DSC-8000 data sheet

At PerkinElmer, we're committed to the future of thermal analysis. Our new line of high-performance DSC solutions, enables you to see more than you ever thought possible. Whether you're performing QA/QC applications, studying processes in polymers or pharmaceuticals, or developing the cures of tomorrow, our new DSC platforms will open your eyes to a world of exciting new opportunities.

Truly comprehensive, our DSC portfolio of applications, instruments and services, combined with our expertise in materials characterization, can help you push the edge of science. That means greater access to insights, a far more effective work experience and the answers you need today and tomorrow. Look ahead, and you'll see new potential.

Reliable performance. Any way you look at it.

Our new DSC 4000 is a compact workhorse that performs like a champion. It's the single-furnace solution you can depend on for a wide range of routine and traditional materials characterization research applications in the academic, polymer and pharmaceutical markets. Not only is the DSC 4000 consistent, reliable and easy-to-use, it's also upgradeable to meet your laboratory's future needs.

- Single-furnace DSC
- Optional 45-position autosampler
- Upgradeable to DSC 6000

Excellence for every size lab

Proven advantages

- Low-mass furnace and easy-to-fit lids allows for fast measurements
- Integrated mass flow controller provides convenient gas control and switching
- Hardened nickel chromium plate with no exposed thermocouples makes cleaning easy
- Portable cooling device (PCD) enables cost-effective operation
- Temperature range and robustness prevents furnace oxidation

Applications focus

- Traditional materials characterization research
- Routine quality assurance and goods-in testing
- Oxidative Induction Testing (OIT)
- Multi-user, ad-hoc DSC analysis

See what enhanced performance can do for you

It gives you all the advantages of the DSC 4000. But our advanced, single-furnace DSC 6000 gives you so much more. Now you can get Modulated Temperature DSC (MT-DSC) technology for easier data interpretation, and new capabilities for product development and trouble-shooting. It's easy to see why the DSC 6000 is essential for any laboratory.

- Single-furnace DSC
- Modulated Temperature DSC
- Optional photocalorimeter accessory or 45-position autosampler
- Enhanced software package

Expanded DSC capabilities

Proven advantages

- MT-DSC enables the separation of kinetic and thermal events
- Liquid nitrogen cooling enables the faster cooling rates needed for challenging applications
- Advanced photocalorimeter accessory allows for the study of photo-cured materials
- Continuously increase your laboratory's capabilities with a variety of cooling system options and autosampler

Applications focus

- Advanced materials research
- Analytical services
- Multipurpose analysis

Deepen your insight with exclusive technology

Responding to your need for greater sensitivity and accuracy, PerkinElmer brings you the DSC 8000. It features our proprietary double-furnace technology, which directly measures the change in heat flow of the sample. And with the most precise energy measurements over the whole temperature range, it gives you new insights into materials to meet your most demanding applications.

- Double-furnace DSC
- Optional 96-position autosampler
- Enhanced software package
- Upgradeable to DSC 8500

Pioneering DSC innovation

Outstanding sensitivity and reproducibility

- All new double-furnace design delivers the most accurate heat-flow measurements
- Non-oxidating, chemically resistant platinum alloy furnaces

• Controlled heating and cooling for the most accurate results

Superior Flexibility

- Upgradeable to DSC 8500
- Heating rates from 0.01 ºC to 300 ºC/min
- High-pressure cell option enabling measurement of samples to 600 psi
- Optional UV Photocalorimeter accessory
- Remote sampling head enabling measurements of hazardous samples
- Includes MT-DSC for understanding kinetic events
- Switch easily between cooling accessories in the lab – future proofing your investment

Typical applications for DSC 8000

- Isothermal kinetics studies
- UV curing in polymers
- Process and product improvement
- Demanding industrial and academic research

Hyper-enabled performance. Truly revealing.

