LINSEIS

pushing boundaries

TIM L58

Thermal Interface **Material Tester**

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Since 1957 LINSEIS Corporation has been delivering outstanding service, know-how and leading innovative products in the field of thermal analysis and thermo-physical properties.

Customer satisfaction, innovation, flexibility, and high quality are what LINSEIS represents. Thanks to these fundamentals, our company enjoys an exceptional reputation among the leading scientific and industrial organizations. LINSEIS has been offering highly innovative benchmark products for many years.

The LINSEIS business unit of thermal analysis is involved in the complete range of thermoanalytical equipment for R&D as well as quality control. We support applications in sectors such as polymers, chemical industry, inorganic building materials, and environmental analytics. In addition, thermophysical properties of solids, liquids, and melts can be analyzed.

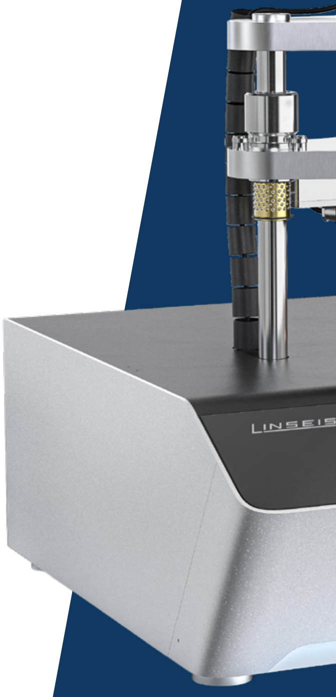
Rooted in a strong family tradition, LINSEIS is proudly steered into its third generation, maintaining its core values and commitment to excellence, which have been passed down through the family leadership. This generational continuity strengthens our dedication to innovation and quality, embodying the essence of a true family-run business.

LINSEIS provides technological leadership. We develop and manufacture thermoanalytic and thermophysical testing equipment to the highest standards and precision. Due to our innovative drive and precision, we are a leading manufacturer of thermal analysis equipment.

The development of thermoanalytical testing machines requires significant research and a high degree of precision. LINSEIS Corp. invests in this research to the benefit of our customers.

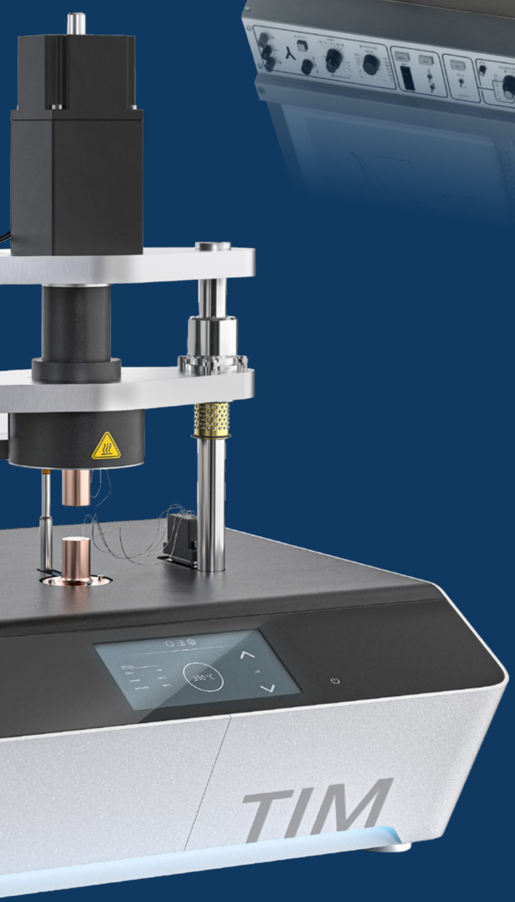
CLAUS LINSEIS

CEO DIPL. PHYS.



To strive for the best due diligence and accountability is part of our DNA. Our history is affected by German engineering and strict quality control.

We want to deliver the latest and best technology for our customers. LINSEIS continues to innovate and enhance our existing thermal analyzers. Our goal is to constantly develop new technologies to enable continued discovery in Science.



Enginering & Innovation

Linseis **Service**

Customized Solutions - The Linseis Advantage

At Linseis, we believe that every measurement challenge is unique — and so should be your instrument.
While many suppliers rely on standardized configurations, Linseis distinguishes itself through exceptional flexibility and the capability to deliver customer-specific adaptations in record time.

Our experienced engineering teams work hand in hand with you to design and implement fully customized solutions that meet your precise application requirements — whether that means a unique sensor configuration, an extended temperature range, or a specialized software integration.

With decades of experience and a modular product architecture, we turn customization into a standard service — fast, efficient, and reliable.
Choose Linseis and experience what true flexibility in thermal analysis and material characterization means.

Contact form

Service & Support

Redefining Ownership

When investing in analytical instrumentation, long-term value matters just as much as precision. That's why Linseis systems are engineered to deliver the lowest **Total Cost of Ownership** in their class — combining reliability, efficiency, and flexibility in every detail.

Our instruments are built with robust, high-quality components designed for longevity and minimal maintenance. This means fewer service interventions, shorter downtimes, and reduced operating costs over the entire product lifetime. Intelligent software updates and remote support further ensure that your system remains state-of-the-art, even years after installation.

Thermal Interface **Materials**

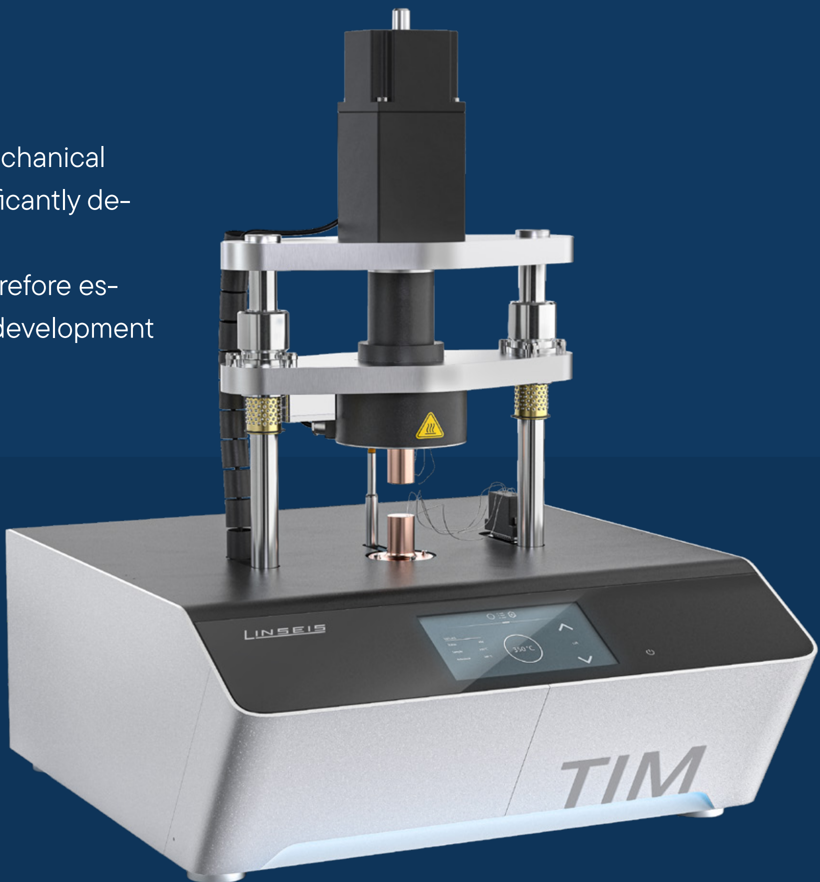
With the increasing power density of modern electronic and electrochemical systems, the importance of efficient heat dissipation is constantly growing. **Thermal interface materials (TIMs)** form the crucial interface between heat-generating components and cooling structures.

