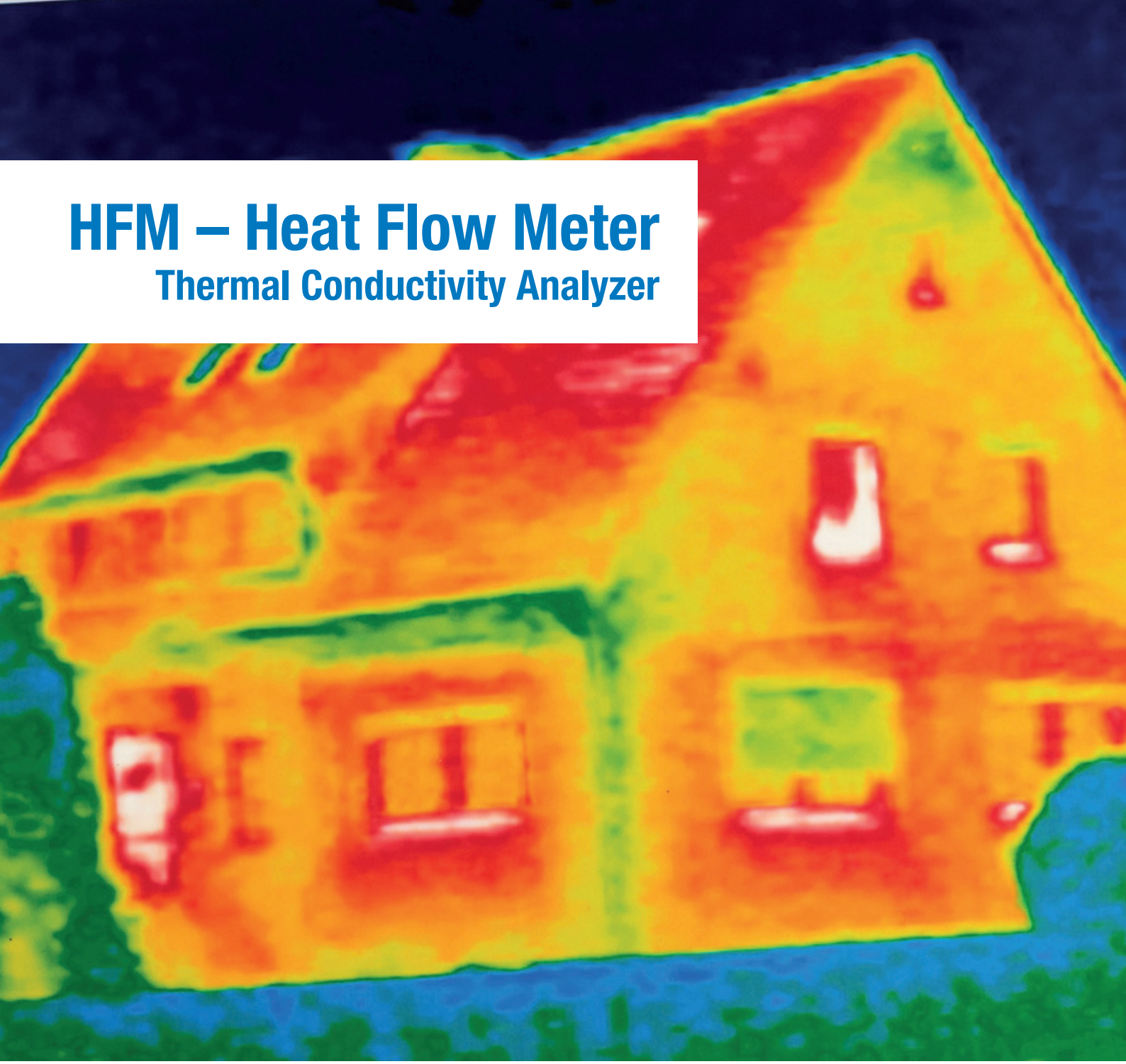


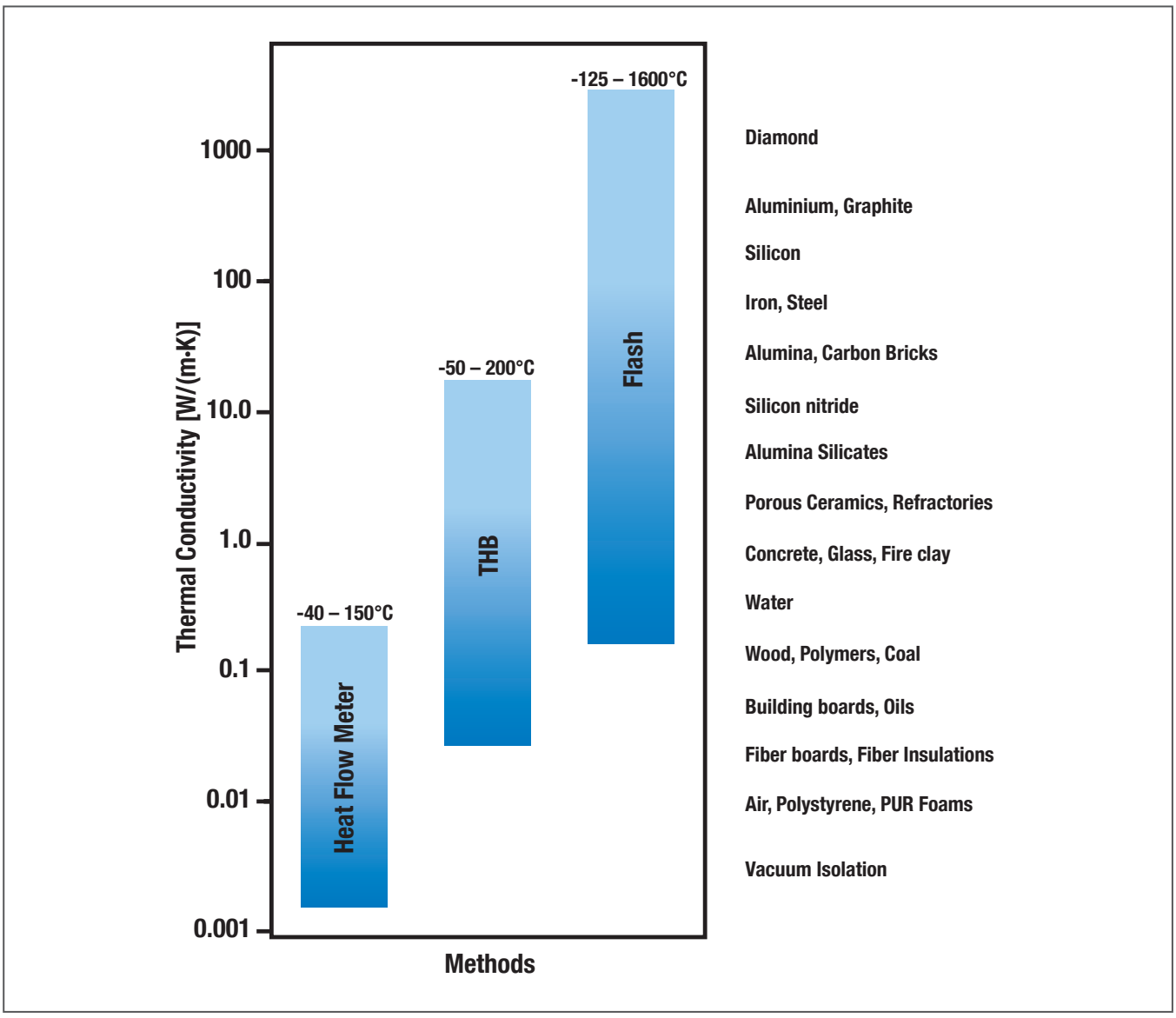
HFM – Heat Flow Meter

Thermal Conductivity Analyzer

LINSEIS

Introduction

An insulating material is a material with low thermal conductivity, which in the construction industry, equipment manufacturing, or the production of refrigerators, freezers, etc. is used for thermal insulation.
The physical properties to determine the effectiveness of insulation material are the thermal conductivity, the heat transfer coefficient.
The performance of an insolation material component is given by its heat transfer coefficent DELTA . This value can be determined with a HFM where a square specimen (300x300mm or 600x600mm) is located between a hot and a cold plate (temperature gradient). The heat transfer coeaffcient can be calculated from the measured heat flow through the sample divided by the cross-section area and the applied temperature difference. For a homogeneous material the thermal conductivity lambda is given by the quotient of DELTA divided by the sample thickness.



