

A close-up photograph of a Differential Scanning Calorimeter (DSC) sample pan. The pan is made of a dark, polished metal and features a grid of 24 circular wells, each numbered from 1 to 24. The wells are arranged in a roughly rectangular pattern. The pan is positioned within a larger, light-colored metal housing, with a curved metal component visible above it. The lighting is bright, highlighting the metallic surfaces and the precision of the manufacturing.

DSC

Differential Scanning Calorimeter

LINSEIS

Introduction

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 T_g, 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 64 position autosampler

Widest temperature range – from -180 °C to 750 °C in one measurement

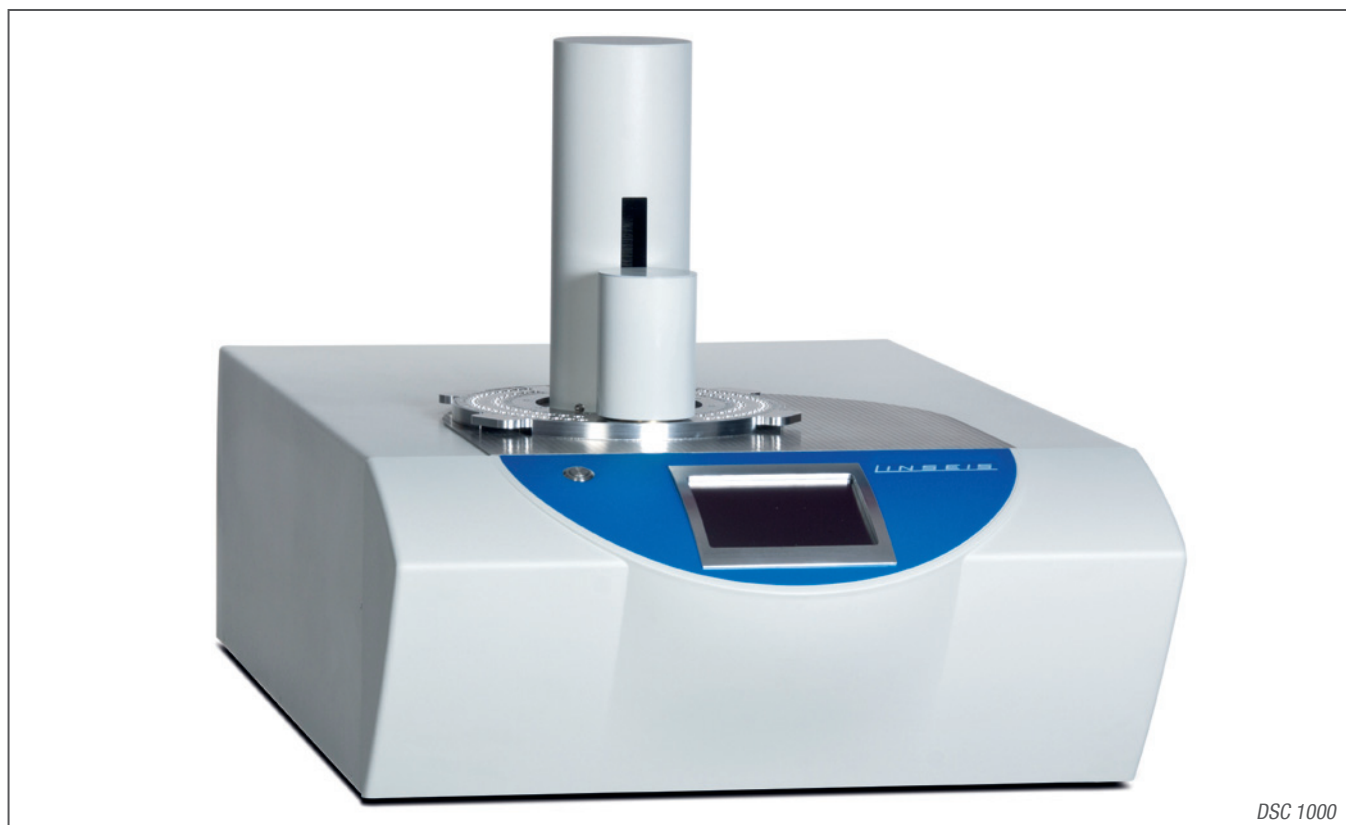
The LINSEIS Differential Scanning Calorimeters (DSC) operates in agreement with national and international standards such as: ASTM C 351, D 3417, D 3418, D 3895, D 4565, E 793, E 794, DIN 51004, 51007, 53765, 65467, DIN EN 728, ISO 10837, 11357, 11409.

