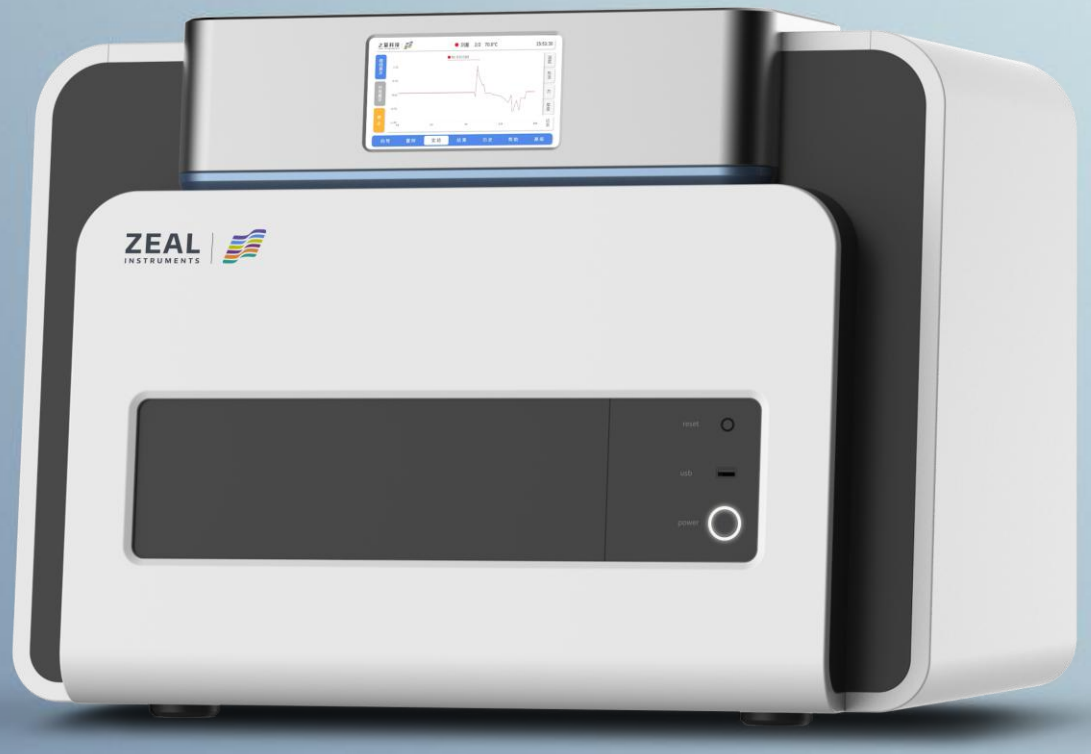
ZEAL INSTRUMENTS

Heat Flow Meter
HFM 510AE



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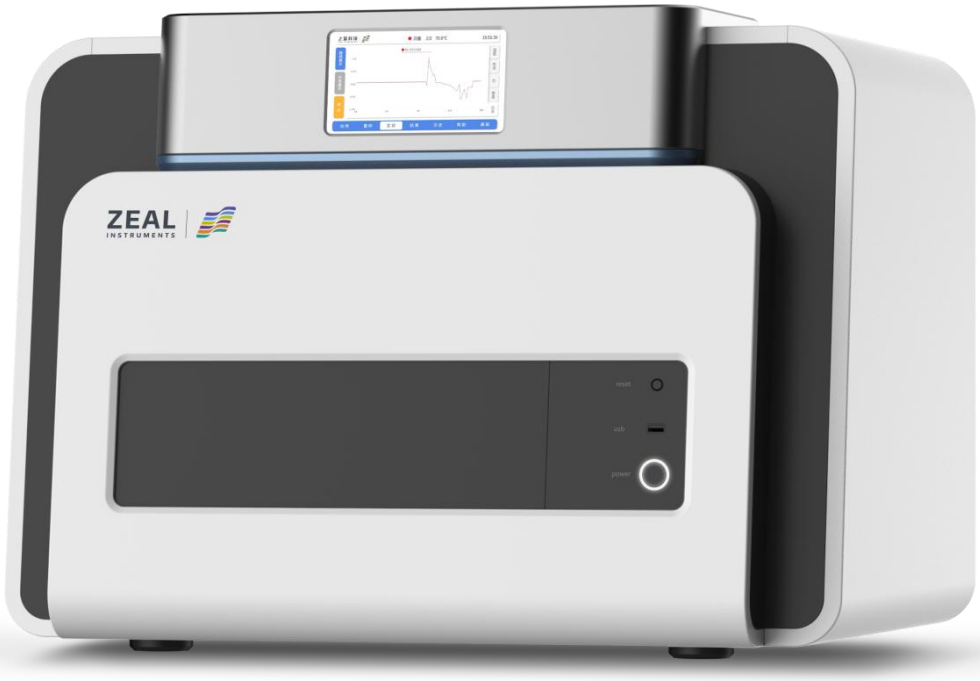
Product Overview

