NETZSCH
Proven Excellence.

Heat Flow Meter – HFM 783 *Aspida*

Based on ISO 8301, ASTM C 518, DIN EN 12664, EN 12667, JIS A1412-2
Method and Technique for the Characterization of Insulation Materials

Analyzing & Testing

A Key Parameter for Improved Energy Efficiency

THERMAL CONDUCTIVITY

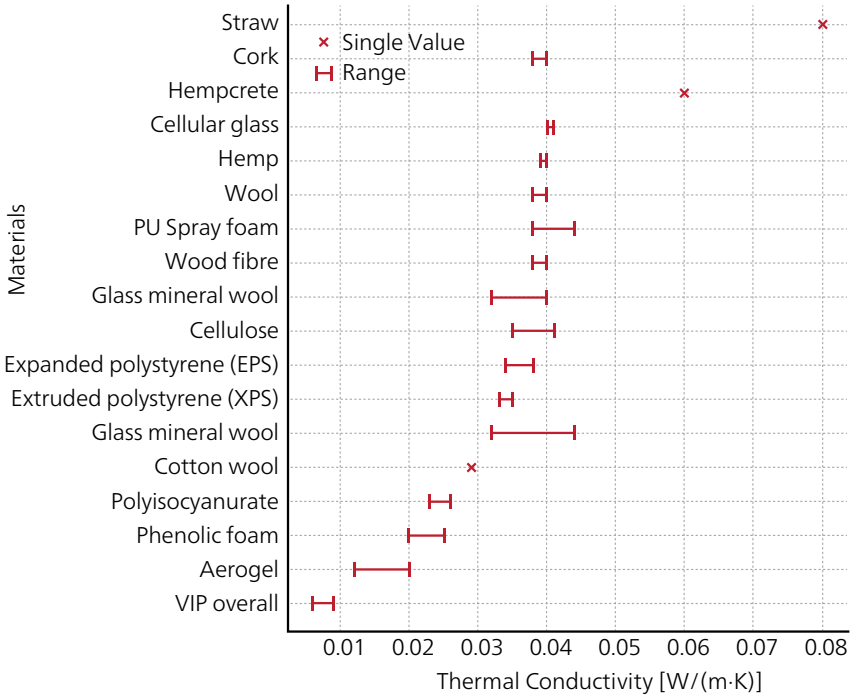
Measuring Heat Flow is of critical importance for Several Reasons

Thermal Properties
The heat flow method is used to determine the thermal conductivity and thermal transmittance (U-value) of materials, which are critical in assessing how well a material insulates.

Energy Efficiency
Accurate heat flow measurements provide insight into the efficiency of insulation materials and help identify areas prone to energy loss. This information is essential for developing energy-efficient solutions in building and machinery design.

Materials Development
Materials with lower thermal conductivity are better insulators, reducing heat transfer. This understanding guides materials development and helps engineers design energy-efficient buildings and create insulation with tailored properties, such as moisture resistance.

Standardization and Compliance
Accurate heat flow measurements are necessary for compliance with industry standards (e.g., ASTM C518, ISO 8301) to ensure that materials meet required thermal performance specifications.



There are various insulation materials available on the market, each with unique properties and thermal conductivity values.

Measuring Thermal Conductivity

The Relative Heat Flow Methodology According to Standards

The Heat Flow Meter is an efficient and precise technique for measuring thermal conductivity, particularly of insulating materials.

Set Up
A sample with a known thickness is placed between a heated top plate and a cooled bottom plate, creating a temperature gradient.

Heat Flow Measurement
As heat transfers from the hot plate to the cold plate, sensors measure the heat flow rate, which is essential for evaluating the conductivity of the material.