LINSEIS DSC – 1000

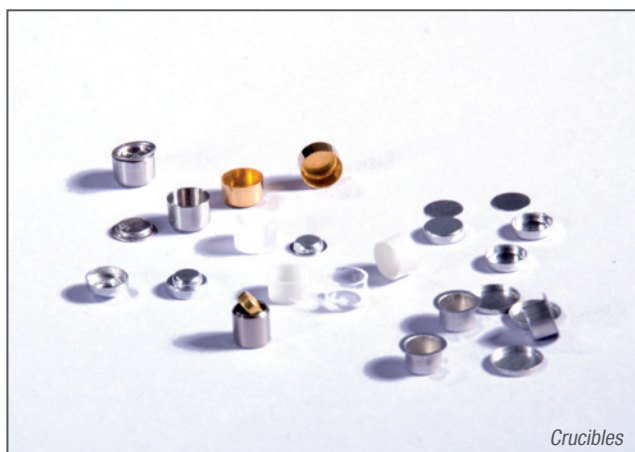
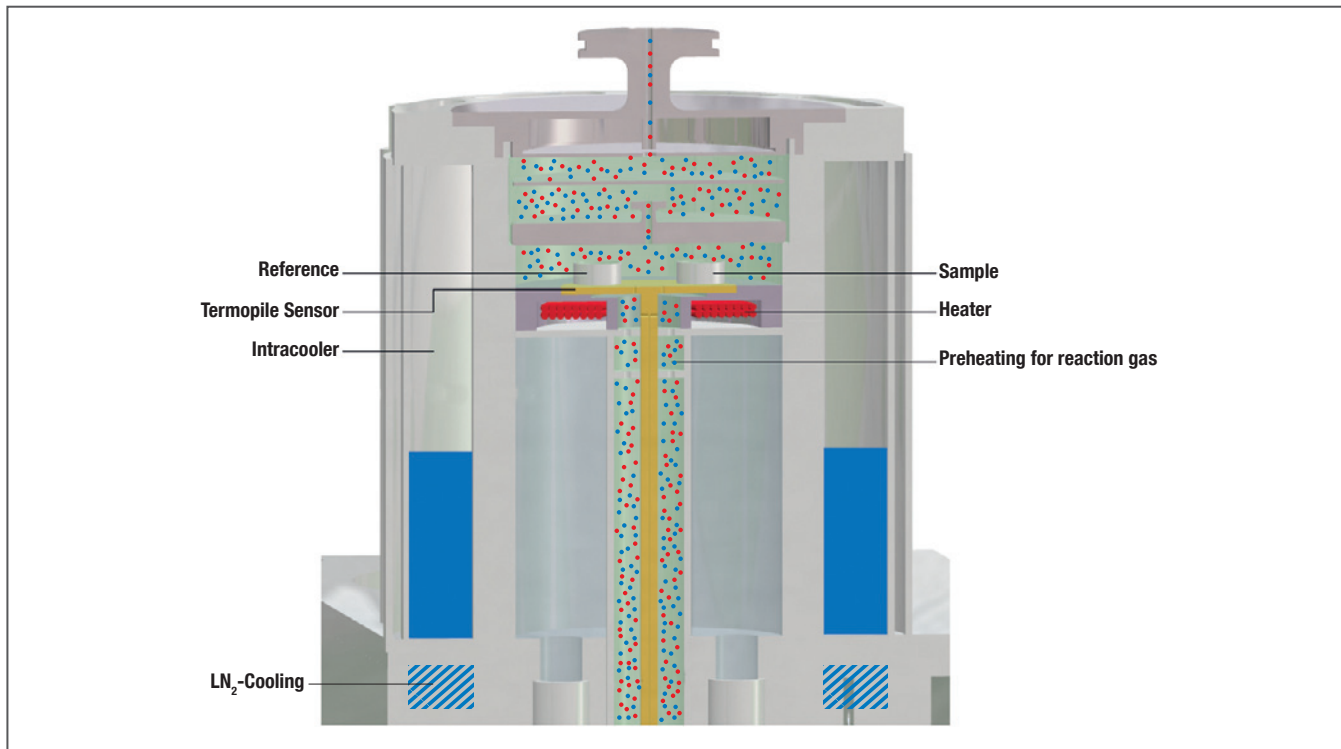
This product was developed to provide a general purpose TM - DSC with a broad temperature range (-150 – 725°C) for all common applications. Furthermore emphasis was placed on an extremely stable baseline and high reproducibility. The design allows manual and automatic operation. The conception of the cell guarantees maximum mechanical and chemical resistance. The 120 thermocouple sensor MR12 provides highest resolution and outstanding sensitivity.