Since even precision-machined surfaces have microscopic irregularities and air gaps, this results in increased thermal resistance. TIMs completely fill these gaps and replace the insulating air with a material that has significantly higher thermal conductivity.

Depending on the application, TIMs can comprise different material classes:

- **Viscous liquids**
  (e.g. greases, pastes, phase-change materials)
- **Viscoelastic solids**
  (e.g. pads, gels, soft and hard rubbers)
- **Elastic and rigid solids**
  (e.g. ceramics, metals, plastics)

The thermal impedance, thermal conductivity, mechanical adaptability, and long-term stability of a TIM significantly determine the performance of the entire system.
Precise characterization of these properties is therefore essential for material selection, quality control, and development of efficient thermal management solutions.



To optimize the thermal management of complex systems, the **LINSEIS Thermal Interface Material Tester (TIM Tester / TIM L58)** offers a precise and standard-compliant solution for determining thermal material properties.

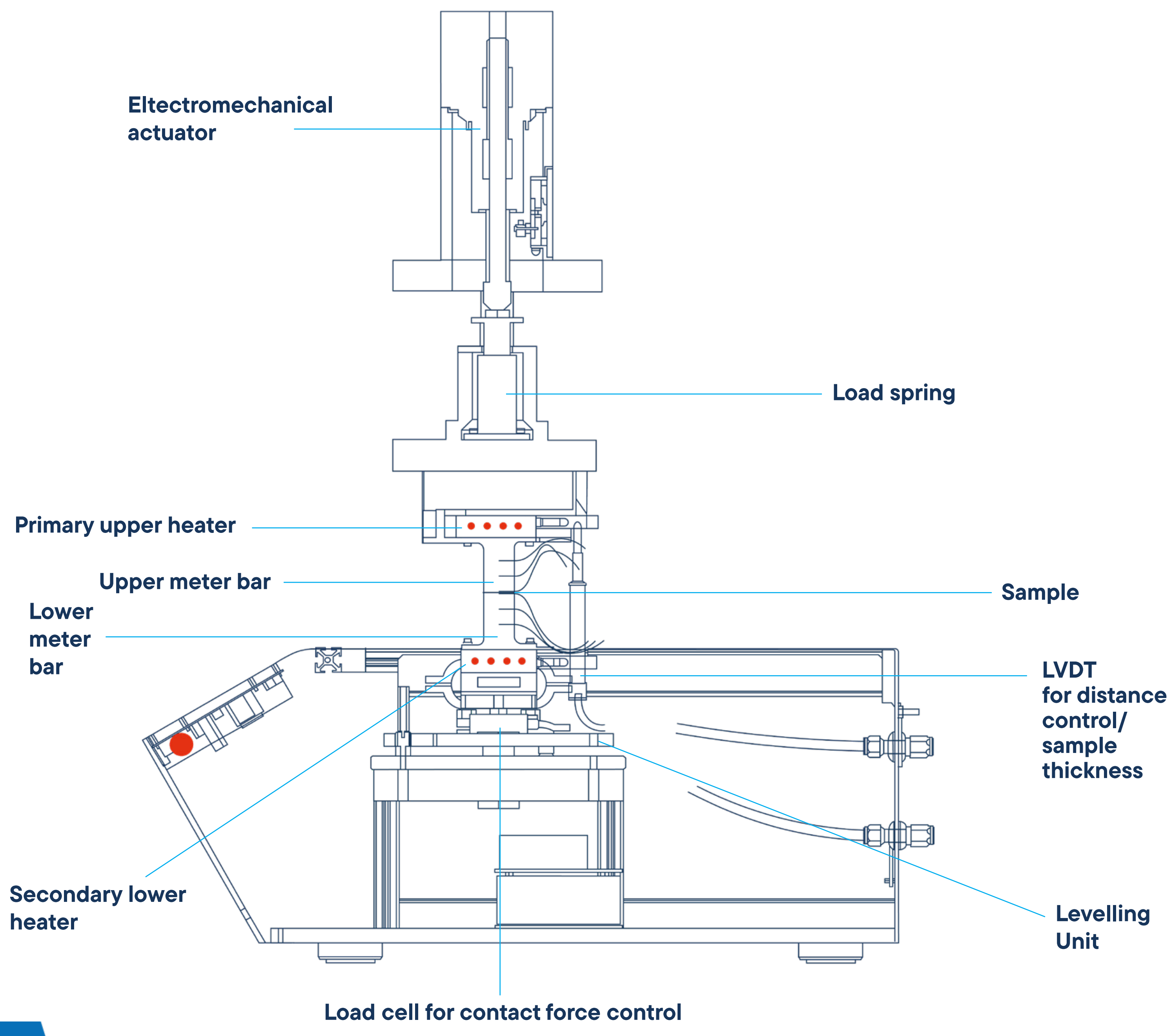
The **TIM L58** measures the thermal impedance and uses this to determine the apparent thermal conductivity of a wide range of materials.
The test method complies with the **ASTM D5470 standard**, thus ensuring a high degree of comparability and reproducibility of the measurement results.

