LINSEIS
CALNEOS

DSC L92

Ultimate **Micro Calorimeter**

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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.

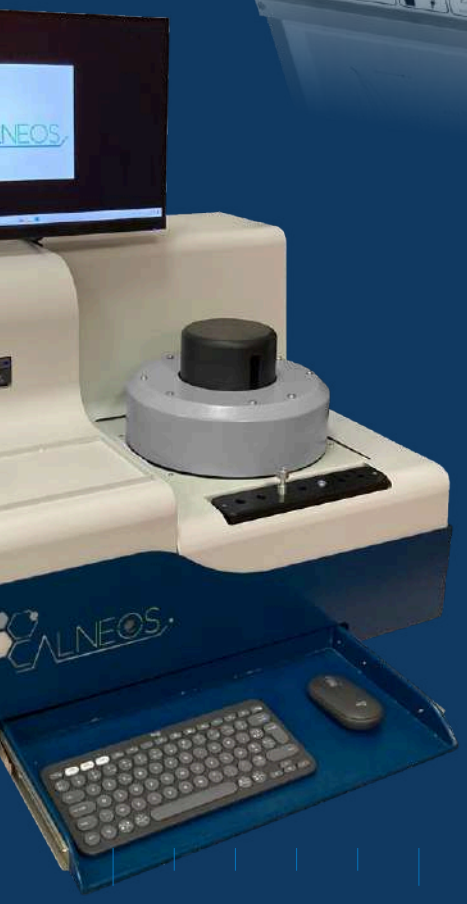
C L A U S L I N S E I S

C E O D I P L . P H Y S .

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.



Ultimate
Micro Calorimeter

The Ultimate micro calorimeter UMC is a differential temperature scanning micro calorimeter offering unrivalled sensitivity, enabling the study of all types of materials, including the most dilute solutions. It operates as a conventional micro-calorimeter.

The UMC‘s unique, innovative design enables sensitive measurement at a level never archieved before for a micro-calorimeter with extractable cells/test crucibles.

- Ultra sensitive
- High performance
- Ultra simple

Available Cells

1 Batch cells

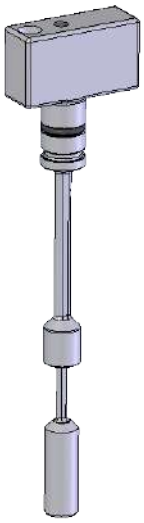
These cells can be used to study solids and liquids. They are the best for precise heat capacities measurements (better than 3%) of and they are reusables.
They can also be used to study transitions (melting/crystallisation) and liquid-solid or liquid-liquid phase diagrams.
Useful volume: 850 µl
Pressure: A few bars

2 High Pressure cells

They are identical to batch cells, with a pressurization tube to control pressure using the appropriate pressurization system.

Useful volume: Up to 330 µl (pressure dependent)
Pressure: Up to 1000 bars

3 Liquid Cp cells - High pressure



These cells have been specifically developed to measure the heat capacity of liquids under pressure. Their unique design makes them easy to fill completely and clean. Measurements are carried out in constant volume and the cells are installed in the instrument for the entire measurement campaign. They do not need to be removed to change the liquid being measured, which means that the Cp volume can be measured with an accuracy of better than 1%.
These cells can be used to observe very weak liquid-liquid transitions such as „de-mixing“ or „degassing“. They can be used at atmospheric pressure or under a few bars and have been tested up to 100 bars. With the right equipment, these cells can also be filled under pressure.
They can therefore be used to analyse gas-laden solutions under pressure.

Useful volume: 750 µL
Pressure: 100 bar

4 BI-Compartment cells

These cells enable enthalpy of reaction measurements to be made by limiting the Cp effect of the injection. A liquid is loaded into the upper compartment and injected into the lower compartment (solid or liquid).

Useful volumes: 150 + 250µL (other volumes on request)
Pressure: A few bars

5 Continuous A + B reaction cells

These cells measure the enthalpy of mixing of 2 fluids in a continuous flow (heat of chemical reaction, heat of gas dissolution or enthalpy of excess of a liquid mixture). The measurement is carried out dynamically. An internal tubing system is used to equilibrate the fluids to the temperature of interest, then mixing takes place within the measurement system and is discharged outside the calorimeter. The heat measured is directly proportional to the flow rates and heats measured.