LINSEIS DSC – 1000 HiRes

Research grade TM - DSC with unsurpassed HR24 Sensor comprising 240 thermocouples and a dual detector arrangement, combining the advantages of heat flux and power compensation technology into one integrated sensor arrangement. This design provides the highest sensitivity and resolution in the market, outperforming all competitive designs by a magnitude. Furthermore the instrument allows full automation due to its 64 position autosampler, automatic gas dosing system and the optional vacuum tight design. The broad temperature range (-180 up to 750°C) ensures that even most demanding applications can be analyzed.



DSC 1000



MR12

120 Thermocouples in a row ensure unparalleled resolution. The glass ceramic sensor designs ensure highest resolution and durability. This sensor is perfectly suited for day to day operation in research and quality control.

HR24

The combined heat flux & power compensation sensor for most demanding application, 240 thermocouples ensure unsurpassed sensitivity and resolution. Even with smallest sample quantities and slow heating rates weak transitions can be detected.

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 120 or 240 thermocouples deliver the highest resolution on the market. This permits the detection of smallest thermal effects. The glass ceramic sensor structure ensures shortest possible time constants, permitting the separation of overlapping effects over the full temperature range. Unlike competing metal sensors the ceramic design does not oxidize and thus can be used ongoing over the full temperature range without aging effect.



Accessories

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.
Two stage Intracooler	Enables controlled heating and cooling in the temperature range -90 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.



