



Standard Test Methods for Alternating-Current Magnetic Properties of Materials at Power Frequencies Using Sheet-Type Test Specimens¹

This standard is issued under the fixed designation A 804/A 804M; 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 These test methods cover the determination of specific core loss and peak permeability of single layers of sheet-type specimens tested with normal excitation at a frequency of 50 or 60 Hz.

NOTE 1—These test methods have been applied only at the commercial power frequencies, 50 and 60 Hz, but with proper instrumentation and application of the principles of testing and calibration embodied in the test methods, they are believed to be adaptable to testing at frequencies ranging from 25 to 400 Hz.

1.2 These test methods use calibration procedures that provide correlation with the 25-cm [250-mm] Epstein test.

1.3 The range of test magnetic flux densities is governed by the properties of the test specimen and by the available instruments and other equipment components. Normally, non-oriented electrical steels can be tested over a range from 8 to 16 kG [0.8 to 1.6 T] for core loss. For oriented electrical steels, the normal range extends to 18 kG [1.8 T]. Maximum magnetic flux densities in peak permeability testing are limited principally by heating of the magnetizing winding and tests are limited normally to a maximum ac magnetic field strength of about 150 Oe [12 000 A/m].

1.4 These test methods cover two alternative procedures as follows:

Test Method 1—Sections 6-12

Test Method 2—Sections 13-19

1.4.1 Test Method 1 uses a test fixture having (1) two windings that encircle the test specimen, and (2) a ferromagnetic yoke structure that serves as the flux return path and has low core loss and low magnetic reluctance.

1.4.2 Test Method 2 uses a test fixture having (1) two windings that encircle the test specimen, (2) a third winding located inside the other two windings and immediately adjacent to one surface of the test specimen, and (3) a ferromagnetic yoke structure which serves as the flux-return path and has low magnetic reluctance.

1.5 The values and equations stated in customary (cgs-emu and inch-pound) units 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.

1.6 *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:²

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

A 340 Terminology of Symbols and Definitions Relating to Magnetic Testing

A 343/A 343M Test Method for Alternating-Current Magnetic Properties of Materials at Power Frequencies Using Wattmeter-Ammeter-Voltmeter Method and 25-cm Epstein Test Frame

A 677/A 677M Specification for Nonoriented Electrical Steel Fully Processed Types

A 683/A 683M Specification for Nonoriented Electrical Steel, Semiprocessed Types

A 876 Specification for Flat-Rolled, Grain-Oriented, Silicon-Iron Electrical Steel, Fully Processed Types

3. Terminology

3.1 Definitions:

3.1.1 *General*—The definitions of terms, symbols, and conversion factors relating to magnetic testing found in Definitions A 340 are used in these methods.

¹ These methods are under the jurisdiction of ASTM Committee A06 on Magnetic Properties and are the direct responsibility of Subcommittee A06.01 on Test Methods.

Current edition approved May 1, 2004. Published May 2004. Originally approved in 1982. Last previous edition approved in 1999 as A 804/A 804M – 99.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.