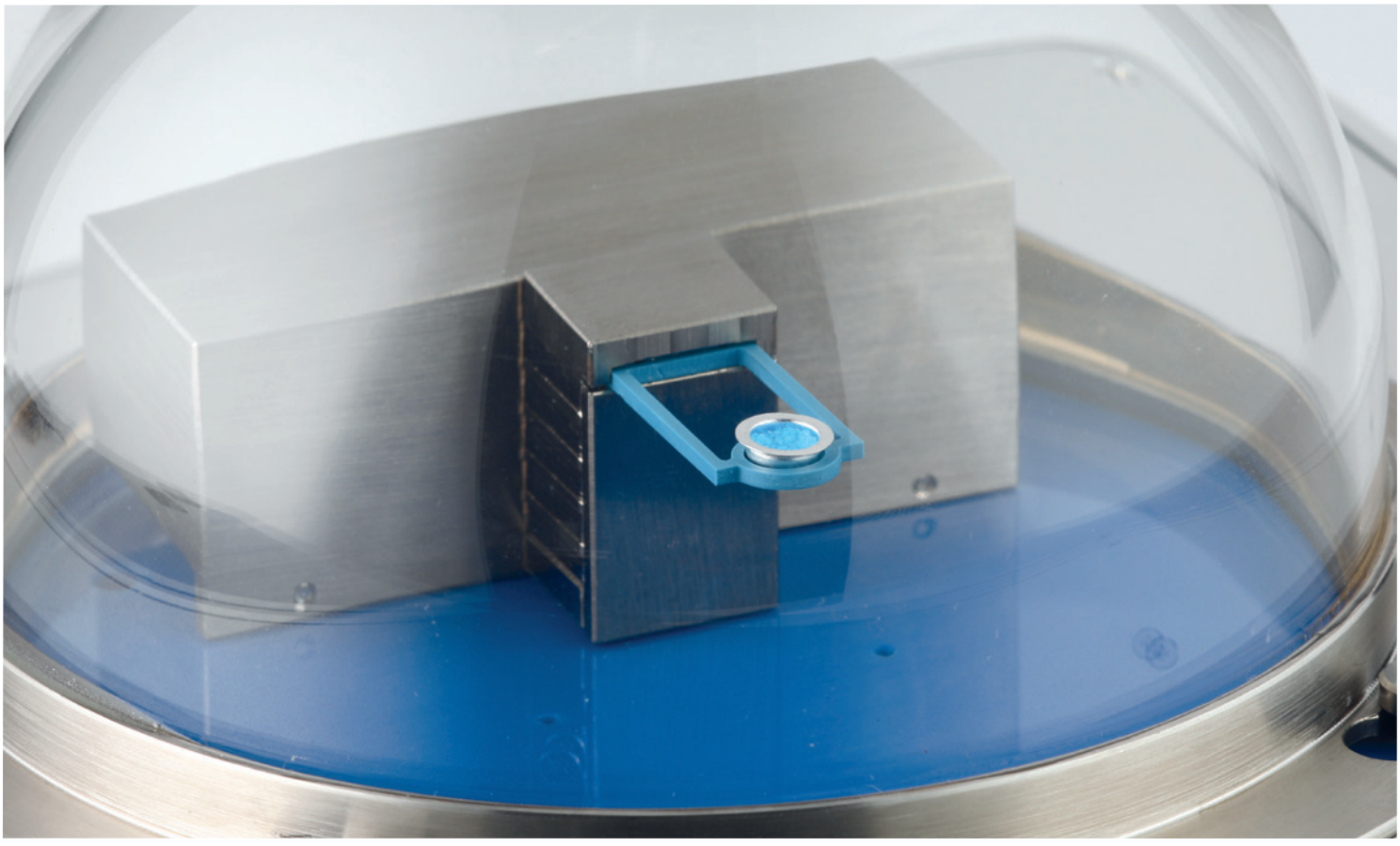
LINSEIS

THERMAL ANALYSIS

DIFFERENTIAL SCANNING CALORIMETER

Chip-DSC 100

Chip-DSC 10



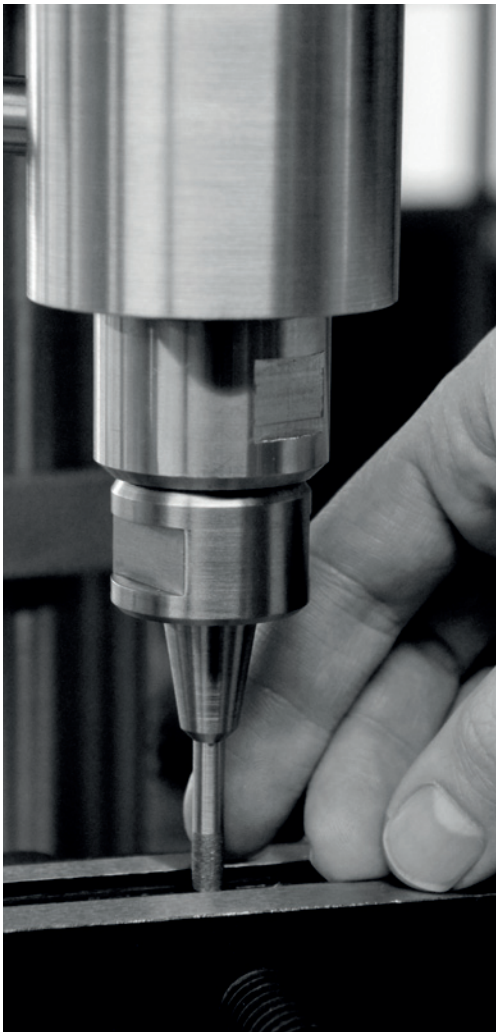
Since 1957 LINSEIS Corporation has been delivering outstanding service, know how and leading innovative products in the field of thermal analysis and thermo physical properties.

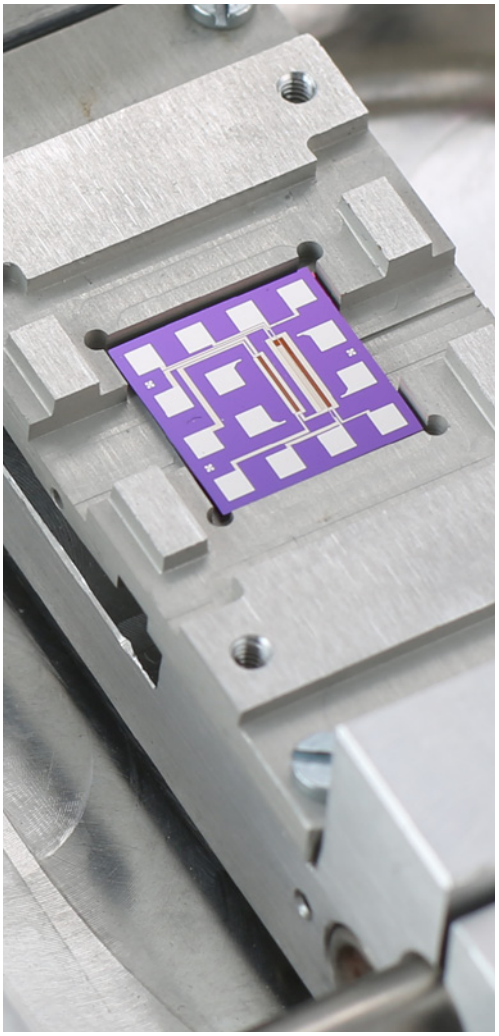
Customer satisfaction, innovation, flexibility and high quality are what LINSEIS represents. Thanks to these fundamentals our company enjoys an exceptional reputation among the leading scientific and industrial organizations. LINSEIS has been offering highly innovative benchmark products for many years.

The LINSEIS business unit of thermal analysis is involved in the complete range of 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





