



Designation: D1816 – 12 (Reapproved 2019)

Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes¹

This standard is issued under the fixed designation D1816; 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 the dielectric breakdown voltage of insulating liquids (oils of petroleum origin, silicone fluids, high fire-point mineral electrical insulating oils, synthetic ester fluids and natural ester fluids). This test method is applicable to insulating liquids commonly used in cables, transformers, oil circuit breakers, and similar apparatus as an insulating and cooling medium. Refer to Terminology [D2864](#) for definitions used in this test method.

1.2 This test method is sensitive to the deleterious effects of moisture in solution especially when cellulosic fibers are present in the liquid. It has been found to be especially useful in diagnostic and laboratory investigations of the dielectric breakdown strength of insulating liquid in insulating systems.²

1.3 This test method is used to judge if the VDE electrode breakdown voltage requirements are met for insulating liquids. This test method should be used as recommended by professional organization standards such as IEEE C57.106.

1.4 This test method may be used to obtain the dielectric breakdown of silicone fluid as specified in Test Method [D2225](#), Specification [D4652](#), or Specification [D6871](#), provided that the discharge energy into the sample is less than 20 mJ (milli joule) per breakdown for five consecutive breakdowns.

1.5 Both the metric and the alternative inch-pound units are acceptable.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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:³

[D235](#) Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

[D923](#) Practices for Sampling Electrical Insulating Liquids

[D2225](#) Test Methods for Silicone Fluids Used for Electrical Insulation

[D2864](#) Terminology Relating to Electrical Insulating Liquids and Gases

[D3487](#) Specification for Mineral Insulating Oil Used in Electrical Apparatus

[D4652](#) Specification for Silicone Fluid Used for Electrical Insulation

[D6871](#) Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus

2.2 IEEE Standard:

[Standard 4](#) IEEE Standard Techniques for High Voltage Testing⁴

[C57.106](#) Guide for Acceptance and Maintenance of Insulating Oil in Equipment⁴

3. Significance and Use

3.1 The dielectric breakdown voltage of an insulating liquid is of importance as a measure of the liquid's ability to withstand electric stress without failure. The dielectric breakdown voltage serves to indicate the presence of contaminating agents such as water, dirt, cellulosic fibers, or conducting particles in the liquid, one or more of which may be present in significant concentrations when low breakdown voltages are obtained. However, a high dielectric breakdown voltage does not necessarily indicate the absence of all contaminants; it may merely indicate that the concentrations of contaminants that are

¹ This test method is under the jurisdiction of ASTM Committee [D27](#) on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee [D27.05](#) on Electrical Test.

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² Supporting data is available from ASTM Headquarters. Request RR:D27-1006.

³ 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.

⁴ Available from the Institute of Electrical and Electronic Engineers, Inc., PO Box 1331, Piscataway, NJ 08855.

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