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EIA STANDARD

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Salt Spray Test Procedure for Electrical Connectors, Contacts and Sockets

EIA/ECA-364-26B

(Revision of EIA-364-26A)

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ELECTRONIC INDUSTRIES ALLIANCE

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This standard is based upon the major technical content of International Electrotechnical Commission standard 512-6, test 11f; corrosion, salt mist, 1994. It conforms in all essential respects to this IEC standard.

This Standard does not purport to address all safety problems associated with its use or all applicable regulatory requirements. It is the responsibility of the user of this Standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before its use.

(From Standards Proposal Number 3932-A, formulated under the cognizance of the CE-2.0 National Connector Standards Committee.)

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TEST PROCEDURE No. 26B

SALT SPRAY TEST PROCEDURE
FOR
ELECTRICAL CONNECTORS, CONTACTS AND SOCKETS

(From EIA Standards Proposal No. 3932-A, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards, and previously published in EIA-364-26A.)

1 Introduction

1.1 Scope

This standard establishes a test method to assess the effects of a controlled salt-laden atmosphere on electrical connector components, finishes, and mechanisms and permit electrical readings to be taken after exposure when specified.

1.2 Object

The salt spray test, in which specimens are subjected to a fine mist of salt solution, has several more or less useful purposes when utilized with full recognition of its deficiencies and limitations. There is no implied relationship between this test and the effect of seacoast atmospheres, its usefulness being limited to a comparison of the corrosion resisting properties of various materials and protective coatings. The failure mechanism induced by the salt spray is an electrolytic corrosion.

2 Test resources

2.1 Equipment

2.1.1 Chamber

The chamber and all accessories shall be made of material that will not affect the corrosiveness of the fog, such as glass, hard rubber, or plastic. Wood or plywood should not be used because they are resiniferous. Materials containing formaldehyde or phenol in their composition should not be used. In addition, all parts that come in contact with the test specimen shall be of materials that will not cause electrolytic corrosion. The chamber and accessories shall be constructed and arranged so that there is free circulation of the spray to the same degree for all specimens, no return of the liquid that has come in contact with the test specimens to the salt-solution reservoir, and no direct impinging of the spray or condensation dripping on the specimens. The chamber shall be properly vented to prevent pressure build-up and allow uniform distribution of salt spray. The discharge end of the vent shall be protected from strong drafts that can cause strong air currents in the chamber.

2.1.2 Atomizers

The atomizer or atomizers used shall be of such design and construction as to produce a finely divided, wet, dense fog. The atomizing nozzle shall be made of material that does not react with the salt solution.

