



Designation: D6744 – 23

Standard Test Method for Determination of the Thermal Conductivity of Anode Carbons by the Guarded Heat Flow Meter Technique¹

This standard is issued under the fixed designation D6744; 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.

1. Scope*

1.1 This test method covers a steady-state technique for the determination of the thermal conductivity of carbon materials in thicknesses of less than 25 mm. The test method is useful for homogeneous materials having a thermal conductivity in the approximate range $1 < \lambda < 30 \text{ W}/(\text{m}\cdot\text{K})$, (thermal resistance in the range from 10 to $400 \times 10^{-4} \text{ m}^2 \cdot \text{K}/\text{W}$) over the approximate temperature range from 150 K to 600 K. It can be used outside these ranges with reduced accuracy for thicker specimens and for thermal conductivity values up to $60 \text{ W}/(\text{m}\cdot\text{K})$.

NOTE 1—It is not recommended to test graphite cathode materials using this test method. Graphites usually have a very low thermal resistance, and the interfaces between the specimen to be tested and the instrument become more significant than the specimen itself.

1.2 This test method is similar in concept to Test Methods E1530 and C518. Significant attention has been paid to ensure that the thermal resistance of contacting surfaces is minimized and reproducible.

1.3 The values stated in SI units are regarded as standard.

1.3.1 *Exception*—The values given in parentheses are for information only.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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 D02.05 on Properties of Fuels, Petroleum Coke and Carbon Material.

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2. Referenced Documents

2.1 ASTM Standards:²

- C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants
- E1530 Test Method for Evaluating the Resistance to Thermal Transmission by the Guarded Heat Flow Meter Technique

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *average temperature, n* —the average temperature of a surface is the area-weighted mean temperature of that surface.

3.2.2 *heat flux transducer, HFT, n* —a device that produces an electrical output that is a function of the heat flux, in a predefined and reproducible manner.

3.2.3 *thermal conductance, C, n* —the time rate of heat flux through a unit area of a body induced by unit temperature difference between the body surfaces.

3.2.4 *thermal conductivity, λ, n* —the time rate of heat flow, under steady conditions, through unit area, per unit temperature gradient in the direction perpendicular to the area.

3.2.5 *thermal resistance, R, n* —the reciprocal of thermal conductance.

3.3 Symbols:

- λ = thermal conductivity, $\text{W}/(\text{m}\cdot\text{K})$, $[\text{Btu}\cdot\text{in}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})]$
- C = thermal conductance, $\text{W}/(\text{m}^2\cdot\text{K})$, $[\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})]$
- R = thermal resistance, $\text{m}^2\cdot\text{K}/\text{W}$, $(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F}/\text{Btu})$
- Δx = specimen thickness, mm, (in.)
- A = specimen cross sectional area, m^2 , (ft^2)

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