



Designation: D1748 – 22

## Standard Test Method for Rust Protection by Metal Preservatives in the Humidity Cabinet<sup>1</sup>

This standard is issued under the fixed designation D1748; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

### 1. Scope\*

1.1 This test method covers the evaluation of the rust-preventive properties of metal preservatives under conditions of high humidity.

1.2 The values stated in SI units are to be regarded as the standard except where the test apparatus or consumable parts are only available in other units. In such cases these will be regarded as standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

**A109/A109M** Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled

**D512** Test Methods for Chloride Ion in Water (Withdrawn 2021)<sup>3</sup>

**D516** Test Method for Sulfate Ion in Water

**E11** Specification for Woven Wire Test Sieve Cloth and Test Sieves

**E323** Specification for Perforated-Plate Sieves for Testing Purposes

#### 2.2 Federal Standards:<sup>4</sup>

**QQ-S-698** Steel Sheet and Strip, Low Carbon

#### 2.3 Military Standards:<sup>5</sup>

**MIL-C-5646F** Cloth, Airplane

**MIL-C-15074E** Corrosive Preventive Compound Finger Print Remover

#### 2.4 SAE International:<sup>6</sup>

**SAE 1009C** Tee Reducer, Bulkhead on Side, Flareless Tube

### 3. Summary of Test Method

3.1 Steel panels are prepared to a prescribed surface finish, dipped in the test oil, allowed to drain, and then suspended in a humidity cabinet at 48.9 °C (120 °F) for a specified number of hours. The oil fails or passes the test in accordance with the size and number of rust dots on the test surfaces of the panels.

### 4. Significance and Use

4.1 This test method is used for measuring the relative abilities of metal preservatives to prevent the rusting of steel panels under conditions of high humidity. It should not be relied upon to predict the effectiveness of a metal preservative in which high humidity is not the principal factor in the rusting.

4.2 Comparisons made by this test method should normally be limited to similar metal preservative combinations designed for similar applications. The test life required for each type of metal preservative and for each intended application should be based on actual experience with that type of preservative in the intended service.

4.3 Since the precision of the test method appears to be less than desired, a number of repeat tests may be necessary to

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.L0.03 on Corrosion Testing of Sheet Metal Processing Fluids.

Current edition approved May 1, 2022. Published May 2022. Originally approved in 1960. Last previous edition approved in 2015 as D1748 – 10 (2015). DOI: 10.1520/D1748-22.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

<sup>5</sup> Available from <https://quicksearch.dla.mil/qaSearch.aspx>.

<sup>6</sup> Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

\*A Summary of Changes section appears at the end of this standard

establish the test life of a given metal preservative, and repeat tests by this test method in more than one cabinet are sometimes desirable.

4.4 The data obtained from this accelerated test is of interest only in eliminating the most unsuitable materials or for indicating a probable relative order of protection against rust under conditions of high humidity. This test method does not prescribe the exposure periods to be used for a specific product, nor the interpretation to be given to the results.

## 5. Apparatus

5.1 The apparatus shall conform to the details shown in the **Annex A1**.

## 6. Panel Cleaning Materials

### 6.1 Aluminum Oxide Cloth, 240 grit.

NOTE 1—Paper-backed abrasives, wet or dry, waterproof, or iron oxide abrasives are prohibited.

6.2 *Silica Sand*, white, dry, sharp, chloride free, or *aluminum oxide*, blasting grade. (The size shall be such that it meets the following sieve requirements of Specifications **E11** and **E323**.

6.2.1 One hundred percent must pass through a No. 10 (2.00 mm) sieve.

6.2.2 Minimum of 90 % must pass through a No. 20 (850 µm) sieve.

6.2.3 Maximum of 10 % permitted to pass through a No. 50 (300 µm) sieve.

6.3 *Cleaners*—Select a cleaning media and method, which is safe, non-chlorinated, non-film forming and which does not in any way attack or etch the surface chemically. In addition, no Class 1 ozone depleting substances conforming to Section 602(a) of the Clean Air Act Amendments of 1990 (42USC7671a) as identified in Section 326 of PL 102-484 should be used. Use a procedure as outlined in Test Method F22 to judge the merit of the selected cleaning technique.

NOTE 2—A typical solvent found acceptable for this purpose is hexane, heptane, or Stoddard solvent.

NOTE 3—The original precision was developed using a combination of petroleum naphtha and methanol. These are no longer used due to toxicity issues.