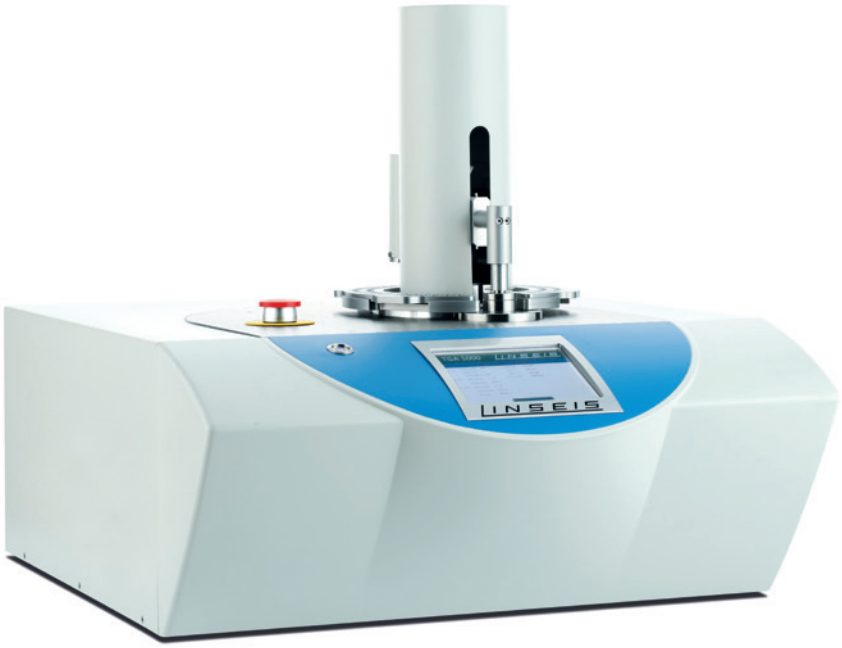
German engineering

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



Chip-DSC 100

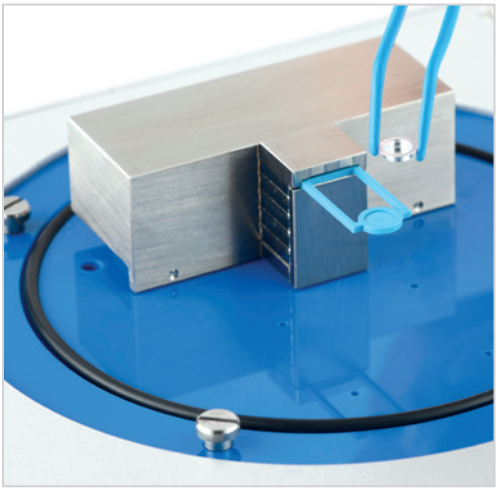


Chip-DSC 10

The DSC Principle

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 -150 °C to 600°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.



INTEGRATED CHIP TECHNOLOGY

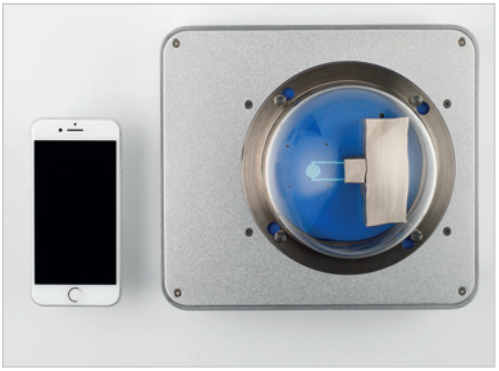
Reinventing Differential Scanning Calorimetry (DSC)- Integrated chip technology for your application needs

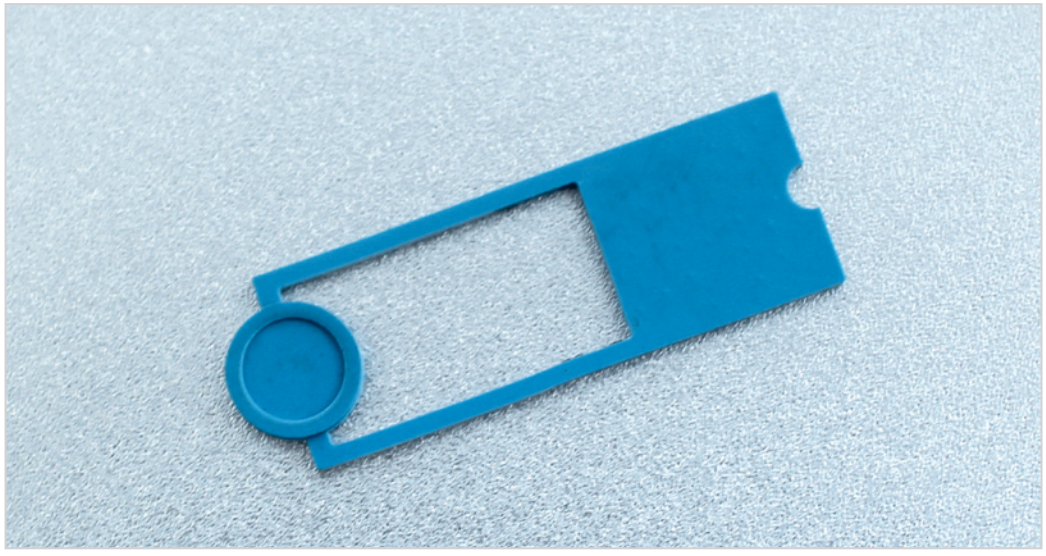
Revolutionary Sensor Concept

The all new Chip DSC-sensor integrates all essential parts of DSC, furnace, sensor and electronics in a miniaturized housing. The chip-arrangement comprises the heater and temperature sensor in a chemically inert ceramic arrangement with metallic heater and temperature sensor.

