



Designation: D149 – 20

Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies¹

This standard is issued under the fixed designation D149; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This test method covers procedures for the determination of dielectric strength of solid insulating materials at commercial power frequencies, under specified conditions.^{2,3}

1.2 Unless otherwise specified, the tests shall be made at 60 Hz. However, this test method is suitable for use at any frequency from 25 to 800 Hz. At frequencies above 800 Hz, dielectric heating is a potential problem.

1.3 This test method is intended to be used in conjunction with any ASTM standard or other document that refers to this test method. References to this document need to specify the particular options to be used (see 5.5).

1.4 It is suitable for use at various temperatures, and in any suitable gaseous or liquid surrounding medium.

1.5 This test method is not intended for measuring the dielectric strength of materials that are fluid under the conditions of test.

1.6 This test method is not intended for use in determining intrinsic dielectric strength, direct-voltage dielectric strength, or thermal failure under electrical stress (see Test Method D3151).

1.7 This test method is most commonly used to determine the dielectric breakdown voltage through the thickness of a test specimen (puncture). It is also suitable for use to determine dielectric breakdown voltage along the interface between a solid specimen and a gaseous or liquid surrounding medium

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 D09.12 on Electrical Tests.

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² Bartnikas, R., Chapter 3, “High Voltage Measurements,” *Electrical Properties of Solid Insulating Materials, Measurement Techniques*, Vol. IIB, Engineering Dielectrics, R. Bartnikas, Editor, ASTM STP 926, ASTM, Philadelphia, 1987.

³ Nelson, J. K., Chapter 5, “Dielectric Breakdown of Solids,” *Electrical Properties of Solid Insulating Materials: Molecular Structure and Electrical Behavior*, Vol. IIA, Engineering Dielectrics, R. Bartnikas and R. M. Eichorn, Editors, ASTM STP 783, ASTM, Philadelphia, 1983.

(ashover). With the addition of instructions modifying Section 12, this test method is also suitable for use for proof testing.

1.8 This test method is similar to IEC Publication 243-1. All procedures in this method are included in IEC 243-1. Differences between this method and IEC 243-1 are largely editorial.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 7. See also 6.4.1.

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:⁴

D374 Test Methods for Thickness of Solid Electrical Insulation (Metric) D0374_D0374M

D618 Practice for Conditioning Plastics for Testing

D877 Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes

D1711 Terminology Relating to Electrical Insulation

D2413 Practice for Preparation of Insulating Paper and Board Impregnated with a Liquid Dielectric

D3151 Test Method for Thermal Failure of Solid Electrical Insulating Materials Under Electric Stress (Withdrawn 2007)⁵

⁴ 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.

⁵ The last approved version of this historical standard is referenced on www.astm.org.

*A Summary of Changes section appears at the end of this standard