LINSEIS offers a complete range of thermal conductivity analyzers, ranging from Laser Flash and Xenon Flash Thermal constant Analyzers (small samples, liquids, powders, pasts, multilayer samples, broad measuring range and temperature) to Heat Flow Meters (Building and Insulation material) and a Transient Hot Bridge Analyzer (Solids, Liquids, Powders, Pasts and Gasses).
Furthermore Dilatometers (DIL L76 and L75) for length and density change and Differential Scanning Calorimeters DSC for determination of Specific Heat Cp are available.

LINSEIS HFM 300 / 600

This Heat Flow Meter provides a rapid and easy to use instrument to determine the thermal conductivity properties of low thermal conductivity insulation materials and other materials with a high level of accuracy. The instrument is designs as per ASTM C518, JIS A1412, ISO 8301 and DIN 12667. The principle of measurement is to position a sample between a hot and a cold plate, and cold plate and to measure the heat flow.

Service and Maintenance

The robust system design and the unique “zero maintenance” peltier heating and cooling cycle ensure a minimum of upholding cost.

Test Cycles

The double heat flux sensor configuration ensures shortest possible measurement cycles. A typical measurement for most samples can take as little as 15 minutes until the temperature stabilizes.

Sample Thickness

The instrument has a built in Linear Variable Differential Transformer (LVDT) offering automated highest precision sample thickness determination.

Two heat flux sensor then measures the heat flow which is precisely defined between the hot and cold plate.

HFM 300/600

System Design

Software

System Design

The LINSEIS Heat Flow Meter is a robust and reliable instrument. Its unique design enables highly accurate measurements within minutes. The intelligent peltier heating and cooling technology for the model 300/1 and 300/2 do not require any cooling water and thus reduce maintenance cost significantly. The system provides an excellent long term stability enabling precise long term aging studies. Fast measurement cycles as little as 15 minutes can be achieved, resulting in a high sampling rate. To enable these fast and precise sampling intervals the instrument uses a dual sensor arrangement. An integrated LVDT for length measurements (µm-resolution) provides immediate sample thickness data.

