METHODS OF NEUTRAL SALT SPRAY TESTING

JIS Z 2371—1994

Translated and Published

by

Japanese Standards Association

Printed in Japan
In the event of any doubt arising,
the original Standard in Japanese is to be final authority.
1. **Scope**  This Japanese Industrial Standard specifies the methods for judging corrosion resistance of metallic materials, or of those electroplated, or treated with inorganic or organic films by a neutral salt spray testing.

   **Remarks:** Standards cited in this Standard are given in the following:
   - JIS K 8150  Sodium chloride
   - JIS K 8180  Hydrochloric acid
   - JIS K 8576  Sodium hydroxide
   - JIS Z 8802  Methods for determination of pH of aqueous solutions

2. **Apparatus**  The apparatus necessary to neutral salt spray testing shall be composed of an atomizing chamber equipped with an atomizer, a testing salt solution reservoir, a specimen support, atomized solution sampling containers, a temperature controller, etc.; a salt water supply tank, a compressed air feeder, an exhaustor, etc., and shall conform to the following requirements:

   (1)  The atomizer shall be of a spray tower system or of a nozzle system (see Informative reference 1).

   (2)  The atomizing chamber shall be not less than 0.2 m³ in volume. Its shape or dimensions may be optional.

   (3)  The ceiling or cover of the atomizing chamber shall be so constructed that no drops of solution adhering to its inner surface fall on a specimen.

   (4)  Corrosive materials shall not be used for the apparatus.

   (5)  The apparatus shall be so constructed that the temperature and atomization in the atomizing chamber are not influenced by the open air and the solution fallen from the specimen is not reused for the testing.

   (6)  The specimen support shall be capable of keeping the specimen at a specific angle (1).

   **Note (1)** The materials of specimen supports shall be glass, rubber, plastics, or suitably coated wood, and the specimen should preferably be supported from the underside of the bottom or the side face. The specimen may be hung by a glass hook or a vinyl string, provided it is kept in a specific position. If necessary, the specimen is supported from the bottom.

   (7)  The atomized solution sampling container shall be a clean container of 80 cm² in horizontal sampling area, and the containers shall be placed at not less than two positions so as to ensure the uniformity of atomization, for example: one near and the other far from the atomizer.
(8) The exhauster shall not be influenced by the wind pressure of the open air.

(9) The maintenance and control of the apparatus shall always be correctly carried out to meet the specified requirements.

3. Specimen  The shape and dimensions of the specimen should preferably be a flat sheet of 70 × 150 × 1.0 mm or 60 × 80 × 1.0 mm. However, a member may be used subject to an agreement between the parties concerned with delivery.

4. Preparation of specimen  The specimen shall, as a rule, be free from stains or flaws. The preparation of the specimen shall be as follows:

(1) The section of the specimen shall be protected by a stable film under test conditions, as required (2).

Note (2) The film includes a tape, coating material, paraffin, etc.

(2) Metallic and metallic coated specimens shall be suitably cleaned. Cleaning shall be carried out by an appropriate method according to the nature of surface and the contaminants. Abrasives other than pasty precipitated calcium carbonate, aluminium oxide and magnesium oxide, or detergents causing a corrosive or protective coating shall not be applied.

    The specimen, after cleaning, shall be protected from contamination.

(3) The specimen coated with paint and non-metallic coatings shall not be, prior to test, subject to cleaning or other treatments.

    Further, when it is required to measure the development of corrosion from an abraded area, the coating shall be scratched in order to expose the underlying metal prior to the test. The method for scratching shall be subject to an agreement between the parties concerned with delivery.

    The following method is an example:

Example  After coating about 5 mm of the periphery of a specimen for protection, scratch a flaw shaped like \( \times \) at \( \frac{1}{4} \) to \( \frac{1}{3} \) of the long side of the specimen from the bottom. The flaw shall have a depth reaching the underlying metal surface, and the size of the incision should preferably be made constant. The type of the cutting tool should preferably be a cutter knife, a razor blade, etc.