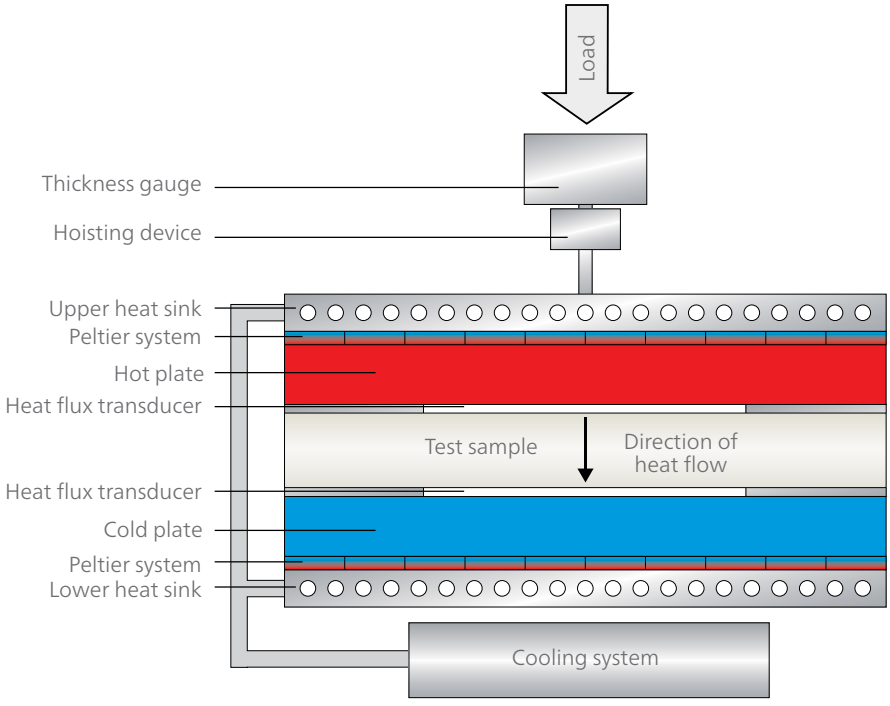
Calculation of Thermal Conductivity
Thermal conductivity (λ with the unit W/(m·K)) describes the transport of energy – in the form of heat – through a body of mass as the result of a temperature gradient. According to the second law of thermodynamics, heat always flows in the direction of the lower temperature.

Calibration
Since the Heat Flow Method is a relative method, the instrument must be calibrated against a reference material. NETZSCH also offers its own factory-certified NETZSCH EPS (expanded polystyrene) standard.

Advantages

- **Speed**
  Results can be obtained in as little as 15 minutes.
- **Accuracy**
  Advanced sensors provide reliable measurements for low-conductivity materials.
- **Versatility**
  Suitable for a variety of insulation materials and complies with test standards such as ASTM C518 and ISO 8301.

The heat flow method is an essential tool for accurate and precise thermal conductivity measurements, providing fast and reliable data for materials analysis.



The HFM 783 *Aspida*

Exceptional Value and Proven NETZSCH Performance in Quality Control and Research

Take the next step with the NETZSCH entry-level Heat Flow Meter! Perfect for businesses and laboratories seeking an accurate and economical solution for analyzing thermal conductivity.

As a leading provider of thermal analysis instruments, NETZSCH has stood for quality, reliability, and innovation for decades. Our new device brings state-of-the-art measurement technology to a wider audience – while maintaining the high standards NETZSCH is known for.

User-Friendly Design

With its compact design, intuitive software, and straightforward sample preparation, our heat flow meter is the ideal tool for both beginners and experts.

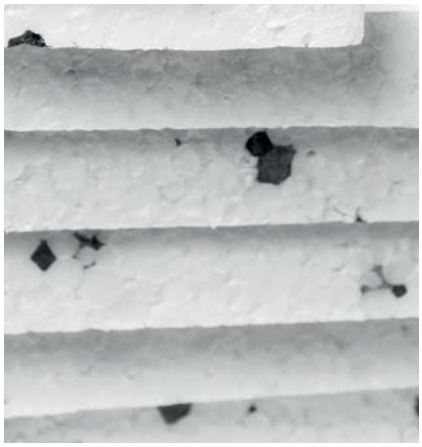
- Designed for square samples with a width of 300 mm and a thickness of up to 100 mm
- Wide thermal conductivity measurement range of $\lambda = 0.002$ to 0.5 W/m·K
- Wide temperature range of -10°C to 70°C
- Intuitive menu