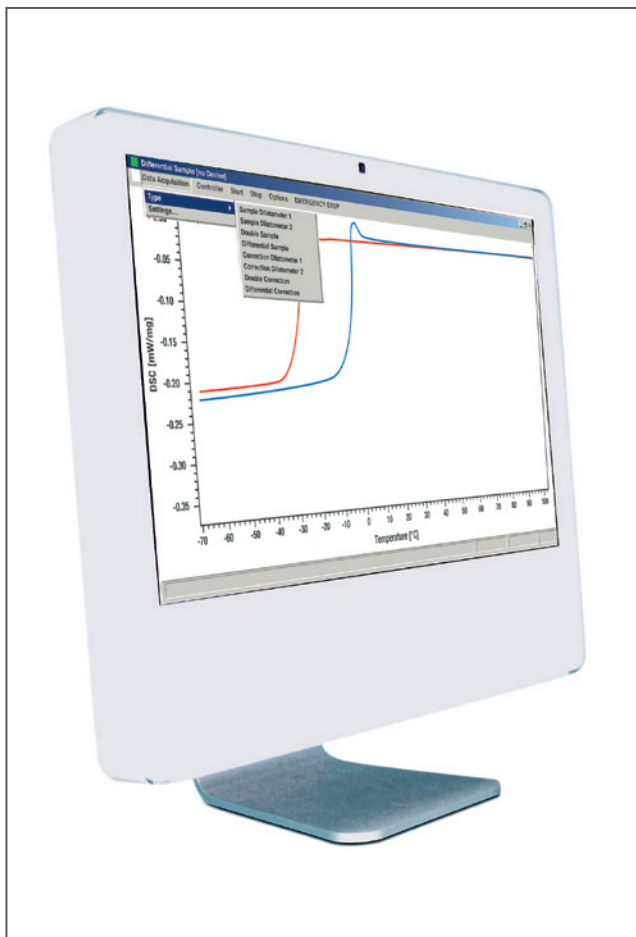
Software

Software

All thermo analytical devices of LINSEIS are PC controlled and the individual software modules exclusively run under Microsoft Windows operating systems. The complete software consists of 3 modules: temperature control, data acquisition and data evaluation. The Linseis 32 – bit software encounters all essential features for measurement preparation, execution and evaluation with a DSC run, just like with other thermo analytical experiments. Due to our specialists and application experts LINSEIS was able to develop this easy understandable and highly practical software.

Features

- Temperature Modulated DSC
- Repetition measurements with minimum parameter input
- Evaluation of current measurement
- Curve comparison up to 32 curves
- Curve subtraction
- Multi-methods analysis (DSC TG, TMA, DIL, etc.)
- Zoom function



- 1. and 2. Derivative
- Multiple smoothing functions
- Complex peak evaluation
- Multipoint calibration for sample temperature
- Multipoint calibration for change of enthalpy
- Cp calibration for heat flow
- Storage and export of evaluations
- Program capable of text editing
- Export and import of data ASCII
- Data export to MS Excel
- Signal-steered measuring procedures
- Zoom in function
- Undo function

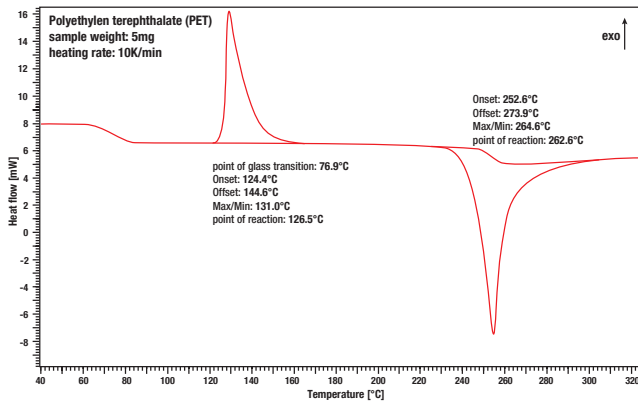
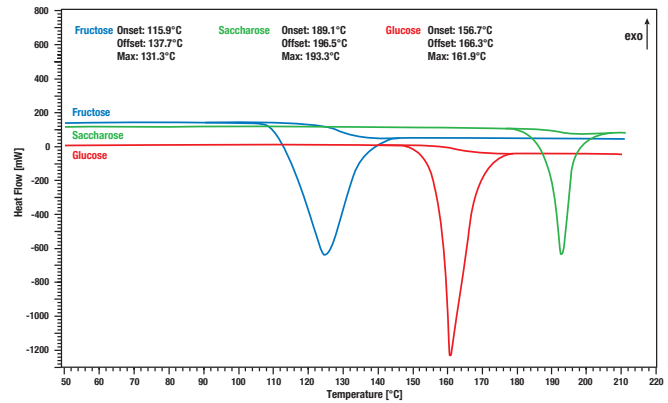
The following interesting physical properties of materials can be measured:

- Enthalpy, melting energy
- Specific heat
- Glass point
- Crystallinity
- Reaction enthalpy
- Thermal stability
- Oxidation stability
- Aging
- Purity
- Phase transformation
- Eutectics
- Polymorphs
- Product identification

Applications

Food

The three evaluated substances (Fructose, Glucose and Saccharose) show distinctive melting points. These melting points can be precisely determined by means of Differential Scanning Calorimetry (DSC). For this the analytical method is frequently used for the determination of unknown substances. Even mixtures with identical molecular weight such as Fructose and Glucose can thus be recognized.