6.4 *Gauze*, lint free cotton or gauze pads.

## 7. Humidity Cabinet Operating Conditions

7.1 During evaluation of a sample the cabinet shall be run continuously with the following standard conditions being maintained:

|                                    |                                                           |
|------------------------------------|-----------------------------------------------------------|
| Air temperature:                   |                                                           |
| Inside the cabinet                 | 48.9 °C ± 1.1 °C (120 °F ± 2.0 °F)                        |
| Outside the cabinet                | 24.1 °C ± 5.5 °C (75.4 °F ± 10.0 °F)                      |
| Rate of air to the cabinet         | (31.0 ft ± 1 ft <sup>3</sup> /h) at 25.0 °C and 760 mm Hg |
| 0.878 m ± 0.028 m <sup>3</sup> /h  |                                                           |
| Water in cabinet:                  |                                                           |
| Level                              | 203.0 mm ± 6.4 mm (8.0 in. ± ¼ in.)                       |
| pH                                 | 5.5 to 7.5                                                |
| Oil content                        | clear with no evidence of oil                             |
| Chlorides                          | less than 20 ppm (Test Methods <b>D512</b> )              |
| Sulfates and sulfites <sup>A</sup> | less than 20 ppm as sulfate (Test Method <b>D516</b> )    |

|                       |                                                                |
|-----------------------|----------------------------------------------------------------|
| Speed of rotating     | 0.33 r/min ± 0.03 r/min                                        |
| Cover                 | close fitting                                                  |
| Cloth layers in cover | shall not be torn, contaminated, nor contain droplets of water |
| Cover opening         | to a height of 355 mm (14 in.) at the front                    |

<sup>A</sup> Boil the water sample with 10 mL of saturated bromine water before making the test for sulfates.

7.2 Rate of air to the cabinet, air temperature, pH, and water level shall be checked and regulated if necessary twice each day, at 7 h to 8 h intervals. Remaining standard conditions shall be closely checked once each week. The pH measurement may be made with wide-range indicator paper.

NOTE 4—Values for pH outside the limits shown indicate contamination that should be investigated and corrected. A persistent low pH along with a positive sulfate test indicates that the air supply is contaminated with sulfur oxides. In this case, the water in the cabinet should be replaced, and a suitable alkali scrubber system installed in the air train.

NOTE 5—Details of the cabinet operation described in 7.1 and 7.2 and the details of panel preparation described in Section 8, must be carefully carried out. Only by such standardization can results be obtained that are significant and comparable to those run at another time or in another laboratory.

## 8. Panel Preparation

8.1 Remove the protective packaging from all the panels to be used for a particular day and wash away the rust preventive material in a beaker of solvent selected in 6.3 (swabbing is permissible using materials defined in 6.4). Carefully inspect each panel and use only those which comply with requirements given in **A1.10**. Identify each panel by an appropriate number in the right-hand lower corner, outside of the significant area, or by attaching a small metal tag to the outside wire hook after the panel is polished.

8.2 The following are pertinent to the polishing operations:

8.2.1 Do not allow the bare fingers to touch the panel. Tongs, metal hooks, or pieces of lint-free paper are suitable helpers for manipulating and holding the panel.

8.2.2 Always keep the panel on a clean, dry surface.

### 8.3 Alternative Surface Finishes—Polishing:

8.3.1 The amount of polishing of the panel by the operator conducting the humidity cabinet test should only be that required to give it a fresh, clean, and active surface. This requires only a few minutes per panel. A fast-moving belt sander should not be used since the heat of friction may change the surface characteristics of the panel. Surface finish limits for the panel are not defined here. There should be no appreciable change of the finish from the 0.25 µm to 0.51 µm (10 µm to 20 µm) obtained by the original surface grinding **A1.10.1.3**.

8.3.2 Divide the 240 grit aluminum oxide abrasive cloth into convenient size strips for the subsequent polishing operations. Observing the precautions given in 8.2 and 8.3, buff all four of the rounded edges with even strokes in the direction of each edge. Ream out the two holes used for suspension and wipe clean, using gauze wet with solvent selected in 6.3.

8.3.3 While polishing, place the panel on a clean, dry surface with a suitable thickness of clean paper under it to help prevent contamination. The panel may be held by hand, using paper between the fingers and the steel surface. Alternatively it may be held in a special holder such as a wooden block, having