The Heat Flow Meter HFM 510AE, based on the steady-state heat flow meter method, offers high accuracy, efficiency, and excellent repeatability for precise thermal conductivity measurement (0.002–2 W/(m·K)) of insulation materials such as expanded/extruded polystyrene, rigid PU foam, mineral wool, expanded perlite, foam glass, natural fibers, aerogels, and concrete.



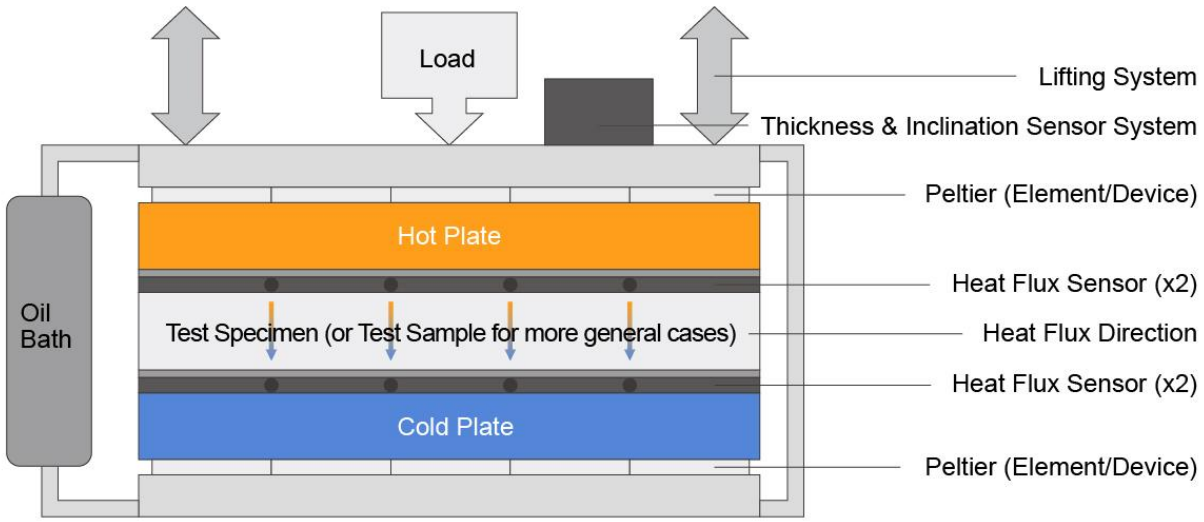
Principle

Place the sample between the upper and lower temperature-controlled plates and apply a constant temperature difference. The heat flow through the sample under steady-state conditions is measured by heat flow sensors.

The magnitude of the heat flow (Q) depends on the sample's thermal conductivity (λ), thickness (Δx), temperature difference (ΔT) between the plates, and the heat transfer area (A).