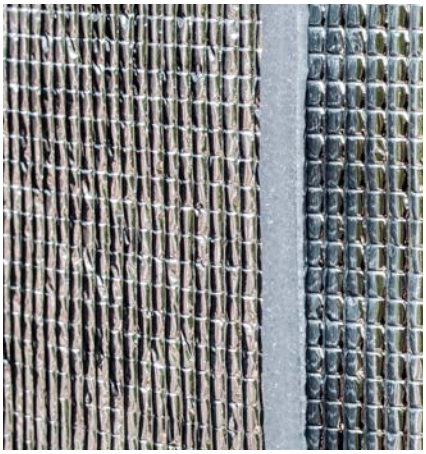
Robust and Reliable

The HFM 783 *Aspida* is designed to withstand demanding conditions, making it suitable for both industrial and research applications. Its compact construction ensures consistent performance even in harsh environments.

- Service and maintenance friendly design
- Simplified routines for definition and reuse methods
- Robust touch screen for user friendly operation
- High data storage capacity

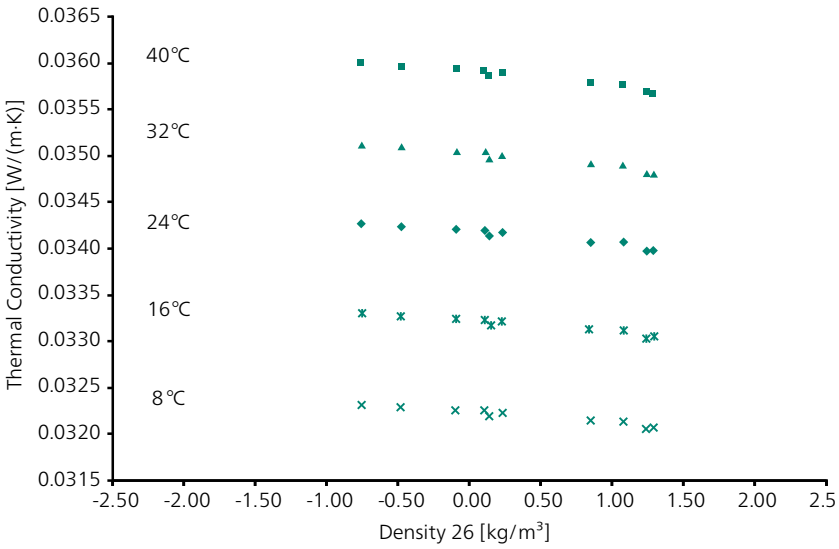
Standard-compliant, steady-state measurement method with two symmetrically arranged precision heat flux sensors in accordance with ISO 8301, ASTM C 518, DIN EN 12664, EN 12667, JIS A1412-2





Applications

Performance Checked on EPS Material



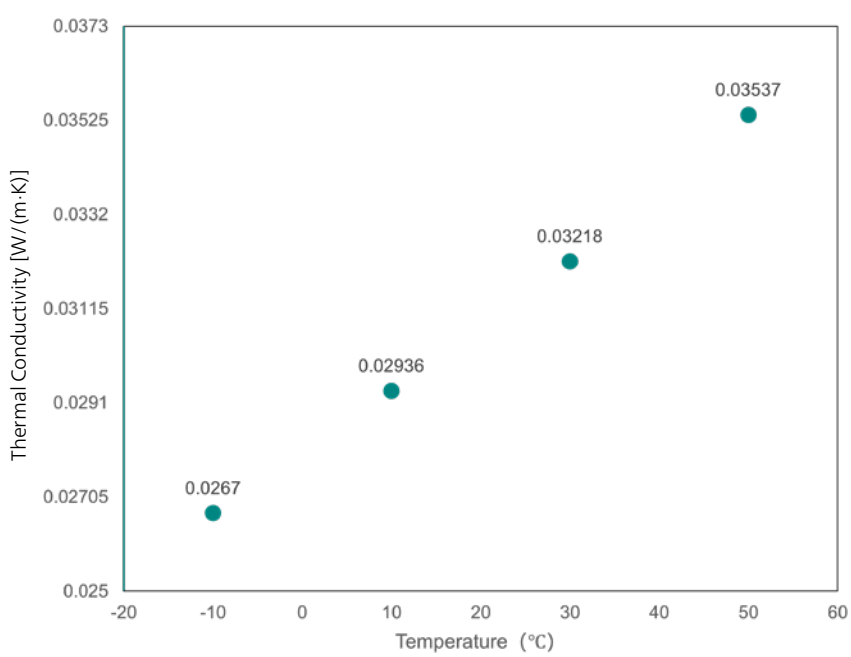
Temperature- and density-dependent thermal conductivity of 30 different NETZSCH EPS specimens.

