LINSEIS

pushing boundaries

# PRODUCT OVERVIEW

# Thermal Analysis, Thermo Physical Properties & Calorimetry



WWW.LINSEIS.COM



# 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 and liquids 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.

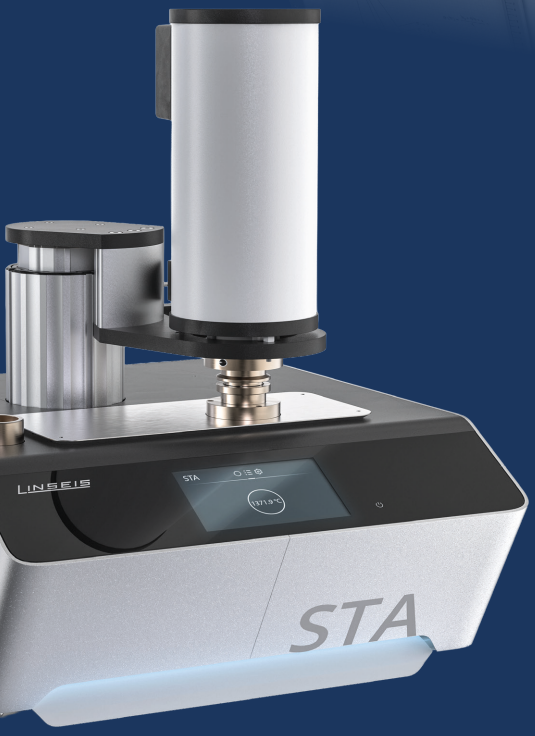


# Engineering & Innovation

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.





# Thermal Analysis, Thermophysical Properties & Calorimetry

The characterization of thermal and thermophysical properties is a central component of modern materials science. Whether polymers, metals, ceramics, semiconductors, batteries, or thin films—every material reacts to temperature, atmosphere, or mechanical stress with specific changes. These reactions significantly determine the functionality and reliability of a product.
Thermal analysis methods, calorimetry, and thermophysical methods provide the relevant parameters for this.