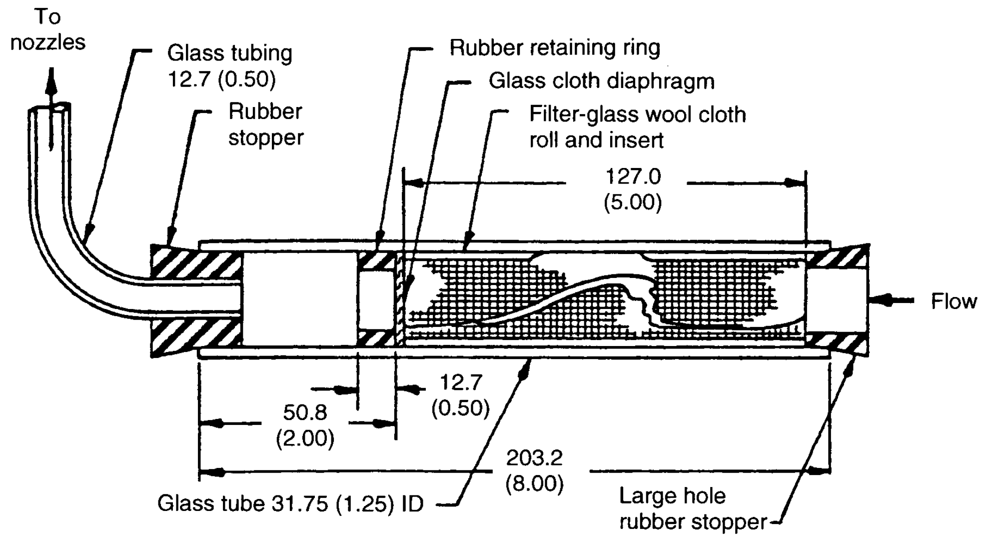
2.1.3 Air supply

The compressed air entering the atomizers shall be free from all impurities such as oil and dirt. Means shall be provided to humidify and warm the compressed air as required to meet the operating conditions. The air pressure shall be suitable to produce a finely divided dense fog with the atomizer or atomizers used. To ensure against clogging the atomizers by salt deposition, the air should have a relative humidity of 95 - 98% at the point of release from the nozzle. A satisfactory method is to pass the air in very fine bubbles through a tower containing heated water. The temperature of the water should be 35 °C (95 °F), minimum. The permissible temperature increases with increasing volume of air and with decreasing heat insulation of the chamber, and the temperature of its surroundings should not exceed a value above which an excess of moisture is introduced into the chamber (for example, 43 °C (110 °F)) at an air pressure of 0.083 MPa (12 pounds per square inch), or a value that makes it impossible to meet the requirements for operating temperature.

2.2 Material

2.2.1 Salt solution

The salt solution concentration shall be 5%. The salt used shall be sodium chloride containing on the dry basis not more than 0.1% of sodium iodide, and not more than 0.5% of total impurities. The 5% solution shall be prepared by dissolving 5 ± 1 parts by weight of salt in 95 parts by weight of distilled or other water. Distilled or other water used in the preparation of solution shall contain not more than 50 parts per million of total solids. The solution shall be kept free from solids by filtration using a noncorrosive filter similar to that shown on figure 1, and located in the salt solution reservoir in a manner such as that illustrated on figure 2, or decantation. The solution shall be adjusted to and maintained at a specific gravity in accordance with figure 3. The pH shall be maintained between 6.5 and 7.2, when measured at a temperature of 34 °C to 36 °C (93 °F to 97 °F). Before adjusting the pH, gently boil a specimen of the solution (e.g. 10 milliliters in a Pyrex beaker) for 30 s to 60 s to remove the CO_2 absorption; then cool to the specified temperature prior to measuring the specimen solution pH. Only diluted chemically pure hydrochloric acid or sodium hydroxide shall be used to adjust the pH. The pH measurement shall be made electrometrically using a glass electrode with a saturated potassium-chloride bridge or by colorimetric method provided the results are equivalent to those obtained with the electrometric method.



NOTE — Inch equivalents in parentheses.

Figure 1 - Salt solution filter

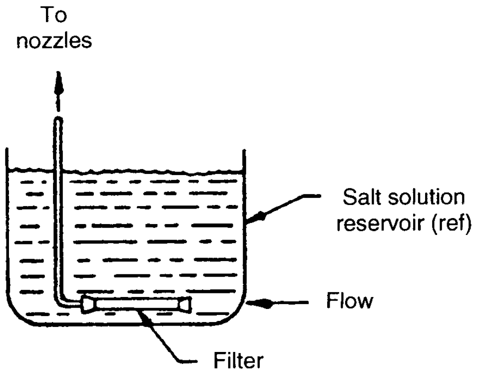


Figure 2 - Location of salt solution filter

3 Test specimen

3.1 Description

A test specimen shall consist of a connector assembly complete with wires, contacts, sealing plugs and accessories according to the referencing document.

3.2 Preparation

3.2.1 The test specimen shall be mounted with the engaging axis horizontal, unless otherwise specified.

3.2.2 Unless otherwise specified, the connector assembly shall be normally mated.

3.2.3 Connector contacts, when tested separately, shall be mounted with the engaging axis horizontal unless otherwise specified, and mated or unmated as specified in the referencing document.