This arrangement allows superior reproducibility and due to the low mass outstanding temperature control and heating rates of up to 1000°C/min. The integrated sensor is easily user exchangeable and available for a low cost.

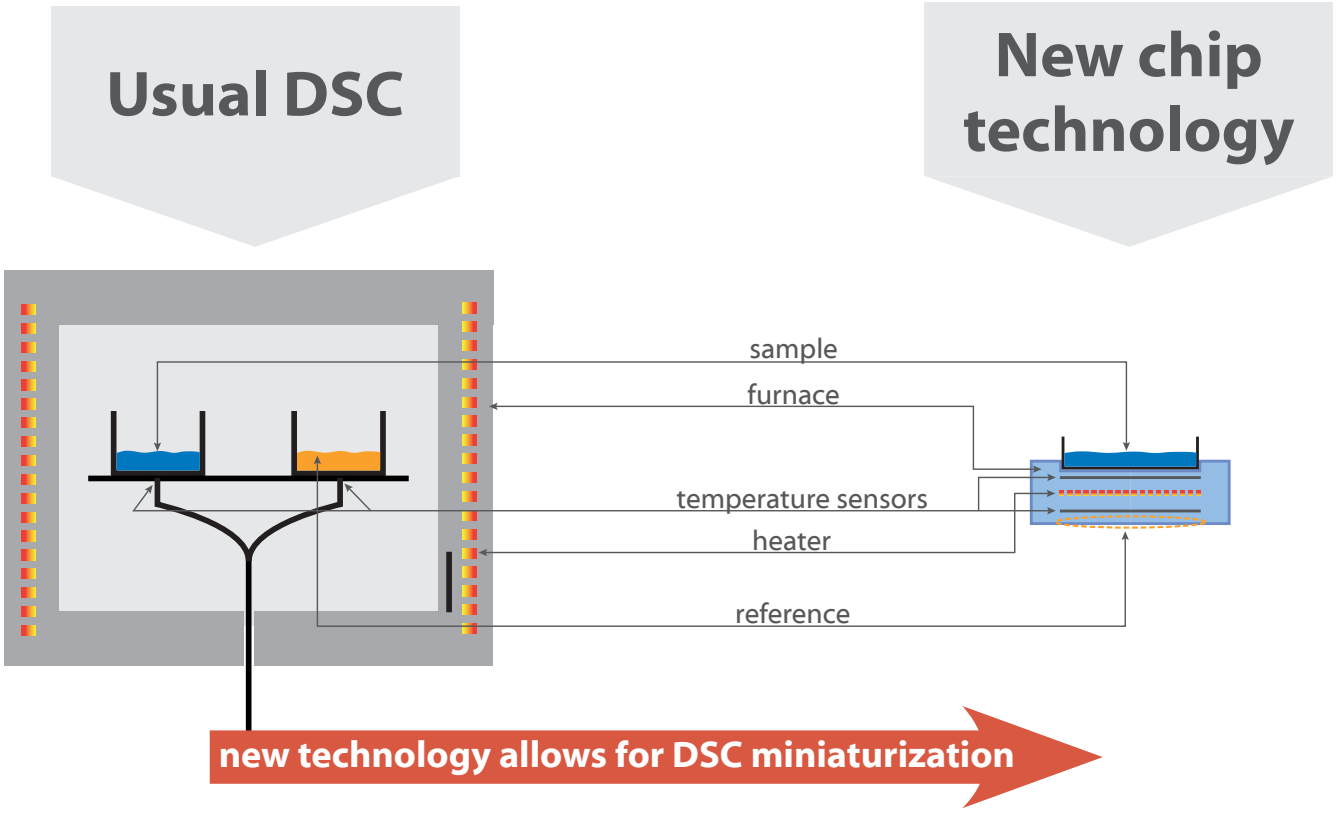
The integrated design of the chip-sensor delivers superior raw data, which enables a direct analysis without pre- or post-processing of heat flow data.





Small Footprint

The compact construction, leads to a significant reduction in production cost which can be passed on to our customers. The low energy consumption and unrivaled dynamic response result in unsurpassed performance of this revolutionary DSC-concept.





Chip reduction: similar to the memory cards

ACCESSORIES

Peltier cooling system (0 – 600°C)

This is a Peltier cooled heat exchanger. The simple to install accessory reduces the starting temperature of the DSC-sensor to 0°C. Due to the low thermal mass of the sensor the DSC can now reach linear heating from 10°C onwards. With this starting temperature 90% of polymers can be evaluated.