PerkinElmer is proud to introduce the DSC 8500, featuring second-generation HyperDSC® technology. Now you can gain unlimited insight into the structure, properties and performance of your materials. And with hyper-enabled, double-furnace technology and better application capabilities, the DSC 8500 gives you higher accuracy and sensitivity than ever before.

- Double-furnace DSC
- HyperDSC
- Enhanced software package
- Optional 96-position autosampler

Forward-thinking DSC innovation

HyperDSC heating and cooling

- Extremely fast controlled scanning rates to 750 ºC/min
- In-situ ballistic cooling to 2100 ºC/min, enabling experiments that mimic real-world processes
- Extremely fast readout rates (100 points/second) providing high data integrity

Proven HyperDSC superiority in:

- Isothermal crystallization

- Polymorph/amorphous-material studies
- High sensitivity measurements
- Process simulation

Typical applications for DSC 8500

- Polymorph characterization in pharmaceuticals
  - Measure samples without heating induced polymorph changes

- Process studies in pharmaceuticals
  - Get a greater understanding of how the process affects the amorphous\crystalline content of the product

- Process simulation in polymers
  - See the effects your process has on the product

The double-furnace difference

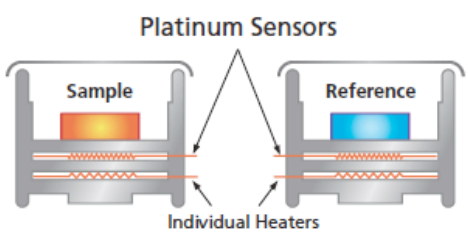
By providing two independent, low-mass furnaces, our double-furnace technology enables you to directly measure the heat flow change of your sample. And that means more accurate measurements over the whole temperature range, as well as rapid response time.

How does it work? Sample and reference materials are placed in different furnaces. A closed loop system adjusts the power to the sample furnace equal to the endothermic or exothermic behavior of the sample. Since energy (power per unit time) is measured directly, no mathematical corrections are required to obtain high quality heat flow data in a DSC experiment.

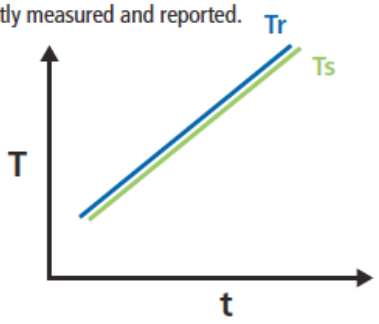
SIZE MATTERS – Heat-flux systems use one large, single-furnace that is between 30 and 200 grams, pictured on the left, while the double-furnace DSC 8000/8500 system features two independent furnaces that are less than 1 gram each. This size difference results in faster, controlled heating and cooling rates and allows direct heat flow determination, eliminating the need for complex mathematics.

Double-furnace DSC

Two independent, small furnaces where energy change of the sample is controlled, directly measured and reported.

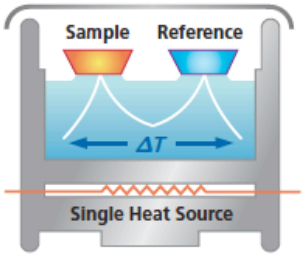


- Two independent small furnaces
- Measures heat flow directly
- True isothermal measurement
- Fastest heating and cooling
- Fastest response times

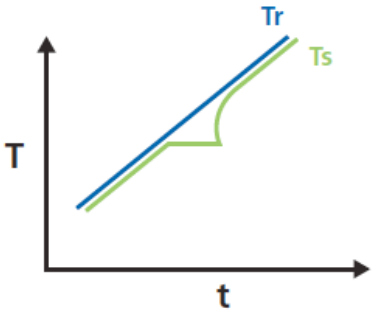


Single-furnace DSC

One large furnace containing both a sample and reference pan where temperature difference between the sample side and reference side are measured and calculations used to determine energy change in the sample.



- One large, single-furnace
- Heat flow derived from ΔT signal



Our new double-furnace DSC design delivers exceptional results on your most promising applications. Learn more about our new application capabilities, and see what you've been missing.