According to Fourier's Law, upon reaching thermal equilibrium, the thermal conductivity (λ) is calculated by the following formula:

$$Q = -\lambda A \frac{dt}{dx}$$



Principle Structure Diagram

Testing Standards

GB/T 10295-2008

Thermal insulation - Determination of steady-state thermal resistance and related properties - Heat flow meter apparatus

ASTM C518-17

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

ISO 8301:1991

Thermal insulation - Determination of steady-state thermal resistance and related properties - Heat flow meter apparatus

DIN EN 12667:2001

Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

Technical Specifications

- **Operating Environment:** 5 ℃ – 40 ℃, <95% RH
- **Plate Temperature Range:** -20–100 ℃
- **Sample Dimensions:** 300 mm × 300 mm, with a thickness range of 5 to 100 mm
- **Thermal Resistance Range:** 0.1–8 m^2·K/W
- **Thermal Conductivity Measurement Range:** 0.002–1 W/(m·K), extendable to 1–2 W/(m·K)
- **Sample Measurement Accuracy:** ±2%
- **Sample Measurement Repeatability:** 0.5%
- **Maximum Adjustable Contact Load:** 1930 N
- **Adjustable Contact Load Accuracy:** 5%

Product Features

Fully integrated automation for effortless operation.

High-precision thermal conductivity measurement with verified accuracy.

Customizable testing modes to meet diverse requirements.

Intelligent data management for significantly enhanced productivity.

Product Advantages

Fully Integrated Automation for Effortless Operation

The instrument features fully automated operations including hot plate lifting, automatic force loading, precise thickness measurement, intelligent temperature control, and motorized chamber door movement. Users simply need to place the sample and set parameters to initiate the test with minimal effort.

Product Advantages

High-Precision Thermal Conductivity Measurement with Verified Accuracy and Reliability

The instrument ensures data integrity through three core technical features: independent temperature control of both plates for precise, stable unidirectional heat field establishment; external oil bath cooling for long-term thermal stability and testing efficiency; and internal nitrogen purging to eliminate moisture interference.

Product Advantages

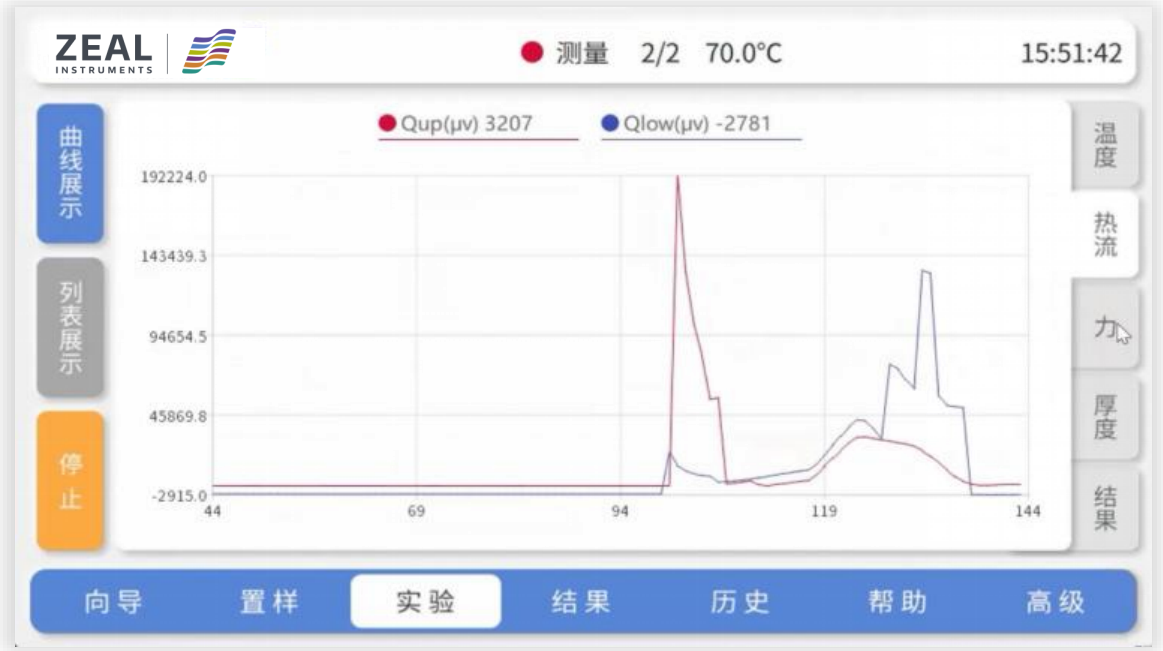
Customizable Testing Modes for Comprehensive Requirement Coverage

Overcoming the 1–2 hour measurement bottleneck of traditional steady-state heat flow meter methods, the instrument offers three distinct testing modes—Custom, Rapid, and Standard (ASTM C518)—to accommodate diverse needs for precision and testing duration.