Closed-loop Intracooler (-100 – 600°C)

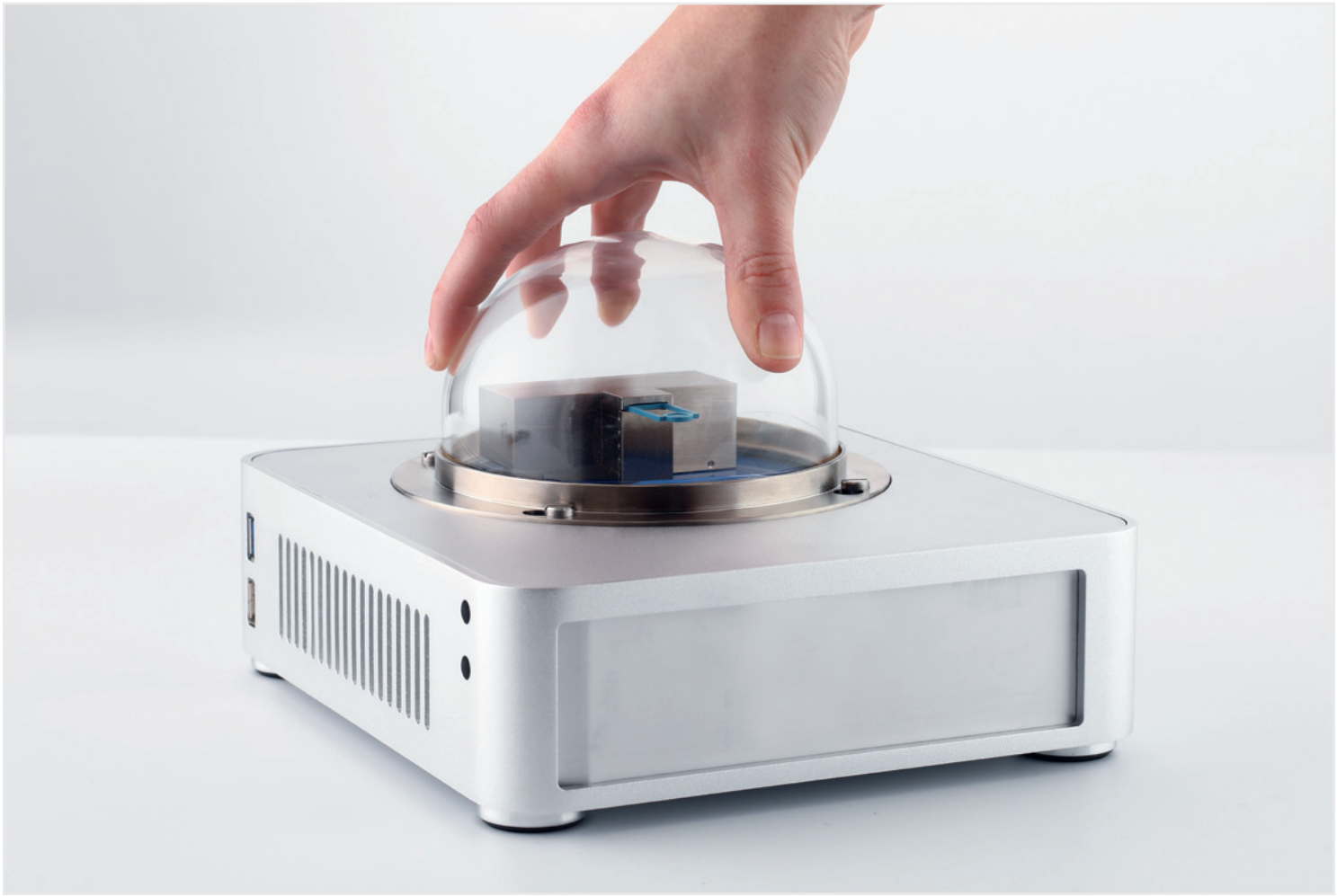
Closed cycle refrigerated cooling system. Can cool down to -100°C. This Intracooler eliminates the need of refilling LN2 for cooling purposes.

LN_2 Cooling system (-150 – 600°C)

Controlled cooling system for ultra-low temperature application down to -150°C. This accessory provides the greatest flexibility and cooling capacity of all available options.

DSC-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.



