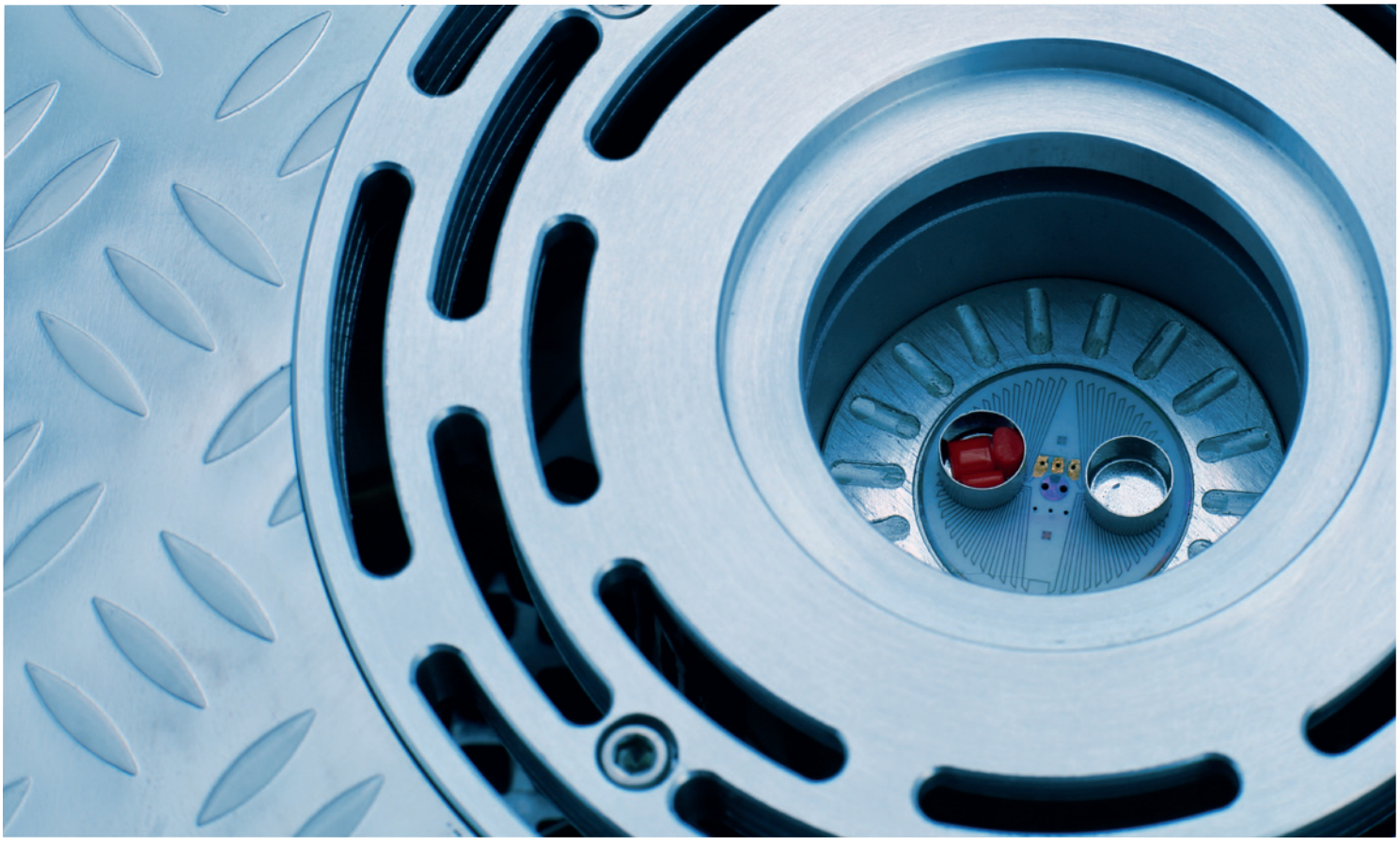
LINSEIS

THERMAL ANALYSIS

DIFFERENTIAL SCANNING CALORIMETER

DSC PT 1000



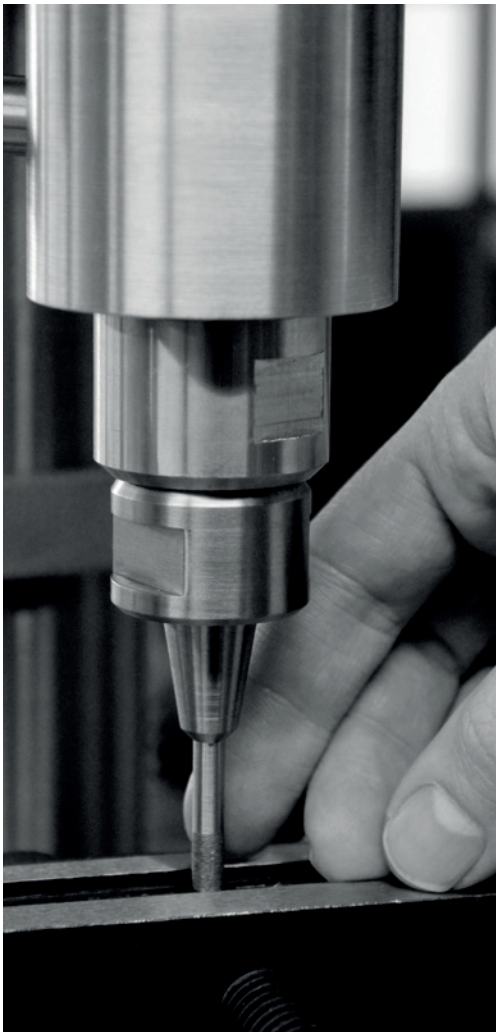
Since 1957 LINSEIS Corporation has been delivering outstanding service, know how and leading innovative products in the field of thermal analysis and thermo physical properties.

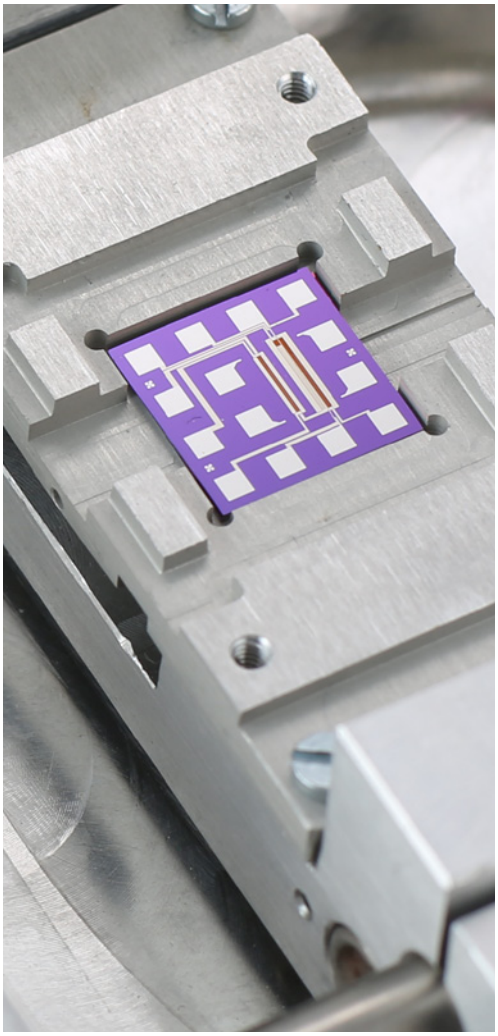
We are driven by innovation and customer satisfaction.

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 thermo analytical 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, thermo physical properties of solids, liquids and melts can be analyzed.
LINSEIS provides technological leadership. We develop and manufacture thermo analytic and thermo physical 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 thermo analytical 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
Managing Director