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Applications

# Applications



Automotive & Aviation



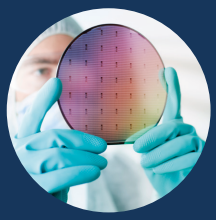
Building Materials



Batteries



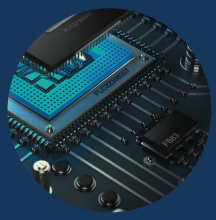
Chemistry



Thin Films



Research



Semiconductors & Electronics



Nuclear & Energy



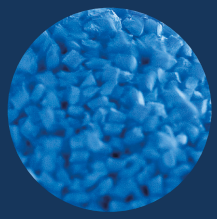
Hydrogen Technology



Ceramic & Glasses



Pharmacy & Food



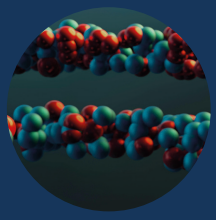
Polymers



Metals & Alloys



Life Science



Enzyms & Proteins

# 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

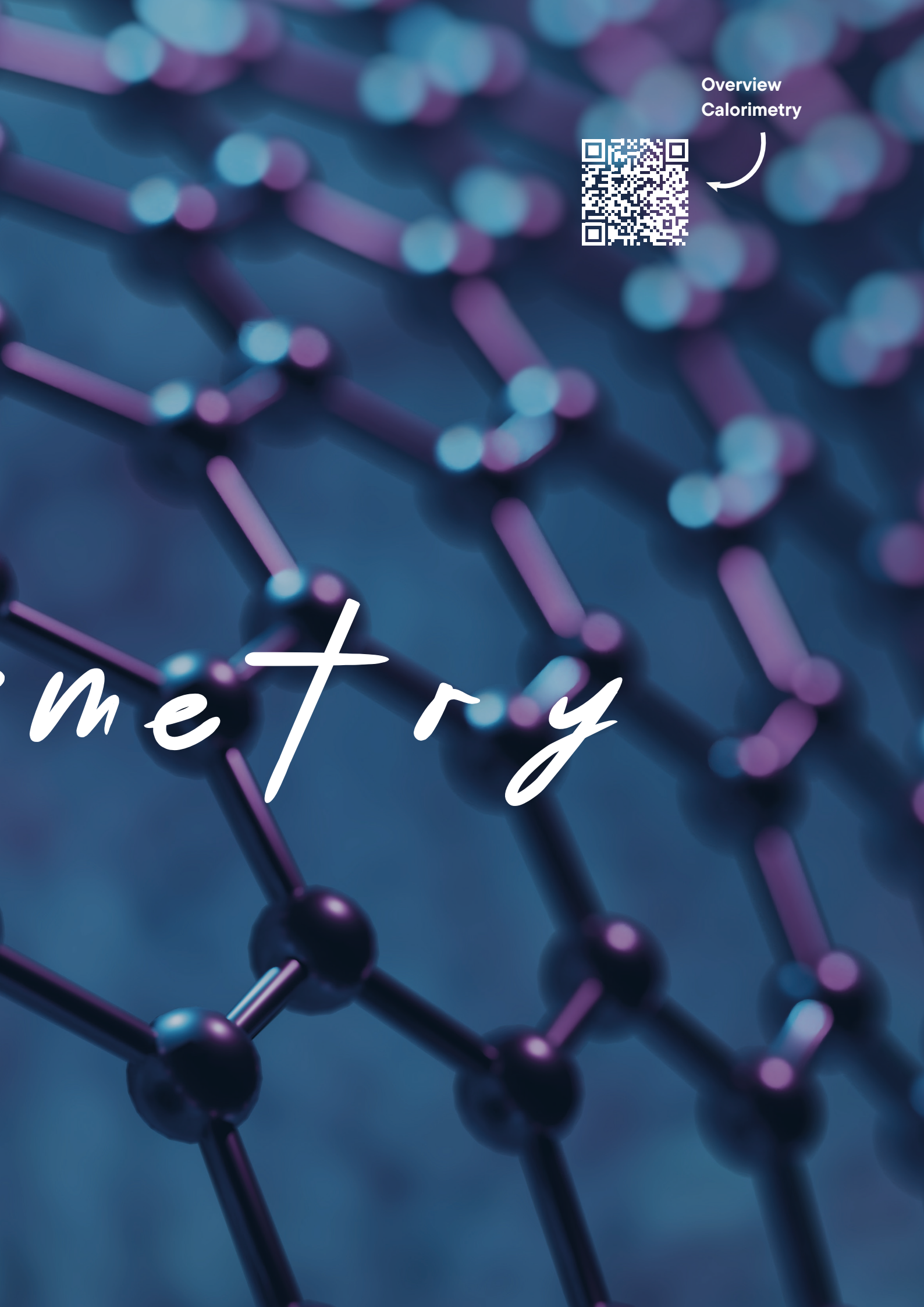
When investing in analytical instrumentation, long-term value matters just as much as precision. That's why Linseis systems are engineered to deliver the lowest **Total Cost of Ownership** in their class — combining reliability, efficiency, and flexibility in every detail.

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.






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Overview
Calorimetry
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# Calorimetry

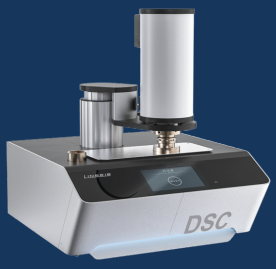
DSC Overview

## Measurable Properties

- Heat Capacity (Cp)
- Enthalpy (ΔH)
- Endo-/ Exothermic
- Phase changes
- Melting temperature (Tm)
- Heat of reaction
- Glass transition temperature (Tg)
- Crystallization temperature (Tc)
- Thermal stability
- Oxidative stability
- Oxidative Induction Time (OIT)
- Heat of interaction (ITC)

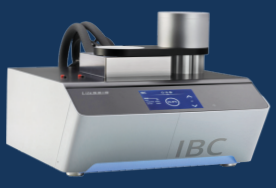
All DSC fulfill all relevant international standards such as **ASTM E967, ASTM E968, ASTM E793, ASTM D3895, ASTM D3417, ASTM D3418, DIN 51004, DIN 51007, DIN 53765 and ISO 11357** and thus guarantee reproducible and standard-compliant results.