UV curing of polymers

Many modern products use light-initiated (UV) cured resins. Understanding the kinetics of the UV cure is critical to optimize photo-initiator concentration and processing parameters during product development and scale-up.

The PerkinElmer double-furnace DSC advantage

- Rapid response time to study even the fastest cures
- Only a double-furnace design can hold your sample at a constant temperature, allowing cure kinetics to be calculated accurately

• Heat flow is measured directly – not calculated – increasing confidence in your results

Improved characterization of polymorphs in pharmaceuticals

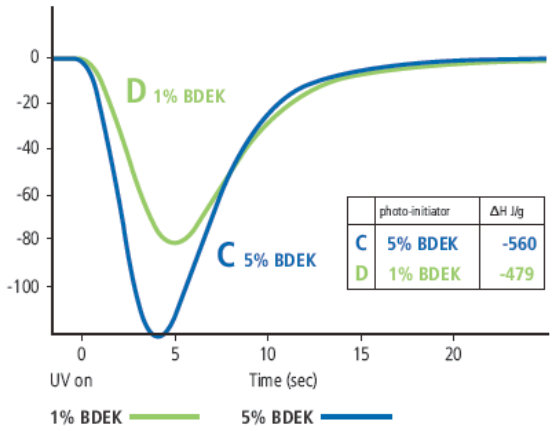
As early in the discovery process as possible, it's critical to fully characterize the polymorphic behavior of a drug candidate. Changes in the crystal form can diminish stability and bioavailability, as well as the tableting characteristics and dissolution rates of a drug. If this occurs, it could cost pharmaceutical companies millions.

The PerkinElmer HyperDSC advantage

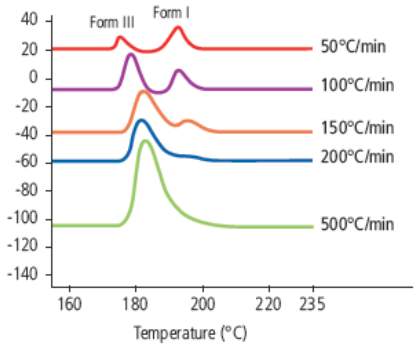
• Ability to suppress transition between different polymorphs allows you to study the actual drug form

• Increased sensitivity to detect even the lowest concentration of polymorphic content

• Lower detection limits allow you to use smaller amounts of often expensive sample materials



The effect of photo-initiator (BDEK) concentration on acrylate ploymerization.



Sample of pure Form III scanning at 500 °C suppresses polymorph transitions seen in carbamazepine at standard scanning rates.

High sensitivity, low-amorphous content study in pharmaceuticals

During pharmaceutical processing, the presence of amorphous material in crystalline substances is often problematic. Not only can the levels of disordered, amorphous material undermine product performance, but they can also be very difficult to detect.

The PerkinElmer HyperDSC advantage

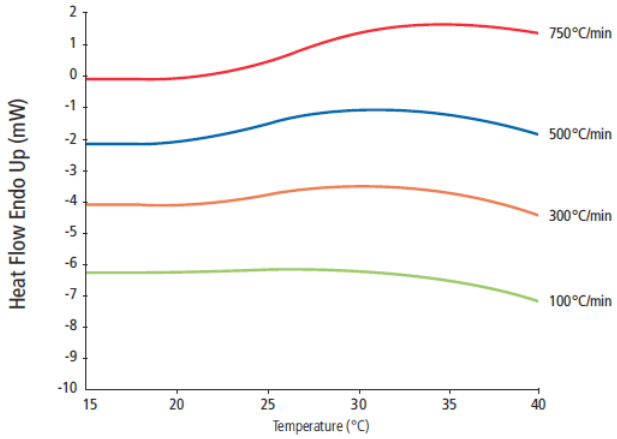
- Increased sensitivity to detect even the lowest concentrations of amorphous content
- Fast sampling time for extremely high sample throughput

