



Standard Practice for Evaluating Thermal Conductivity of Gasket Materials¹

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^{ε1} NOTE—Editorially corrected Footnote 6 in July 2014.

1. Scope

1.1 This practice covers a means of measuring the amount of heat transfer quantitatively through a material or system.

1.2 This practice is similar to the Heat Flow Meter System of Test Method C518, but modified to accommodate small test samples of higher thermal conductance.

1.3 The values stated in SI units are to be regarded as the standard. 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 and health practices and determine the applicability of regulatory limitations prior to use.*

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

D2214 Test Method for Estimating the Thermal Conductivity of Leather with the Cenco-Fitch Apparatus (Withdrawn 2008)³

F104 Classification System for Nonmetallic Gasket Materials

3. Terminology

3.1 Definitions:

3.1.1 *thermal conductivity, k, of a solid material*—the time rate of steady heat flow, watts (or Btu/h), through a unit area,

m^2 (or ft^2), per unit temperature gradient in the direction perpendicular to an isothermal surface $^{\circ}C/m$ (or $^{\circ}F/in.$). The k -factor is expressed $W/m \cdot K$ ($Btu \cdot in./h \cdot ft^2 \cdot ^{\circ}F$).

3.2 Symbols:

k	= thermal conductivity, $W/m \cdot K$ ($Btu \cdot in./h \cdot ft^2 \cdot ^{\circ}F$)
C	= thermal conductance, $W/m^2 \cdot K$ ($Btu/h \cdot ft^2 \cdot ^{\circ}F$)
Δx	= sample thickness, mm (in.)
A	= sample cross-sectional area, m^2 (ft^2)
q	= heat flow, W (Btu/h)
ϕ	= heat flow transducer output, mV
N	= heat flow transducer calibration constant, $W/m^2 \cdot mV$ ($Btu/h \cdot ft^2 \cdot mV$)
$N\phi$	= heat flux, W/m^2 ($Btu/h \cdot ft^2$)
ΔT	= temperature difference, $^{\circ}C$ ($^{\circ}F$) or mV
T_1	= temperature of lower sample surface, $^{\circ}C$ ($^{\circ}F$) or mV
T_2	= temperature of upper sample surface, $^{\circ}C$ ($^{\circ}F$) or mV
T_h	= temperature of HFT surface facing sample, $^{\circ}C$ ($^{\circ}F$) or mV
T_c	= temperature of upper heater surface facing sample, $^{\circ}C$ ($^{\circ}F$) or mV
T	= temperature, $^{\circ}C$ ($^{\circ}F$)
δ	= total temperature drop across interfaces between sample and adjacent surfaces, $^{\circ}C$ ($^{\circ}F$) or mV
ρ	= coefficient of thermal resistance at interfaces, $m^2 \cdot K/W$ ($h \cdot ft^2 \cdot ^{\circ}F/Btu$)
α	= correction constant
subscripts	= unknown sample
subscript r	= known calibration sample

4. Summary of Practice

4.1 The sample and the heat flow transducer (HFT) are sandwiched between two controlled heater plates. The lower heater is set at a higher temperature than the upper plate to produce a flow of heat through the sample. The differential of these two temperatures, ΔT , sensed by thermocouples, is amplified along with the electrical output, ϕ , of the HFT and is directly proportional to the heat flow through the sample, expressed as W/m^2 ($Btu/h \cdot ft^2$). See Appendix for further

¹ This practice is under the jurisdiction of ASTM Committee F03 on Gaskets and is the direct responsibility of Subcommittee F03.10 on Composite Gaskets.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.