Instrument Features

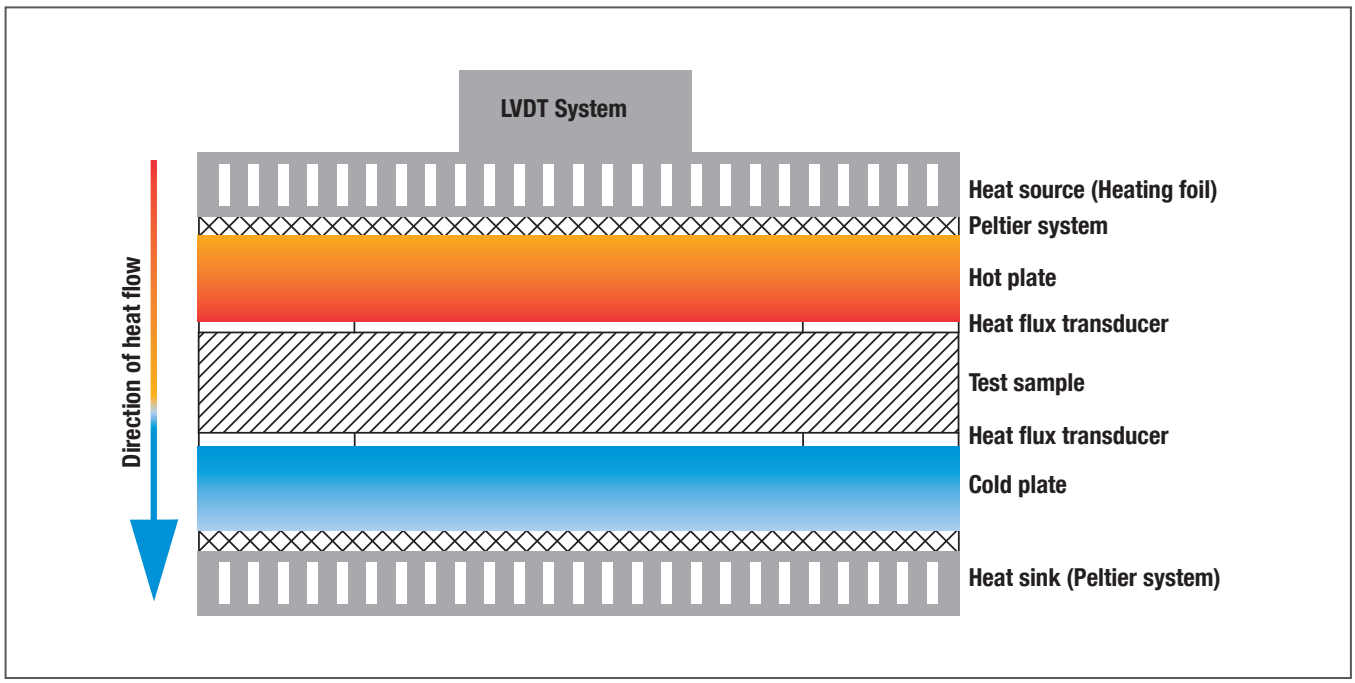
- Highest precision and accuracy
- Very robust design
- Very easy handling
- Fast sampling (approx. 15min for QC)
- Automated operation
- No cooling water required
- No PC required