Continuous flow system
Isothermal measurements
Pressures: up to 100 bar (higher pressures on request)
Flow rates: up to 1mL/min

6 ITC cell

UMC can be equipped with titration cells (1 ml) and with a suitable injection system (250 µl or 500 µl syringes). Injections are performed in both sample and reference cells to minimize the need for a “control experiment.”
This would enable isothermal titration calorimetry tests to be performed and interactions to be investigated. Accessible binding parameters are:

Binding constant (K): Indicates how strong the binding is.
Enthalpy change (ΔH): Indicates whether the binding is exothermic or endothermic.
Entropy change (ΔS): Provides information about changes in order in the system.
Free energy (ΔG): The combined thermodynamic expression of the binding
Stoichiometry parameter (n): How many ligands bind per target molecule

7 Customized Cells

If none of the above cells is suitable for your application, customized cells are also available on request.

Technical **Specifications**

Temperature range	from -60 °C* up to 170 °C
Scanning rate	0.001 to 5 °C/min
Temperature precision regulation	100 µ °C
Measurement time	30 to 60 min
Sensors type	Peltier Elements
Sample volume	up to 850 µL **
Key metrological features	Direct T sample measurement Built-in Joule Effect calibration
Measurement range	+/- 150 mW
RMS noise	0.05 µWa
Dimensions	L*w*h = 700*650*500 mm

* depends on chiller

** depends on vessel type

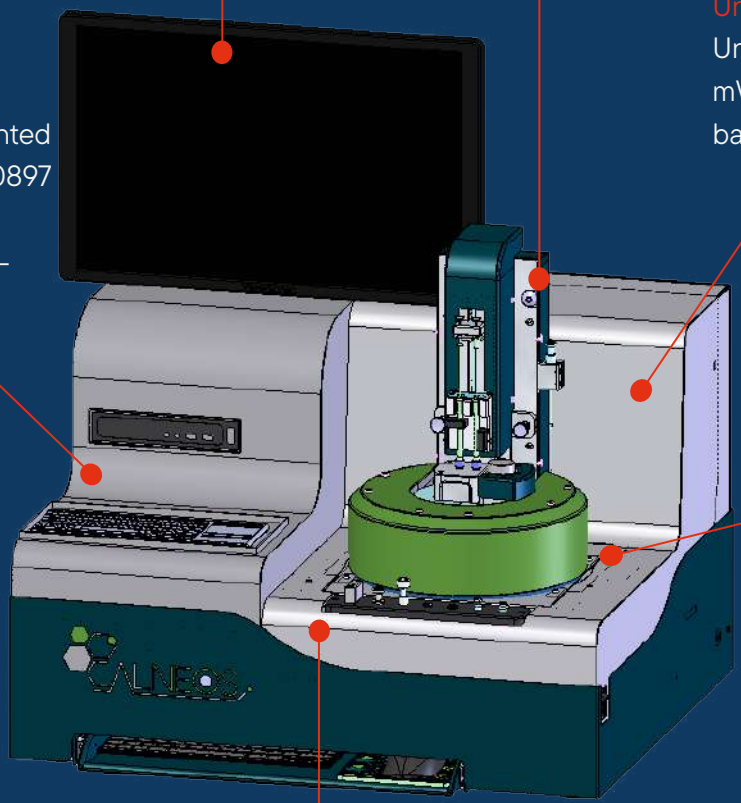
Unique **Features**

Customized cells
Wide range of customized cells depending on applications

ITC mode
Both DSC and ITC modes available in a single instrument

Unrivalled sensitivity
Unrivalled sensitivity (300 µV/mW) with a Peltier éléments based sensor

Ultra stable temperature
(100 µ°C) thanks to a patented furnace (patent n° FR1360897 consisting in 3 successive thermally controlled chambers)