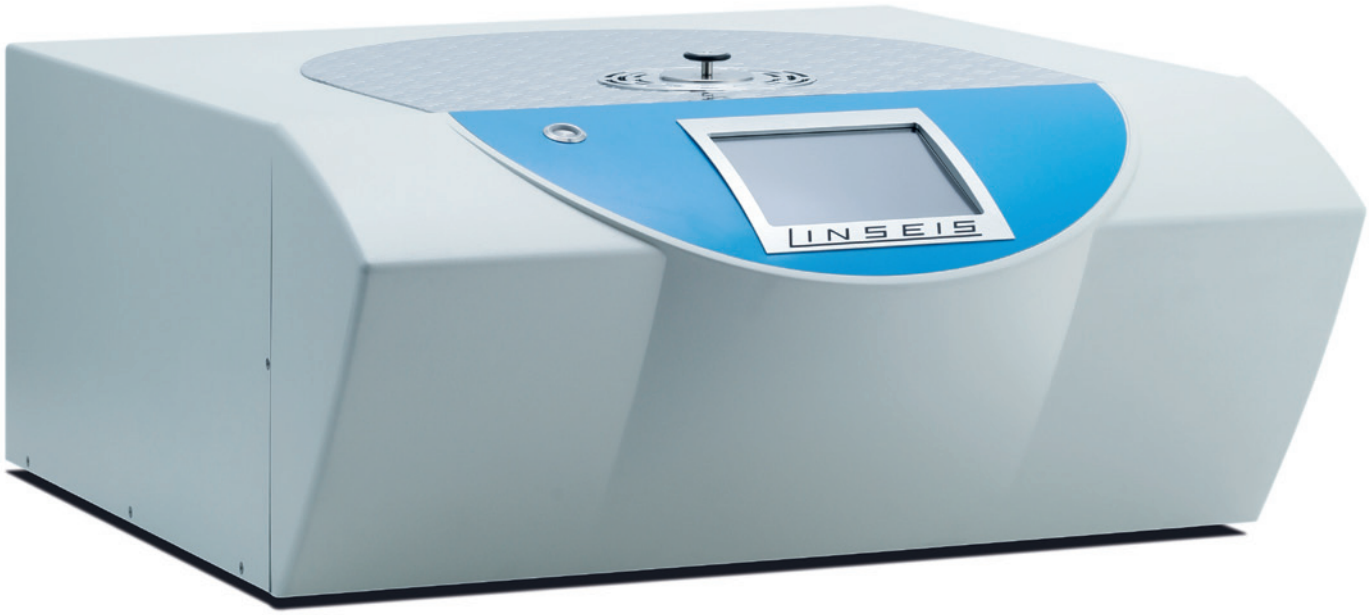
German engineering

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

Innovation

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 constantly develop new technologies to enable continued discovery in Science.

DIFFERENTIAL SCANNING CALORIMETER



The Differential Scanning Calorimetry (DSC) is the most popular thermal analysis technique to measure endothermic and exothermic transitions as a function of temperature.

The instrument is used to characterize polymers, pharmaceuticals, foods/biologicals, organic chemicals and inorganics. Transitions measured include Tg, melting, crystallization, curing, cure kinetics, onset of oxidation and heat capacity.

Unsurpassed performance

Revolutionary Sensor Design – Combined Heat Flux & Power Compensation in one Sensor

Unsurpassed sensitivity – for detection of melts and weak transitions

Benchmark resolution – precise separation of close lying events

Reliable Automation – up to 40 or 80 position autosampler

Widest temperature range – from -180 °C to 725 °C in one measurement

The LINSEIS Differential Scanning Calorimeters (DSC) operates in agreement with national and international standards such as: ASTM C 351, D 3417, D 3418, D 3895, D 4565, E 793, E 794, DIN 51004, 51007, 53765, 65467, DIN EN 728, ISO 10837, 11357, 11409.

LINSEIS DSC – 1000 M

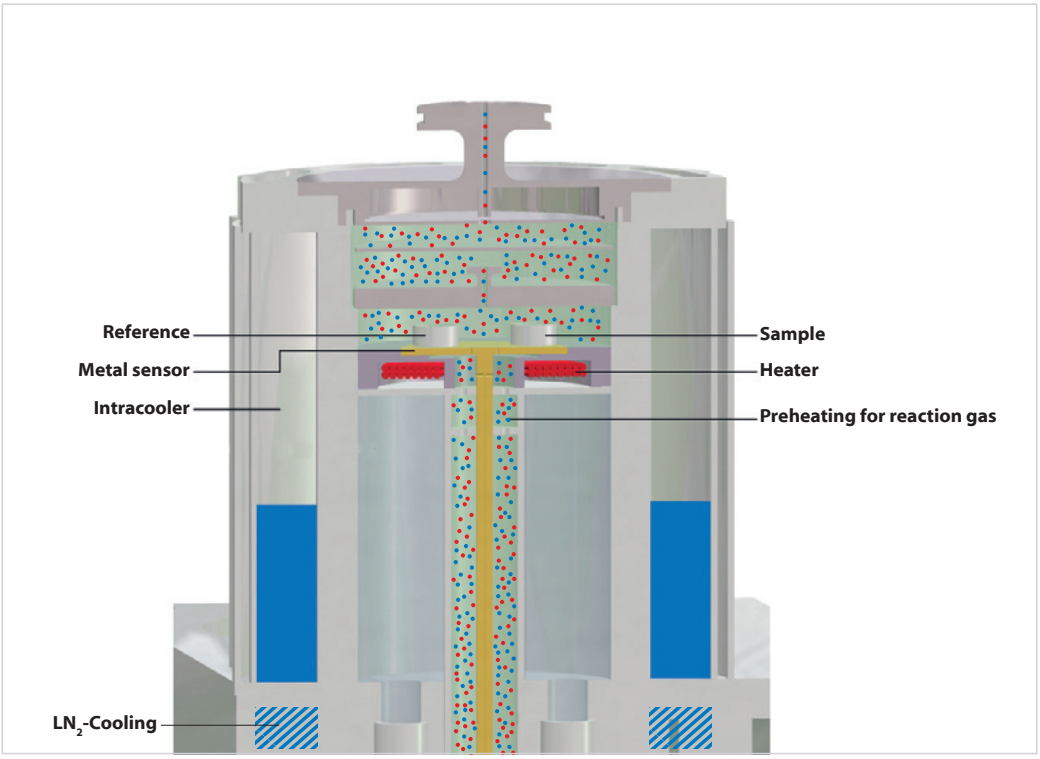
This product was developed to provide a general purpose DSC with a broad temperature range (-150 up to 725°C) for all common applications. Furthermore emphasis was placed on an extremely stable baseline and high reproducibility. The design allows manual and automatic operation. The conception of the cell guarantees maximum mechanical and chemical resistance. The high resolution metal sensor MHR provides highest resolution and outstanding sensitivity.