SPECIFICATIONS

	Chip-DSC 10	Chip-DSC 100
Temperature range	–150°C (with appropriate cooling option) up to +600°C (Peltier cooling system, LN_2 cooling system)	–180°C up to +600°C (Peltier cooling system, Closed-loop Intracooler, LN_2 cooling system)
Heating and cooling rates	0,001 up to 300°C/min	0,001 up to 1000°C/min
Temperature accuracy	+/- 0.2K	+/- 0.2K
Temperature precision	+/- 0.02K	+/- 0.02K
Digital resolution	16.8 million points	16.8 million points
Resolution	0.03 µW	0.03 µW
Atmospheres	inert, oxidizing (static, dynamic)	inert, oxidizing (static, dynamic)
Measuring range	+/-2.5 up to +/-250mW	+/-2.5 up to +/-250mW
Calibration materials	included	included
Calibration	recommended 6-month interval	recommended 6-month interval

SOFTWARE

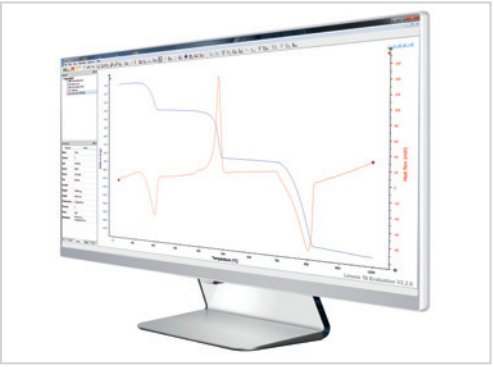
Smart Software Solutions from LINSEIS

The all new Rhodium Software greatly enhances your workflow as the intuitive data handling only requires minimum parameter input.
AutoEval offers a valuable guidance for the user when evaluating standard processes such as glass transitions or melting points.
Thermal library product identification tool, provides a database with 600 polymers permitting an automatic identification tool for your tested polymer.
Instrument control and/or surveillance through mobile devices gives you control wherever you are.

- Software packages are compatible with latest Windows operating system
- Set up Menu entries
- All specific measuring parameters (User, Lab, Sample, Company, etc.)
- Optional password and user levels
- Undo and Redo function for all steps
- infinite heating, cooling or dwell time segments
- multiple language versions such as English, German, French, Spanish, Chinese, Japanese, Russian, etc. (user selectable)
- Evaluation software features a number of functions enabling a complete evaluation of all types of data
- Multiple smoothing models
- Complete evaluation history (all steps can be undone)
- Evaluation and data acquisition can be performed simultaneously
- Data can be corrected using zero and calibration correction
- Data evaluation includes: Peak separation software Signal correction and smoothing, first and second derivative, curve arithmetic, data peak evaluation, glass point evaluation, slope correction. Zoom / individual segment display, multiple curve overlay, annotation and drawing tools, copy to clip board function, multiple export features for graphic and data export, reference based correction

HDSC – Features:

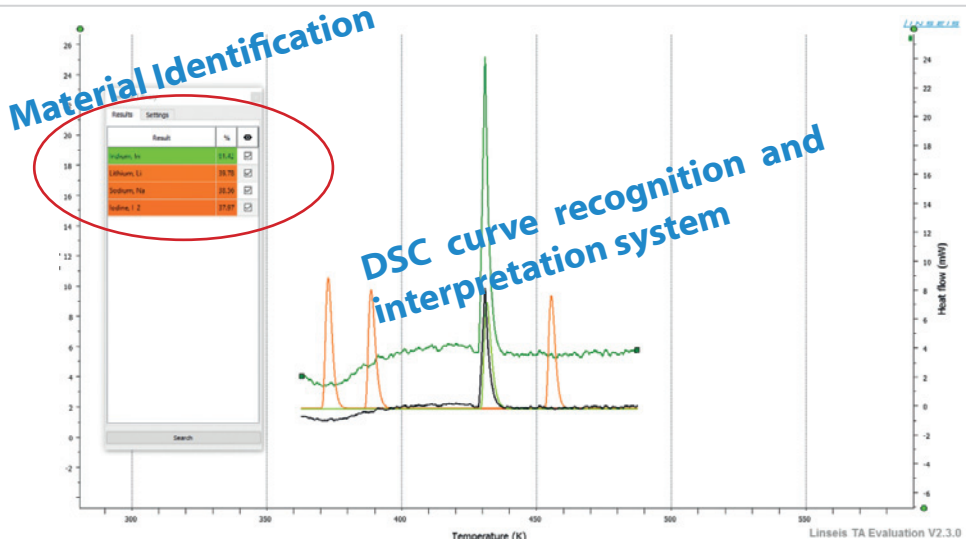
- Glass transition temperature
- Complex peak evaluation
- Multipoint calibration for sample temperature
- Multipoint calibration for change of enthalpy
- Cp calibration for heat flow
- Signal-steered measuring procedures



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.

