



## Standard Practice for Calibrating Thin Heat Flux Transducers<sup>1</sup>

This standard is issued under the fixed designation C1130; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This practice, in conjunction with Test Method C177, C518, C1114, or C1363, establishes an experimental procedure for determining the sensitivity of heat flux transducers that are relatively thin.

1.1.1 For the purpose of this standard, the thickness of the heat flux transducer shall be less than 30 % of the narrowest planar dimension of the heat flux transducer.

1.2 This practice discusses a method for determining the sensitivity of a heat flux transducer to one-dimensional heat flow normal to the surface and for determining the sensitivity of a heat flux transducer for an installed application.

1.3 This practice should be used in conjunction with Practice C1046 when performing in-situ measurements of heat flux on opaque building components.

1.4 This practice is not intended to determine the sensitivity of heat flux transducers that are components of heat flow meter apparatus, as in Test Method C518.

1.5 This practice is not intended to determine the sensitivity of heat flux transducers used for in-situ industrial applications that are covered in Practice C1041.

1.6 *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>

C168 Terminology Relating to Thermal Insulation

C177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of

the Guarded-Hot-Plate Apparatus

C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C1041 Practice for In-Situ Measurements of Heat Flux in Industrial Thermal Insulation Using Heat Flux Transducers

C1044 Practice for Using a Guarded-Hot-Plate Apparatus or Thin-Heater Apparatus in the Single-Sided Mode

C1046 Practice for In-Situ Measurement of Heat Flux and Temperature on Building Envelope Components

C1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus

C1155 Practice for Determining Thermal Resistance of Building Envelope Components from the In-Situ Data

C1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

### 3. Terminology

3.1 *Definitions*—For definitions of terms relating to thermal insulating materials, see Terminology C168.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *mask*—material (or materials) having the same, or nearly the same, thermal properties and thickness surrounding the heat flux transducer thereby promoting one-dimensional heat flow through the heat flux transducer.

3.2.2 *sensitivity*—the ratio of the electrical output of the heat flux transducer to the heat flux passing through the device when measured under steady-state heat flow.

3.2.3 *test stack*—a layer or a series of layers of material put together to comprise a test sample (for example, a roof system containing a membrane, an insulation, and a roof deck).

3.3 *Symbols:*  $R$  = thermal resistance,  $\text{m}^2 \cdot \text{K/W}$  ( $\text{h} \cdot \text{ft}^2 \cdot \text{F/Btu}$ )  
 $q$  = heat flux,  $\text{W/m}^2$  ( $\text{Btu/h} \cdot \text{ft}^2$ )

$Q_{\text{expected}}$  = heat flux expected in application,  $\text{W/m}^2$  ( $\text{Btu/h} \cdot \text{ft}^2$ )

$E$  = measured output voltage, V

$S$  = sensitivity,  $\text{V}/(\text{W/m}^2)$  ( $\text{V}/(\text{Btu/hr} \cdot \text{ft}^2)$ )

$\Delta T$  = temperature difference, K ( $^{\circ}\text{F}$ )

$R_{\text{layer}}$  = thermal resistance of a layer in the test stack,  $\text{m}^2 \cdot \text{K/W}$  ( $\text{h} \cdot \text{ft}^2 \cdot \text{F/Btu}$ )

$T$  = temperature, K ( $^{\circ}\text{F}$ )

$u_c$  = combined standard uncertainty

<sup>1</sup> 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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<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.