UNSURPASSED SENSITIVITY

BENCHMARK RESOLUTION

UP TO 44/88 POSITION AUTO-SAMPLER

TECHNOLOGY


Reference
Metal sensor
Intracooler
LN2-Cooling
Sample
Heater
Preheating for reaction gas

SENSORS

SENSORS

The key part of every DSC is the sensor, so don't make any compromise. Up to now it has been impossible to achieve highest resolution and sensitivity in one sensor. The revolutionary design of the HiperRes® Sensor line now enables just that. The high resolution MHR metal sensor delivers outstanding resolution. This permits the detection of smallest thermal effects. The unique design ensures shortest possible time constants, permitting the separation of overlapping effects over the full temperature range.

MHR

High resolution metal sensor ensures unparalleled resolution and durability. This sensor is perfectly suited for day to day operation in research and quality control.

Crucibles

ACCESSORIES

	OPTIONS
Forced air cooling	Quench air cooling system
One stage Intracooler	Enables controlled heating and cooling in the temperature range -40 up to 550°C.
Liquid Nitrogen Quenching	Enables controlled heating and uncontrolled cooling in the temperature range -150 up to 400°C. The accessory consists of a reservoir which can be filled with Liquid Nitrogen, ice water, etc.
Liquid Nitrogen Cooling Unit	Enables controlled heating and cooling in the temperature range -180 up to 750°C. This accessory consists of a Liquid Nitrogen Dewar and an Electronic controlling the cooling speed.
Sample Press	For optimum sample preparation two different ergonomic sample presses are available. One for pressure crucibles and one for standard crib and hermetic pans.

Intracooler Julabo FT900


DSC-Press

SOFTWARE

All LINSEIS thermo analytical instruments are PC controlled. The individual software modules run exclusively under Microsoft® Windows® operating systems. The complete software consists of 3 modules: temperature control, data acquisition and data evaluation. The Windows® software incorporates all essential features for measurement preparation, execution, and evaluation of a thermoanalytical measurement. Thanks to our specialists and application experts, LINSEIS was able to develop comprehensive easy to understand user friendly application driven software.

Features-Software:

