



Thermal Conductivity of Building & Insulating Materials B480



- ***Supplied with Software to Allow Rapid Automatic Testing.***
- ***Utilises a Patented Heat Flowmeter.***
- ***Tests to ISO 8301.***
- ***Can be connected to any IBM Compatible PC.***
- ***Two year warranty.***



Introduction

With the general acceptance of global warming as a continuing problem, energy efficiency is becoming a higher priority for many areas of industry.

One aspect of energy efficiency is the improved insulation of buildings by using materials of a low thermal conductivity. In temperate and polar climates this results in reduced heating requirements, whilst in equatorial regions air conditioning energy consumption is decreased.

Additionally, in order to reduce CO₂ and alter emissions, legislation and standards concerning insulation levels in buildings and other applications involving heat transfer are becoming more stringent world wide.

Therefore the ability to accurately determine the thermal conductivity of a material plays an important role when considering its suitability for energy saving insulation, whether it be for building use or for more general heating or cooling processes.

Several national and international standards have been drawn up to define an acceptable method of ascertaining a material's thermal conductivity.

The direct methods typically involve thermally guarded enclosures, and require very sophisticated control and measuring techniques. They are very costly and time consuming to implement, often taking several days to test one sample at one temperature.

However, results can be obtained in a matter of hours by using a comparative method incorporating a calibrated heat flowmeter which measures heat flow through the specimen. ISO8301: 1991 is a recognised international standard using this technique.

The Hilton B480 unit is based on ISO8301 and incorporates a heat flowmeter (Patented). It provides an accurate and easy to use technique to determine the thermal conductivity of a wide range of materials used in buildings and for insulation. A standard sample size of 300 x 300 mm is used and thicknesses of up to 75mm may be tested.

The B480 can operate using either mains water-cooling or with an optional thermo-chiller

circulator. Full data logging and temperature control is available when the unit is connected to an IBM compatible PC. This feature coupled with the full colour menu driven software supplied with the unit makes the B480 suitable for commercial R & D work or product quality control as well as the teaching of students in:

- Architecture
- Building services
- Civil Engineering
- Environmental Engineering
- Mechanical Engineering
- Plant & Process Engineering
- Refrigeration & Air Conditioning

B480A Water Chiller



Capabilities and Features

- Rapid measurement of Thermal Conductivity for materials with Thermal Resistance in the range 0.1 to 1.4 m² K/W.
(Resistance=Thickness/Conductivity)
- Suitable for Sheet, Fibrous, Granular and Cellular materials.
- Measurement of the variation of Thermal Conductivity with Mean Temperatures up to 50°C.
- Suitable for soft, rigid, and semi-rigid materials up to 5kg sample weight.
- Thermal Performance of single layer and composite materials of various thicknesses up to 75mm, within the above thermal resistance range.
- Suitable for homogeneous and non-homogeneous materials.
- Fast, low cost comparative screening tests for new materials.
- Industrial research capability.



Description

An insulated fibreglass hinged enclosure houses the main components of the unit

The base section of the enclosure contains the heat flowmeter and cold plate assembly. This is cooled using water at a stable temperature such that the plate is sensibly isothermal. An optional water chiller (B480A) is available if required. The integral heat flowmeter gives a millivolt output proportional to the heat flux into the cold plate.

The enclosure top houses the electrically heated hot plate. This is controlled to a set temperature by a panel mounted four channel digital PID controller that will also control the optional water chiller(B480A).

The hot plate is raised and lowered by the screw handle mechanism situated on top of the enclosure. A dial indicator within the hand wheel enables the thickness of the specimen under test to be determined in situ. The movement of the hot plate allows for specimens up to 75 mm thick.

An optical switch under the cold plate senses the compression of loading springs to ensure that a consistent pressure is applied to every specimen.

Calibration

Each unit is supplied complete with calibration data determined from tests performed with reference samples of known thermal conductivity. The thermal conductivity of these reference samples has been found by a direct method to British Standards 874:Part 2: 1986. The calibration data provided enables the user to easily calculate the thermal conductivity of the material under test.