- **Automatic pressure adjustment using electric actuator (up to 16 MPa*)**
- **Automatic thickness determination using high resolution LVDT**
- **Fully integrated, software controlled device**
- **Safety Box Option (protective enclosure with safety interlocks)**
- **Optional vacuum tight design (including protective chamber)**

LINSEIS WIKI:
Thermal **I**nterface **M**aterials

* depends on configuration

Illustration of the TIM L58



Measuring Principle according ASTM D5470-17

A stable, directional heat flow is generated by the defined thermal load between a heated and an actively cooled meter bar. The sample is located exactly between these two temperature zones, allowing its behavior to be precisely quantified under realistic contact, pressure, and temperature conditions.

Multiple integrated temperature sensors, a controlled actuator for pressure control, and high-resolution thickness measurement form the basis for reliable determination of thermal impedance and the apparent thermal conductivity derived from it.

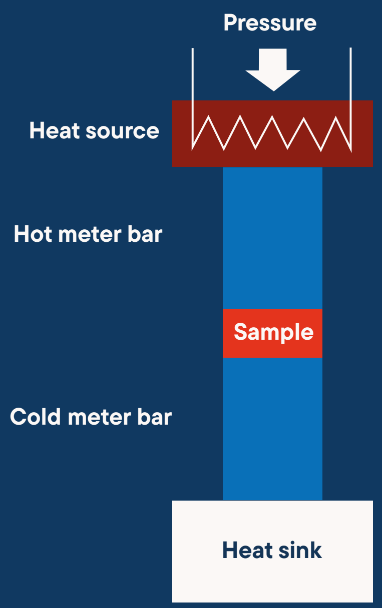


Fig. Schematic illustration of the measuring principle

Calculation of the thermal Impedance $\boldsymbol{\theta}$

$$\boldsymbol{\theta} = \frac{A}{Q} \cdot (T_H - T_C)$$

$\boldsymbol{\theta}$: Thermal impedance [(K m²)/W], Q: Heat flux specimen [W]

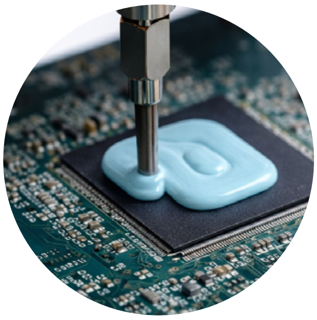
T_H / T_C : Surface temperature of the hot/cold meter bar [K],

A: Contact area of the meter bars [m²]

Thanks to exchangeable components and a wide range of configuration options, the LINSEIS TIM L58 adapts to different applications.

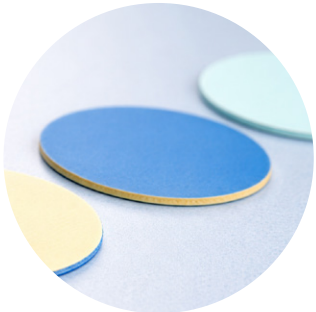
Sample types

TYPE I - Viscous liquids



- Pastes
- Greases
- Phase change materials (PCM)
- Liquids

TYPE II - Viscoelastic solids



- Pads
- Tapes
- Foams
- Gap fillers

TYPE III - Solids

- Polymers
- Metals
- Ceramics

Sample preparation & Accessories

Cutting tool

- Precise sample preparation
- Defined geometry
- High reproducibility
- Clean cutting edges

Exchangeable meter bars

- Different materials
- Various geometries
- multiple surface options
- EEPROM for automatic identification

Configurations

Measurement settings	Adapted to material class (Type I, II and Type III)
Protective Housing/ Vacuum Tight Chamber	On request
Meter bar materials	• Aluminium • Copper • Brass • Stainless steel • Other materials and special coatings on request
Meter bars	• **Round:** ⌀ 20 mm, 25 mm, 40 mm • **Rectangular:** 20 mm x 20 mm, 25 mm x 25 mm, 40 mm x 40 mm • **Custom dimensions on request**
Liquid sample holder	On request
Reference materials	Certified reference materials

Customized Solutions?

NEW User exchangeable meter bars

The modular design of the LINSEIS TIM L58 enables the user to configure the measurement system according to the specific application rather than adapting the application to a fixed instrument setup. Interchangeable meter bars allow the characterization of a wide variety of thermal interface materials under application-specific boundary conditions while maintaining full compliance with ASTM D5470.

By selecting the appropriate meter bar material, surface finish and geometry, the measurement configuration can be optimized for different sample types.

This modular concept provides maximum flexibility for research, development and quality assurance while ensuring highly reproducible and application-relevant results.

PLUG & PLAY FUNCTIONALITY

- Integrated memory chip stores all relevant device parameters
- User exchangeable
- Automatic data retrieval upon connection for instant real-time evaluation

STORED CORE SPECIFICATION

- **Material & Geometry:** Essential data for heat flow and pressure calculations
- **Calibration Data:** Factory calibration for thermocouples and heatflow measurement

SYSTEM SPECIFIC CONFIGURATION

- **Thickness Measurement:** Calibrated for specific TIM-Tester/Meterbar pairs

SAFETY & SERVICE INFORMATION

- **Safety Limits:** Protection via force and temperature thresholds
- **Remote Support:** Serial number and manufacturing date for easier remote servicing

Technical **Specifications**

	TIM L58
Sample temperature range (max)	-30 °C** to 450 °C*
Standard sample size	**Round:** ø 20 mm, 25 mm, 40 mm **Rectangular:** 20 mm x 20 mm, 25 mm x 25 mm, 40 mm x 40 mm (Other sizes on request)
Sample thickness	0.001 to 8 mm (with extension up to 20 mm)
Thickness control	± 5 µm
Sample measurement range	0.1 - 50 W/mK
Sample resistance range	0.005 - 500 [cm²K/W]*
Contact pressure range	0 up to 16 MPa/ 0 up to 2300 psi (depending on sample size and shape)
Reproducibility	± 2 %*
Accuracy	± 3 - 5 %*
Force options	1 kN, 2 kN, 5 kN
Meter bar material	Aluminium, copper, brass (other materials and special coatings on request)
Software Plugins	• Thickness modulation • Temperature cycling • Quality management tool • High acceleration: 5000 cycles per day
Cooling options	Standard water cooling unit, intracooler 600 (-20 °C cold side)**, intracooler 1000 (-30 °C cold side)**
Power supply	110/115/220/230 VAC 50/60 Hz

* Under optimum conditions
** Lowest cold side meter bar temperature under optimum conditions

Unique features

NEW Exchangeable meter bars

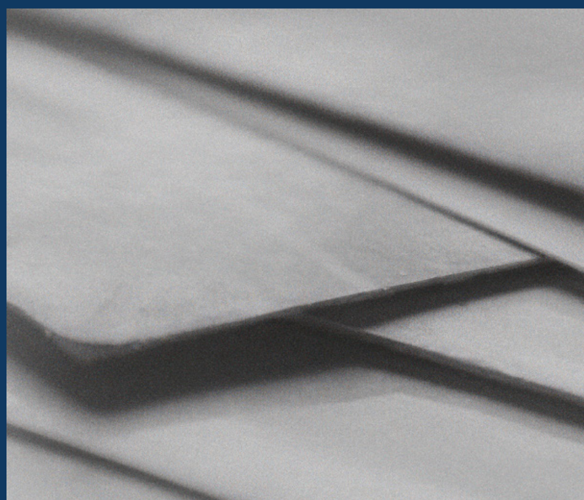
The **LINSEIS TIM L58** offers a clear operational advantage: exchangeable meter bars allow the measurement configuration to be quickly adapted to different applications, without the need for recalibration. This plug-and-play concept significantly increases sample throughput and positions the system as a powerful solution for laboratories that require flexible and efficient workflows.