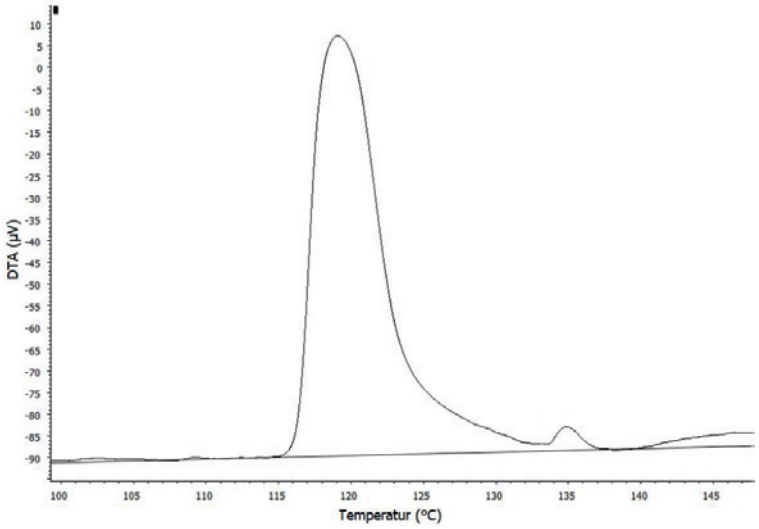
Kinetic software

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

APPLICATION TAWN TEST

TAWN Test Part 1 – Resolution

LINSEIS Chip-DSC TAWN I Resolution Test 20K/min



Scope

4,4´-Azoxyanisole reference material was used to perform the so called TAWN test. The substance forms a liquid cristalline phase at 120°C which transforms into liquid phase at 134°C with a small activation energy barrier in a second step.

This "double peak" is used in the TAWN test to investigate sensitivity and resolution of a DSC system and compare different DSC instruments with each other.

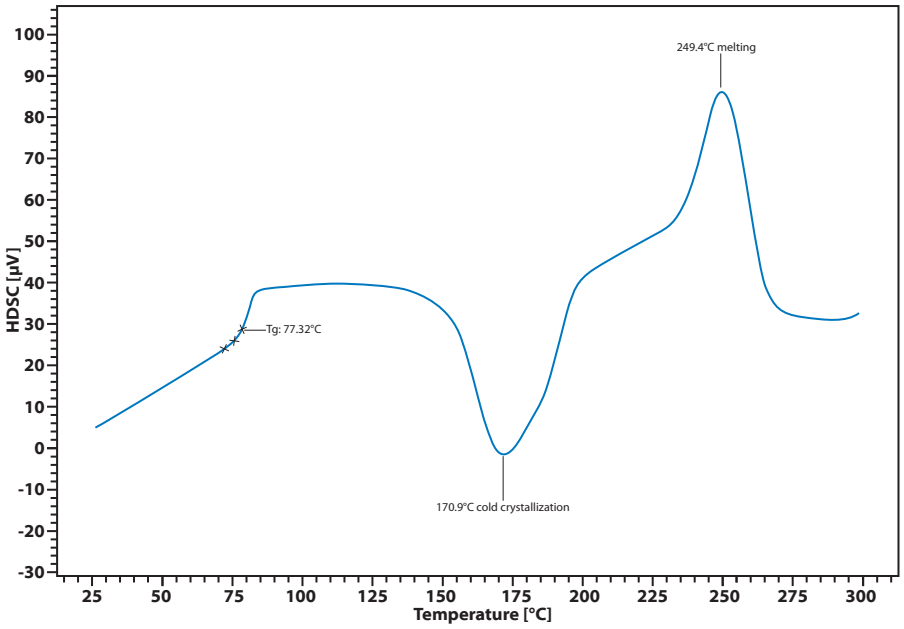
For both parts of the test an open aluminum crucible has to be used. The atmosphere must be air, argon or nitrogen, in this case we used air. Part 1 investigates the resolution and is performed with 5 mg test substance. At a heating rate of 20 K/min the double peak is measured and the ratio of baseline between the two peaks and the maximum of the second peak is taken for evaluation. This ratio is defined as $R_{(20)}$ – baseline/peak maximum and gives the first constant for the TAWN result.

