation is possible (type of liquid/solution used, duration of testing, other relevant info)
- Time intervals for intermediate testing
- Test results (parameter values before, during (if applicable) and after testing), if applicable: plotting of parameter values over time), other types of measurements
- Results of visual inspection before, during (if applicable) and after testing
- Any deviations from the presented methods
- Comments

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