



Designation: D4881 – 05 (Reapproved 2012)

Standard Test Method for Thermal Endurance of Varnished Fibrous- or Film-Wrapped Magnet Wire¹

This standard is issued under the fixed designation D4881; 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 thermal endurance of rectangular and square fibrous- or film-wrapped magnet wire coated with an insulating varnish.

1.2 The values given in SI units are the standard. The values given in parentheses are for information only.

1.3 *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.* A specific precautionary statement is given in Section 5.

NOTE 1—There is no similar or equivalent IEC Standard.

2. Referenced Document

2.1 *ASTM Standards*:²

D1711 Terminology Relating to Electrical Insulation

D2307 Test Method for Thermal Endurance of Film-Insulated Round Magnet Wire

D3353 Test Methods for Fibrous-Insulated Magnet Wire

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *varnish, electrical insulating, n*— a liquid resin system that is applied to and cured on electrical components providing electrical, mechanical, and environmental protection.

3.1.1.1 *Discussion*—There are two types of electrical insulating varnishes: solvent-containing and solventless. Solvent-containing types are solutions, dispersions, or emulsions of a polymer or a mixture of polymers in a volatile, nonreactable

liquid. Solventless types are liquid resin systems free of volatile, nonreactable solvents.

3.1.2 Refer to Terminology D1711 for definitions of other terms.

4. Significance and Use

4.1 Individual varnishes behave differently when applied to the same fibrous- or film-wrapped magnet wire when exposed to elevated temperatures. Likewise, a varnish does not always behave the same when applied to different types of fibrous or film-wrapped magnet wires and when exposed to elevated temperatures.

5. Safety Precautions

5.1 It is unsafe to use varnish at temperatures above the flash point without adequate ventilation, especially if the possibility exists that flames or sparks are present. Store varnish in sealed containers.

6. Test Specimens

6.1 *Construction of Test Specimens*:

6.1.1 Cut two 250-mm (10-in.) lengths of wire for each specimen to be made.

6.1.2 Determine the thickness dimensions per Test Method D3353.

6.1.3 Form each length in a fixture as shown in Fig. 1.

6.1.4 Prepare a test specimen by placing the two formed wires together back to back and wrap tightly with a minimum of 6 turns of glass yarn over the middle 6-in. (150-mm) section. The glass yarn shall have a gap between turns and there must be intimate contact of the two wires.

6.1.5 Prepare ten specimens for each test temperature.

6.2 *Varnishing the Test Specimens*:

6.2.1 Adjust the consistency of a solvent-containing varnish to give a 0.025 ± 0.005 -mm (0.0010 ± 0.0002 -in.) cured film on each side of a 0.13-mm (0.005-in.) copper strip withdrawn at a rate of 100 mm/min (4 in./min). Use solventless varnish as received.

6.2.2 Submerge the test specimens vertically in the varnish to be tested. Withdraw them at a rate of 100 mm/min (4 in./min). Drain the test specimens for 10 to 12 min. Cure according to the manufacturer's recommendations. If a

¹ This test method is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.01 on Electrical Insulating Varnishes, Powders and Encapsulating Compounds.

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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.