



# Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base<sup>1</sup>

This standard is issued under the fixed designation D 1400; 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.

## 1. Scope

1.1 This test method covers the nondestructive measurement of the dry film thickness of electrically nonconductive coatings applied over a nonferrous metal base using commercially available eddy current instruments.

1.2 This test method is not applicable to coatings that are readily deformable under the load of the measuring instruments, as the instrument probe must be placed directly on the coating surface to take a reading.

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.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

D 823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels<sup>2</sup>

D 1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers<sup>2</sup>

D 1730 Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting<sup>3</sup>

D 3980 Practice for Interlaboratory Testing of Paint and Related Materials<sup>2</sup>

## 3. Summary of Test Method

3.1 After calibrating the instrument using shims of known thickness and either a bare part of the metal object or metal of the same kind, the instrument probe is placed in contact with the coated metal. In instruments of this type, electrical characteristics of a coil and the probe are changed by the eddy currents created in substrates by the alternating flux of the coil. The extent of such changes varies with the distance between the probe and the metal, the distance being the thickness of the dry coating film.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.23 on Physical Properties of Applied Paint Films.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 02.05.

3.2 It should be recognized that the accuracy of the measurements can be influenced or affected when measurements are made closer than 1 in. (25 mm) to an edge or 3 in. (75 mm) to another mass of metal.

## 4. Significance and Use

4.1 The results of many test methods applicable to coatings are markedly affected by the film thickness of the dry film, some examples being adhesion, flexibility, and hardness to name a few. To be able to compare results obtained by different operators, it is essential to measure film thickness closely.

4.2 Most protective and high performance coatings are applied to meet a requirement or a specification for the dry film thickness of each coat, or for the complete system, or both. Coatings must be applied within certain minimum and maximum thickness tolerances in order that they can fulfill their intended function. In addition to potential performance deficiencies, it is uneconomical to apply more material than necessary when coating large areas such as metal structures and coils. This test method is used to measure film thickness of coatings on nonferrous metals.

## 5. Apparatus

5.1 *Eddy Current Thickness Gages*, commercially available, suitable to measure coating thickness accurately.<sup>4</sup>

5.2 *Nonconductive Thickness Shims for Calibration*—Shims with assigned values traceable to National Standards are available, but when shims are used that are not traceable to National Standards, thickness must be measured to the nearest 0.1 mil (2.5 μm) using a micrometer using a method such as Procedure D in Test Method D 1005.

## 6. Test Specimens

6.1 When this test method is used in the field, the specimen is the coated structure or article on which the thickness is to be evaluated.

6.2 For laboratory use apply the materials to be tested to panels of the composition and surface conditions on which it is desired to determine the thickness.

NOTE 1—Applicable test panel description and surface preparation

<sup>4</sup> Apparatus found to be typical are shown in Table 1. Sources for the instruments are available from ASTM, 1916 Race St., Philadelphia, PA 19103.