## Instrument Overview



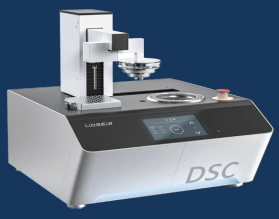

HDSC L62/DTA

- -150 °C up to 2400 °C
- Up to $10^{-5}$ mbar
- Sample robot up to 42 positions



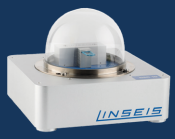

IBC L91
*80/300*

- -40 °C up to 90 °C
- Isothermal battery calorimeter
- Heat flow, temperature & battery performance




DSC L63

- -170 °C up to 750 °C
- Sample robot up to 90 positions
- Flexible cooling options




Chip DSC L66
*Basic/Advanced/Ultimate*

- -150 °C up to 600 °C
- Highest resolution
- User exchangeable sensor
- unsurpassed sensitivity

**Linseis *Calneos* Applications**

## **NEW** Linseis *Calneos* - Product Line

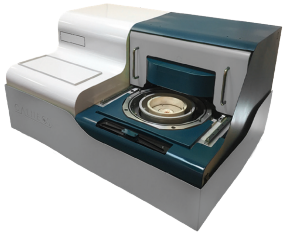
With the acquisition of *Calneos*, Linseis is expanding its expertise in calorimetry for **life sciences, pharmaceuticals and materials research.**

## Instrument Overview



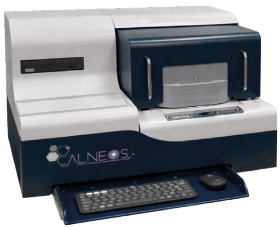
CAL L92

- -60 °C up to 170 °C
- Scan rates 0.001 to 5 °C/min
- Ultra high sensitivity
- measurement under pressure up to 1000 bar



UDSC L64

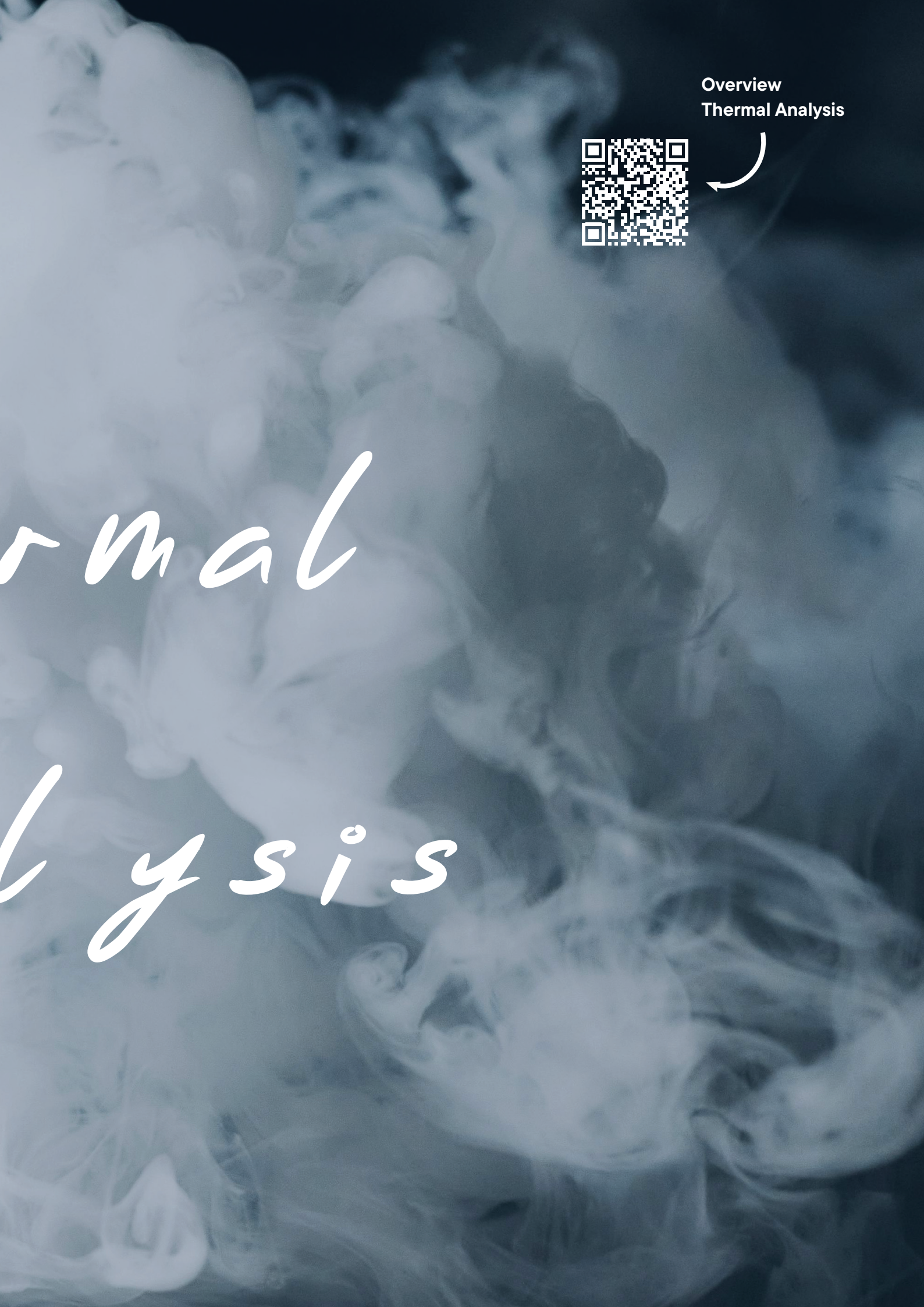
- -60 °C up to 160 °C
- Scan rates up to 10 °C/min
- Tailored for protein stability analysis



