



Standard Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base¹

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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 are intended to supplement manufacturers' instructions for the manual operation of the gages and are not intended to replace them. They cover the use of instruments based on magnetic measuring principles only. Test Method A provides for the measurement of films using mechanical magnetic pull-off gages and Test Method B provides for the measurement of films using magnetic electronic 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 The values given in SI units of measurement are to be regarded as the standard. The values in parentheses are for information only.

1.4 *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 609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products²

D 823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels²

2.2 Steel Structures Painting Council Standard:

SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gages³

¹ These test methods are under the jurisdiction of ASTM Committee D1 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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² *Annual Book of ASTM Standards*, Vol 06.01.

³ Available from SSPC: The Society for Protective Coatings, 40 24th St., Sixth Floor, Pittsburgh, PA 15222-4643 (see www.sspc.org).

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 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 microns) between the magnet and the substrate.

4. Significance and Use

4.1 Many coating properties are markedly affected by the thickness of the dry film such as adhesion, corrosion protection, flexibility, and hardness. To be able to compare results obtained by different operators, it is essential to know film thickness.

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 thicknesses to fill their expected function. In addition to potential performance deficiencies, it is uneconomical to apply more material than necessary when coating large areas. This test method is used to measure film thickness of coatings on ferrous metals.

5. Apparatus

5.1 *Permanent Magnet*, small, either attached directly to a coil spring ("pencil" gage) or to a horizontal lever arm that is attached to a helical spring ("dial-type" gage). Increasing force is applied to the magnet by extending the coil spring in the first case or turning a graduated dial that coils the helical spring in the second. The readings obtained are shown directly on the instrument scale.

5.2 *Coating Thickness Standards*, with assigned values traceable to national standards are available from several sources, including most manufacturers of coating thickness gages.