Software

The B480 comes complete with menu driven software that will operate on any IBM or compatible computer.

An RS232 lead supplied enables all measured parameters to be passed to the user supplied computer. The software supplied allows unattended automatic determination of the thermal conductivity of a sample over a range of mean temperatures. Data is stored on floppy disk for subsequent examination. Both graphical and numeric hard copy can be obtained using a suitable printer.

For unattended operation and safety, the unit is fitted with both overload and 30mA residual current circuit breakers, and the hot plate has high temperature cut out protection.

Specification

A bench top self-contained unit for the determination of thermal conductivity of building and other insulating materials utilising a calibrated heat flowmeter based on ISO8301.

The unit stabilises comparatively quickly and allows measurement of thermal conductivity for materials with thermal resistance in the range 0.1 to 1.4 m² K/W at mean temperatures up to 50°C.

An insulated GRP enclosure contains a height-adjustable 500W hot plate in the lid section, and a Patented heat flowmeter supported on a water-cooled cold plate in the base section.

Soft, rigid or semi-rigid materials of up to 5kg can be tested. Specimen size is 300 x 300mm and up to 75mm thick. A plinth enables granular materials to be tested.

A 4 channel digital instrument gives display of temperatures and heat flowmeter output, and provides control of hot plate temperature.

A data logging and control facility using RS232 serial lead operating at 9600 baud permits automatic determination of thermal conductivity at a range of mean temperatures. (Requires an IBM compatible personal computer with hard disk, VGA graphics, 1Mb (extended) RAM, 3 1/2" floppy disk drive and 9 or 25 pin serial port).

Related Equipment:

P.A. Hilton also have available a portable heat flowmeter HFS300, similar to that used in the B480. This can be hand held or secured to a surface and gives a digital readout of heat flow directly in W/m².

Details available on request.

Dimensions

B480

Height 46.5cm Depth 68cm
Width 95cm Weight 51 kg



Accessories and Spares

Unit supplied with:

- One experimental operating and maintenance manual in English, Spanish, French
- Software on 3 1/2" floppy disks.
- RS232 serial lead for both 9 and 25 pin D type connectors.
- Plinth for loose or granular materials.
- Insert mats for specimens with high conductivity or rough surfaces.
- Pack of sample materials available. Details available on request.
- Accessories and spares for 2 years normal operation. List available on request.

Services Required

B480 Electrical:

- Either: A. 520W, 2.5A, 220/240 Volts, Single Phase, 50Hz (with earth/ground)
- or: B. 520W, 5A, 110/120 Volts, Single Phase, 60Hz (with earth/ground)

Units for other voltages or supply frequencies are available on special order. Details available on request.

B480 Water:

3 litres/minute (minimum) at 10 m head at stable temperature.

Note that where lower mean temperatures are required, or where more accurate readings are needed, the optional **B480A** is recommended to maintain constant cold plate temperature.

(Optional) B480A:

Thermo-chiller circulator to provide chilled water for B480 down to 0°C, controlled to 0.1°C. Complete with insulated hoses and couplings.

- Requires: 2.2kW, 10A, 220/240 Volts, Single Phase, 50Hz (with earth/ground)
- or: 2.2kW, 20A, 110/120 Volts, Single Phase, 60Hz (with earth/ground)

Ordering Information

Order as: B480 Thermal Conductivity of Building & Insulating Materials.
Optional: B480A Water Chiller.

Electrical Specification

Either: **A:** 220-240 Volts, Single Phase, 50Hz (With earth/ground).
B: 110-120 Volts, Single Phase, 60Hz (With earth/ground).

Language

Either: English, Spanish or French.

Shipping specifications

B480

Net Weight: 59 kg (Approx).
Gross Weight: 105 kg (Approx).
Packing Case Dimensions: 112 x 82 x 73cm (Approx).
Packing Case Volume: 0.670 m³ (Approx).

Also Available On Request

Further detailed specification.
Additional copies of instruction manual.
Recommended list of spares for 5 years operation.

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