5. Angle and position of specimens during testing  The angle and position of the specimens in the atomizing chamber during testing shall conform to the following conditions (see Informative reference 2):

(1) The angle of the specimens shall be 20 ± 5° to a vertical line. In the case of a member, it shall be placed with its significant surface at 20 ± 5° to a vertical line.

    Other angles may be employed subject to an agreement between the parties concerned with delivery.
The surfaces of the specimens shall be exposed to the motion of free atomization, and shall be placed in the atomizing chamber not to intersect the stream of spray from the atomizing nozzle at right angles.

(2) The specimens shall contact with nothing other than the support.

(3) Each specimen shall be so positioned and spaced as not to interfere with the free falling of the spray.

(4) The salt solution dripping from one specimen shall not fall on other specimens.

6. Salt solution for testing

6.1 Preparation of salt solution for testing  The preparation of salt solution shall be as follows:

(1) Salt to be used  The sodium chloride of Grade 1 specified in JIS K 8150.

(2) Water to be used  The deionized water not more than 1 μS/cm in electric conductivity.

(3) Preparation  Dissolve the sodium chloride in deionized water, and control the salt concentration to 5 ± 0.5%. As to the controlled result, measure the specific gravity using a hydrometer, and confirm that it is within the range of 1.0259 to 1.0329 at 35°C.

If it is found to be outside this range of specific gravity, prepare the solution again.

6.2 Conditions of salt solution for testing  The salt solution for testing shall be free from suspended substance before atomization(*) and shall be so controlled that under a state of being sprayed at 35°C the solution is within a range of 6.5 to 7.2 in pH(†).

In regulating pH, 0.1 mol/l solution of the hydrochloric acid specified in JIS K 8180 or sodium hydroxide specified in JIS K 8576 shall be used, as required.

The measurement of the pH shall be carried out in accordance with JIS Z 8802. However, the colorimetric method (Bromothymol blue indicator or the like) may be used as an expedient means.

Notes (*) When suspended substance will not disappear even with sufficient mixing, the solution filtered through filter paper or the like is used.

† The following are the methods for ensuring the pH of atomized solution sampled, during atomization of salt solution for testing at 35°C, to be within the range of 6.5 to 7.2.

(1) When the pH of salt solution is regulated at a room temperature and the solution is sprayed at 35°C, pH of the sampled solution generally becomes higher than that of the original due to the disappearance of carbon dioxide dissolved in the solution. Therefore, when the pH of salt solution is regulated at the room temperature, it is kept at about 6.5 level.
(2) After boiled quietly for about 30 s, the salt solution is cooled to 35°C, or after kept at 35°C for 48 h, the pH is regulated.

(3) Salt solution is prepared using the water from which carbon dioxide is expelled by being heated at not lower than 35°C, and then the pH is regulated.

7. Air to be fed The compressed air to be fed to the nozzle for atomizing salt solution shall be free from oil and dust, and its pressure shall be maintained at 0.098 ± 0.010 MPa.

8. Conditions in atomizing chamber Conditions in the atomizing chamber shall be as follows:

(1) Temperature The temperature around the specimen holder in the atomizing chamber shall be kept at 35 ± 2°C.

(2) Temperature of salt solution reservoir for testing The temperature of the salt solution reservoir for testing shall be kept at 35 ± 2°C.

(3) Spray The sprayed particles shall, as a rule, naturally settle, and be baffled from impinging directly on a specimen with the atomizing nozzle turned to a direction where the specimen is clear of the direct spray.

(4) Atomization sampling solution After an operation of consecutive 24 h under a state where the inside of the atomizing chamber is filled up with specimens of a specified shape and dimensions, the amount of sampled atomized solution collected shall average 1 ml to 2 ml per 1 h for each 80 cm² of horizontal sampling area. In this case, the salt concentration of sampled atomized solution shall be (5 ± 1) % (^). Further, its pH shall be 6.5 to 7.2. The pH measurement shall be carried out in accordance with the method specified in 6.2.

Note (^) When a specific gravity at 35°C is 1.0223 to 1.0364 measured with a hydrometer, the salt concentration of atomizing solution is considered to conform to the specified requirements.

