



Designation: D8365 – 20

Standard Test Method for Corrosion of Metal Produced by Contact with Leather¹

This standard is issued under the fixed designation D8365; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This test method covers the qualitative determination of corrosion produced by leather in contact with metal. This test method does not apply to wet blue or wet white.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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 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:*²

- D1193 Specification for Reagent Water
- E104 Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions

3. Terminology

3.1 *Definitions:*

3.1.1 *corrosion, n*—a modification of the metal surface in contact with a leather specimen, evidenced by visible pitting and erosion of the metal surface in comparison with a blank determination. Any permanent discoloration in film form on the specimen (metal) that does not readily buff off with a nonabrasive cloth shall be called incipient corrosion, while any

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

visible pitting of the metal surface or formation of a layer of reaction products on the metal surface shall be considered as corrosion.

3.1.2 *sandwich corrosion test, n*—a comparative accelerated environmental test of the corrosivity of solid materials such as various alloys in contact with leather.

3.1.3 *staining, n*—a discoloration of the metal surface after contact with a leather specimen, which discoloration is caused by minor amounts of leather—metal interaction products formed on the metal surface. Such stains should readily buff off the metal surface without permanent marring of its surface appearance.

4. Summary of Test Method

4.1 Leather swatch and a metal plate are stacked together under a load of 25 ± 5 lbf (111 ± 22 N) and placed in a humidity/temperature test chamber maintained at a relative humidity of 90 to 95 % at $38 \pm 1^\circ\text{C}$ ($100 \pm 2^\circ\text{F}$) for a period of 14 days.

5. Significance and Use

5.1 The procedure is primarily intended to evaluate corrosion produced by leather in contact with metals or metal objects that are used in construction and production of upholstery, briefcases, watches, jewelry, gun holsters, knife sheaths and any other circumstances where leather is in direct contact with various metal hardware and under circumstances where metal corrosion is a serious factor. A high relative humidity and increased temperature is used for the purpose of accelerating the results.

5.2 The relative corrosion severity rating system is provided in order to allow a numerical classification of the test results and to eliminate the necessity for elaborate weight loss measurements. Pitting corrosion, which is rated 4—extensive (severe) corrosion, may involve only a negligible weight loss.

6. Apparatus and Reagents

6.1 *Humidity/Temperature Test Cabinet*, capable of maintaining 5 to 100 % relative humidity at $38 \pm 1^\circ\text{C}$ ($100 \pm 2^\circ\text{F}$).

6.2 *Desiccator*, containing a saturated solution of ammonium dihydrogen phosphate (may use combination of salts from Practice E104 to achieve same humidity level).

6.3 *Oven*, forced air circulation, capable of maintaining $37.7 \pm 1^\circ\text{C}$ ($100 \pm 2^\circ\text{F}$).

6.4 *Metal to Be Tested*—The surface roughness should be 8 to 20 μin . (203 to 508 nm) rms finish. They should be approximately 25 by 100 mm and of uniform thickness. Surface may be cleaned using acetone.

6.5 *Mass*, 25 ± 5 lb (11.3 ± 2.3 kg).

6.6 *Nonabrasive Cloth*—The cloth should not scratch or mar the surface of the metal plates when the plates are rubbed with the cloth, or cause any change in the mass of the metal plates.

6.7 *Forceps*.

6.8 *Microscope*, binocular, $10\times$ to $40\times$.

6.9 *pH Meter*.

6.10 *Hydrochloric Acid*.

6.11 *Reagent Water*, demineralized (unless otherwise indicated, reference to water shall be understood to mean reagent water as defined by type IV of Specification **D1193**).

6.12 *Acetone*, for cleaning.

6.13 *Alkaline Artificial Perspiration Solution*, containing, per liter of solution (all solutions shall be prepared with reagent grade chemicals):

5.0 g of sodium chloride,

5.0 g of tris(hydroxymethyl)aminomethane [$\text{NH}_2\text{C}(\text{CH}_2\text{OH})_3$],

0.5 g of urea, and

0.5 g of nitrilotriacetic acid [$\text{N}(\text{CH}_2\text{COOH})_3$], and adjusted to pH 8.0 ± 0.1 with hydrochloric acid (2 mol/L).