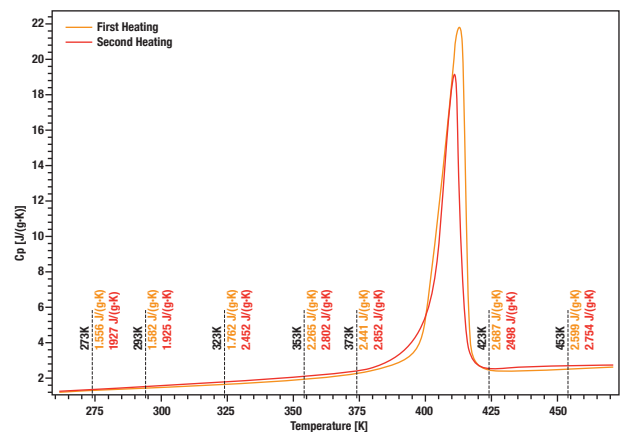


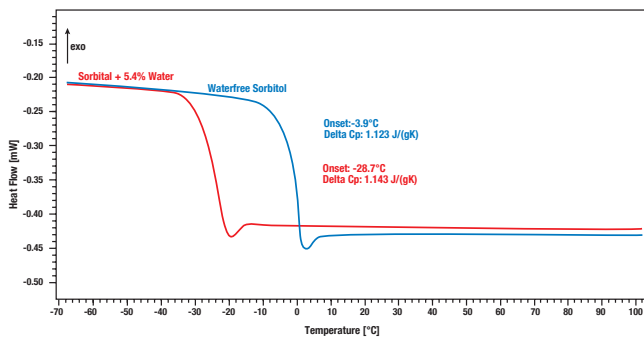
Polymers

PolyEthylenTerephthalat (PET) shows a significant endothermic glass point at about 76.9°C, which is quite special for partly crystalline thermoplasts. The relation between the exothermal cold crystallization at 131.0°C and the endothermic melting peak is a measure for the degree of crystallization of the material. In the case of (PET) the crystalline part is very small which results in a good transparency of the material.

Specific Heat of Polyethylene

The Picture shows a Polyethylene standard material in a Heat-Cool-Heat Experiment. There are differences in the first and the second heating curve due to change of crystallinity of the sample.



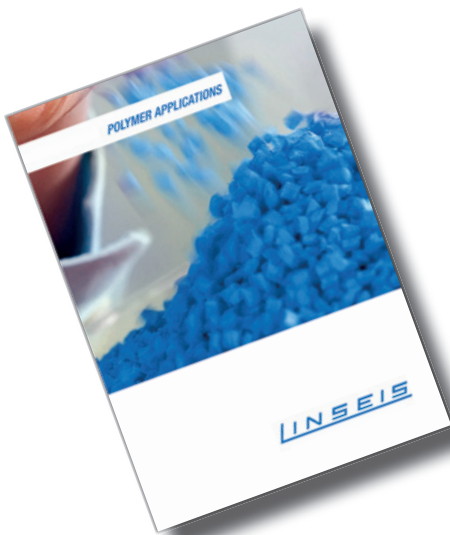
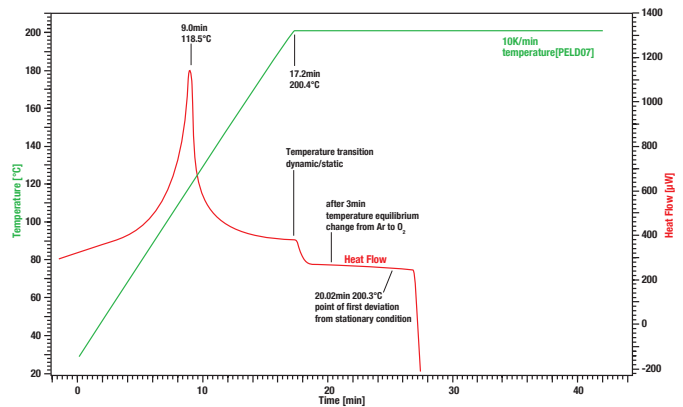