3.2.4 Unless otherwise specified:

3.2.4.1 The specimens shall be subjected to a minimum of handling, particularly on significant surfaces, and shall be prepared for test immediately before exposure.

3.2.4.2 Specimens soiled with oil, dirt or grease shall be cleaned as necessary.

3.2.4.3 Specimens having an intended coating shall not be cleaned with solvent.

3.2.4.4 A suitable coating of wax or similar substance impervious to moisture shall be applied to protect those portions of specimens that come in contact with the support. In the case of coated specimens, cut edges and surfaces not required to be coated shall also be protected.

4 Test procedure

4.1 Location of specimens

The specimens shall be suspended from the top using glass or plastic hooks, waxed twine, string, or nylon thread. If plastic hooks are used, they shall be fabricated of material that is nonreactive to the salt solution. The use of metal hooks is not permitted. The specimens shall be positioned so as to ensure uniform exposure without contacting each other or shielding each other from the freely settling fog. Corrosion products and condensate from one specimen shall not fall upon another specimen. Parts with blind holes shall be suspended with the hole opening pointing downward whenever possible, unless conflicting with 3.2.1 or 3.2.3.

4.2 Operating conditions

4.2.1 Temperature

The test shall be conducted with a temperature in the exposure zone that is maintained at 35 °C +1 °C, -2 °C (95 F +2 °F, -3 °F). Satisfactory methods for controlling the temperature accurately include housing the apparatus in a room where the temperature is properly controlled, thoroughly insulating the apparatus and preheating the air to the proper temperature prior to atomization, and jacketing the apparatus and controlling the temperature of the water or of the air used. The use of immersion heaters for the purpose of maintaining the temperature within the chamber is prohibited.

4.2.2 Atomization

4.2.2.1 The conditions maintained in all parts of the exposure zone shall be such that a suitable receptacle placed at any point in the exposure zone will collect from 0.5 milliliter to 3.0 milliliters of solution per hour for each 80 square centimeters of horizontal collecting area (10 centimeters diameter) based on an average run of at least 16 hours. The 5% solution collected shall have a sodium-chloride content of from 4% to 6% (specific gravity) in accordance with Figure 3. At least two clean fog-collecting receptacles shall be used, one placed near any nozzle and one placed as far as possible from all nozzles. Receptacles shall be fastened so that they are not shielded by specimens and so that no drips of solution from specimens or other sources will be collected. The specific gravity and quantity of the solution collected shall be checked following each salt spray test. Suitable atomization has been obtained in boxes having a volume of less than 0.34 cubic meter (12 cubic feet) with the following conditions:

4.2.2.1.1 Nozzle pressure of from 0.08 MPa to 0.13 MPa (12 lb to 18 lb per square inch).

4.2.2.1.2 Orifices of from 0.5 to 0.7 millimeter (0.02 to 0.03 inch) in diameter.

4.2.2.1.3 Atomization of approximately 2.8 liters (3 quarts) of the salt solution per 0.28 cubic meter (10 cubic feet) of box volume per 24 hours.

4.2.2.2 When using boxes having a volume in excess of 0.34 cubic meter (12 cubic feet), the conditions in 4.2.2.1.1 through 4.2.2.1.3 may have to be modified in order to meet the requirements for operating conditions.