9. Start of test After the confirmation of conditions for an atomizing chamber, the spray is temporarily suspended, and a specimen is placed in the atomizing chamber to start the test.

10. Continuation of test The test shall be carried out continuously during the test period. However, it may be intermittently carried out subject to an agreement between the parties concerned with delivery.

When the test is interrupted due to inspection and putting in and taking out of the specimen, the time of interruption shall be minimized by stopping the atomization only.

11. Duration of test The duration of the test shall be of that specified according to the materials to be tested, product standards, etc.

12. Treatment of specimen after test The specimen after the test shall be treated as follows:
(1) The specimen shall be carefully taken out.

(2) In order to remove the sodium chloride adhering to the surface of the specimen, the specimen shall be washed with water at ordinary temperature and dried immediately.

(3) In the case of removing corrosion products, they shall be removed by mechanical methods such as brushing, ultrasonic irradiation, grain injection, water injection, etc., chemical method or electrolytic method (see Attached Table 1 or Attached Table 2), or otherwise by combination of these methods.

13. **Evaluation method** The method for evaluation of test results shall be in accordance with either of the following methods. However, other methods may be applied subject to an agreement between the parties concerned with delivery.

(1) **Area method** The results shall be evaluated by the rating number method specified in Annex.

(2) **Mass method** The change of mass of the specimen before and after the test shall be examined by mechanical method, chemical method, or electrolytic method to be evaluated.

14. **Record** The following items should preferably be recorded:

(1) Name and type of test apparatus and system of atomizer

(2) Shape and dimensions of specimens and members, or otherwise number or type of parts

(3) Method of cleaning specimen before and after test

(4) Preparation method of specimen

(5) Existence and size of scratch, and type of cutter

(6) Supporting angle of specimen. In the case of members, its supporting angle and method

(7) Types of salt and water used for preparation of salt solution for testing

(8) Temperature around the specimen holder in the atomizing chamber

(9) Daily records of numeral values obtained from each sampling container on the following items

   - Volume (ml) of atomized solution sampled per hour for 80 cm³
   - Salt concentration and specific gravity of sampled atomized solution (35°C)
   - pH of sampled atomized solution

(10) When the test is carried out intermittently, the duration of atomization and the suspended time of atomization

(11) When the test is interrupted, its reason and duration of interruption

(12) Period of test
(13) When the corrosion products are removed, its method and details
(14) Evaluation method and expression of results
(15) Photograph of specimen, if necessary
(16) Others

Related standards:

JIS C 0023  Basic environmental testing procedures Part 2: Tests — Test Ka: salt mist
JIS H 8502  Methods of corrosion resistance test for metallic coatings
JIS H 8681  Test methods for corrosion resistance of anodic oxidation coatings on aluminium and aluminium alloys
JIS K 2246  Rust preventive oils
JIS K 5400  Testing methods for paints
JIS Z 0304  Outdoor exposure test for protected metals
ISO 4611  Plastics — Determination of the effects of exposure to damp heat, water spray and salt mist
ISO 7253  Paints and varnishes — Determination of resistance to neutral salt spray
IEC 68-2-11 Environmental testing Part 2: Tests — Test Ka: Salt mist
IEC 68-2-52 Environmental testing Part 2: Tests — Test Kb: Salt mist, cyclic (sodium chloride solution)
# Attached Table 1. Chemical method for removal of corrosion products