UDSC L64-LT

- Low temperature option
- -170 °C up to 50 °C
- Cooling without using $LN_2$


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Thermal Analysis
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# Simultaneous **Thermal Analysis**

STA Overview

## Measurable Properties

**DSC**

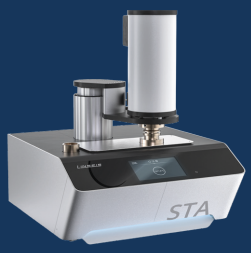
- Heat Capacity (Cp)
- Enthalpy (ΔH)
- Endo-/ Exothermic
- Phase changes
- Melting temperature (Tm)
- Glass transition temperature (Tg)
- Crystallization temperature (Tc)
- Thermal stability
- Oxidative stability
- Oxidative Induction Time (OIT)

**TGA**

- Compositional analysis
- Mass Change
- Residual mass

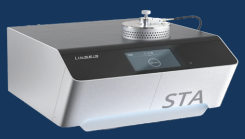
The simultaneous measurement of mass change **(Thermogravimetry / TG)** and energy conversion **(Differential Scanning Calorimetry / DSC)** on a single sample (Simultaneous Thermal Analysis – STA) offers a considerable information advantage over separate measurements in different devices.

## Instrument Overview




STA L81

- -150 °C °C up to 2400 °C
- Tri-Couple DTA measuring-system
- Patentet "Forced Flow" method




STA L82

- RT up to 1100 °C
- Sample robot up to 90 positions
- Temperature precision: 0.001 °C




STA/TGA HP L85

- RT up to 1000 °C/ 1200 °C
- High Pressure STA: up to 150 bar
- customized pressure solutions on request

**TGA Overview**



STA HP L84

- RT up to 1800 °C
- extremely high resolution and long-term drift stability
- Pressure range up to 150 bar



STA/TGA L86

- -150 °C up to 1000 °C
- RT up to 2400 °C
- up to $10^{-2}$ mbar vacuum
- Temperature precision: 0.001 °C



STA L81 Nuclear

- -150 °C up to 1000 °C
- RT up to 2400 °C
- For nuclear materials
- Sample robot up to 42 positions

## TGA Instrument Overview

Our thermobalances (TGA) operate in accordance with the following national and international standards:
**ASTM E1131, D3850, ISO 11358, DIN 51006, ISO/DIS 9924**




TGA L81

- -150 °C up to 2400 °C
- MS/FTIR coupling for evolved gas analysis
- High-resolution microbalance




TGA L83

- RT up to 1100 °C
- Ultra-high-resolution microbalance
- Flexible atmosphere control with MS/FTIR coupling capability



