Designation: D4308 – 13

An American National Standard

Standard Test Method for Electrical Conductivity of Liquid Hydrocarbons by Precision Meter[1]

This standard is issued under the fixed designation D4308; 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 and applies to the determination of the "rest" electrical conductivity of aviation fuels and other similar low-conductivity hydrocarbon liquids in the range from 0.1 to 2000 pS/m (see 3.1.2). This test method can be used in the laboratory or in the field.

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

1.3 **WARNING**—Mercury has been designated by many regulatory 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 or country may be prohibited by law.

1.4 *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.* For specific warning statements, see 7.1.1, 7.2, 8.3, and Annex A1.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation

D2624 Test Methods for Electrical Conductivity of Aviation and Distillate Fuels

D4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination

E1 Specification for ASTM Liquid-in-Glass Thermometers

3. Terminology

3.1 *Definitions:*

3.1.1 *picosiemens per metre, n*—the unit of electrical conductivity is also called a conductivity unit (CU). A siemen is the SI definition of reciprocal ohm sometimes called mho.

$$1\ \text{pS/m} = 1 \times 10^{-12}\ \Omega^{-1}\ \text{m}^{-1} = 1\ \text{cu} = 1\ \text{picomho/m} \quad (1)$$

3.1.2 *rest conductivity, n*—the reciprocal of the resistance of uncharged fuel in the absence of ionic depletion or polarization. It is the electrical conductivity at the initial instant of current measurement after a dc voltage is impressed between electrodes.

4. Summary of Test Method

4.1 A sample of liquid hydrocarbon is introduced into a clean conductivity cell which is connected in series to a battery voltage source and a sensitive dc ammeter. The conductivity, automatically calculated from the observed peak current reading dc voltage and cell constant using Ohm's law, appears as a digital value in either a manual or automatic mode of meter operation.

5. Significance and Use

5.1 The generation and dissipation of electrostatic charge in fuel due to handling depend largely on the ionic species present which may be characterized by the rest or equilibrium electrical conductivity. The time for static charge to dissipate is inversely related to conductivity. This test method can supplement Test Method D2624 which is limited to fuels containing static dissipator additive.

NOTE 1—For low-conductivity fluids below 1 pS/m in conductivity, an ac measurement technique is preferable to a dc test method for sensing the electrical conductivity of bulk fluid. This dc test method can be used at conductivities from 0.1 to 1 pS/m if precautions are observed in cell cleaning and sample handling. A waiting period of 15 min is required after

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.J0.04 on Additives and Electrical Properties.

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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.

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

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