



Standard Test Method for Thermal Endurance of Film-Insulated Round Magnet Wire¹

This standard is issued under the fixed designation D 2307; 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 determination of the thermal endurance of film-insulated round magnet wire in air at atmospheric pressure. It is not applicable to magnet wire with fibrous insulation, such as cotton or glass.

NOTE 1—Other solid conductors such as coated resistance wire may be evaluated by this test method.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI units in parentheses are provided for information only.

1.3 This test method covers the evaluation of thermal endurance by observing changes in response to ac proof voltage tests. The evaluation of thermal endurance by observing changes in other properties of magnet wire insulation requires the use of different test methods.

1.4 Exposure of some types of film insulated wire to heat in gaseous or liquid environments in the absence of air may give thermal endurance values different from those obtained in air. This fact should be considered when interpreting the results obtained by heating in air with respect to applications where the wire will not be exposed to air in service.

1.5 Electric stress applied for extended periods at a level exceeding or even approaching the discharge inception voltage may change significantly the thermal endurance of film insulated wires, varnished or unvarnished. Under such electric stress conditions, comparisons between materials may also differ from those developed using this method.

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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 115 Test Methods for Varnishes Used for Electrical Insulation²

D 5423 Specification for Forced-Convection Laboratory

¹ This test method is under the jurisdiction of ASTM Committee D-9 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.10 on Magnet Wire Insulation. Originally published as D 2307 – 64T. Last previous edition D 2307 – 78.

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² *Annual Book of ASTM Standards*, Vol 10.01.

Ovens for Evaluation of Electrical Insulation³

2.2 *IEEE Standards*:⁴

IEEE 101 Statistical Analysis of Thermal Life Test Data

3. Terminology

3.1 Definitions:

3.1.1 *temperature index, n*—a number which permits comparison of the temperature/time characteristics of an electrical insulating material, or a simple combination of materials, based on the temperature in degrees celsius which is obtained by extrapolating the Arrhenius plot of life versus temperature to a specified time, usually 20 000 h.

3.1.2 *thermal endurance, n*—an expression for the stability of an electrical insulating material, or a simple combination of materials, when maintained at elevated temperatures for extended periods of time.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *specimen failure time, n*—the hours at the exposure temperature that have resulted in a specimen failing the proof test (see 9.1).

3.2.2 *time to failure, n*—the hours calculated for a set of specimens, calculated from the individual specimen failure times at an exposure temperature (see 9.2).

4. Summary of Test Method

4.1 This test method specifies the preparation of specimens, the aging of these specimens at elevated temperatures, and the periodic testing of the specimens by applying a preselected proof voltage.

4.2 The cyclic exposure to temperature is repeated until a sufficient number of specimens have failed to meet the proof test, and the time to failure is calculated in accordance with Section 9. The test is carried out at three or more temperatures. A regression line is calculated in accordance with Section 10, and the time to failure values plotted on thermal endurance graph paper (see Fig. A1.1) as a function of the exposure temperature.

5. Significance and Use

5.1 This test method is useful in determining the thermal endurance characteristics and a temperature index of the film-insulated round magnet wire in air (see 1.4), alone or in

³ *Annual Book of ASTM Standards*, Vol 10.02.

⁴ Available from the Institute of Electrical and Electronics Engineers, Inc., 345 E. 47th St., New York, NY 10017.