<table>
<thead>
<tr>
<th>Material</th>
<th>Chemicals</th>
<th>Time</th>
<th>Temperature</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium and aluminium alloy</td>
<td>Add 50 ml of phosphoric acid ($H_3PO_4$, 1.69 in specific gravity) and 20 g of chromium oxide (VI) ($Cr_2O_3$) into distilled water to make up to 1000 ml.</td>
<td>5 min to 10 min</td>
<td>90°C boiling</td>
<td>When the coating of corrosive product remains, the following nitric acid treatment is successively carried out.</td>
</tr>
<tr>
<td>Nitric acid ($HNO_3$, 1.42 in specific gravity)</td>
<td>1 min to 5 min</td>
<td>20°C to 25°C</td>
<td>In order to prevent a reaction inducing excessive removal of underlying metal, peripheral extraneous matters and bulky corrosion products are removed.</td>
<td></td>
</tr>
<tr>
<td>Copper and copper alloy</td>
<td>Add 500 ml of hydrochloric acid ($HCl$, 1.19 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>1 min to 3 min</td>
<td>20°C to 25°C</td>
<td>Removal of air in solution with highly pure nitrogen controls the removal of underlying metal.</td>
</tr>
<tr>
<td>Add 4.9 g of sodium cyanide ($NaCN$) into distilled water to make up to 1000 ml.</td>
<td>1 min to 3 min</td>
<td>20°C to 25°C</td>
<td>Copper sulfide corrosion product which is not likely to be removed by hydrochloric acid treatment mentioned above is removed.</td>
<td></td>
</tr>
<tr>
<td>Add 100 ml of sulfuric acid ($H_2SO_4$, 1.84 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>1 min to 3 min</td>
<td>20°C to 25°C</td>
<td>Bulky corrosion product is removed, prior to treatment, to prevent copper from adhering again to the surface of specimen.</td>
<td></td>
</tr>
<tr>
<td>Add 120 ml of sulfuric acid ($H_2SO_4$, 1.84 in specific gravity) and 30 g of sodium bichromate ($Na_2Cr_2O_7$ $\cdot$ 2$H_2$O) into distilled water to make up to 1000 ml.</td>
<td>5 s to 10 s</td>
<td>20°C to 25°C</td>
<td>Re-adhesion of copper resulting from the above-mentioned sulfuric acid treatment is removed.</td>
<td></td>
</tr>
<tr>
<td>Add 54 ml of sulfuric acid ($H_2SO_4$, 1.84 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>30 min to 60 min</td>
<td>40°C to 50°C</td>
<td>Air is separated from solution using nitrogen. To remove corrosion products, preferably brush the specimen and dip again for 3 s to 4 s.</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Chemicals</td>
<td>Time</td>
<td>Temperature</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------</td>
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<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Iron and steel</td>
<td>1000 ml of hydrochloric acid (HCl, 1.19 in specific gravity), 20 g of antimony trioxide (Sb₂O₃), and 50 g of tin (II) chloride (SnCl₂)</td>
<td>1 min to 25 min</td>
<td>20°C to 25°C</td>
<td>Solution is sufficiently stirred, or otherwise specimen is brushed. When occasion demands, the process may be carried out for a longer time.</td>
</tr>
<tr>
<td></td>
<td>Add 50 g of sodium hydroxide (NaOH) and 200 g of granular zinc or zinc chip into distilled water to make up to 1000 ml.</td>
<td>30 min to 40 min</td>
<td>80°C to 90°C</td>
<td>Since zinc powder may naturally ignite by contact with air, attention shall be paid in using zinc powder.</td>
</tr>
<tr>
<td></td>
<td>Add 200 g of diammomium citrate [(NH₄)₂H₂C₄H₆O₇] into distilled water to make up to 1000 ml.</td>
<td>20 min</td>
<td>75°C to 90°C</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 500 ml of hydrochloric acid (HCl, 1.19 in specific gravity) and 3.5 g of hexamethylenetetramine into distilled water to make up to 1000 ml.</td>
<td>10 min</td>
<td>20°C to 25°C</td>
<td>When occasion demands, the process may be carried out for a longer time.</td>
</tr>
<tr>
<td>Lead and lead alloy</td>
<td>Add 10 ml of acetic acid (CH₃COOH) into distilled water to make up to 1000 ml.</td>
<td>5 min</td>
<td>Boiling</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 50 g of ammonium acetate (CH₃COONH₄) into distilled water to make up to 1000 ml.</td>
<td>10 min</td>
<td>60°C to 70°C</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 250 g of ammonium acetate (CH₃COONH₄) into distilled water to make up to 1000 ml.</td>
<td>10 min</td>
<td>60°C to 70°C</td>
<td>—</td>
</tr>
<tr>
<td>Magnesium and magnesium alloy</td>
<td>Add 100 g of chromium (VI) oxide (CrO₃) and 10 g of silver chromate (Ag₂CrO₄) into distilled water to make up to 1000 ml.</td>
<td>1 min</td>
<td>Boiling</td>
<td>The purpose of silver chromate is to precipitate chloride.</td>
</tr>
<tr>
<td></td>
<td>Add 200 g of chromium (VI) oxide (CrO₃), 10 g of silver nitrate (AgNO₃), and barium nitrate [Ba(NO₃)₂] into distilled water to make up to 1000 ml.</td>
<td>1 min</td>
<td>20°C to 25°C</td>
<td>The purpose of barium nitrate is to precipitate sulfide.</td>
</tr>
<tr>
<td>Material</td>
<td>Chemicals</td>
<td>Time</td>
<td>Temperature</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------</td>
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<td>---------</td>
</tr>
<tr>
<td>Nickel and nickel alloy</td>
<td>Add 150 ml of hydrochloric acid (HCl, 1.19 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>1 min to 3 min</td>
<td>20°C to 25°C</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 100 ml of sulfuric acid (H₂SO₄, 1.84 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>1 min to 3 min</td>
<td>20°C to 25°C</td>
<td>—</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>Add 100 ml of nitric acid (HNO₃, 1.42 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>20 min</td>
<td>60°C</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 150 g of diaminom citrate [(NH₄)₂H₂C₀H₂O₁] into distilled water to make up to 1000 ml.</td>
<td>10 min to 60 min</td>
<td>70°C</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 100 g of citric acid (C₆H₈O₇), 50 ml of sulfuric acid (H₂SO₄, 1.84 in specific gravity) and 2 g of inhibitor (diorthotolthiourea, quinoline ethiodide, or β-naphtholquinoline) into distilled water to make up to 1000 ml.</td>
<td>5 min</td>
<td>60°C</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 200 g of sodium hydroxide (NaOH), 30 g of potassium permanganate (KMnO₄) and 100 g of diaminom citrate [(NH₄)₂H₂C₀H₂O₁] into distilled water to make up to 1000 ml.</td>
<td>5 min</td>
<td>Boiling</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 100 ml of nitric acid (HNO₃, 1.42 in specific gravity) and 20 ml of hydrofluoric acid (HF, 0.987 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>5 min to 20 min</td>
<td>20°C to 25°C</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Add 200 g of sodium hydroxide (NaOH) and 50 g of powdery zinc into distilled water to make up to 1000 ml.</td>
<td>20 min</td>
<td>Boiling</td>
<td>Since powdery zinc naturally ignites by contact with air, care shall be taken.</td>
</tr>
</tbody>
</table>
## Attached Table 1. (continued)