Fully automated actuators and thickness measurement

Automatic pressure control and precise layer thickness determination ensure consistent sample contact and increase reproducibility.

Wide range of materials

From liquid compounds to thermal interface materials (TIMs) such as pastes and pads, and on to solid materials



High measurement accuracy and reproducibility

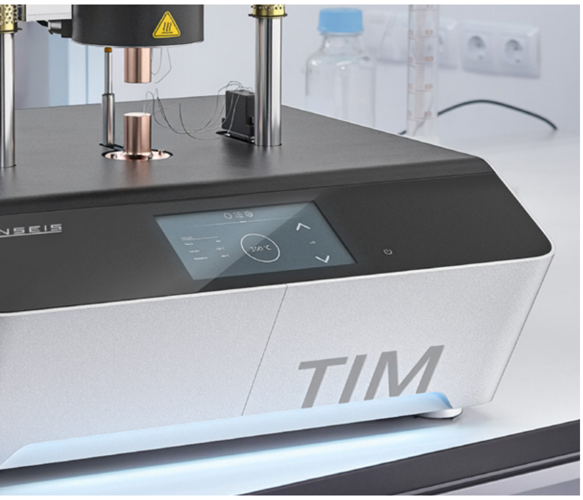
Industrial-grade precision enables reliable quality control, material comparability, and compliance with standards.

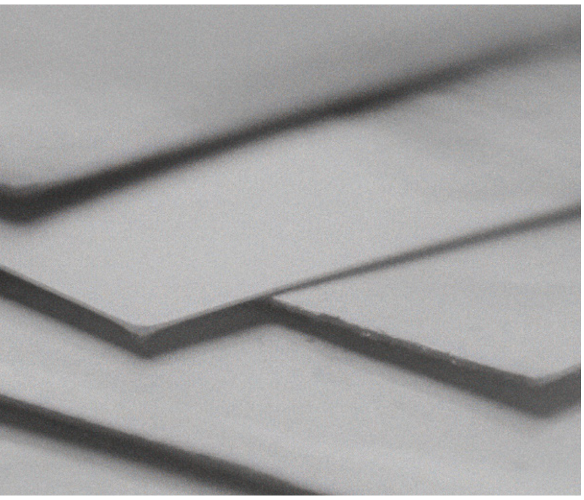
Robust, industry-focused system architecture

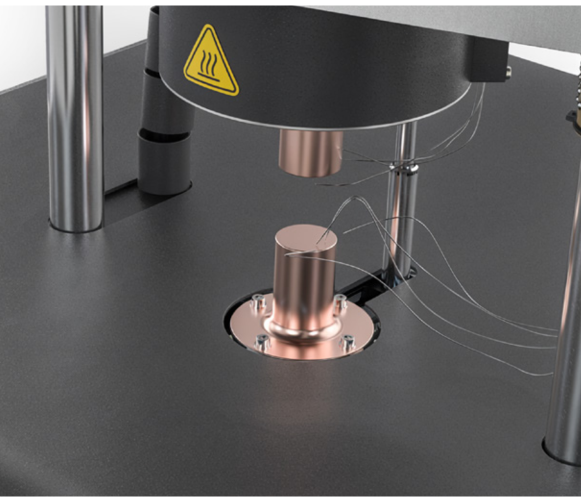
Designed for continuous use, stable quality assurance processes, and reliable results in laboratory and production environments.

Highest pressure capacity (up to 16 MPa)

Simulates industrial contact pressures and ensures stable, reproducible measurement conditions even with demanding material combinations.







Widest temperature range -30 °C up to 450 °C

The **LINSEIS TIM L58** supports realistic test conditions for applications in power electronics, battery modules, and high-temperature systems.

Automatic calibration

The integrated automatic calibration function in both software and hardware significantly simplifies operation. The TIM L58 automatically determines and applies the required calibration factor, which is displayed transparently to the user. This minimizes user intervention and reduces the risk of calibration errors.

Demanding applications

The system enables comprehensive studies of curing parameters, boundary condition analyses, in-situ reliability tests, and tests under extreme operating conditions, thus providing a central platform for holistic material and process characterization.