TGA/GSA L87 MSB

- -196 °C up to 2400 °C
- For high-pressure and reactive gas environments (up to 150 bar)
- Ideal for sorption, gas-solid interaction, and advanced material research

# Gravimetric
# Sorption Analysis

GSA Overview

## Measurable Properties

- Adsorption and desorption capacity
- Sorption isotherms
- Diffusion coefficients
- Permeability and storage capacity
- Gas-solid interaction strength

Our integrated solutions offer the possibility to control the pressure, temperature and gas dosing independently of each other using the supplied software.
We offer two different load cells, a mechanical microbalance and a magnetic levitation balance. The magnetic levitation balance offers a unique, hermetically sealed measuring cell for highly reactive gases.

## Instrument Overview




GSA L81

- -150 °C up to 1600 °C
- Pressure range up to 15 bar
- Ideal for routine material screening



GSA L84

- -150 °C up to 1800 °C
- Higher measurement sensitivity
- For advanced material research



GSA L87

- -170 °C up to 1800 °C
- High pressure and reactive gas capability
- Maximum precision for gas/solid interaction studies

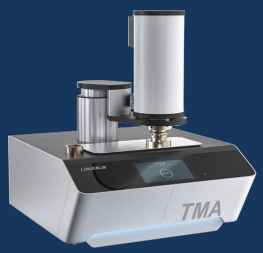
# Thermomechanical **Analysis**

## Measurable Properties

- Coefficient of thermal expansion (CTE)
- Dimensional stability
- Elastic and viscoelastic deformation
- Glass transition
- Softening and transition temperatures
- Creep behavior under load

All TMA devices operate in accordance with the following national and international standards:
**ASTM E831, E1545, ISO 11359 (Part 1-3), DIN EN ISO 11359**

## Instrument Overview




TMA L71

- RT up to 1000 °C
- High-resolution expansion and deformation measurement
- Robust platform for routine QC and material characterization



TMA L72

- RT up to 1600 °C
- Force control and measurement sensitivity
- For high temperature research

**TMA Overview**


Dilat


Overview
Dilatometry
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# Dilatometry

## Measurable Properties

- CTE
- Linear thermal expansion
- Sintering temperature
- Phase transformations
- Softening points
- Decomposition temperatures
- Glass transition temperatures

All **Dilatometers** comply with international standards such as **ASTM E228, D696, DIN 51045, DIN EN 821** and guarantee reproducible, standard compliant results.

## Instrument Overview



DIL L73
*Laser*

- -180 °C up to 1000 °C
- Vacuum, inert, reducing or oxidizing atmospheres for universal material testing
  Resolution: up to 0.3 nm



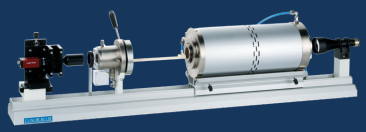
DIL L75 HP

- RT up to 1800 °C
- Vacuum: 10E$^{-4}$ mbar
- Optional pressure controllable gas mixing system (MFC´s)



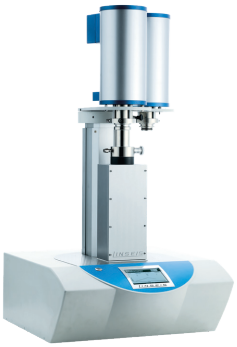
DIL L75/L76
*Horizontal*

- -180 °C up to 2800 °C
- Push rod technology
- Versatile system for routine, research and development applications



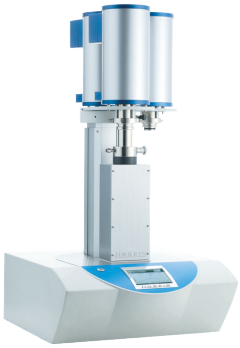
DIL L74 OD/HM

- -100 °C up to 2000 °C
- Contact angle measuring with vacuum-tight sample chamber
- For fragile, soft or irregular samples



## DIL L75
*Vertical*

- -263 °C up to 2800 °C
- Optional cryo extension under vacuum or controlled atmospheres
- Multiple furnace configuration



## DIL L75
*Quattro*

- -180 °C up to 2800 °C
- Sample length up to 50 mm
- Sample diameter up to 7 mm
- Multiple furnace configuration



