



Standard Practice for Calibrating Thin Heat Flux Transducers¹

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1. Scope

1.1 This practice establishes an experimental procedure for determining the sensitivity of heat flux transducers (HFTs) that are relatively thin. The term *sensitivity* in this practice refers to the ratio of HFT electrical output to heat flux through the HFT.

1.1.1 For the purpose of this standard, the thickness of the HFT shall be less than 15 % of the narrowest planar dimension of the HFT.

1.2 This practice discusses two methods for determining HFT sensitivity. The first method is the calibration of the HFT in unperturbed heat flow normal to the surface of the HFT, while the second method is the sensitivity of the HFT in actual use, or the HFT conversion factor.

1.3 This practice should be used in conjunction with Practice C 1041 when measuring in-situ heat flux and temperature on industrial insulation systems, and with Practice C 1046 when performing in-situ measurements of heat flux on opaque building components.

1.4 This practice is not intended to determine the sensitivity of HFTs that are components of heat flow meter apparatus, as in Test Method C 518. Refer to Practice C 1132 for this purpose.

1.5 The following safety caveat pertains only to the Specimen Preparation and Procedure portions, Sections 5 and 6, of this practice: *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:

- C 168 Terminology Relating to Thermal Insulating²
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus²
- C 236 Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box²

C 335 Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation²

C 518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus²

C 976 Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box²

C 1041 Practice for In-Situ Measurements of Heat Flux in Industrial Thermal Insulation Using Heat Flux Transducers²

C 1044 Practice for Using the Guarded-Hot-Plate Apparatus or Thin-Heater Apparatus in the Single-Sided Mode²

C 1046 Practice for In-Situ Measurement of Heat Flux and Temperature on Building Envelope Components²

C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus²

C 1132 Practice for Calibration of the Heat Flow Meter Apparatus²

3. Terminology

3.1 *Definitions*—For definitions of terms relating to thermal insulating materials, see Definitions C 168.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *heat flux transducer*—a device containing a thermopile (or equivalent) that produces an output which is a function of the heat flux passing through the HFT.

3.2.2 *sensitivity*—the ratio of the electrical output of the heat flux transducer to the heat flux passing through the HFT. The sensitivity of the HFT will be a function of the HFT temperature, the HFT construction, its curvature, and the method with which it is applied to the building component.

3.2.3 *heat flux transducer calibration factor*—the sensitivity of the heat flux transducer when measured in an undisturbed one-dimensional temperature field.

3.2.4 *heat flux transducer conversion factor*—the sensitivity of the heat flux transducer for the thermal conditions surrounding the HFT in actual use.

3.2.4.1 The relationship between the heat flux transducer calibration and conversion factors is indicative of the magnitude of the heat flux distortion created by the application of the HFT.

3.2.5 *temperature field*—a set of temperatures, where each temperature is associated with a point or small domain of space in a region of interest. An example is the distribution of temperatures within a slab of insulation.

3.2.6 *test stack*—a layer or a series of layers of material put

¹ This practice is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.30 on Thermal Measurement.

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² *Annual Book of ASTM Standards*, Vol 04.06.