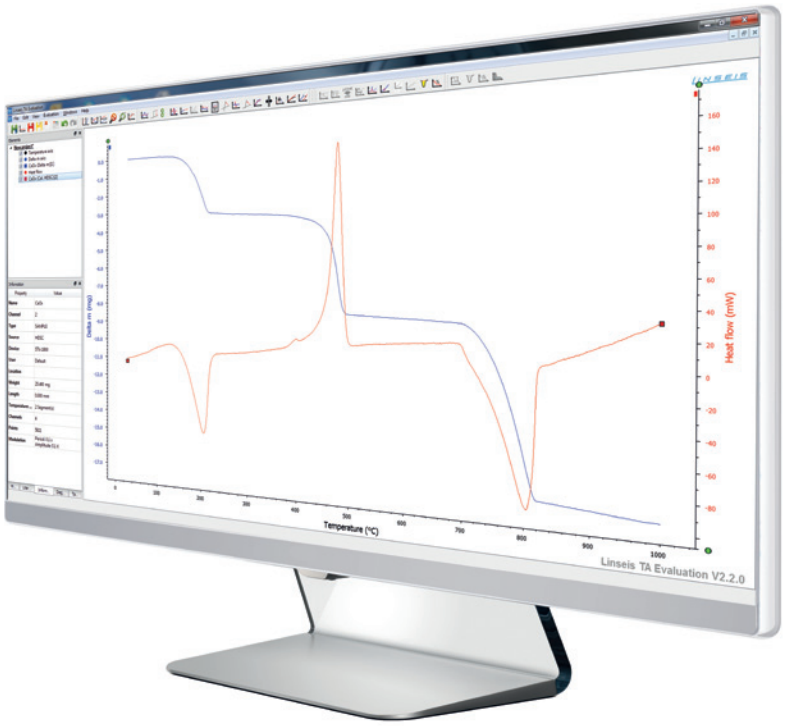
- Program capable of text editing
- Data security in case of power failure
- Thermocouple break protection
- Repetition measurements with minimum parameter input
- Evaluation of current measurement
- Curve comparison up to 32 curves
- Storage and export of evaluations
- Export and import of data ASCII
- Data export to MS Excel
- Multi-methods analysis (DSC TG, TMA, DIL, etc.)
- Zoom function
- 1 and 2 derivation
- Programmable gas control
- Curve arithmethics
- Statistical evaluation package
- Free scaling
- Optional Kinetic and Lifetime Prediction Software packages

TG – Features:

- Mass change as % and mg
- Rate Controlled Mass Loss (RCML)
- Evaluation of mass loss
- Residue mass evaluation

HDSC – Features:

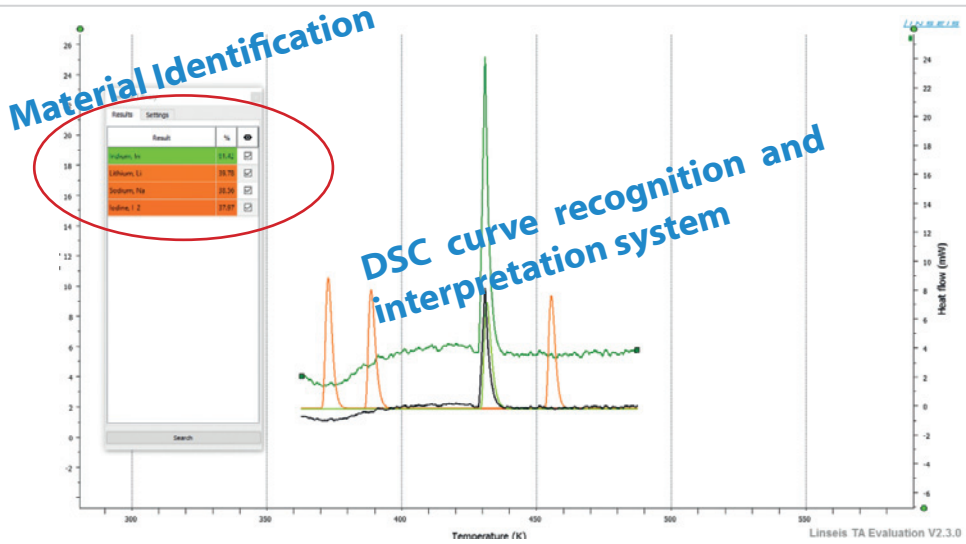
- Glass transition temperature
- Complex peak evaluation
- Multipoint calibration for sample temperature
- Multipoint calibration for change of enthalpy
- Cp calibration for heat flow
- Signal-steered measuring procedures



Thermal Library

The LINSEIS Thermal Library software package comes as an option for the well-known, user friendly LINSEIS Platinum evaluation software that is integrated in almost all our instruments.

The Thermal Library allows you the comparison of the complete curves with a data base providing thousands of references and standard materials within only 1-2 seconds.



Measured and matching reference curves (green) and reference curves with poor fit (red).

Multi-Instrument

All LINSEIS instruments DSC, DIL, STA, HFM, LFA, etc. can be controlled from one software template.

Report Generator

Convenient template selection to generate customized measurement reports.

Data Base

State of the art data base design enables easy data handling.