Pharmaceuticals

Sorbitol is frequently used as replacement for sugar in Sweets, Diet products and as carrier substance for pharmaceuticals. The glass point from water-free sorbitol at -3.9°C is increased to -28.7°C by adding 5.4% water. Both samples remain entirely amorphous after the smelting (took place before the heating up).

OIT “Oxidative Induction Time”/Temperature

Initially the polyethylene sample is heated up to 200°C under argon atmosphere with a heating rate of 10K/min. After 3 minutes at the equilibrium the environment is changed from argon to oxygen. After an additional 5 minutes the exothermal oxidation of the sample starts.



LINSEIS Application Handbook:

Polymer Applications

- DTA
- DSC
- HDSC
- TG
- TMA
- DIL
- MS/FTIR Coupling

Technical Specifications

DSC	
Hoist system	It should have double hoist system for covering entire range of -150 to 1500°C.
Temperature range	150 to 1500°C
Temperature calibration	up to 4 points or better
Temperature accuracy	± 0.5 K
Temperature repeatability	0.1°C or better, based on metal standards
Heating rates	0.001 to 50°C/min for entire range
DSC Sensitivity	1.1 µV/mW or better
Enthalpy accuracy	± 3.5% or better
Enthalpy precision	± 0.6% or better
Calorimetric accuracy	2.5% or better (based on metal standards)
Calorimetric precision	2.5% or better (based on metal standards)
Specific heat range	0 to 4.5J/g or better
Specific heat accuracy	± 3% up to at least 1000°C or better
Vacuum tightness	The unit should be under vacuum tight with 10 ⁻² mbar or better.
Calibration	Heat flow calibration using sapphire as the calibrant over the entire temperature range
MFC	It should have digital mass flow controller for three channels to provide software control for gas purging with appropriate flow rate (up to 1 liter/min) and programmable with automated switching of purge gas.
Thermocouples	Pt/Pt-Rh. Quick connect thermocouple for easy changeover automated furnace cooling and programmable end-of-run conditions an automated furnace cooling and programmable end-of-run conditions and furnace movement
Crucibles	500 Al crucibles, 10 Alumina crucibles and 6 platinum crucibles
Crucible spacers	10 crucible spacers for DSC
OTS	spare oxygen trap system to reduce the oxygen up to 1 ppm level
Data acquisition	A suitable data acquisition system with data analysis software for the results is to be provided.



LINSEIS GmbH

Vielitzerstr. 43

95100 Selb

Germany

Tel.: (+49) 9287-880 - 0

Fax: (+49) 9287-70488

E-mail: info@linseis.de



LINSEIS Inc.

109 North Gold Drive

Robbinsville, NJ 08691

USA

Tel.: (+1) 609 223 2070

Fax: (+1) 609 223 2074

E-mail: info@linseis.com



LINSEIS China

Kaige Scientific Park 2653 Hunan Road

201315 Shanghai

Tel.: (+86) 21 5055 0642

Fax.: (+86) 21 6806 3576



LINSEIS France

Bureaux Paris

52 Boulevard Sébastopol

75003 Paris

Tel.: (+33) 173-028 272

www.linseis.com

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



LINSEIS