Product Advantages

Intelligent Data Management for Significantly Enhanced Productivity

The system features optional user login with access control, supports real-time data visualization in both graphical and tabular formats, automatically generates test reports and synchronizes results to a dedicated database, while enabling historical data retrieval with date-based filtering and customizable export functions.



Operating Instructions

Step 1: Sample Preparation

Block Samples: 300 mm (length) × 300 mm (width) × 5-100 mm (thickness).

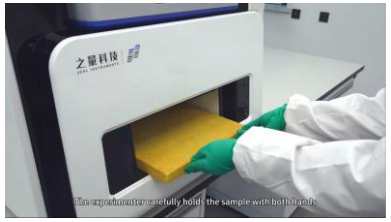
Powder Samples: Must be pre-pressed into a formed specimen using a mold.

Step 2: Parameter Setting

Set the standby temperature, measurement points, and test mode (only one mode can be selected for a single experiment).

Step 3: Sample Placement

Place the sample smoothly inside the test chamber. The upper plate will then lower and the chamber will close.



Step 4: Test Completion

The test results, including the data table and line graph, are automatically displayed on the screen.

No.

Instrument Calibration

- **Sample Name:** Medium-Alkali Glass Fiber Resin Board
- **Test Condition:** Variable Temperature 100 N
- **Test Date:** 05/2025
- **Test Count:** 3

- 25 °C Test Point: Mean Value 0.00448, Repeatability 0.077%

No.	Set Temperature (Celsius)	Test Time	Measured Average Temperature (Celsius)	Measured Temperature Difference (Celsius)	Sample Thickness (mm)	Measured Pressure (N)	Calibration Factor ($W \cdot m^{-2} \cdot V^{-1}$)
1	25	0:49:31	24.999	20.00	26.01	98.8	0.004478
2	25	1:03:31	25.004	20.00	26.01	99.2	0.004484
3	25	1:24:01	24.998	20.01	26.01	99.9	0.004478

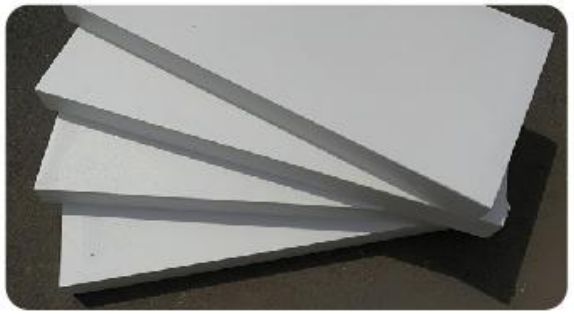
- 70 °C Test Point: Mean Value 0.00437, Repeatability 0.233%

No.	Set Temperature (Celsius)	Test Time	Measured Average Temperature (Celsius)	Measured Temperature Difference (Celsius)	Sample Thickness (mm)	Measured Pressure (N)	Calibration Factor ($W \cdot m^{-2} \cdot V^{-1}$)
1	70	2:13:01	69.996	20.00	26.29	104.4	0.004386
2	70	2:27:30	70.005	20.00	26.31	106.6	0.004367
3	70	2:41:30	70.002	20.00	26.32	108.2	0.004370