Multi-Lingual

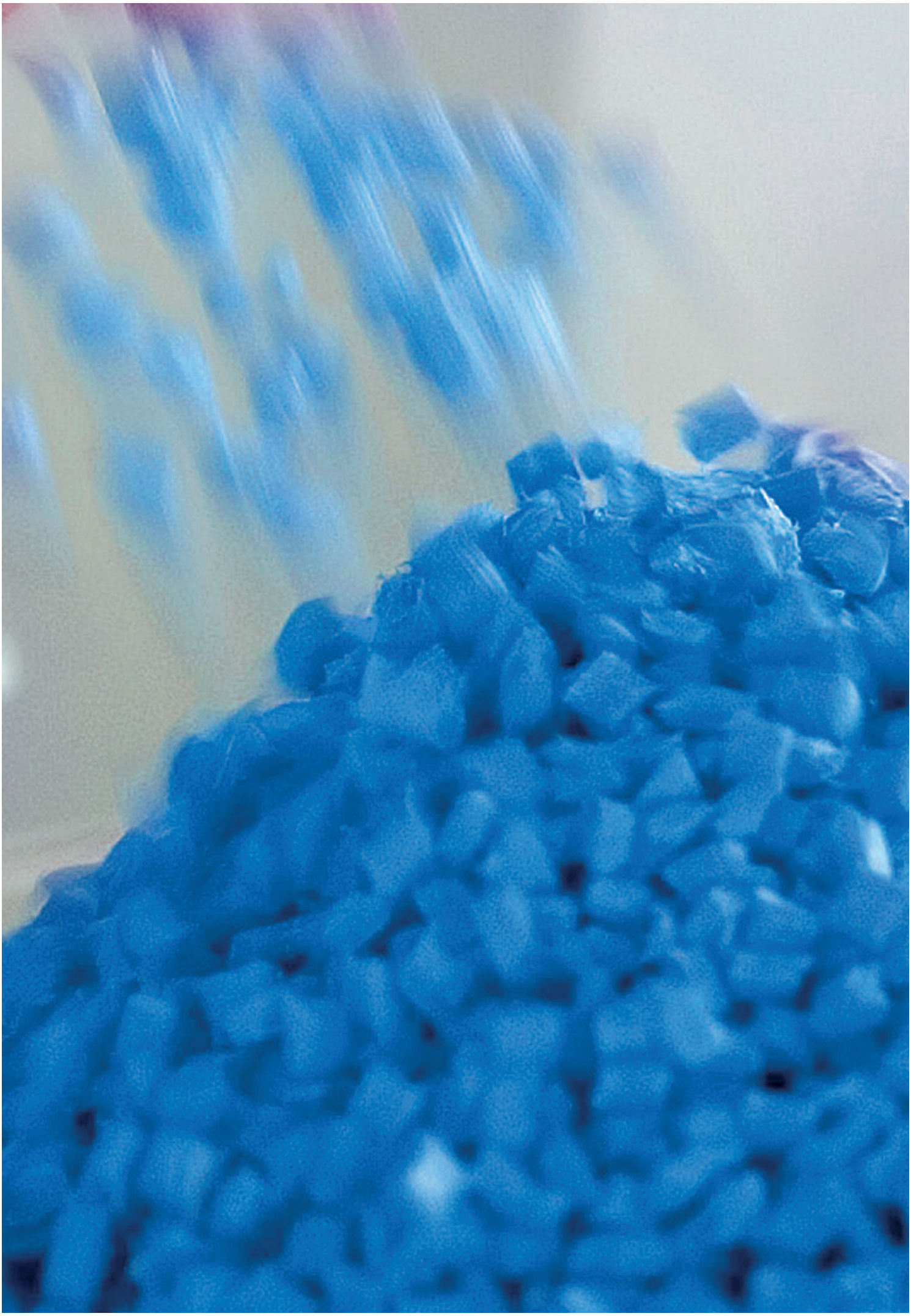
Our software is available in many different user exchangable languages, such as: English, Spanish, French, German, Chinese, Korean, Japanese, etc.

Multi-User

The administrator can generate different user levels providing different rights to operate the instrument. A optional Log file is available, too.

Kinetic software

Kinetic analysis of DSC, DTA, TGA, EGA (TG-MS, TG-FTIR) data for the study of the thermal behavior of raw materials and products.