6.14 To prepare 1 L of alkaline perspiration solution, dissolve the weighed-out components in about 900 mL of demineralized water (6.11) in a 2-L beaker. Transfer to a 1-L volumetric flask and make up to volume with demineralized water. Check the pH of this solution with a pH meter (6.9) and add 2 mol/L hydrochloric acid solution (6.10) drop by drop until the pH reaches 8.0 ± 0.1 . Smaller volumes can be prepared as required. Check the pH of the solution periodically and discard it if the pH is not within 8.0 ± 0.1 . Also discard the solution if colonies of microbes become visible.

7. Test Specimen

7.1 The leather specimen and the metal test plates shall be size of 25 by 100 mm. The test should be conducted in triplicate.

8. Procedure

8.1 For laboratory corrosion tests that simulate exposure to service environments, a commercial metal surface, closely resembling the one that would be used in service, will yield the most meaningful results. Metal surface may be cleaned using acetone before testing (6.12).

8.2 It is desirable to mark specimens used in corrosion tests with a unique designation during preparation.

8.3 Suggested metals plates that can be used:

Metal #1=Type 2024 T3 Aluminum AD-14 Alclad,

Metal #2=Type 2024 T3 Aluminum AD-14 Bare,

Metal #3=Type 321 Stainless Steel,

Metal #4=Type Grade 2 Titanium.

Section A – Leather in contact with metal

8.4 Place the metal plate (or metal object that is specified in agreement) next to the leather specimen (place the side of leather, that is, grain or flesh side that most likely will be in contact with metal during use), hold the metal/leather combination under a mass of 25 ± 5 lb (11.3 ± 2.3 kg), and place them in the humidity/temperature test chamber. Also test blank control metal plate in the same manner. Hold the specimen and plates at 90 to 95 % relative humidity at $38 \pm 1^\circ\text{C}$ ($100 \pm 2^\circ\text{F}$) for a period of 14 days.

8.5 At the end of 14 days, inspect the surfaces of the plates that were in contact with the leather specimen and compare them with the control plates.

Section B – Leather soaked in alkaline artificial perspiration solution in contact with metal

8.6 Soak leather sample in alkaline artificial perspiration solution (6.13) for 1 h (if leather does not wet easily one can use vacuum). Let drain for 1 min.

8.7 Place the metal plate next to the soaked leather specimen (place the side of leather, that is, grain or flesh side that most likely will be in contact with metal during use), hold the metal/leather combination under a mass of 25 ± 5 lb (11.3 ± 2.3 kg), and place them in the humidity/temperature test chamber. Also test blank control metal plate in the same manner. Hold the specimen and plates at 90 to 95 % relative humidity at $38 \pm 1^\circ\text{C}$ ($100 \pm 2^\circ\text{F}$) for a period of 14 days.

8.8 At the end of 14 days, inspect the surfaces of the plates that were in contact with the leather specimen and compare them with the control plates.

9. Interpretation of Results

9.1 Relative corrosion severity rating system:

Appearance/Corrosion:

0—No visible corrosion and no discoloration present

1—Very slight corrosion or very slight discoloration, and/or up to 5 % of area *under leather* corroded

2—Discoloration and/or up to 10 % of area *under leather* corroded

3—Discoloration and/or up to 25 % of area *under leather* corroded

4—Discoloration and/or more than 25 % of area *under leather* corroded, and/or pitting present

10. Report

10.1 Report section A or section B was used for testing.

10.2 Report the leather as being either noncorrosive, causing staining, causing incipient corrosion, or causing corrosion according to the 9.1 relative corrosion severity rating system.

10.3 Prepare a report certifying that the test has been run in accordance with this test method (document any deviations) and listing the exact conditions of the test as performed. Tabulate the corrosion rating.