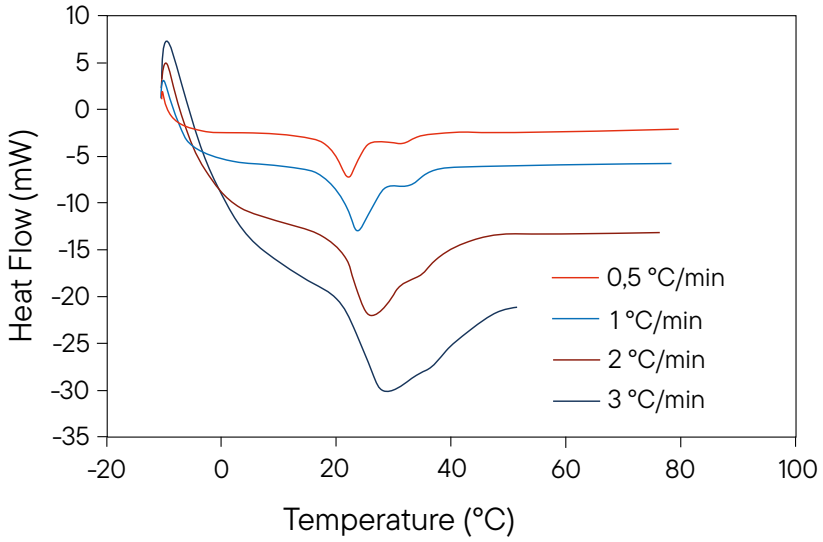


Temperature range
Direct sample temperature measurement; extended temperature range from -60 °C up to 170 °C

Electrical calibration
Built in electrical calibration allowing for cells dependant calibration

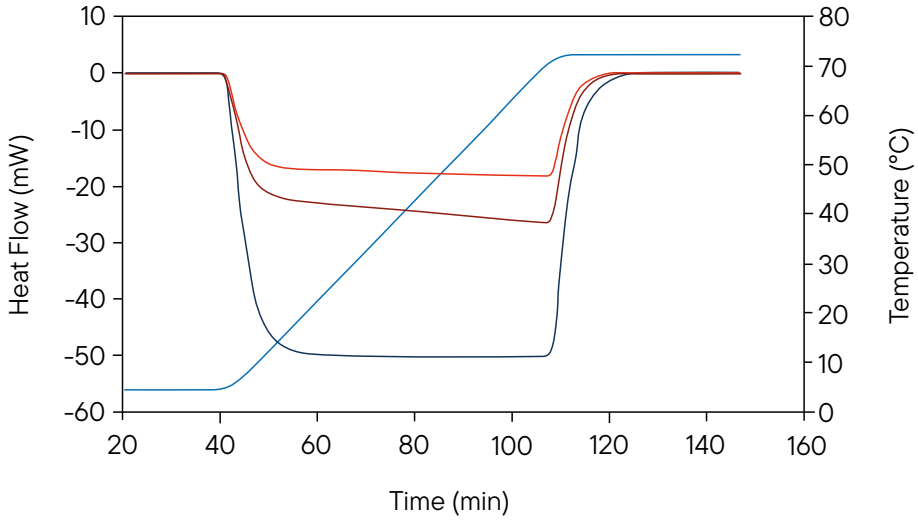
Applications

PTFE Analysis



A 524 mg PTFE cylinder was placed in the measurement cell while the reference cell remained empty.
The Ultimate Micro Calorimeter was programmed to perform several heating ramps between -10 °C and 80 °C, at scanning speeds of between 0.5 °C and 3 °C/min. The thermograms obtained are shown opposite.
At all the speeds tested, the two Teflon phase transitions were observed. The separation of the two transitions is all the more marked on the thermograms when the scanning speed is low.

Volumic Heat Capacity of liquids



Heat Capacities of ethanol, water and cyclohexane were measured using a scan rate of 1°C/min. Derived Cp values at 40°C (in (J/mL/°C) perfectly match with literature:

Cp vol. at 40 °C (J/ml/°C)	Theoretical	Measured
Water	4.15	4.13
Ethanol absolute	1.99	1.99
Cyclohexane	1.45	1.45

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10/2025