<table>
<thead>
<tr>
<th>Material</th>
<th>Chemicals</th>
<th>Time</th>
<th>Temperature</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tin and tin alloy</td>
<td>Add 150 g of trisodium phosphate dihydrate (Na₃PO₄ · 12H₂O) into distilled water to make up to 1000 ml.</td>
<td>10 min</td>
<td>Boiling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add 50 ml of hydrochloric acid (HCl, 1.19 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>10 min</td>
<td>20°C</td>
<td></td>
</tr>
<tr>
<td>Zinc and zinc alloy</td>
<td>Add 150 ml of ammonium hydroxide (NH₄OH, 0.90 in specific gravity) into distilled water to make up to 1000 ml. Then, add 50 g of chromium (VI) oxide (CrO₃) and 10 g of silver nitrate (AgNO₃) into distilled water to make up to 1000 ml.</td>
<td>5 min</td>
<td>20°C to 25°C</td>
<td>Silver nitrate is dissolved in water, and add boiling chromium oxide water solution to prevent the crystallization of excess silver chromate. In order to ward off the attack by zinc on the underlying metal, chromium oxide shall be free from sulfate mixing in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 s to 20 s</td>
<td>Boiling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add 100 g of ammonium chloride (NH₄Cl) into distilled water to make up to 1000 ml.</td>
<td>2 min to 5 min</td>
<td>70°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add 200 g of chromium (VI) oxide (CrO₃) into distilled water to make up to 1000 ml.</td>
<td>1 min</td>
<td>80°C</td>
<td>Chromium oxide water solution polluted by corrosion products formed in salt atmosphere shall be removed to prevent the attack by zinc on the underlying metal.</td>
</tr>
<tr>
<td></td>
<td>Add 85 ml of hydriodic acid (HI, 1.5 in specific gravity) into distilled water to make up to 1000 ml.</td>
<td>15 s</td>
<td>20°C to 25°C</td>
<td>The underlying metal of zinc may be removed. Controlled specimen shall be used.</td>
</tr>
<tr>
<td></td>
<td>Add 100 g of ammonium peroxodisulfate ([NH₄]₂S₂O₈] into distilled water to make up to 1000 ml.</td>
<td>5 min</td>
<td>20°C to 25°C</td>
<td>Especially effective for electroplated specimen.</td>
</tr>
<tr>
<td></td>
<td>Add 100 g of ammonium acetate (CH₃COONH₄) into distilled water to make up to 1000 ml.</td>
<td>2 min to 5 min</td>
<td>70°C</td>
<td></td>
</tr>
</tbody>
</table>
### Attached Table 2. Method for removal of corrosion product by electrolysis

