



Designation: D2091 – 96 (Reapproved 2017)

Standard Test Method for Print Resistance of Lacquers¹

This standard is issued under the fixed designation D2091; 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 (ϵ) 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 resistance of dried lacquer films to imprinting.

1.2 The values stated in SI units are to be regarded as the 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 establish appropriate safety and health 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

[D823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels](#)

[D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers](#)

[D1186 Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base \(Withdrawn 2006\)³](#)

[D1400 Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base \(Withdrawn 2006\)³](#)

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.52 on Factory Coated Wood Products.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.

[D5235 Test Method for Microscopic Measurement of Dry Film Thickness of Coatings on Wood Products](#)

2.2 *U.S. Federal Specifications:*⁴

[CCC-C-419\(f\) Cloth, Duck, Cotton, Unbleached, Plied](#)

[CCC-C-440\(e\) Cloth, Cheesecloth, Bleached and Unbleached](#)

3. Summary of Test Method

3.1 A weight presses a piece of fabric against the test surface. The surface is then examined and changes in appearance of the test surface are reported.

4. Significance and Use

4.1 An unsatisfactory appearance can result from pressure deformation of a film inherently too soft or containing residual solvent. This test method is primarily used to evaluate the resistance of a lacquer finish to printing under the conditions of packaging, shipping, and warehousing.

5. Apparatus and Materials

5.1 *Test Panels*—A plane surface consisting of wood, metal, paper supported on plate glass, plastic, or other surface with an area at least 100 % greater than the base of the weight. The planeness, smoothness, and composition should be agreed upon by the purchaser and the seller.

5.2 *Imprinting Fabric*, 8-oz Army duck, Type III, conforming to Fed. Spec. CCC-C-419(f) or cheesecloth, Type I, conforming to Federal Specification CCC-C-440(e).

NOTE 1—With the cheesecloth only, use a pad of nonwoven felt cloth at least 1.3 mm (0.05 in.) thick, weighing 0.24 kg/m² (7 oz/yd²) and larger than the plane end of the weight.

5.3 *Weights*, consisting of metal cylinders cut from standard stock 51 mm (2 in.) in diameter, with plane ends perpendicular to the axis, and of a length to give a pressure of 3.5 or 7.0 kPa (½ or 1 lb/in.²).

5.4 *Automatic Application Equipment, (Optional)*, as described in Practices [D823](#).

⁴ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

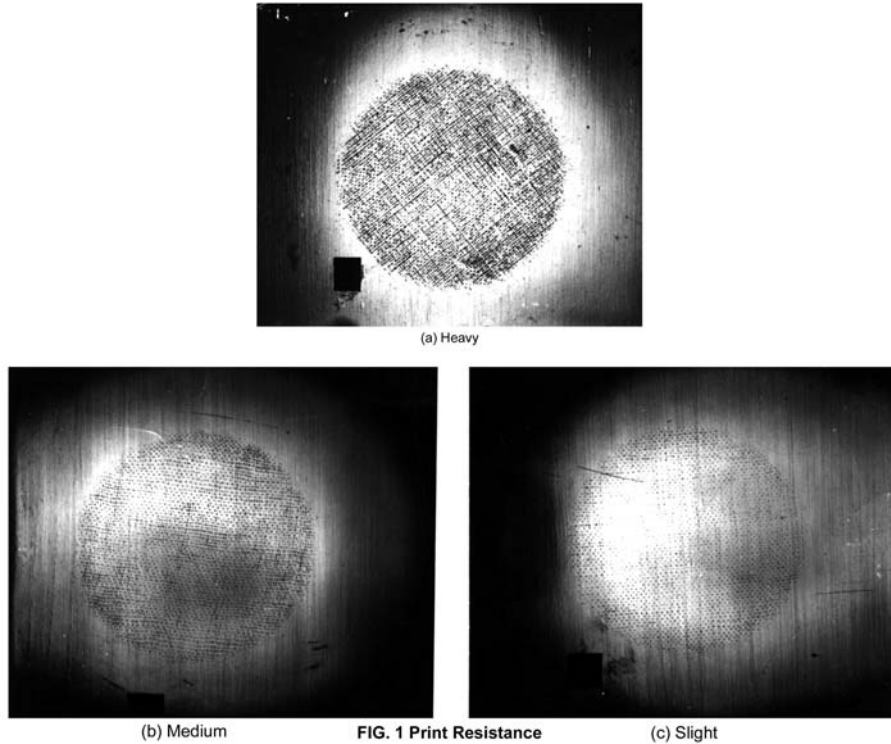


FIG. 1 Print Resistance

5.5 *Film Thickness Measuring Apparatus*, as described in Test Methods [D1005](#), [D1186](#), [D1400](#), and [D5235](#).

6. Preparation of Test Specimen

6.1 *Single Coats*—Prepare a specimen for test by applying the test lacquer to a panel with a film applicator or other specified method, as described in Practices [D823](#), to give a specified film thickness to be stated in the result. In the absence of a specified dry film thickness, $25 \pm 3 \mu\text{m}$ ($1 \pm 0.1 \text{ mil}$) is recommended.

6.2 *Multiple Coats*—Use the finish system as agreed upon between the purchaser and the seller. In the absence of a specified dry film thickness, $75 \pm 8 \mu\text{m}$ ($3 \pm 0.3 \text{ mils}$) are recommended.

6.3 *Conditioning*—Allow to dry as agreed upon between the purchaser and the seller, but run the test within 48 h after coating. In the absence of a specified drying schedule, a period of 24 h at $23 \pm 2^\circ\text{C}$ ($73.5 \pm 3.5^\circ\text{F}$) and a relative humidity of $50 \pm 5 \%$ is recommended.

7. Procedure

7.1 Place over a uniform area of the specimen either a smooth piece of duck cloth or a piece of cheesecloth with a felt pad cushion. Place one or more weights, each on top of the other, on the duck or cheesecloth and pad and maintain the weight in compliance with one of the following test conditions:

- 7.1.1 At $23 \pm 2^\circ\text{C}$ ($73.5 \pm 3.5^\circ\text{F}$) and $50 \pm 5 \%$ relative humidity for an 18-h period,
- 7.1.2 At 50°C (120°F) for a 4-h period, or
- 7.1.3 At 60°C (140°F) for a 4-h period.

7.2 After the specified time, remove the weight, pad, and fabric. Remove lint and dust from the panel with a clean air stream. Examine the specimen immediately under bright, diffused illumination for impression of the fabric into the lacquered surface and compare to photographic standards ([Fig. 1](#)).

8. Report


- 8.1 Report the following information:
 - 8.1.1 Surface involved,
 - 8.1.2 Drying schedule,
 - 8.1.3 Film thickness,
 - 8.1.4 Weight used,
 - 8.1.5 Test temperature used, time, and
 - 8.1.6 Conditions of test other than those primarily specified in this test method.

9. Precision

9.1 Results varying by more than 1° of print should be suspect, either with the same or different operators.

10. Keywords

- 10.1 lacquer; print resistance

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