Application Fields

Thermal Insulation Materials

Glass Fiber

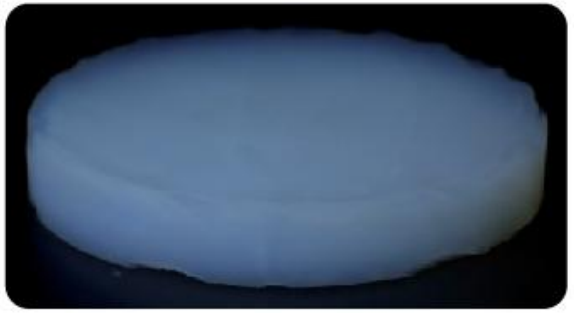


Expanded Polystyrene (EPS)

Wood Fiber Insulation Board

Rigid Graphite Foam Materials

Rubber & Elastomers



Porous Aerogels

Proficiency Testing

中国认可
能力验证
PROFICIENCY TESTING
CNAS PT0017

能力验证结果证书

证书编号：CNAS PT0017-T265-0020

之量科技：

贵机构参加2024年由山东非金属材料研究所组织开展的保温材料导热系数的测定能力验证项目，其中，导热系数参数提交的检测/校准结果为满意结果，特发此证。

山东非金属材料研究所

2024年11月29日

中国认可
能力验证
PROFICIENCY TESTING
CNAS PT0017

能力验证计划结果通知单

计划编号：CNAS-PT0017-T265

计划名称：保温材料导热系数的测定

实验室名称：之量科技

实验室代码：20

测试项目	实验室结果 (W/(m·K))	中位值 (W/(m·K))	标准化 IQR (W/(m·K))	Z 比分数
导热系数	0.0333	0.0336	0.000593	-0.51

注：1. |Z|≤2 为满意结果；
2<|Z|<3 为有问题的结果，用 * 标出；
|Z|≥3 为不满意（离群）结果，用 § 标出。
2. 本结果通知单应与能力验证计划结果报告结合使用。

