



Standard Test Method for D-C ELECTRICAL CONDUCTIVITY OF HYDROCARBON FUELS¹

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1. Scope

1.1 This method applies to the laboratory determination of the "rest" electrical conductivity of aviation fuels and other similarly low-conductivity liquids in the range from 1000 to 0.01 pS/m (see 4.2). With suitable battery operated components, the method can be used in the field.

2. Summary of Method

2.1 A sample of fuel is placed in the conductivity cell which is then connected in series with a d-c voltage source and a sensitive d-c ammeter. The conductivity is calculated by Ohm's law from the cell characteristics, the voltage across the cell, and the almost instantaneous peak current reading.

3. Significance

3.1 The generation and dissipation of electrical charge in fuel depend largely on the ionic species present which may be characterized by the "rest" electrical conductivity.

4. Definitions

4.1 "rest" conductivity—the conductivity of uncharged fuel in the absence of ionic depletion or polarization. It is, in effect, the conductivity at the initial instant of a d-c measurement.

4.2 *picomho/meter*—an arbitrary unit of electrical conductivity, also often called a Conductivity Unit (C.U.). In the SI, picosiemens replaces picomho.

1 C.U. = 1 picomho/m
 $= 1 \times 10^{-12} \Omega^{-1} \text{m}^{-1} = 1 \text{ pS/m}$

5. Apparatus

5.1 Components of the conductivity test apparatus are shown in Fig. 1 and the assembled apparatus in Fig. 2.

5.2 *Conductivity Cell*, consisting of a TFE-fluorocarbon insulated, two-terminal electrode assembly, and a sample holder so configured that the electrodes are suspended in the sample without the sample contacting the insulation. The electrode gap should be not less than 1.0 mm, and the cell constant should be not greater than 0.01 cm^{-1} .

5.2.1 A typical cell assembly consists of (a) an electrode assembly², (b), a 250-ml stainless steel Griffin-form beaker and (c) a stainless steel or aluminum support disk about 1 mm thick and 80 mm in outside diameter with a 32-mm diameter center hole. Three equally spaced tabs bent down from the rim will keep the disk centered on the beaker.

5.3 *Sensitive d-c Ammeter*, capable of measuring to a least significant increment of $3 \times 10^{-14} \text{ A}$, with an error not exceeding ± 5 percent of the full-scale meter deflection, and with a rise time (10 to 90 percent) of less than 2 s for currents greater than $3 \times 10^{-13} \text{ A}$.³

¹ This method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants.

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² The 100T2 cell available from Balsbaugh Laboratories, 25 Industrial Park Rd., South Hingham, Mass. 02043, has been found satisfactory. The glass container provided with this cell is used in cleaning the cell.

³ The battery powered model 600B, or other 600 series electrometer available from Keithley Instruments, 28775 Aurora Rd., Cleveland, Ohio 44139, is satisfactory.