## DIL L78
*RITA*

- -150 °C up to 1600 °C
- Quenching and deformation dilatometer
- For simulation of industrial thermal processes

**DIL Overview**

The following table shall give an orientation concerning our dilatometers and their capabilities. For more detailed information please contact our product and application specialists.

| Devices | DIL L75 Horizontal | DIL L75 Vertical | DIL L75 HP | DIL L75 Quattro |
|---|---|---|---|---|
| **Info** | Precision dilatometer for standard Applications | Vertical precision dilatometer for high and low temperature applications | High pressure process simulation dilatometer | High throughput four sample dilatometer |
| **Measurement** | | | | |
| **Coefficient of thermal expansion (CTE)** |  |  |  |  |
| **Defined atmospheres** |  |  |  |  |
| **High temperature range** |  |  |  |  |
| **Multiple sample measurement** |  |  |  |  |
| **Deformation/Quenching** |  |  |  |  |
| **Contactless measurement** |  |  |  |  |
| **Calculated DTA** |  |  |  |  |
| **Relative density** |  |  |  |  |
| **Temperature range** | -180 °C up to 2800 °C | -263 °C up to 2800 °C | RT up to 1800 °C | -180 °C up to 2800 °C |
| **Price** | $$ | $$ | $$$ | $$ |

 Measurement is possible

 Measurement is probably possible

 Measurement is not possible

| | DIL L73 Laser | DIL L74 HM | DIL L74 OD | DIL L76 Horizontal | DIL L78 |
|---|---|---|---|---|---|
| | Ultra high resolution dilatometer | Heating microscope for contact free shape detection | Optical non contact dilatometer | Horizontal standard pushrod dilatometer | Rapid heating, quenching and deformation dilatometer |
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| | -180 °C up to 1000 °C | -100 °C up to 500 °C | -100 °C up to 500 °C | RT up to 1600 °C | -150 °C up to 1600 °C |
| | $$$ | $$ | $$ | $ | $$$ |




Overview
Electrical Properties


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Thermal Conductivity
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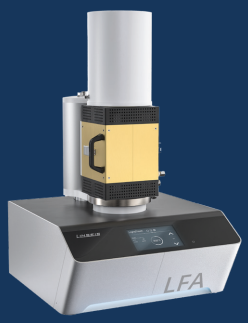
# Thermal **Conductivity**

## Measurable Properties

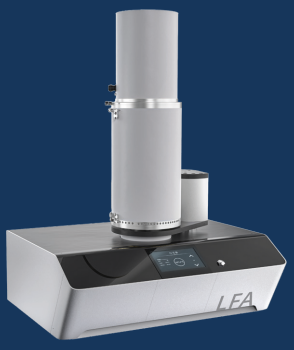
- Thermal conductivity (λ )
- Thermal diffusivity (α)
- Specific heat capacity (Cp)
- Thermal effusivity
- Thermal resisitivity

The thermal conductivity is determined internationally according to established standards such as **ISO 22007, ASTM E1461** depending on the measurement method used. In particular, the laser flash method according to **ISO 22007-4** and **ASTM E1461** is considered the globally recognized standard for the precise determination of the thermal diffusivity and derived thermal conductivity of solids over a wide temperature range.

## Instrument Overview




LFA L51



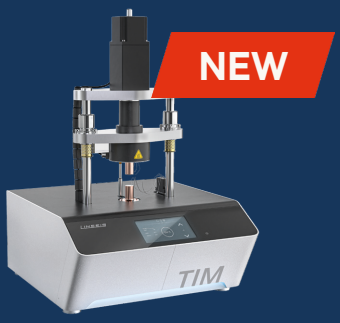

LFA L52




**NEW**

coming soon

TPA L56
*Basic/Advanced*



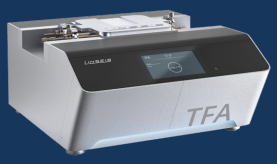

TIM L58
*Basic/Advanced*



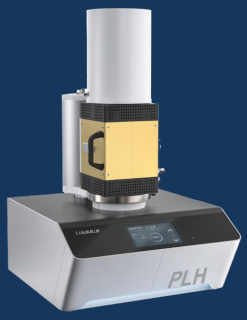
HFM L57
*200/300/600*



TF-LFA L54




TFA L59




PLH L53



LZT L32

**Wiki Thermal Conductivity**

The following table shall give an orientation concerning measurement devices and their capabilities. For more detailed information please contact our product and application specialists.