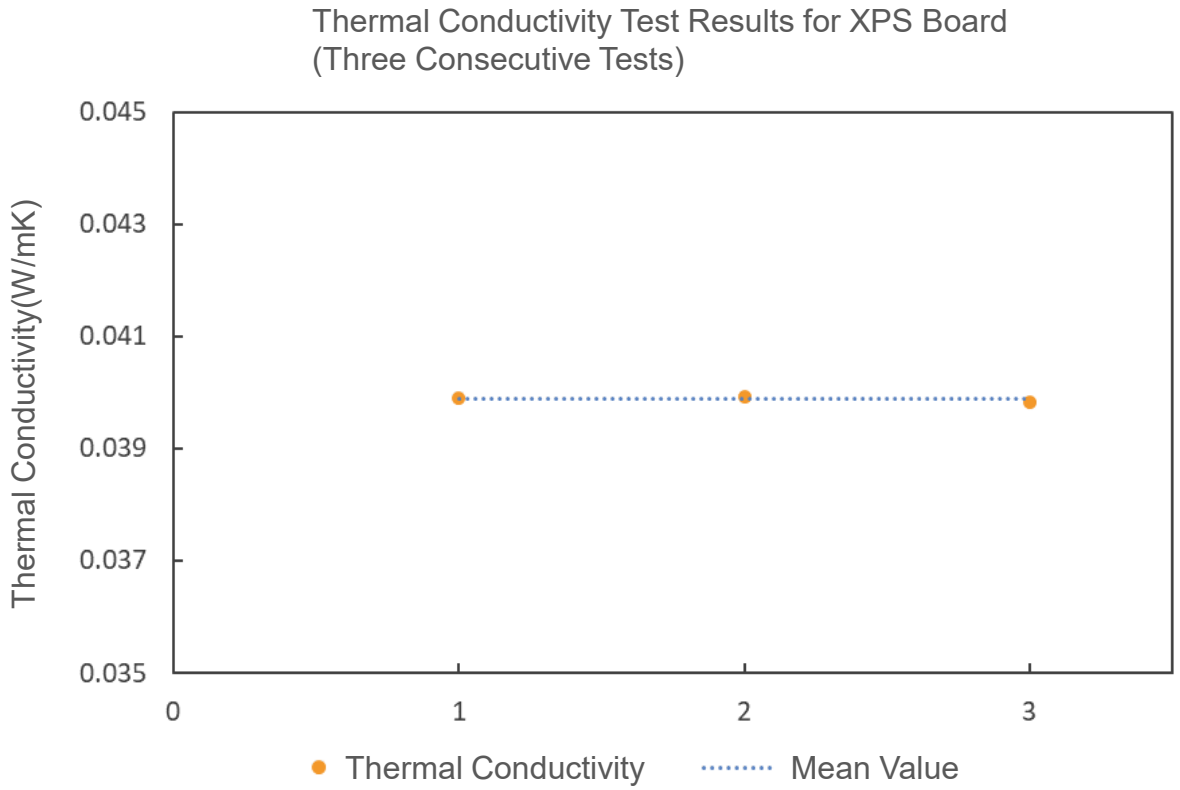
山东非金属材料研究所

2024年11月29日

Typical Example

- Thermal conductivity test results (25 °C) for three consecutive measurements

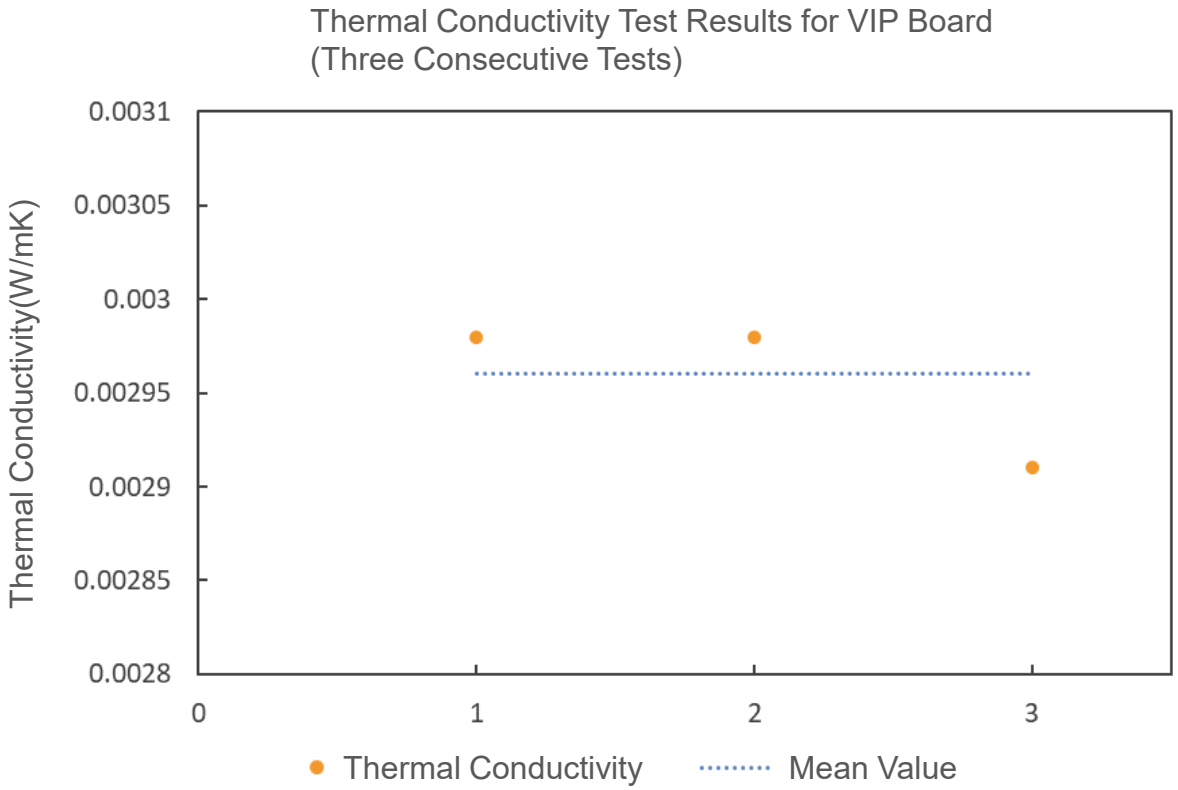
Group	Thermal Conductivity (λ) [W/(m·K)]	Mean Value [W/(m·K)]	Repeatability
1	0.03989		
2	0.03992	0.03988	0.129%
3	0.03982		