Integrated LINSEIS platform

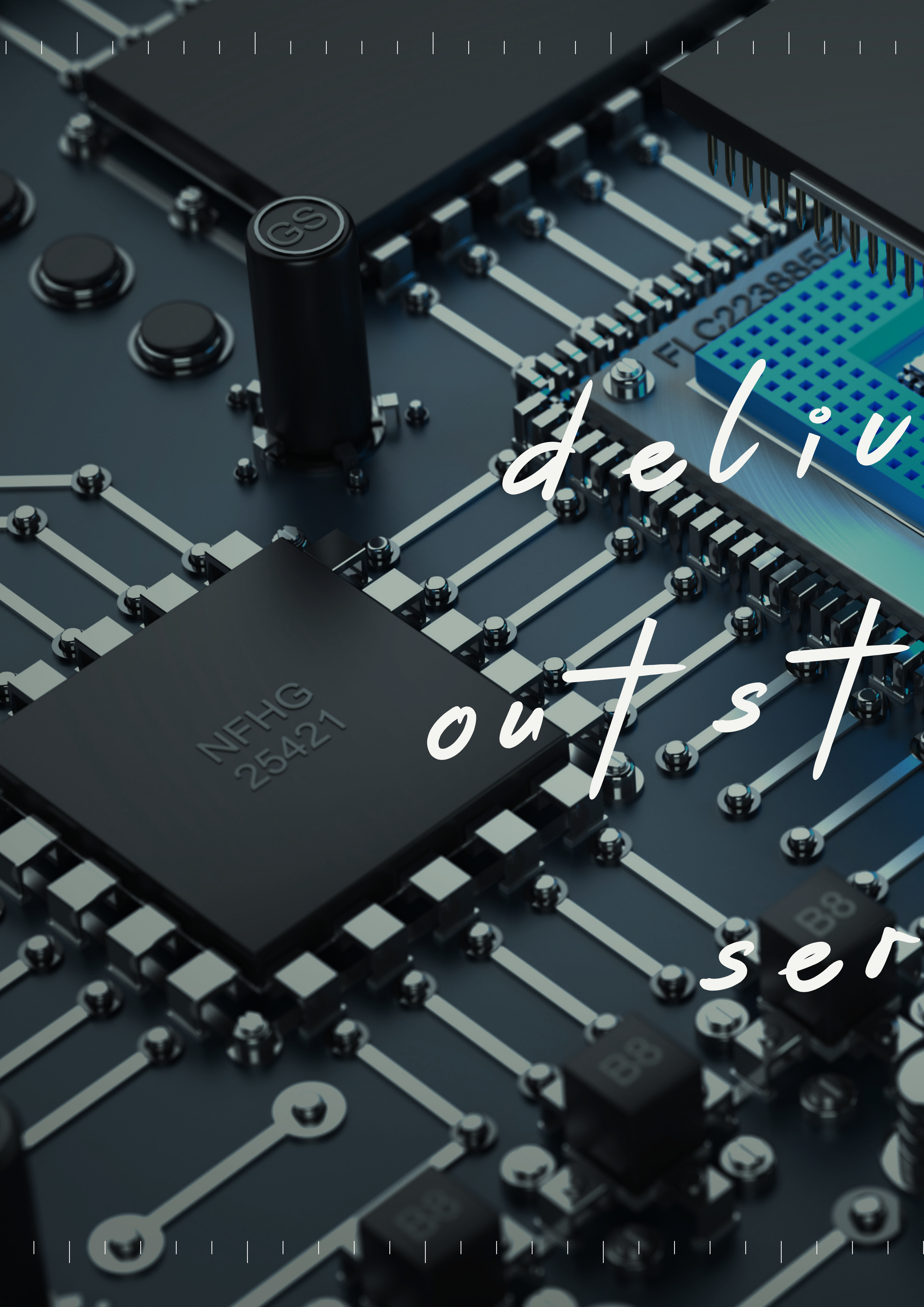
The integrated LiEAP software offers a comprehensive solution, combining both hardware and software for maximum process security and precision. By providing a unified platform, it ensures seamless integration of components and devices from external partners, resulting in a highly robust system.

Customization

Close collaboration with customers to develop customized solutions, leveraging LINSEIS's expertise to meet their specific requirements. For electrical solutions – Optional upgrade with the TEG tester module

Service

Our international presence across every continent enables us to deliver the best and fastest service possible.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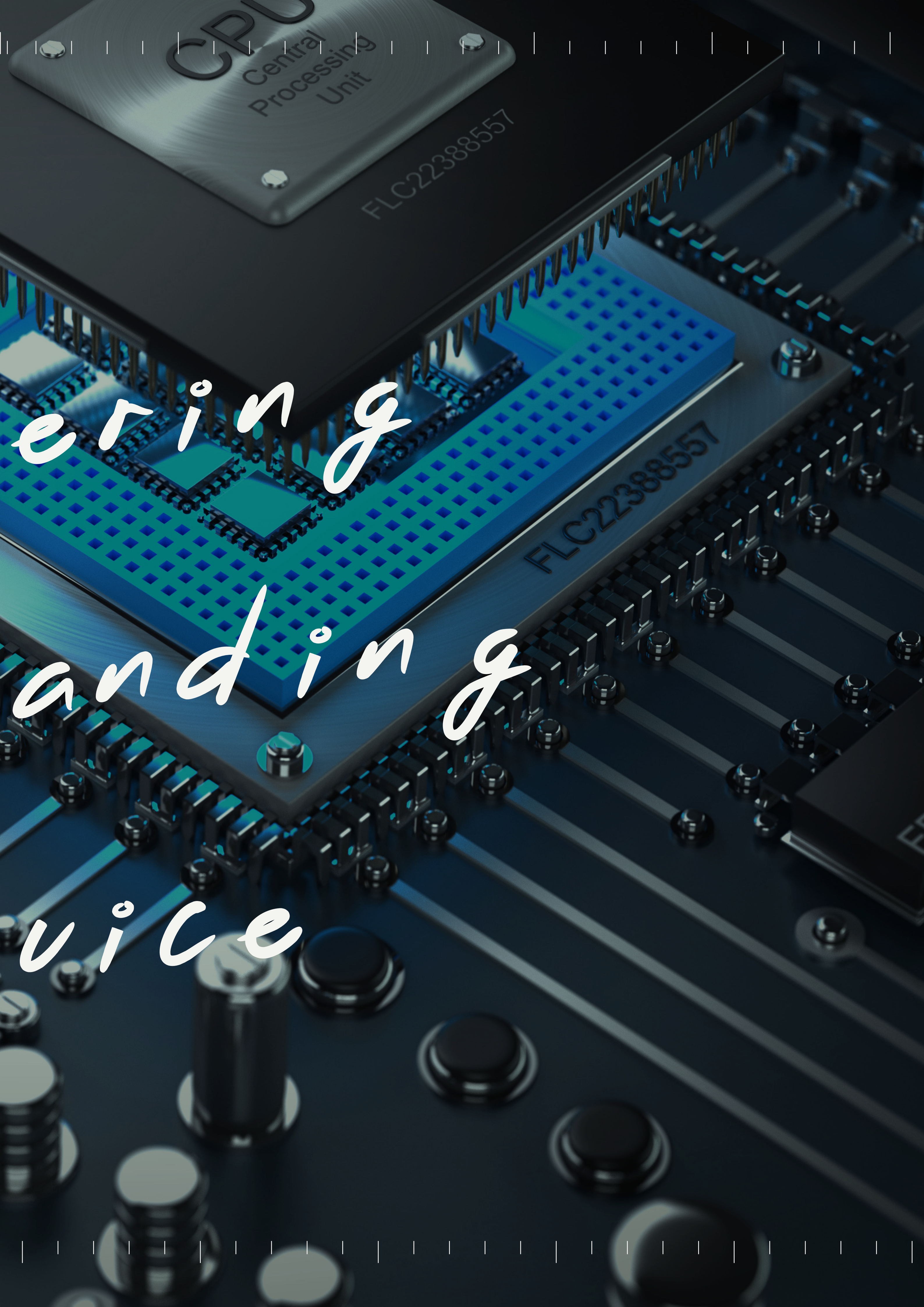
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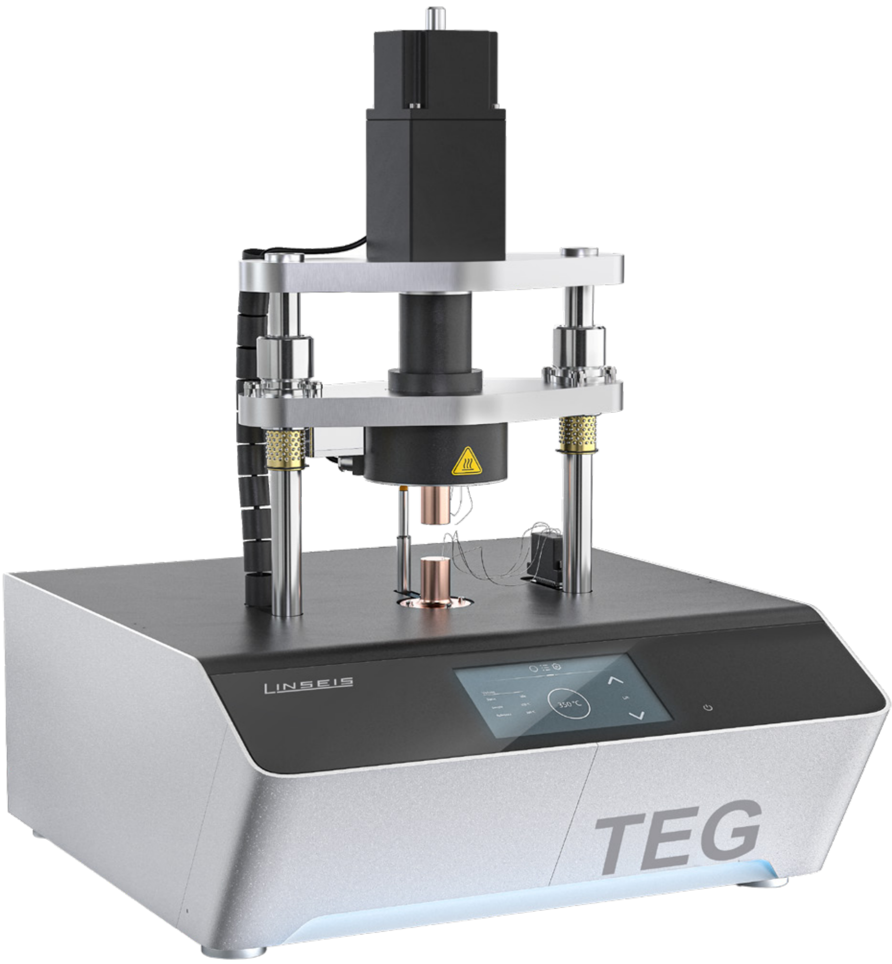
More Information