In addition to certified reference materials from NIST and NPL, NETZSCH offers its own factory standard for the calibration and validation of HFM devices in the temperature range 8 ... 40°C: NETZSCH EPS (expanded polystyrene).

The figure shows that the thermal conductivity of NETZSCH EPS measured for 10 different specimens with the dimensions of 300 mm x 300 mm x 25 mm is reproducible to within about ± 0.5%. The mean thermal conductivity depends on the temperature and also slightly on the specimen density (mean value 26 kg/m³).

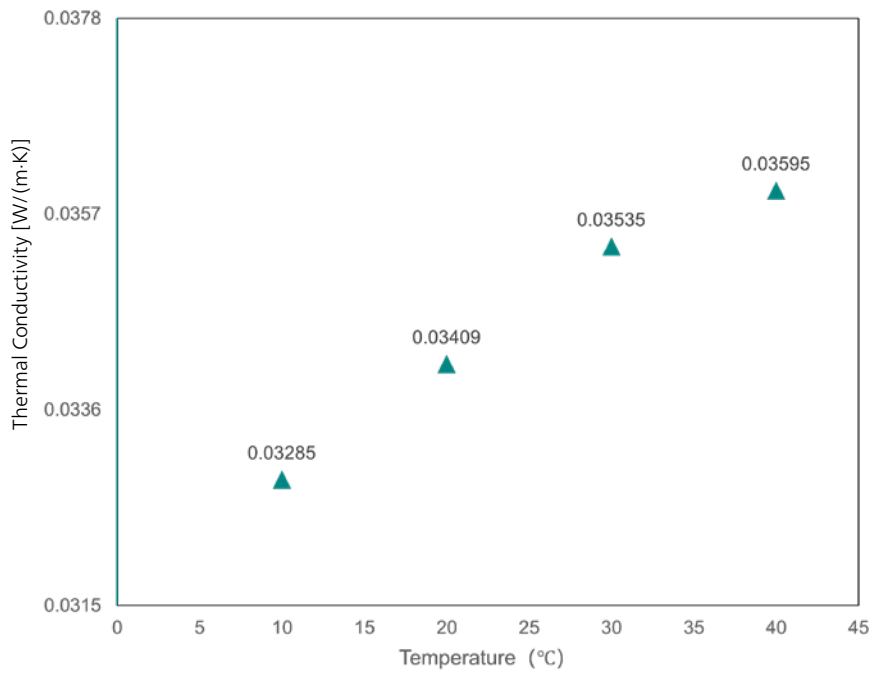
The Relationship between the Thermal Conductivity of Extruded Polystyrene Foam (XPS) Boards and Temperature

XPS (Extruded Polystyrene Foam) is a widely used thermal insulation material known for its excellent thermal stability and low water absorption. The figure on the right provides a clear understanding of the material's insulation performance under different environmental conditions. This test data provides valuable insights for assessing the effectiveness of XPS in applications such as building insulation and the thermal insulation of industrial pipework.