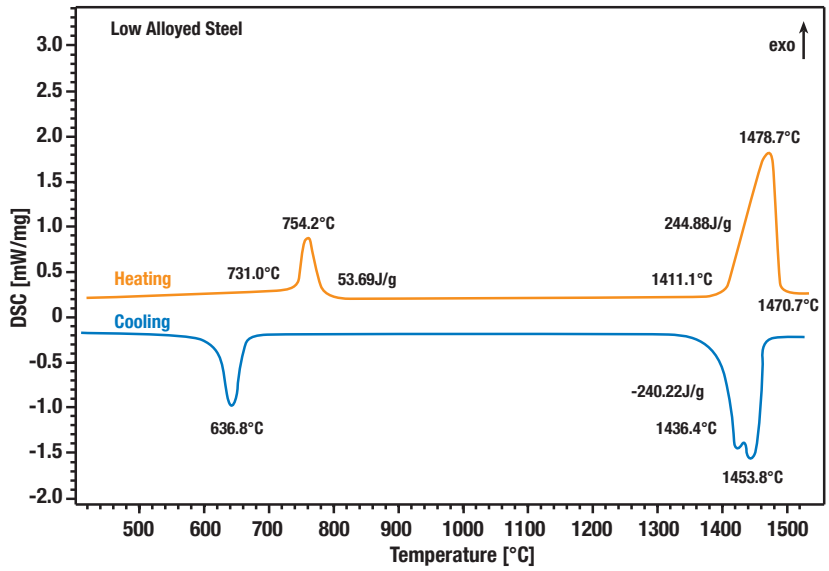


SPECIFICATIONS

	DSC PT 1000
Temperature range	–150°C up to 725°C (low temperature with optional parts)
Heating and cooling rates	0.01 up to 100°C/min
Temperature accuracy	+/- 0.2K
Temperature precision	+/- 0. 2K
Digital resolution	16.8 million points
Resolution	0.03 µW
Atmospheres	inert, oxidizing (static, dynamic)
Measuring range	+/-2.5 up to +/-250mW
Calibration materials	included
Calibration	recommended 6 month interval

