Designation: A 341/A341M – 00

Standard Test Method for Direct Current Magnetic Properties of Materials Using D-C Permeameters and the Ballistic Test Methods[1]

This standard is issued under the fixed designation A 341/A341M; 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 provides dc permeameter tests for the basic magnetic properties of materials in the form of bars, rods, wire, or strip specimens which may be cut, machined, or ground from cast, compacted, sintered, forged, extruded, rolled, or other fabricated materials. It includes tests for determination of the normal induction under symmetrically cyclically magnetized (SCM) conditions and the hysteresis loop (B-H loop) taken under conditions of rapidly changing or steep wavefront reversals of the direct current magnetic field strength.

1.2 This test method shall be used in conjunction with Practice A 34/A 34M.

1.3 This test method covers a range of magnetic field strength in the specimen from about 0.05 Oe [4 A/m] up to above 5000 Oe [400 kA/M] through the use of several permeameters. The separate permeameters cover this test region in several overlapping ranges.

1.4 Normal induction and hysteresis properties may be determined over the flux density range from essentially zero to intrinsic saturation for most materials.

1.5 Recommendations of the useful magnetic field strength range for each of the permeameters are shown in Table 1[2]. Also, see Sections 3 and 4 for general limitations relative to the use of permeameters.

1.6 The symbols and abbreviated definitions used in this test method appear with Fig. 1 and in appropriate sections of this document. For the official definitions, see Terminology A 340. Note that the term flux density used in this document is synonymous with the term magnetic induction.

1.7 The values and equations stated in customary cgs-emu and inch-pound or SI units are to be regarded separately as standard. Within this standard, SI units are shown in brackets except for the sections concerning calculations where there are separate sections for the respective unit systems. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with this standard.

1.8 *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:*

A 34/A 34M Practice for Sampling and Procurement Testing of Magnetic Materials[3]

A 340 Terminology of Symbols and Definitions Relating to Magnetic Testing[3]

A 596/A 596M Test Method for Direct-Current Magnetic Properties of Materials Using the Ballistic Method and Ring Specimens[3]

2.2 *IEC Standard:*

Publication 60404-4, Ed. 2.0 Magnetic Materials – Part 4: Methods of Measurement of D.C. Magnetic Properties of Iron and Steel, IEC, 1995[4]

2.3 *Other Documents:*

NIST Circular No. 74, pg. 269[5]

NIST Scientific Paper 117, SPBTA[5]

3. Significance and Use

3.1 Permeameters require the use of yokes to complete the magnetic circuit and are therefore inherently less accurate than ring test methods. Refer to Test Method A 596/A 596M for further details on ring test methods. However, when testing certain shapes as bars or when magnetic field strength in excess of 200 Oe [15.9 or more kA/m] are required, permeameters are the only practical means of measuring magnetic properties.

3.2 This test method is suitable for specification acceptance, service evaluation, research and development and design.

[1] This test method is under the jurisdiction of ASTM Committee A06 on Magnetic Properties and is the direct responsibility of Subcommittee A06.01 on Test Methods.

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[2] The boldface numbers in parentheses refer to a list of references at the end of this standard.

[3] *Annual Book of ASTM Standards*, Vol 03.04.

[4] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[5] Available from National Institute of Standards and Technology, (NIST), Gaithersburg, MD 20899.

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