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

Description



Thermal Conductivity Measurement Device

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1. Scope
   1.1 This test method covers the measurement of steady state thermal transmission through flat slab specimens using a heat flow meter apparatus.
   1.2 The heat flow meter apparatus is used widely because it is relatively simple in concept, rapid, and applicable to a wide range of test specimens. The precision and bias of the heat flow meter apparatus can be excellent provided calibration is carried out within the range of heat flows expected. This means calibration shall be carried out with similar types of materials, of similar thermal conductances, at similar thicknesses, mean temperatures, and temperature gradients, as expected for the test specimens.
   1.3 This a comparative, or secondary, method of measurement since specimens of known thermal transmission properties shall be used to calibrate the apparatus. Properties of the calibration specimens must be traceable to an absolute measurement method. The calibration specimens should be obtained from a recognized national standards laboratory.
   1.4 The heat flow meter apparatus establishes steady state one-dimensional heat flux through a test specimen between two parallel plates at constant but different temperatures. By appropriate calibration of the heat flux transducer(s) with calibration standards and by measurement of the plate temperatures and plate separation. Fourierâ€™s law of heat conduction is used to calculate thermal conductivity, and thermal resistivity or thermal resistance and thermal conductance.
   1.5 This test method shall be used in conjunction with Practice C1045. Many advances have been made in thermal technology, both in measurement techniques and in improved understanding of the principles of heat flow through materials. These advances have prompted revisions in the conceptual approaches to the measurement of the thermal transmission properties (1-4).

1.6 This test method is applicable to the measurement of thermal transmission through a wide range of specimen properties and environmental conditions. The method has been used at ambient conditions of 10 to 40Â°C with thicknesses up to approximately 250 mm, and with plate temperatures from â€“195Â°C to 540Â°C at 25-mm thickness (5, 6).
1.7 This test method may be used to characterize material properties, which may or may not be

representative of actual conditions of use. Other test methods, such as Test Methods C236 or C976 should be used if needed.
1.8 To meet the requirements of this test method the thermal resistance of the test specimen shall be greater than 0.10 m2 Â·K/W in the direction of the heat flow and edge heat losses shall be controlled, using edge insulation, or a guard heater, or both.
1.9 It is not practical in a test method of this type to try to establish details of construction and procedures to cover all contingencies that might offer difficulties to a person without pertinent technical knowledge. Thus users of this test method shall have sufficient knowledge to satisfactorily fulfill their needs. For example, knowledge of heat transfer principles, low level electrical measurements, and general test procedures is required.
1.10 The user of this method must be familiar with and understand the Annex. The Annex is critically important in addressing equipment design and error analysis.
1.11 Standardization of this test method is not intended to restrict in any way the future development of improved or new methods or procedures by research workers. 1.12 Since the design of a heat flow meter apparatus is not a simple matter, a procedure for proving the performance of an apparatus is given in Appendix X3.

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1.13 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.
1.14 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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

5. Apparatus
   5.1 The construction guidelines given in this section should be understood by the user of this test method. While it is mandatory that these details be followed carefully when constructing an apparatus, it behooves the user to verify that the equipment is built as specified. Serious errors of measurement may result from this oversight.
   5.2 General:
   5.2.1 The general features of a heat flow meter apparatus with the specimen or the specimens installed are described in Section 6 and shown in Figs. 1-3. A heat flow meter apparatus consists of two isothermal plate assemblies, one or more heat flux transducers and equipment to control the environmental conditions when needed. Each configuration will yield equivalent results if used within the limitations stated in this test method. There are distinct advantages for each configuration in practice and these are discussed in Appendix X2.
   NOTE 2â€”Further information can be found in ISO 8301:1991, which is the equivalent ISO standard for the Heat Flow Meter Apparatus.

5.2.2 Further design considerations such as plate surface treatment, flatness and parallelism, temperature requirements and measuring system requirements can be found in Annex A1.

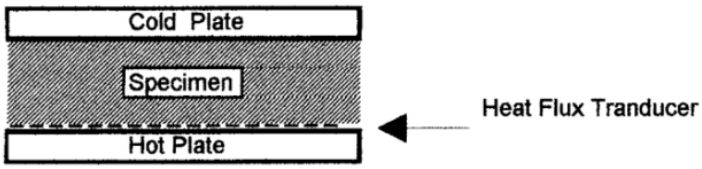
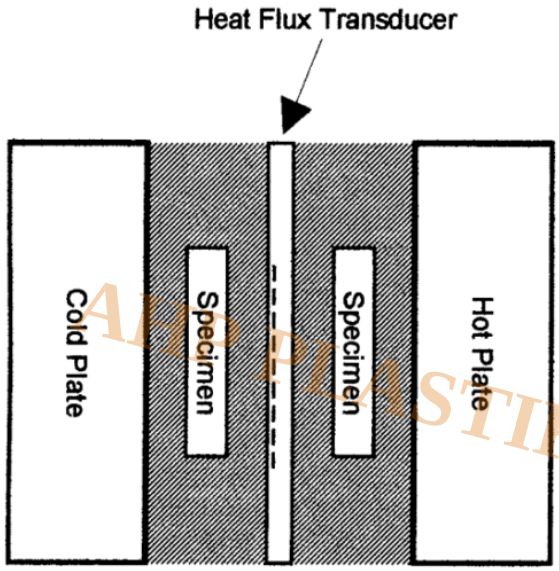


FIG. 1 Apparatus with One Heat Flux Transducer and One Specimen



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FIG. 2 Apparatus with One Heat Flux Transducer and Two Specimens

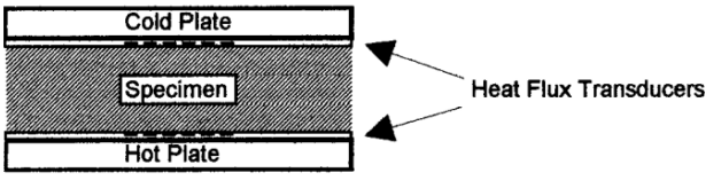


FIG. 3 Apparatus with Two Heat Flux Transducers and One Specimen



Thermal Conductivity Measurement Device According to ASTM C518, ISO 8301, EN 12667

- It is used for thermal conductivity measurement and thermal resistance measurement

- Two heat flux sensor with thermocouples
- Automated plate clamp
- Direction of test through thickness
- Thermal conductivity range 0.002-0.5 W/m.K
- Measurement time about 45 min
- Contact pressure 1 kPa
- Temperature range room temperatureâ€¦ 80C (Other ranges on request by customer either by Peltier element or external cooling unit)
- Max sample thickness 50mm
- Closed cabin for accuracy of measurements
- Sample size up to 200*200*50 mm (Other sizes on request)
- Windows based software
- Report in MS WORD
- Training video included
- Connection port to PC is USB
- Powder coated paint body
- Calculation of standard parameters automatically
- Easy calibration by operator
- Easy to service online from distance
- Online services with distance connection in maximum 24 hours

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Category

1. Equipment for Standards
2. Standards