



Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids¹

This standard is issued under the fixed designation D924; 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 describes testing of new electrical insulating liquids as well as liquids in service or subsequent to service in cables, transformers, oil circuit breakers, and other electrical apparatus.

1.2 This test method provides a procedure for making referee tests at a commercial frequency of between 45 and 65 Hz.

1.3 Where it is desired to make routine determinations requiring less accuracy, certain modifications to this test method are permitted as described in Sections 16 to 24.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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 to determine the applicability of regulatory limitations prior to use. Specific warnings are given in 11.3.3.*

1.6 *Mercury has been designated by the EPA and many state agencies as a hazardous material that can cause 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 the 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

D150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
D923 Practices for Sampling Electrical Insulating Liquids
D2864 Terminology Relating to Electrical Insulating Liquids and Gases
D2865 Practice for Calibration of Standards and Equipment for Electrical Insulating Materials Testing
E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 IEEE Standard:

Standard 4 IEEE Standard Techniques for High-Voltage Testing³

3. Terminology

3.1 **Definitions**—Definitions of terms used in this test method are given in Terminology **D2864**. Also refer to Test Methods **D150** for detailed discussion of terms.

4. Significance and Use

4.1 **Dissipation Factor (or Power Factor)**—This is a measure of the dielectric losses in an electrical insulating liquid when used in an alternating electric field and of the energy dissipated as heat. A low dissipation factor or power factor indicates low ac dielectric losses. Dissipation factor or power factor may be useful as a means of quality control, and as an indication of changes in quality resulting from contamination and deterioration in service or as a result of handling.

4.1.1 The loss characteristic is commonly measured in terms of dissipation factor (tangent of the loss angle) or of power factor (sine of the loss angle) and may be expressed as a decimal value or as a percentage. For decimal values up to

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 Institute of Electrical and Electronic Engineers, 445 Hoes Lane, Piscataway, NJ 08854, www.ieee.org.