| Devices | LFA | TIM | TPA |
|---|---|---|---|
| **Info** | Most universal tool | For thermal interface materials | For fast and easy measurement |
| **Measurement** | | | |
| **Thermal Conductivity** |  |  |  |
| **Thermal Diffusivity** |  |  |  |
| **Specific Heat Capacity** |  |  |  |
| **Thermal Resistivity** |  |  |  |
| **Defined Pressure on Sample** |  |  |  |
| **Atmosphere** |  |  |  |
| **Temperature range** | -100 °C to 2800°C | -30°C to 450°C | -150°C to 700°C |
| **Price** | $$ -$$$ | $$ | $ |
| **Sample Type** | | | |
| **Solid** |  |  |  |
| **Liquid** |  |  |  |
| **Powder** |  |  |  |
| **Paste** |  |  |  |
| **Pad** |  |  |  |
| **Thin films** |  |  |  |

 Measurement is possible  Measurement is probably possible  Measurement is not possible

| | HFM | TFA | TF-LFA | PLH |
|---|---|---|---|---|
| | For insulating materials | Full analysis of thin films | For nm to µm films | For µm to mm films |
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| |  |  |  |  |
| | -35°C to 90°C | -160°C to 280°C | -100°C to 500°C | RT to 300°C |
| | $$ | $$$ | $$$ | $$ |
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# Electrical **Properties**

**Wiki Thermoelectric materials**

## Measurable Properties

- Thermal conductivity (λ )
- Thermal diffusivity (α)
- Seebeck coefficient
- Electrical resistivity
- Hall constant
- ZT characterization

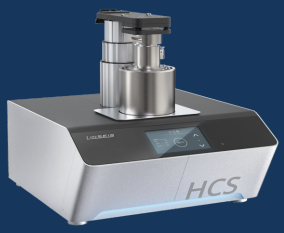
## Instrument Overview



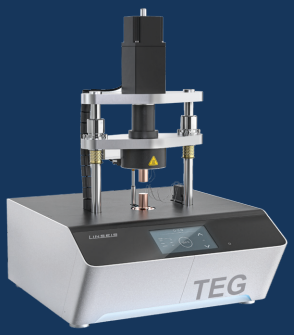
LSR L33



LSR L31



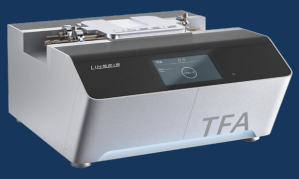

HCS L36
*Basic/Advanced/Ultimate*




TEG L34



LZT L32




TFA L59

The following table shall give an orientation concerning measurement devices and their capabilities. For more detailed information please contact our product and application specialists.

| Devices | LSR | LZT | HCS | TFA | TEG |
|---|---|---|---|---|---|
| **Info** | Most universal tool | Combination of LSR + LFA | Determination of Hall properties | Full analysis of thin films | For thermal inter-face materials |
| **Measurement** | | | | | |
| **Seebeck coefficient** |  |  |  |  |  |
| **Electrical Resistivity** |  |  |  |  |  |
| **Hall constant and mobility, charge carrier concentration** |  |  |  |  |  |
| **Thermal Diffusivity** |  |  |  |  |  |
| **Thermal Conductivity** |  * |  |  |  |  |
| **Complete ZT characterization** |  |  |  |  |  |
| **Temperature range** | -160°C to 1500°C | -100°C to 1100°C | -160°C to 600°C | -160°C to 280°C | -30°C to 300°C |
| **Price** | $$ | $$$ | $ | $$$ | $$ |
| **Sample Type** | | | | | |
| **Solid** |  |  |  |  |  |
| **Thin films** |  |  ** |  |  |  |

* Calculated thermal conductivity from the Harman method for direct ZT measurement. The Harman method is only applicable for good thermoelectric samples from -100°C to +300°C.

** Seebeck and resistivity of thin films can be measured, but the Harman method is only applicable to solids, not thin films.

 Measurement is possible

 Measurement is probably possible

 Measurement is not possible

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*pushing boundaries*


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