OPTIONAL UPGRADE TEG L34

The Linseis TEG L34 is a measuring system for characterizing the efficiency of thermoelectric generators (TEGs) and Peltier elements under variable conditions.

Depending on the mode used, either a temperature gradient or an external current is applied to the module. If TEGs are measured, a known heat flow (determined with maximum accuracy by means of reference block measurement) is impressed through the TEG and the electrical output power can be determined using various methods (CC, CV, FOC, MPPT, P&O).



Software

The software greatly enhances your workflow as the intuitive data handling only requires minimum parameter input.
LiEAP offers a valuable guidance for the user when evaluating standard processes.

Software-Features:

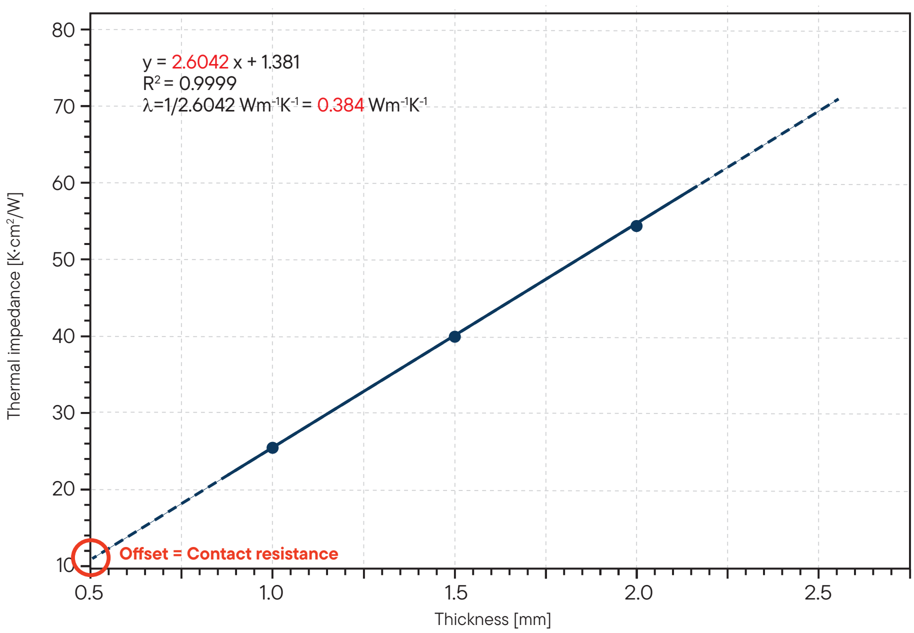
- Program capable of text editing
- Data security in case of power failure
- Repetition measurements with minimum parameter input
- Evaluation of current measurement
- Storage and export of evaluations
- Export and import of data ASCII
- Data export to MS Excel
- Free scaling
- Automatic calibration

TIM-Features:

- Temperature settings allow you to either specify a defined temperature difference (ΔT) or set the upper and lower temperatures of the measuring bars individually
- Fully automatic measurements and evaluation
- Measurement settings adapted to material class (Type I, II and III)
- Definition of individual temperature or pressure profiles possible
- Optional temperature or thickness cycling op-tion
- Optional quality control tool