<table>
<thead>
<tr>
<th>Material</th>
<th>Chemicals</th>
<th>Time</th>
<th>Temperature</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron, cast iron and steel</td>
<td>Add 75 g of sodium hydroxide (NaOH), 25 g of sodium sulfate (Na₂SO₄) and 75 g of sodium carbonate (Na₂CO₃) into distilled water to make up to 1000 ml.</td>
<td>20 min to 30 min</td>
<td>20°C to 25°C</td>
<td>Cathodic treatment is carried out at 100 A/m² to 200 A/m² in current density. Carbon, platinum, or stainless steel is used as an anode.</td>
</tr>
<tr>
<td></td>
<td>Add 28 ml of sulfuric acid (H₂SO₄, 1.84 in specific gravity) and 0.5 g of inhibitor (dithiophosphoric acid, quinoline ethidiole, or β-naphtholquinoline) into distilled water to make up to 1000 ml.</td>
<td>3 min</td>
<td>75°C</td>
<td>Cathodic treatment is carried out at 2000 A/m² in current density. Carbon or platinum is used as an anode.</td>
</tr>
<tr>
<td></td>
<td>Add 100 g of diammonium citrate [(NH₄)₂H₂C₂O₄] into distilled water to make up to 1000 ml.</td>
<td>5 min</td>
<td>20°C to 25°C</td>
<td>Cathodic treatment is carried out at 100 A/m² in current density. Carbon or platinum is used as an anode.</td>
</tr>
<tr>
<td>Lead and lead alloy</td>
<td>Add 28 ml of sulfuric acid (H₂SO₄, 1.84 in specific gravity) and 0.5 g of inhibitor (dithiophosphoric acid, quinoline ethidiole, or β-naphtholquinoline) into distilled water to make up to 1000 ml.</td>
<td>3 min</td>
<td>75°C</td>
<td>Cathodic treatment is carried out at 2000 A/m² in current density. Carbon, platinum or lead is used as an anode.</td>
</tr>
<tr>
<td>Copper and copper alloy</td>
<td>Add 7.5 g of potassium chloride (KCl) into distilled water to make up to 1000 ml.</td>
<td>1 min to 3 min</td>
<td>20°C to 25°C</td>
<td>Cathodic treatment is carried out at 100 A/m² in current density. Carbon or platinum is used as an anode.</td>
</tr>
<tr>
<td>Zinc and cadmium</td>
<td>Add 50 g of disodium hydrogenphosphate (anhydrous) (Na₂HPO₄) into distilled water to make up to 1000 ml.</td>
<td>5 min</td>
<td>70°C</td>
<td>Cathodic treatment is carried out at 110 A/m² in current density. Prior to dipping, a specimen is activated. Carbon, platinum, or stainless steel is used as an anode.</td>
</tr>
<tr>
<td></td>
<td>Add 100 g of sodium hydroxide (NaOH) into distilled water to make up to 1000 ml.</td>
<td>1 min to 2 min</td>
<td>20°C to 25°C</td>
<td>Cathodic treatment is carried out at 100 A/m² in current density. Prior to dipping, a specimen is activated. Carbon, platinum, or stainless steel is used as an anode.</td>
</tr>
</tbody>
</table>
Annex  Rating number method

1. Scope  This Annex specifies the rating number method used for evaluation of test results of neutral salt spray testing.

