



Standard Test Method for Electrical Conductivity of Liquid Hydrocarbons by Precision Meter¹

This standard is issued under the fixed designation D 4308; 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 (€) indicates an editorial change since the last revision or reapproval.

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

€¹ NOTE—Warning notes were placed in the text editorially in April 2001.

1. Scope

1.1 This test method 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 3.2). 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 the standard.

1.3 *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 hazard statements, see 7.1.1 and 7.2.

2. Referenced Documents

2.1 ASTM Standards:

D 150 Test Methods for A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials²

D 2624 Test Methods for Electrical Conductivity of Aviation and Distillate Fuels³

D 4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination⁴

E 1 Specification for ASTM Thermometers⁵

3. Terminology

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

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

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.J0 on Aviation Fuels.

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² *Annual Book of ASTM Standards*, Vol 10.01.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ *Annual Book of ASTM Standards*, Vol 05.02.

⁵ *Annual Book of ASTM Standards*, Vol 14.03.

3.2 *rest conductivity*—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 d-c 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 D 2624 which is limited to fuels containing static dissipator additive.

NOTE 1—For low-conductivity fluids below 1 pS/m in conductivity, an a-c measurement technique is preferable to a d-c test method for sensing the electrical conductivity of bulk fluid. This d-c 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 filling the cell before measuring d-c conductivities below 1 pS/m. A single-laboratory program was conducted comparing this test method with a-c Test Method D 150. The results are on file at ASTM Headquarters. Request RR: D02-1241.

6. Apparatus

6.1 *Conductivity Apparatus*—Components of the dc conductivity apparatus are shown in Fig. 1.⁶

⁶ The KSLA Cell and Precision Conductivity Meter System, Emcee Model #1154 are available from Emcee Electronics, Inc., 520 Cypress Ave., Venice, FL 34292.