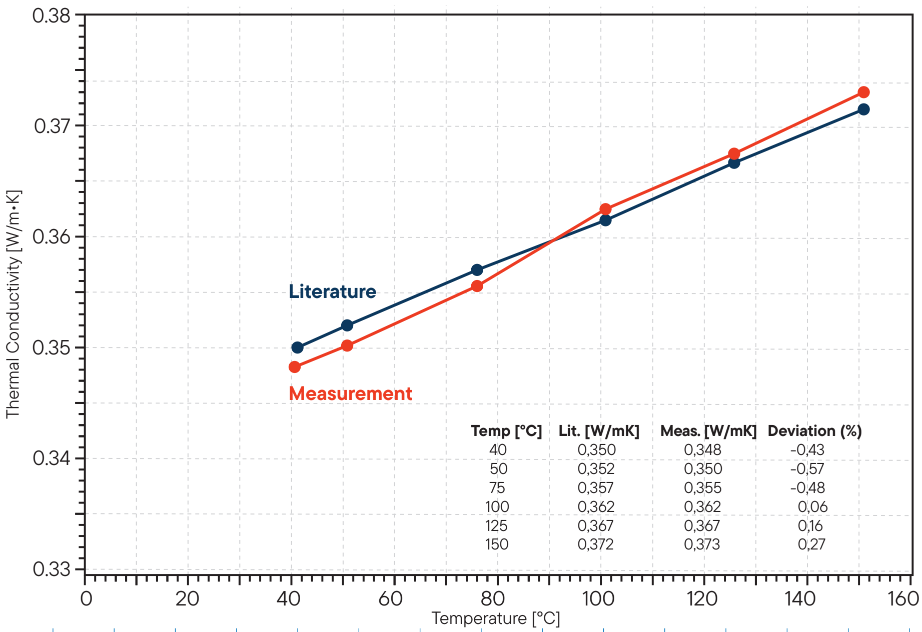
Applications

Measurement of Vespel (Type 3/ at 50 °C/ 1 MPa)



Measurement of the thermal impedance (thermal conductivity) of a 25 mm x 25 mm Vespel™ sample at 50 °C (TH=70 °C, TC=30 °C) and a contact pressure of 1 MPa. Three different samples with a thickness between 1.0 mm and 2.00 mm have been measured in order to determine the apparent thermal conductivity and thermal contact resistance (using linear regression).

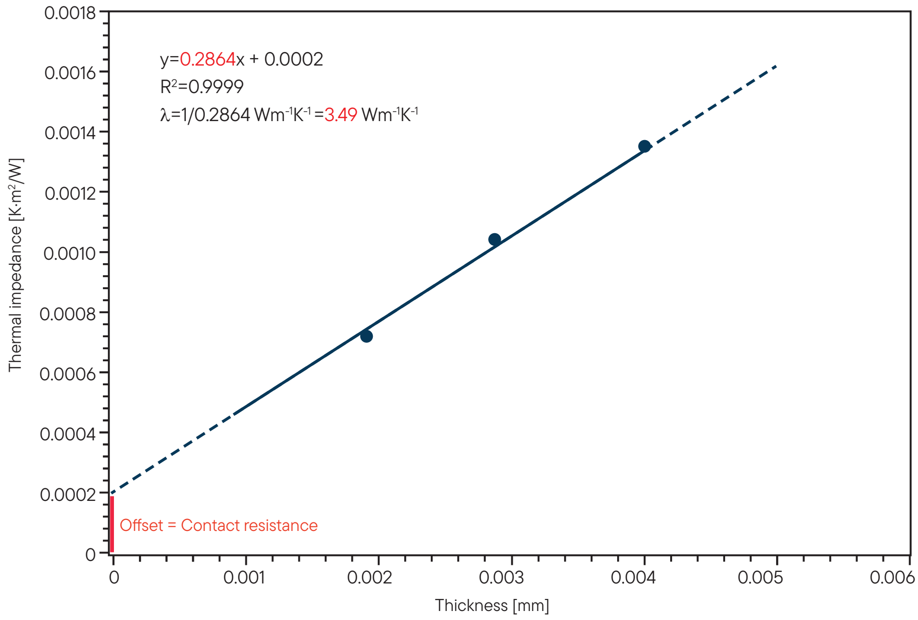
Temperature demendent measurement of Vespel™



Temp [°C]	Lit. [W/mK]	Meas. [W/mK]	Deviation (%)
40	0,350	0,348	-0,43
50	0,352	0,350	-0,57
75	0,357	0,355	-0,48
100	0,362	0,362	0,06
125	0,367	0,367	0,16
150	0,372	0,373	0,27

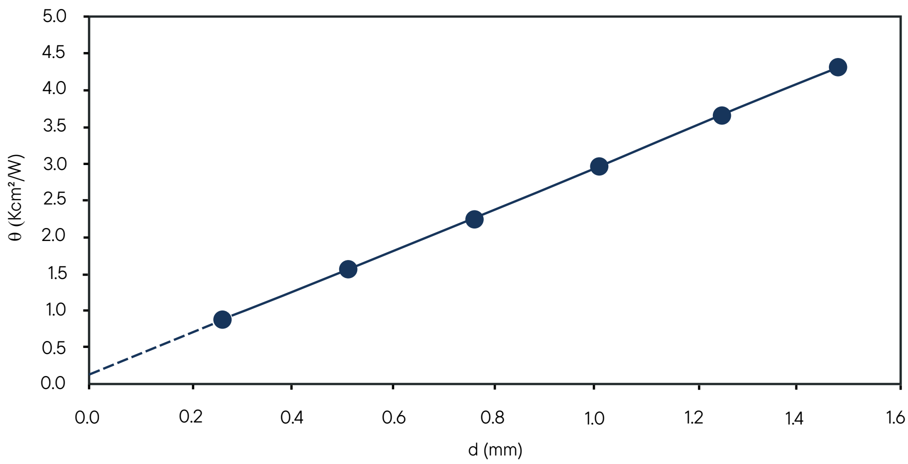
Plot of the temperature dependent apparent thermal conductivity of a 25 mm x 25 mm Vespel™ sample between 40 °C and 150 °C and a constant contact pressure of 1 MPa.