2. Method of comparing results  An area at least 5000 mm² shall be selected on the significant surface of a specimen. To select a surface to be evaluated, a mask having a window 50 mm × 100 mm may be used. The size and number of corrosion defects present on a significant surface shall be collated with the standard drawings of Annex Figs. 1 to 7 and the serial number of the standard drawing nearest in appearance to the specimen, for instance, 9.8-2, 9.5-5, etc. shall be determined as the rating number for the corrosion evaluation. However, corrosion defects generated from a section (edge) are exempted from evaluation.

   Rating number 10 indicates corrosion which can not be identified by the naked eye, and rating number 6 indicates the maximum value of corrosion defect.

   The expression of the test results shall be made by the rating numbers so determined.
Annex Fig. 1. Standard drawings for rating-number 9.8
Annex Fig. 2. Standard drawings for rating-number 9.5
Annex Fig. 3. Standard drawings for rating-number 9.3
Annex Fig. 4. Standard drawings for rating-number 9
Annex Fig 5. Standard drawings for rating-number 8
Annex Fig. 6. Standard drawings for rating-number 7

7-1

7-2

7-3

7-4

7-5

7-6
Annex Fig. 7. Standard drawings for rating-number 6
Informative reference 1. Structure of apparatus

This Informative reference supplements the matters related to the requirements of the text of this Standard and Annex, and does not constitute a part of this Standard.

Models of the apparatus conforming to requirements specified in this Standard are given in Informative reference Figs. 1 and 2.

In order to eliminate the fluctuation of the concentration of neutral salt spray, supplied air shall have a humidity of 95% to 98% when spray is emitted. For that purpose, the temperature of air saturator is kept at 47 ± 2°C.

The water in the air saturator shall be replaced almost each hour so that it may remove the impurities in the air.

Further, deionized water shall be used as the water.

The apparatus shall have a structure taking heat insulation into consideration so that the atomizing chamber and the specimen are not influenced by the changing temperature of the open air. Sensors for regulating temperature, and indicating temperature and humidity shall be positioned in a place at least 100 mm apart from the wall of the atomizing chamber and shall be so arranged as to facilitate reading the temperature and humidity from the outside. Exhaust gas, not to be forced out, should preferably be discharged through an exhaust processing equipment which is not influenced by the wind pressure of the open air.

A salt water supply tank is preferably equipped with an automatic salt water supplier to ensure a long operation.

Informative reference 1 Fig. 1. An example of salt spray testing apparatus

Spray tower system
Informative reference 1 Fig. 1. (continued)

Spray tower

Informative reference 1 Fig. 2. An example of salt spray testing apparatus

Nozzle system

Unit: mm

Atomizing nozzle

Inside diameter $\phi 0.508 \pm 0.533$

Inside diameter $\phi 0.737 \pm 0.762$

Air

Salt solution for testing
Informative reference 2

This Informative reference supplements the matters related to the requirements of the text of this Standard and Annex, and does not constitute a part of this Standard.

Informative reference 2 Fig. 1. Placing and positioning of specimens

Unit: mm

For specimen 70×150×1.0

About 30-50

About 25

Atomizer

Wall

Sampling container for atomized solution

(Plan for atomizing chamber)
Japanese Text

Established by Minister of International Trade and Industry

Date of Establishment: 1955-12-16

Date of Revision: 1994-03-01

Date of Public Notice in Official Gazette: 1994-03-04

Investigated by: Japanese Industrial Standards Committee

Divisional Council on Basic Items

This English translation is published by:
Japanese Standards Association
1-24, Akasaka 4, Minato-ku,
Tokyo 107 Japan
© JSA, 1995

Printed in Tokyo by
Hohbunsha Co., Ltd.