Result:

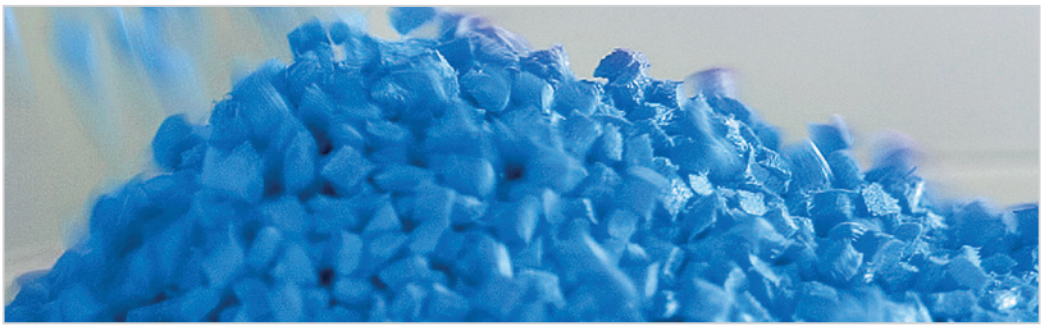
The measurement of the ratio of baseline between peaks and maximum of second peak according to TAWN I for the Linseis Chip-DSC at static air atmosphere in aluminum crucible showed the values 1.64 µV to 5.50 µV. The resulting quotient is $R_{(20)}$= 0.298. This means the resolution of the Chip-DSC is similar to the top comparative instruments on the market.

APPLICATIONS

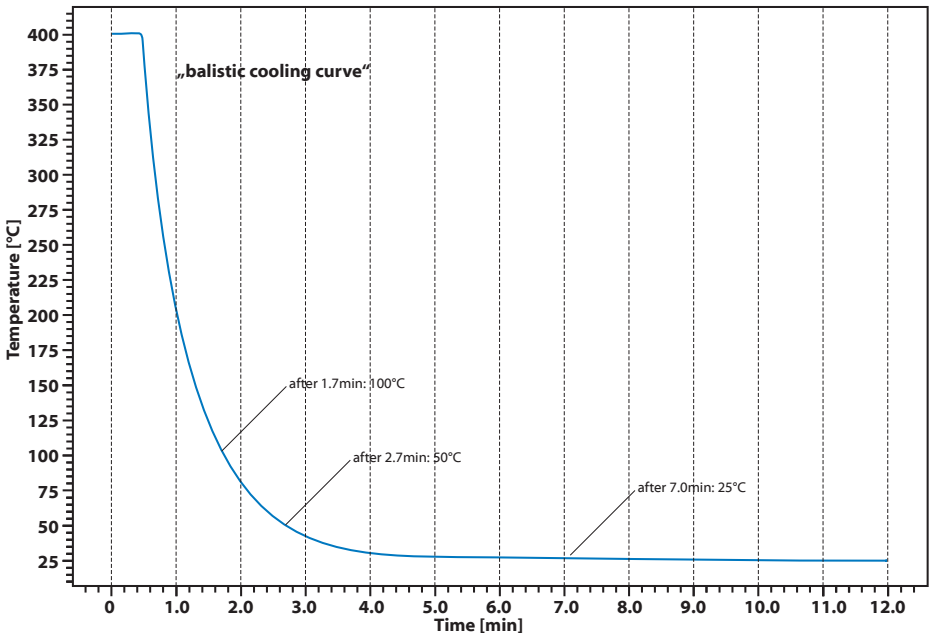
Measurement of PET granulate



The analysis of polymers is one of the main applications of DSC. Effects like glass transitions, melting and crystallization points are of interest and often very hard to detect. The new Linseis Chip-DSC provides high resolution and sensitivity, making it an ideal instrument for this kind of analysis. As an example, a PET granulate was heated, quench cooled to freeze the amorphous state and afterwards measured by Chip-DSC with a linear heating rate of 50°C/min. The curve shows a significant glass transition at 77°C, followed by a recrystallization of the amorphous parts at 170°C and a melting peak at 295°C.



Rapid cooling rates without active cooling



The Linseis Chip-DSC allows fastest possible ballistic cooling rates without any active cooler needed. Due to the low thermal mass and innovative sensor design, cooling rates up to 200°C/min from maximum temperature to 100°C and up to 50°C/min from 100°C to room temperature are possible. Starting ballistic cooling from a 400°C isothermal segment, 50°C is reached under 3 min measurement time. Of course, the signal can still be evaluated during that cooling segment and does not lose sensitivity or accuracy.

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Products: DIL, TG, STA, DSC, HDSC, DTA, TMA, MS/FTIR, In-Situ EGA, Laser Flash, Seebeck Effect, Thin Film Analyzer, Hall-Effect
Services: Service Lab, Calibration Service

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