Measurement of type 2 thermal pad (at 50 °C)



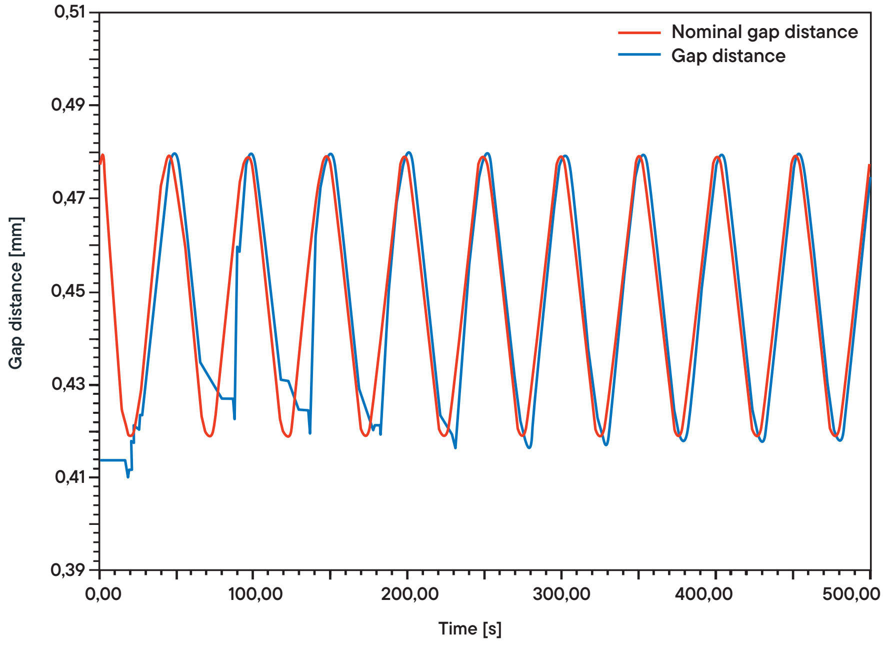
Measurement of the thermal impedance (thermal conductivity) of a 25mm x 25mm thermal conductive pad (sample type 2) at 50 °C (T_H=70 °C, T_C=30 °C). Three different samples with a thickness between approx. 2 mm and 4 mm have been measured in order to determine the thermal contact resistance (using linear regression).

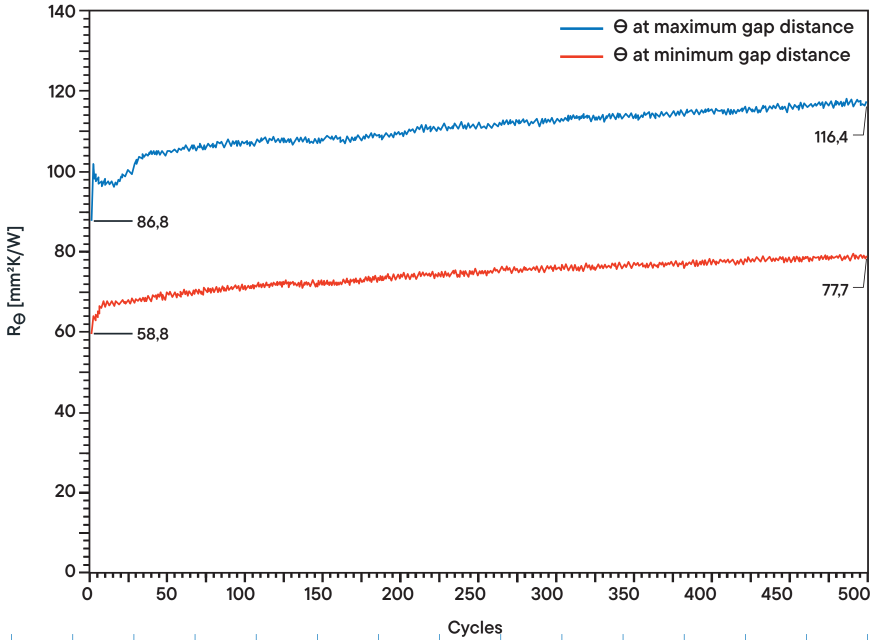
Measurement of type 1 viscous thermal paste (at 60 °C)



Measurement of the thermal impedance (effective thermal conductivity) of a viscous thermal paste (sample type 1) at 60 °C. A sample with nominal thicknesses between 0.25 mm and 1.50 mm was analyzed to quantify the temperature gradient and resulting thermal impedance under zero-pressure conditions.

Cycle Testing

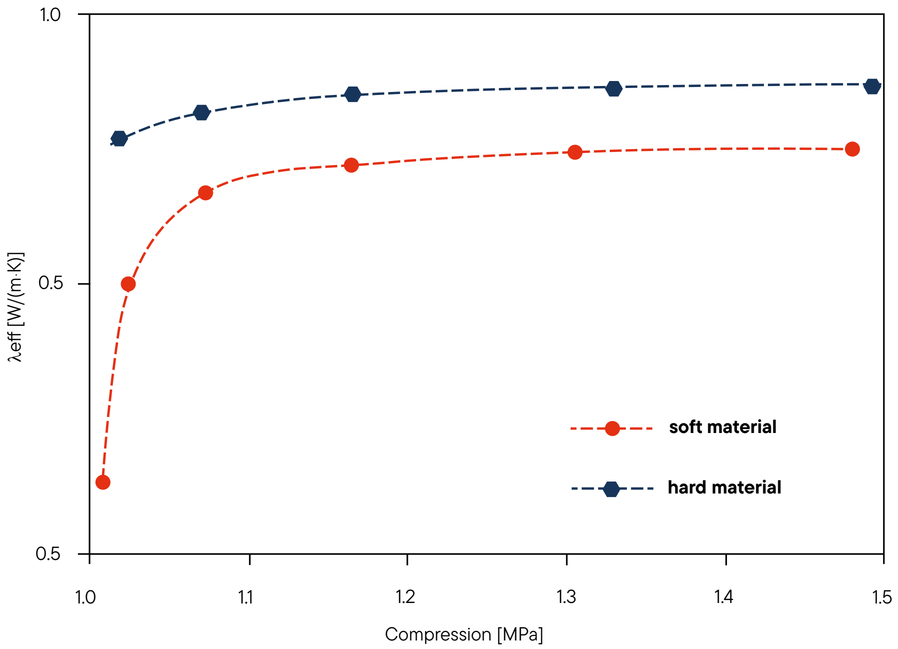




Aging studies and behavior under continuous stress are important tests for understanding the long-term performance of TIM materials. For this characterization, the **TIM Tester (TIM L58)** offers a software plug-in that can be used to cyclically change either the temperature or the gap distance or compression. During the cycle, all properties such as temperature, gap distance/ sample thickness, pressure, and thermal impedance are continuously monitored to directly detect changes in behavior.

The application shows that in the performance test, a cyclic compression of ± 30 µm with a frequency of 0.02 Hz was defined at a constant sample temperature. The first image shows this cycle with the nominal and live tracked gap distance. The second image shows that the thermal impedance increases slightly with the number of cycles, resulting in slightly lower performance during long-term use. This information helps in modeling devices and estimating the service life of individual parts.

Thermal performance/pressure



The measurement shown illustrates the relationship between mechanical compression and the effective thermal conductivity (λ_eff) of thermal interface materials with different mechanical properties. Both soft and hard materials were examined under defined pressure conditions.

More applications

LINSEIS

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