Temperature-dependent thermal conductivity of XPS

Thermal Conductivity Test of Fiberglass Panel

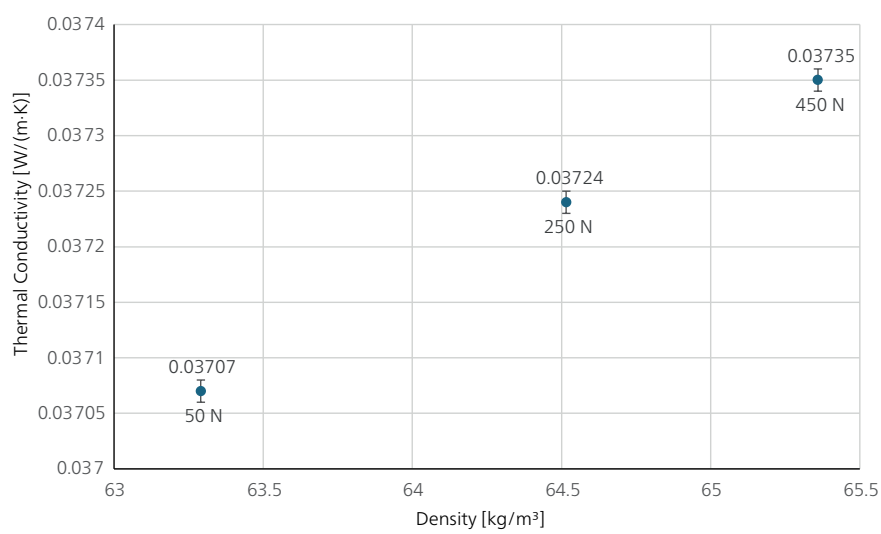


Temperature-dependent thermal conductivity of fiber glass panel

Fiberglass panels are insulators, both thermally and acoustically. They are also natural fire retardants and non-conductive, making them a versatile insulating material. During testing with the HFM 783 *Aspida*, the 20K temperature difference condition was applied.

Thermal Conductivity of Rock Wool Material Under Varying Load Forces

Rock wool, as a widely used thermal insulation material, exhibits significant performance variations under different load conditions. Testing with the HFM 783 *Aspida* revealed that as the load force increases, the thickness of the rock wool material gradually compresses, while its thermal conductivity correspondingly increases. This is primarily because, as the material density rises, the stationary air (which acts as a poor heat conductor) within the material is expelled, thereby enhancing its thermal conductivity.



The relationship between the load force and the thermal conductivity of a fiberglass panel. The applied forces are 50 N, 250 N, and 450 N.

Technical Specifications

HFM 783 *Aspida*	
Standards*	Heat flow meter method according to ISO 8301, ASTM C 518, DIN EN 12664, EN 12667, JIS A1412-2
Type	Stand-alone, with integrated touch display
Measuring range in dependence of sample thickness	0.002 to 0.5 W/(m·K)** Performance data***: ▪ Accuracy: ± 1.0 to 2.0% (ISO 8301 requires max. ± 5.0%) ▪ Repeatability: ± 0.5 % (ISO 8301 requires max. ± 1.0%)
Plate temperature range	-10°C to 70°C
Variable load	0 - 500 N (5.5 kPa)
Metering area heat flux transducer	100 mm x 100 mm
Specimen sizes (max.)	300 mm x 300 mm x 100 mm
Chiller system	External; constant temperature setpoint over plate temperature range
Plate temperature control	Peltier system
Plate motion	Motorized
Plate thermocouples	PT 100
Thermocouple resolution	± 0.01 K

* Additionally for product and measurement technique related standards, e.g., DIN EN 13162, EN 13163, EN 13164, EN 13165, EN 12939, EN 1946-3

** Others on request

*** All performance data is verified with NIST SRM 1450d (thickness 25 mm).
Please note: in the very low thermal conductivity range, accuracy of Lambda (λ) values can be restricted.

The owner-managed NETZSCH Group is a leading global technology company specializing in mechanical, plant and instrument engineering.

Under the management of Erich NETZSCH B.V. & Co. Holding KG, the company consists of the three business units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems, which are geared towards specific industries and products. A worldwide sales and service network has guaranteed customer proximity and competent service since 1873.

When it comes to Thermal Analysis, Calorimetry (adiabatic & reaction), the determination of Thermophysical Properties, Rheology and Fire Testing, NETZSCH has it covered. Our 60 years of applications experience, broad state-of-the-art product line and comprehensive service offerings ensure that our solutions will not only meet your every requirement but also exceed your every expectation.

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