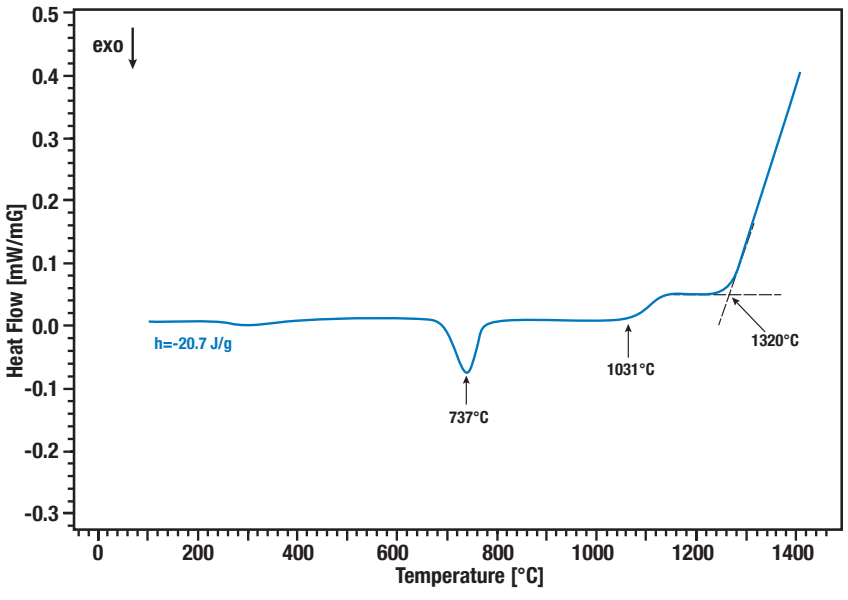
APPLICATIONS

Food



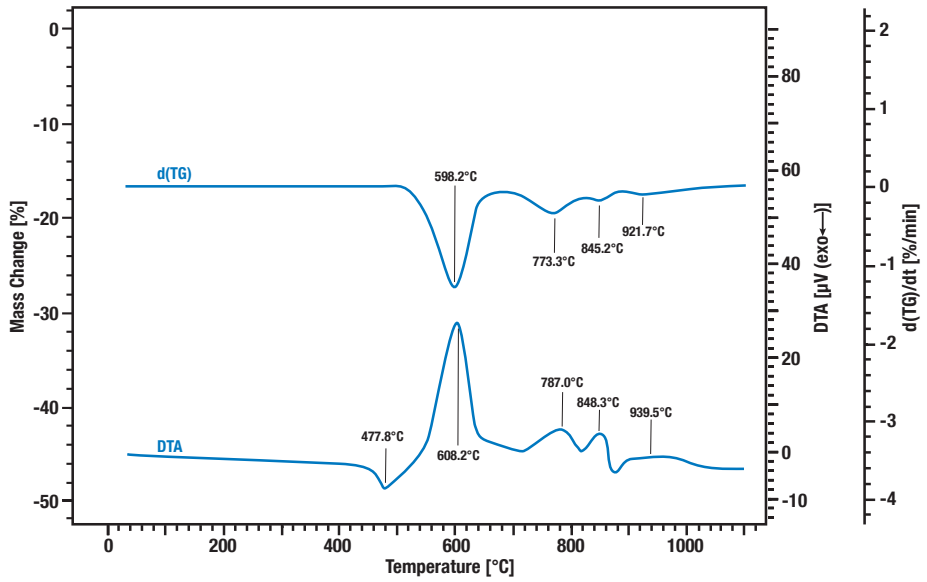
The picture shows the specific heat flow rate of a low-alloyed steel sample, measured by HDSC. At 734°C the change in the crystal structure (from body center to face center) and the change in the magnetic properties (ferromagnetic to paramagnetic) occurred. The melting point can be seen at 1411°C. The liquidus temperature was measured at 1473°C. All peaks are reversible and can be observed in the cooling segment as well. The phase transition to ferromagnetic takes place at 637°C and the crystallization range goes from 1454°C to 1436°C.

DSC powder measurements of ferrites



The components used for production of magnetic ferrites are ZnO, Fe_2O_3 and Cr_2O_3. The Chrome oxide is added for modification of magnetic and electric properties.
At 735°C the powder forms a mixed ferrite with a spinal structure (exothermal reaction: -20.6 J/g).
Above 1034°C and 1321°C the heat flow changes into the endothermic direction due to melting of different phases.
The LINSEIS DSC PT1600 with type S measuring sensor provides a very stable baseline with an extremely low noise level up to 1600°C. This high sensitivity is essential to perform exact reaction enthalpy measurements and evaluations.

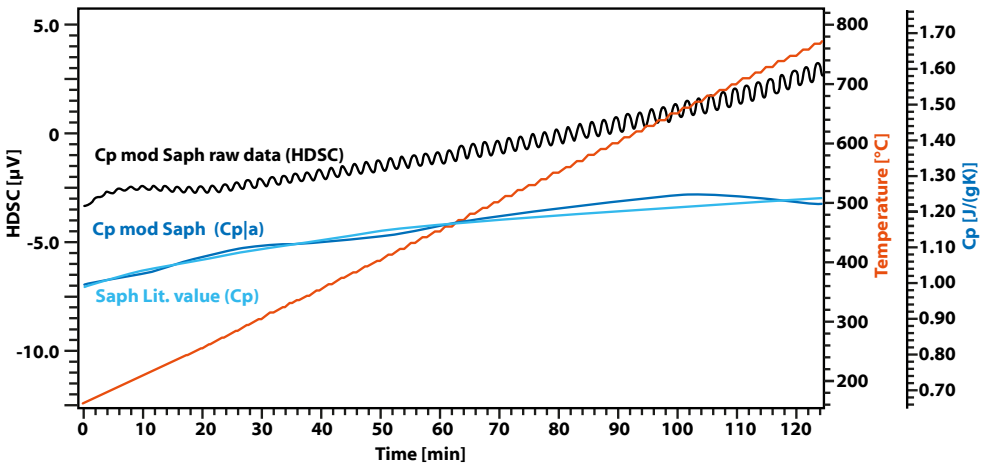
DSC Analysis of Talcum



Talcum ($Mg_3(OH)_2[Si_2O_5]_2$) is a mineral that consists of hydrated magnesium silicate. It is used for the production of steatite bodies used as isolators with high resistance and a low dielectric loss factor. Its impurities (chlorite, carbonates) can be determined and detected using DSC.

The measurement shows the dehydroxylation of chlorite that appears at 608°C and 848°C as endothermal DSC signals. At 768°C the removal of CO_2 can be observed when the contained carbonates decompose into their oxides, releasing the CO_2. Finally the dehydroxylation of talc can be seen at 937°C as an endothermal peak as well.

Modulated Cp determination



For highest possible accuracy of Cp, the LINSEIS DSC allows the usage of modulated heating rate temperature profiles. This method causes a continuous change in heat flow of the sample and the system can monitor the heat uptake much better than with a linear heating profile. The deviation from the literature value is much smaller than with linear DSC runs.

The modulated heat flow signal (black) leads to a significant better Cp resolution (dark blue) that is only slightly different from the literature (bright blue) over the full temperature range. The orange curve shows the modulated heating profile.

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Services: Service Lab, Calibration Service

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