



# Standard Test Methods for DC Resistance or Conductance of Insulating Materials<sup>1</sup>

This standard is issued under the fixed designation D257; 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 These test methods cover direct-current procedures for the measurement of dc insulation resistance, volume resistance, and surface resistance. From such measurements and the geometric dimensions of specimen and electrodes, both volume and surface resistivity of electrical insulating materials can be calculated, as well as the corresponding conductances and conductivities.

1.2 These test methods are not suitable for use in measuring the electrical resistance/conductance of moderately conductive materials. Use Test Method [D4496](#) to evaluate such materials.

1.3 This standard describes several general alternative methodologies for measuring resistance (or conductance). Specific materials can be tested most appropriately by using standard ASTM test methods applicable to the specific material that define both voltage stress limits and finite electrification times as well as specimen configuration and electrode geometry. These individual specific test methodologies would be better able to define the precision and bias for the determination.

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.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- [D150](#) Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
- [D374](#) Test Methods for Thickness of Solid Electrical Insulation (Withdrawn 2013)<sup>3</sup>
- [D1169](#) Test Method for Specific Resistance (Resistivity) of Electrical Insulating Liquids
- [D1711](#) Terminology Relating to Electrical Insulation
- [D4496](#) Test Method for D-C Resistance or Conductance of Moderately Conductive Materials
- [D5032](#) Practice for Maintaining Constant Relative Humidity by Means of Aqueous Glycerin Solutions
- [D6054](#) Practice for Conditioning Electrical Insulating Materials for Testing (Withdrawn 2012)<sup>3</sup>
- [E104](#) Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee [D09](#) on Electrical and Electronic Insulating Materials and are the direct responsibility of Subcommittee [D09.12](#) on Electrical Tests.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

## 3. Terminology

### 3.1 Definitions:

3.1.1 The following definitions are taken from Terminology [D1711](#) and apply to the terms used in the text of this standard.

3.1.2 *conductance, insulation, n*—the ratio of the total volume and surface current between two electrodes (on or in a specimen) to the dc voltage applied to the two electrodes.

3.1.2.1 *Discussion*—Insulation conductance is the reciprocal of insulation resistance.

3.1.3 *conductance, surface, n*—the ratio of the current between two electrodes (on the surface of a specimen) to the dc voltage applied to the electrodes.

3.1.3.1 *Discussion*—(Some volume conductance is unavoidably included in the actual measurement.) Surface conductance is the reciprocal of surface resistance.

3.1.4 *conductance, volume, n*—the ratio of the current in the volume of a specimen between two electrodes (on or in the specimen) to the dc voltage applied to the two electrodes.

3.1.4.1 *Discussion*—Volume conductance is the reciprocal of volume resistance.

3.1.5 *conductivity, surface, n*—the surface conductance multiplied by that ratio of specimen surface dimensions (distance between electrodes divided by the width of electrodes defining the current path) which transforms the measured conductance to that obtained if the electrodes had formed the opposite sides of a square.