Software

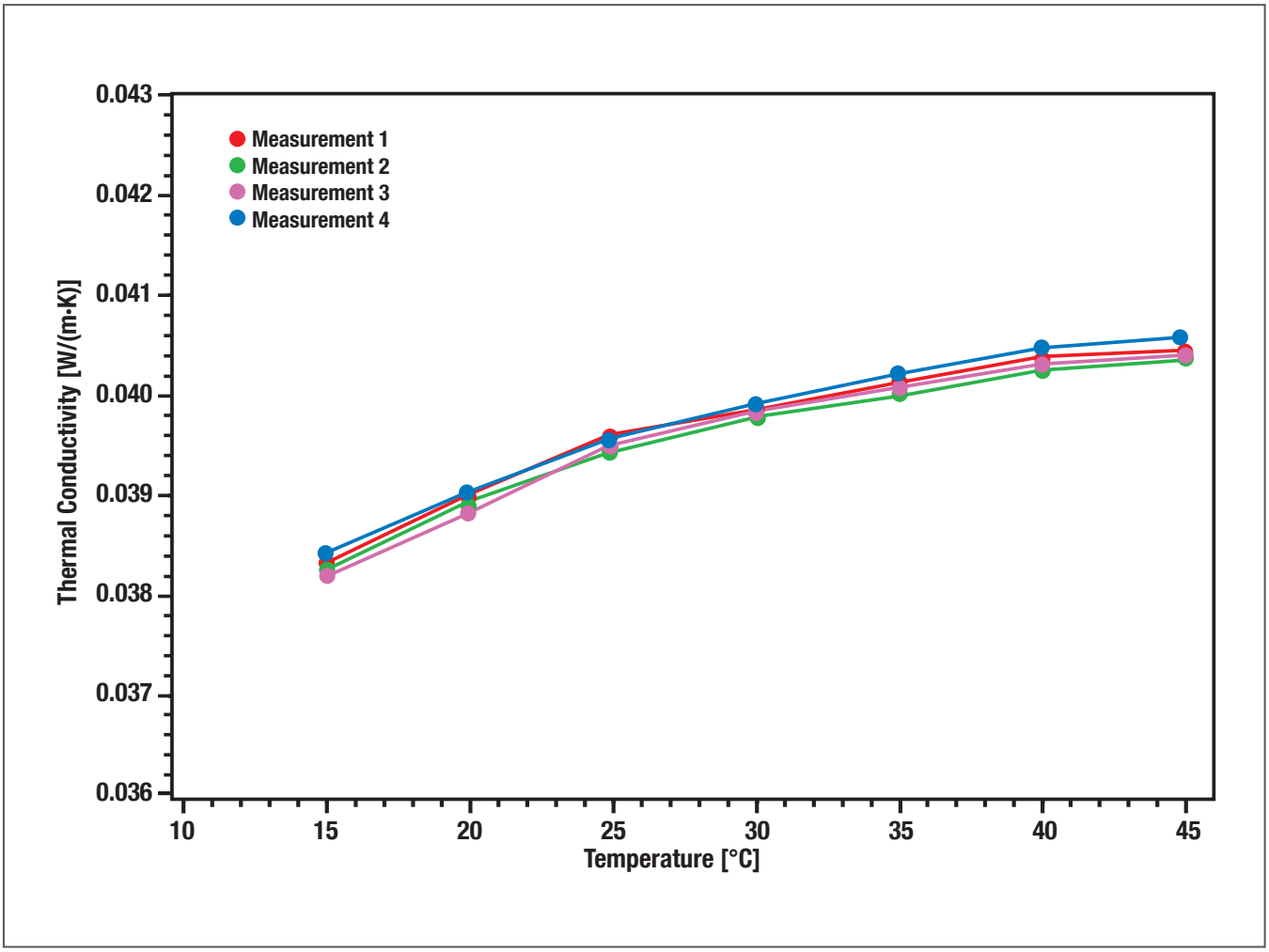
The instrument can be operated true the touch screen front panel. Optional software free of charge is available. This state of the powerfull software package bit software enables convenient temperature programming, data storage and instrument control.

Key features:

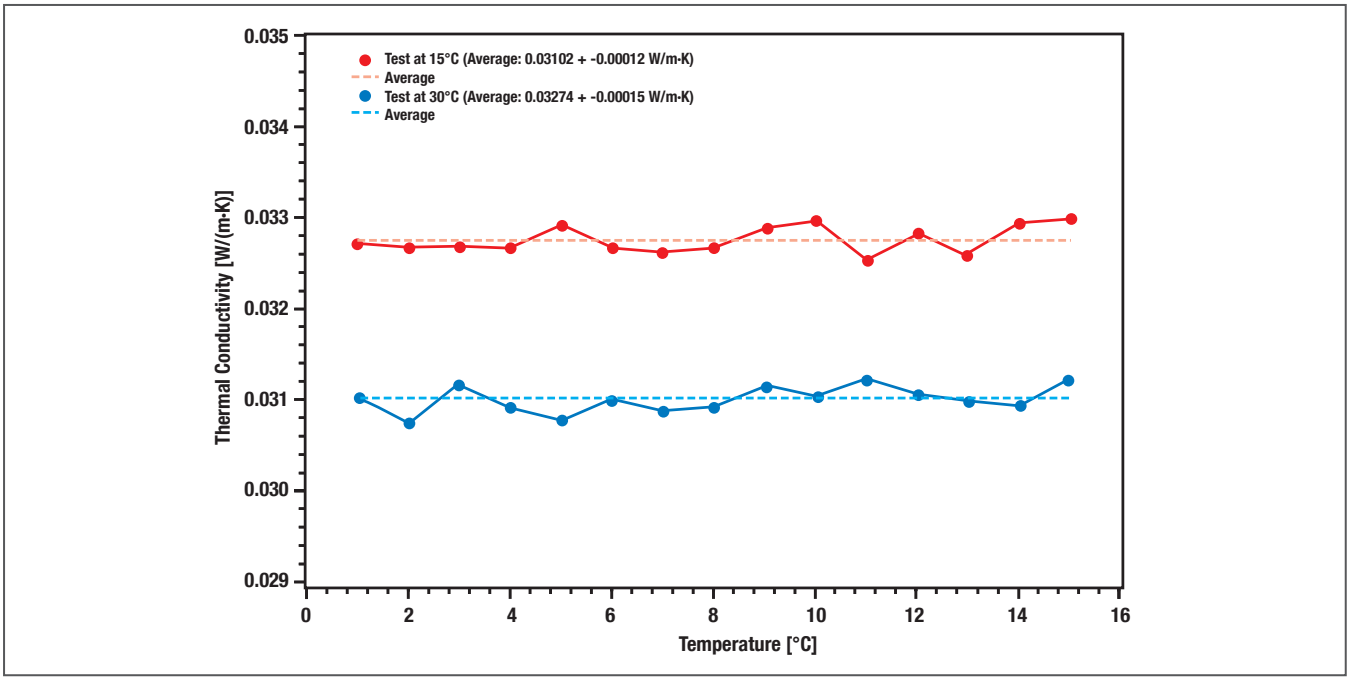
- Easy measurement parameter input
- Measurement data storage and export
- Report printing, layout can be customized
- Multi language software versions
- Instrument monitoring (plate temperature, thermal conductivity results and output signal monitoring)
- Software help functions
- Optional user login and data monitoring



