Designation: D2477 – 07 (Reapproved 2012)

Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Insulating Gases at Commercial Power Frequencies[1]

This standard is issued under the fixed designation D2477; 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 and dielectric strength of insulating gases used in transformers, circuit breakers, cables, and similar apparatus as an insulating medium. The test method is applicable only to gases with boiling points below room temperature at atmospheric pressure.

1.2 This standard may involve hazardous materials, operations, and equipment. *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.*

1.3 *Mercury has been designated by EPA and many state agencies as a hazardous material that can cause central nervous system, kidney and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury containing products. See the applicable product Material Safety Data Sheet (MSDS) for details and EPA's website — http://www.epa.gov/mercury/faq.htm for additional information. Users should be aware that selling mercury and/or mercury containing products into your state may be prohibited by state law.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2864 Terminology Relating to Electrical Insulating Liquids and Gases

2.2 *IEEE Standard:*[3]

No. 4 Standard Techniques for High Voltage Testing

2.3 *ASTM Adjuncts:*

Dielectric cell assembly and detail (2 drawings)[4]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D2864.

4. Significance and Use

4.1 The dielectric breakdown voltage and dielectric strength of an insulating gas in a uniform field depends primarily on the molecular structure of the gas. As different gases are mixed either by plan or by contamination, any change in dielectric breakdown voltage and dielectric strength will depend on both the nature and proportion of the individual gases. This test method uses plane and spherical electrodes which provide a nearly uniform field (see Appendix) in the area of electrical discharge. It is suitable for determining the dielectric breakdown voltage and dielectric strength of different gases and mixtures thereof for research and application evaluations and also as a field test. A more complete discussion of the significance of the dielectric strength test is given in the Appendix.

5. Apparatus

5.1 *Electrical Apparatus:*

5.1.1 *Transformer*— The desired test voltage may be most readily obtained by a step-up transformer energized from a variable low-voltage commercial power frequency source. The transformer and controlling element shall be of such size and design that, with the test specimen in the circuit, the crest factor (ratio of maximum to mean effective) of the 60-Hz test voltage does not differ by more than ±5 % from that of a sinusoidal wave over the upper half of the range of test voltage. The crest factor may be checked by means of an oscilloscope, a sphere gap, or a peak-reading voltmeter in conjunction with an rms voltmeter. Where the waveform cannot be determined conveniently, a transformer having a rating of not less than ½

[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] 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.

[3] Available from The Institute of Electrical and Electronic Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331.

[4] Detailed drawings of this apparatus are available at a nominal cost from: ASTM International Headquarters. Order Adjunct No. ADJD2477.

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