Typical Example

- Vacuum Insulation Panel (VIP): Thermal Conductivity Test Results from Three Consecutive Measurements (25 °C)

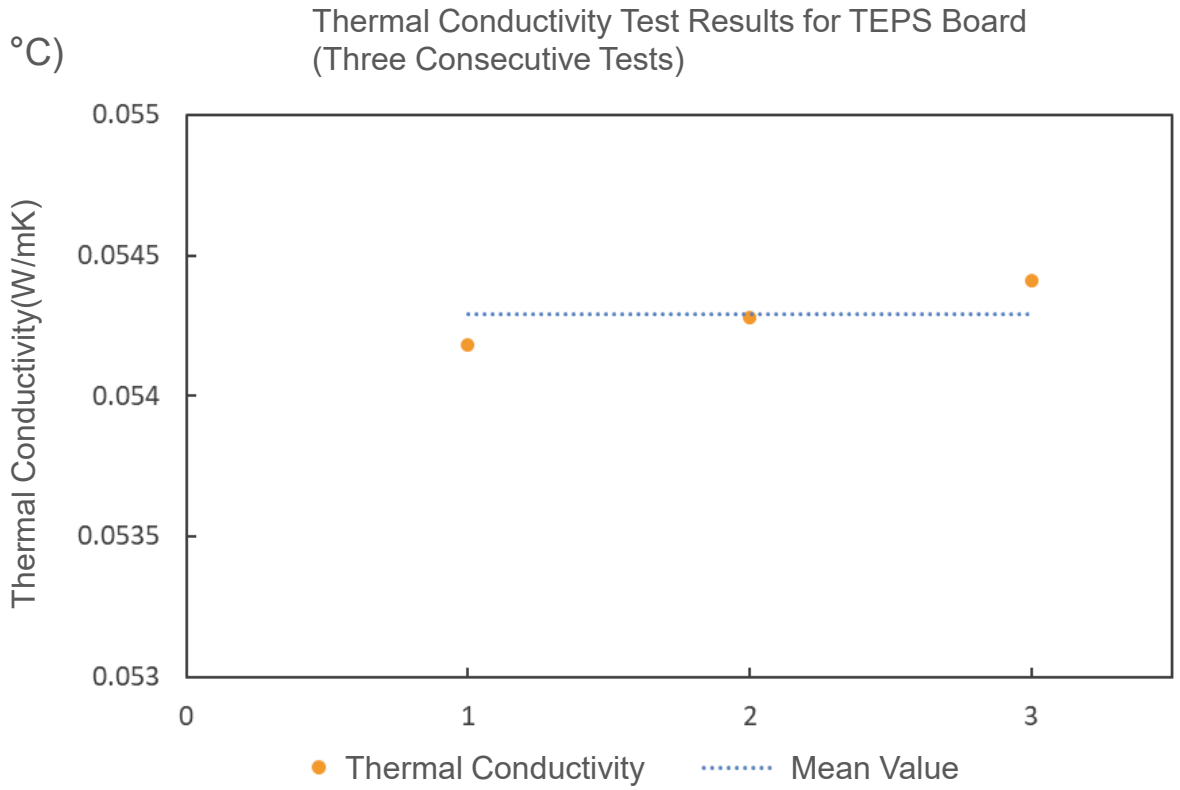
Group	Thermal Conductivity (λ) [W/(m·K)]	Mean Value [W/(m·K)]	Repeatability
1	0.00294		
2	0.00291	0.00292	0.523%
3	0.00292		



Typical Example

- Thermal Conductivity Test Results for Thermoset Composite Polystyrene (TEPS) Foam Board (Three Consecutive Tests, 25 °C)

Group	Thermal Conductivity (λ) [W/(m·K)]	Mean Value [W/(m·K)]	Repeatability
1	0.05418		
2	0.05428	0.05429	0.212%
3	0.05441		



THANKS