



# Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments<sup>1</sup>

This standard is issued under the fixed designation B 244; 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 ( $\epsilon$ ) 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 This test method covers the use of eddy-current instruments for the nondestructive measurement of the thickness of a nonconductive coating on a nonmagnetic basis metal.

1.2 This test method is particularly useful for measuring the thickness of an anodic coating on aluminum alloys. Chemical conversion coatings are too thin to be measured by this test method.

## 2. Referenced Documents

### 2.1 ASTM Standards:

B 499 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals<sup>2</sup>

## 3. Significance and Use

3.1 The thickness of a coating is often critical to its performance. This eddy-current method is nondestructive and is suitable for measuring the thickness of anodic coatings on aluminum, as well as the thickness of most nonconductive coatings on nonmagnetic basis metals.

3.2 This test method requires that the conductivity of the substrate be the same in the calibration standard and in the coated article to be measured.

## 4. Apparatus

4.1 The coating thickness shall be determined with an electromagnetic instrument that measures the changes in apparent impedance of the coil inducing the eddy currents into the basis metal.<sup>3</sup> The design of the instrument shall be such that variations in apparent impedance, produced by variations in

coil to basis metal spacing, can be calibrated to indicate the thickness of coatings.

## 5. Factors Affecting the Measuring Accuracy

5.1 Inherent in the test method is a measuring uncertainty that, for thin coatings, is constant and independent of the coating thickness, and, for a single measurement, not less than 0.5  $\mu\text{m}$ ; for thicknesses greater than about 25  $\mu\text{m}$ , this uncertainty is proportional to the coating thickness.

5.2 *Electrical Properties of the Basis Metal*—Eddy-current measurements are affected by the electrical conductivity of the basis metal, which, itself, is often affected by heat treatments.

5.3 *Basis-Metal Thickness*—For each measurement, there is a critical thickness of the basis metal above which the measurements will not be affected by an increase in that thickness. Its value should be determined experimentally, if not supplied by the manufacturer of the measuring instrument, since it depends on both the measuring frequency of the probe system and the electrical conductivity of the basis metal.

5.3.1 *General Rule*—For a given measuring frequency, the higher the conductivity of the basis metal, the smaller its critical thickness. For a given basis metal, the higher the measuring frequency, the smaller the critical thickness of the basis metal.

5.4 *Edge Effect*—This method is sensitive to abrupt changes in the surface contour of the test specimen. Therefore, measurements made too near an edge or inside corner will not be valid unless the instrument is specifically calibrated for such a measurement.

Boonton Metal Film Gage—Type 255-A, Boonton Radio Corp., Boonton, NJ 07005 (This instrument is no longer manufactured, but many are still in use.)

Dermatron Thickness Tester, Unit Process Assemblies, Inc., 53-15 37th Ave., Woodside NY 11377

Filmeter, American Instrument Co., Silver Spring, MD 20910

Elcotector—MK-II, Ferro Engineering Div. of Ferro Corp., 4150 East 56th St., Cleveland, OH 44105; also available from East Lancashire Chemical Co., Ltd., Fairfield, Manchester, England.

Accuratest Mark II, Coloral Products, Ltd., Steward St., Birmingham 18, England.

Isometer—Type 2-080, Institute, Dr. Forster, Reutlingen/Wurt. Grathwohlstrasse 4, West Germany.

<sup>1</sup> This method is under the jurisdiction of ASTM Committee B-8 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.10 on General Test Methods.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.05.

<sup>3</sup> The following instruments have been found satisfactory for this purpose:

Permascope—Type EC-8-Ty, Twin City Testing Corp., P. O. Box 552, Tonawanda, NY 14150