Applications

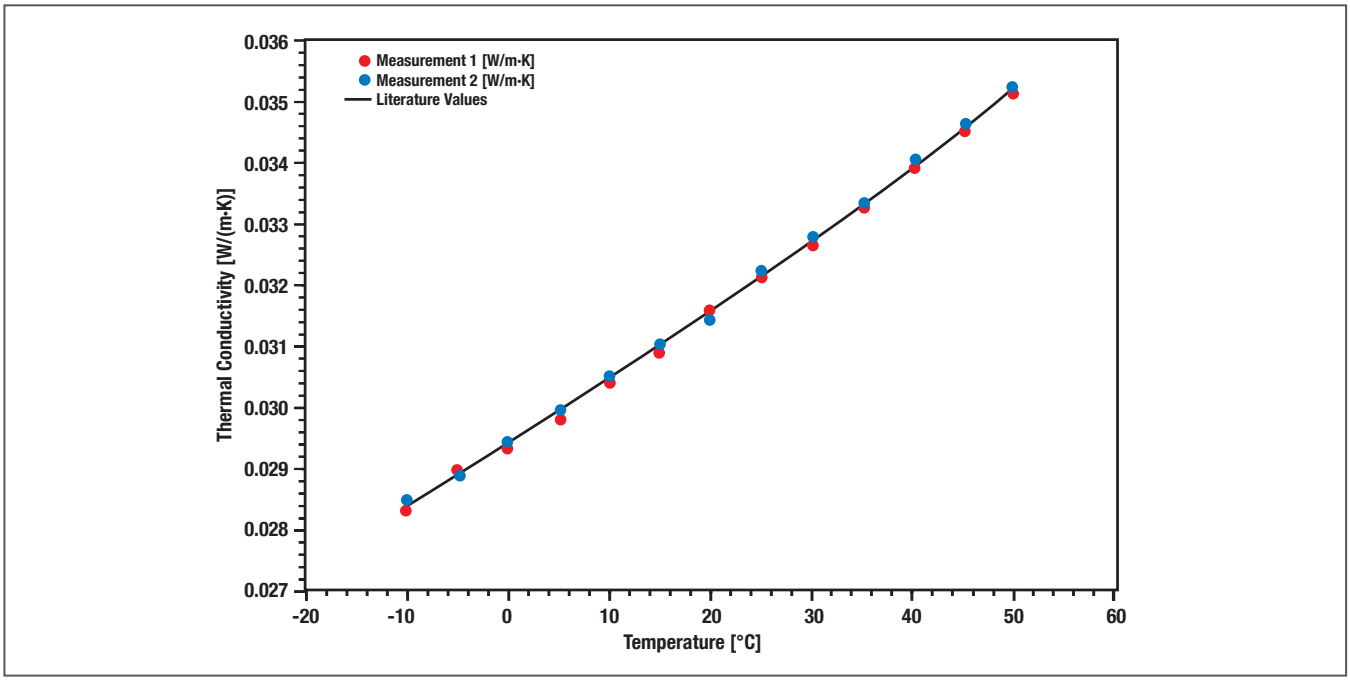


The present measurement clearly demonstrates the outstanding reproducibility of the LINSEIS HFM series. A reproducibility of 0.25% was achieved. The graph display four measurements of an Elastomer Foam in the temperature range 15 to 40°C. The sample was removed and placed into the instrument again after each measurement.



Repeatability:

15 Measurement of the IRMM-440certified reference material (Resin bonded glass fibreboard) with a thermal conductivity of 0,03276 +-0,00028 at 30°C and 0,03103+-0,00028 at 15°C.



Precision:

The graph shows two measurements of the same glass wool specimen at several temperatures. The black line shows the thermal conductivity according the manufactor information.

Technical Specifications

	HFM 300/1	HFM 300/2	HFM 300/3	HFM 600/1
Temperature range (Plates)	Fixed, 0 to 40°C	Variable, 0 to 100°C	Variable, -30 to 90°C	Variable, -20 to 70°C
Cooling system	Forced Air	Forced Air	External Chiller	External Chiller
Temperature control (Plate)	Peltier	Peltier	Peltier	Peltier
Temperature control accuracy	± 0.01°C	± 0.01°C	± 0.01°C	± 0.01°C
Measurement Data Points	1	15	15	15
Sample size	300 x 300 x 105 mm^3	300 x 300 x 105 mm^3	300 x 300 x 105 mm^3	600 x 600 x 205 mm^3
Thermal resistance measuring range	0.1 to 8.0 m^2 K/W	0.1 to 8.0 m^2 K/W	0.1 to 8.0 m^2 K/W	0.1 to 8.0 m^2 K/W
Thermal Conductivity Measuring Range	0.001 to 1 W/m·K Extension: 2.5 W/m·K* with external TC	0.001 to 1 W/m·K Extension: 2.5 W/m·K* with external TC	0.001 to 1 W/m·K Extension: 2.5 W/m·K* with external TC	0.001 to 1 W/m·K Extension: 2.5 W/m·K* with external TC
Thermal Conductivity Reproducibility	0.25%	0.25%	0.25%	0.25%
Thermal Conductivity Accuracy	± 1 to 3%	± 1 to 3%	± 1 to 3%	± 1 to 3%
Thickness accuracy	0.025 mm	0.025 mm	0.025 mm	0.025 mm
Variable contact pressure*	0 - 25 kPa	0 - 25 kPa	0 - 25 kPa	0 - 25 kPa

**optional*

LINSEIS GmbH
Vielitzerstr. 43
95100 Selb
Germany
Tel.: (+49) 9287–880 - 0
Fax: (+49) 9287–70488
E-mail: info@linseis.de

LINSEIS Inc.
109 North Gold Drive
Robbinsville, NJ 08691
USA
Tel.: (+1) 609 223 2070
Fax: (+1) 609 223 2074
E-mail: info@linseis.com

LINSEIS China
Kaige Scientific Park 2653 Hunan Road
201315 Shanghai
Tel.: (+86) 21 505 506 428 004
Fax.: (+86) 21 680 635 76

LINSEIS France
Bureaux Paris
52 Boulevard Sébastopol
75003 Paris
Tel.: (+33) 173-028 272

www.linseis.com

Products: DIL, TG, STA, DSC, HDSC, DTA, TMA, MS/FTIR, In-Situ EGA, Laser Flash, Seebeck Effect, Thin Film Analyzer, Hall-Effect

Services: Service Lab, Calibration Service

LINSEIS