



Standard Test Method for Alternating Current Magnetic Properties of Laminated Core Specimen Using Voltmeter-Ammeter-Wattmeter Methods¹

This standard is issued under the fixed designation A 697/A 697M; 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 covers the determination of several ac magnetic properties of laminated cores made from flat-rolled magnetic materials.

1.2 This test method covers test equipment and procedures for the determination of impedance permeability and exciting power from voltage and current measurements, and core loss from wattmeter measurements. These tests are made under conditions of sinusoidal flux.

1.3 This test method covers tests for two general categories (1 and 2) of cores based on size and application.

1.4 Tests are provided for power and control size cores (Category 1) operating at inductions of 10 to 15 kG [1.0 to 1.5 T] and at frequencies of 50, 60, and 400 Hz.

1.5 Procedures and tests are provided for coupling and matching type transformer cores (Category 2) over the range of inductions from 100 G [0.01 T] or lower to 10 kG [1.0 T] and above at 50 to 60 Hz or above when covered by suitable procurement specifications.

1.6 This test method also covers tests for core loss and ac impedance permeability under incremental test conditions (ac magnetization superimposed on dc magnetization) for the above core types and at inductions up to those that cause the ac exciting current to become excessively distorted or reach values that exceed the limits of the individual test equipment components.

1.7 This test method shall be used in conjunction with Practice A 34/A 34M and Terminology A 340. It depends upon these designated documents and a related reference test manual for detailed information which will not be repeated in this test method.

1.8 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. 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.

1.9 *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

3. Terminology

3.1 The terms and symbols listed below apply only to this test method. The official list of symbols and definitions may be found in Terminology A 340.

3.2 Symbols:

A_s	= E lamination surface area, one side only,
A_{ss}	= EI lamination surface area, one side only,
h	= lamination stack height,
A_{dc}	= dc ammeter,
I_{dc}	= dc current,
N_1	= primary turns,
N_2	= secondary turns,
N_3	= tertiary turns,
R_1	= ammeter shunt resistance,
V_f	= flux voltmeter,
w	= lamination center leg width,
W	= wattmeter, and
Z	= choke coil impedance.

4. Summary of Test Method

4.1 For Category 1 cores, the recommended tests are made at a frequency of 60 Hz and at a test induction within the range from 10 through 15 kG [1.0 to 1.5 T].

4.2 For Category 2 cores, the recommended tests are made at a frequency of 50 or 60 Hz and at inductions of 40, 100 or 200, 2000, 5000, 6000, 7000, and 10 000 G [0.004, 0.01 or 0.02, 0.2, 0.5, 0.6, 0.7, and 1.0 T]. Any or all may be required depending on the type of core material.

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

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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.