



## **Standard Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base<sup>1</sup>**

This standard is issued under the fixed designation D 1186; 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 Department of Defense.*

### **1. Scope**

1.1 These test methods cover the nondestructive measurement of the dry film thickness of nonmagnetic coatings applied over a ferrous base material using commercially available test instruments. The test methods cover the use of instruments based on magnetic measuring principles only. Test Method A provides for the measurement of films using magnetic pull-off gages and Test Method B provides for the measurement of films using magnetic flux gages.

1.2 These test methods are not applicable to coatings that will be 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 problems, 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 609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products<sup>2</sup>

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

#### **2.2 Steel Structures Painting Council Standard:**

SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gages<sup>3</sup>

### **TEST METHOD A—MAGNETIC PULL-OFF GAGES**

#### **3. Summary of Test Method**

3.1 Instruments complying with this test method measure thickness by using a spring calibrated to determine the force required to pull a permanent magnet from a ferrous base coated with a nonmagnetic film. The instrument must be placed directly on the coating surface to take a reading.

3.2 The attractive force of the magnet to the substrate varies inversely with the thickness of the applied film. The spring tension required to overcome the attraction of the magnet to the substrate is shown on the instrument scale as the distance (in mils or micrometres) between the magnet and the substrate.

3.3 It should be recognized that the accuracy of the measurements can be influenced when measurements are made closer than 1 in. (25 mm) to an edge.

#### **4. Significance and Use**

4.1 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 magnet (or metal foot) is placed in contact with the coated metal in the manner described in 12.1. 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

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and are 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> Available from Steel Structures Painting Council, 4516 Henry St., Pittsburgh, PA 15213.