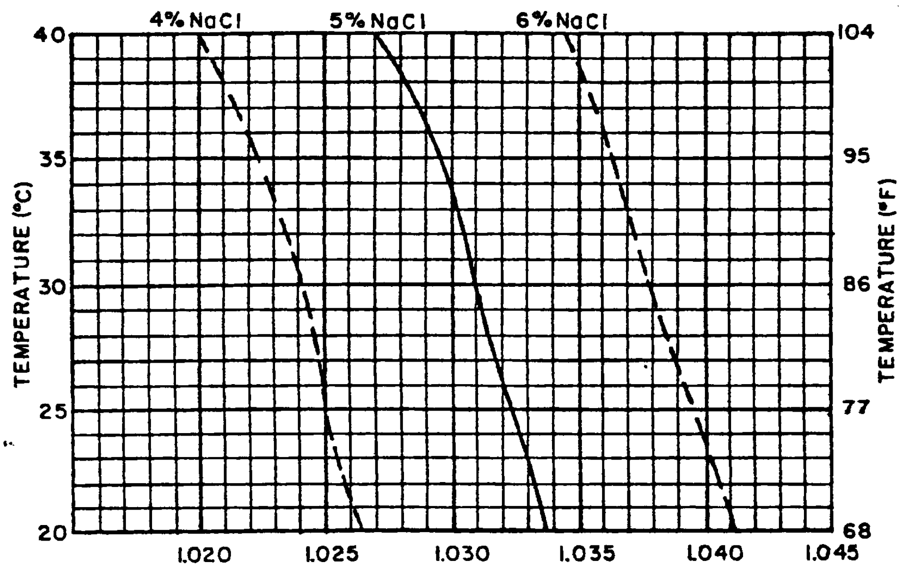


Figure 3 - Variations of specific gravity of salt (NaCl) solution with temperature

4.3 Length of test

4.3 1 The length of the salt spray test shall be indicated in one of the following test conditions, as specified:

Table 1 - Test conditions

Test condition	**Length of test, hours**
A	96
B	48
C	500
D	1000

4.3.2 Unless otherwise specified, the test shall be run continuously for the time indicated or until definite indication of failure is observed, with no interruption except for adjustment of the apparatus and inspection of the specimen.

4.4 Post cleaning

Immediately after exposure, the test specimens shall be dipped in running tap water not warmer than 38 °C (100 °F) for 5 minutes, maximum and dried for 16 hours maximum, in a circulating air oven at a temperature of 38 °C ± 3 °C (100 °F ± 5 °F), after which the specimens shall be examined at room temperature. If closer examination of a plated surface is required, the corrosion products may also be removed using any method that will not affect the plating.

4.5 Measurements

At the completion of the exposure period, measurements shall be made as specified in the referencing document. To aid in examination, specimens shall be prepared in the following manner, unless otherwise specified. Salt deposits shall be removed by a gentle wash or a dip in running water not warmer than 38 °C (100 °F) and a light brushing, if necessary, using a soft-hair brush or plastic-bristle brush.

4.6 Examination

Examination of the connector shall include the following:

4.6.1 Exposure of base metals, pitting and porosity of finishes.

4.6.2 Cracking and delamination of components or finishes, or both.

4.6.3 Abnormal nicks, cracks, or scratches on finished surfaces that indicate the removal of the normal protective coating.

4.6.4 Measurement as required.

5 Detail to be specified

The following details shall be specified in the referencing document:

5.1 Test specimen preparation and mounting, if special

5.2 Test condition letter; (see 4.3.1)

5.3 Cleaning and coating of specimen, if required

5.4 Number of specimens to be tested

5.5 Define test specimens (mated or unmated)

5.6 Acceptance criteria

5.7 Measurements before and after exposure

6 Test documentation

Documentation shall contain the details specified in clause 5, with any exceptions, and the following:

6.1 Title of test

6.2 Specimen description including fixture, if applicable

6.3 Test equipment used, and date of last and next calibration

6.4 Test procedure and condition

6.5 Values and observations

6.5.1 Visual examination; see 4.6

6.6 Name of operator and date of test

Annex

A Informative

A.1 Specimen orientation during exposure

As this procedure specifies that the specimen(s) be tested with the engaging axis horizontal, the potential exists for the specimen to collect significant quantities of liquid salt solution on non-draining surfaces. Pools of liquid salt solution can unduly corrode the specimen, or cause other performance problems. The specifying party should be cognizant of this possibility and consider doing the following when appropriate:

- Specify an alternative orientation, or
- Specifically exclude corrosion or other performance problems that can occur at a collection site, or
- Take no action.

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