



Standard Test Method for Thermal Transmission Properties of Thin Thermally Conductive Solid Electrical Insulation Materials¹

This standard is issued under the fixed designation D 5470; 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 Department of Defense.

1. Scope

1.1 This standard covers a test method for measuring thermal impedance of thin electrical insulation materials.

1.2 This test method is useful with either homogeneous or composite thermally conductive sheet material ranging from 0.02 to 10 mm in thickness.

1.3 This test method measures steady-state heat flux through a flat specimen. Calculations are made as if the specimens were homogeneous. In fact, these materials are usually not homogeneous, but the assumption does not detract from the usefulness of the test methods.

1.4 The term “thermal conductivity” applies only to homogeneous materials. Thermally conductive electrical insulating materials are usually heterogeneous since they typically include fillers, binders, reinforcements such as glass fiber mesh, or a layer of polymeric film. To avoid confusion, this test method uses “apparent thermal conductivity” for measurements of both homogeneous and non-homogeneous materials.

1.5 A limitation of using this test method to calculate apparent thermal conductivity is the problem of accurately determining the specimen thickness. To reflect the commercial practice of measuring thickness as manufactured rather than measuring thickness in an assembly, thickness is determined from measurements made at room temperature in accordance with Method C of Test Methods D 374.

1.6 Thermal impedance test data are influenced by contact pressures, specimen surface characteristics, and the existence of alternate paths for heat transmission which are not through the specimen. This test method determines thermal conduction properties under a specific set of conditions (including a 50°C average test temperature) which may not agree exactly with the conditions in an application. As a result, the degree of correlation between this test method and any particular application needs to be determined.

1.7 The values stated in SI units are to be regarded as standard.

1.8 *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.*

NOTE 1—Earlier versions of this document included a Method B (the Roiseland Method). This method is now deleted because of a lack of general support.

2. Referenced Documents

2.1 ASTM Standards:

D 374 Test Methods for Thickness of Solid Electrical Insulation²

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method³

E 1225 Test Method for Thermal Conductivity of Solids by Means of the Guarded-Comparative-Longitudinal Heat Flow Technique³

2.2 Military Specification:

MIL-I-49456 Insulation Sheet, Electrical, Silicone Rubber, Thermally Conductive, Fiberglass Reinforced⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *average temperature (of a surface), n*— the area-weighted mean temperature.

3.1.2 *composite, n*—a material made up of distinct parts which contribute, either proportionally or synergistically, to the properties of the combination.

3.1.3 *homogeneous material, n*—a material in which relevant properties are not a function of the position within the material.

¹ This test method is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.19 on Dielectric Sheet and Roll Products.

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

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