Isothermal crystallization studies of polymers

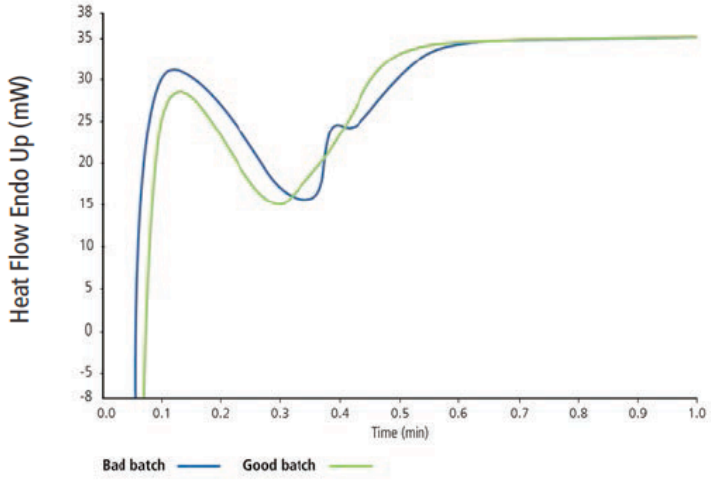
The variation of crystallization behavior of resin will affect the final product's crystallinity after processing, as well as the physical properties of the molded to finished part. Therefore, the consistency of crystallization behavior is important to control, and is often one of the first experiments performed when there's a quality issue in the field.

The PerkinElmer HyperDSC advantage

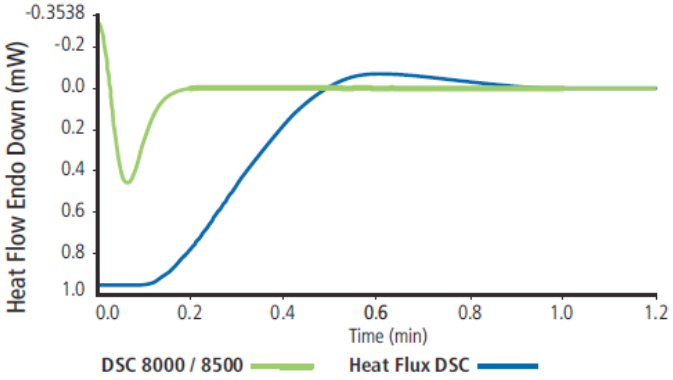
- Fast cooling rates prevent crystallization of the sample until it has reached the target crystallization temperature
- Rapid response time to study fast crystallization



Sample of mannitol showing increased sensitivity at HyperDSC scanning rates.



Differences in good and bad batches of resin highlighted by fast cooling (500 °C/min) prior to isothermal crystallization. Differences not seen with traditional cooling rates.



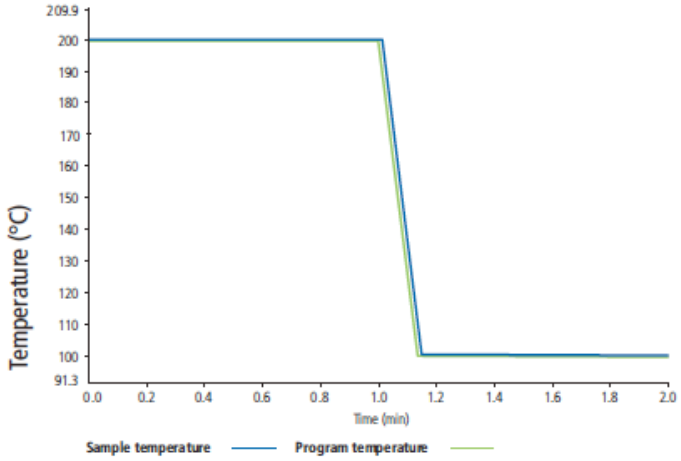
The response time of DSC 8000/8500 compared with a traditional heat flux DSC.

Improved understanding of finished products with better process simulation

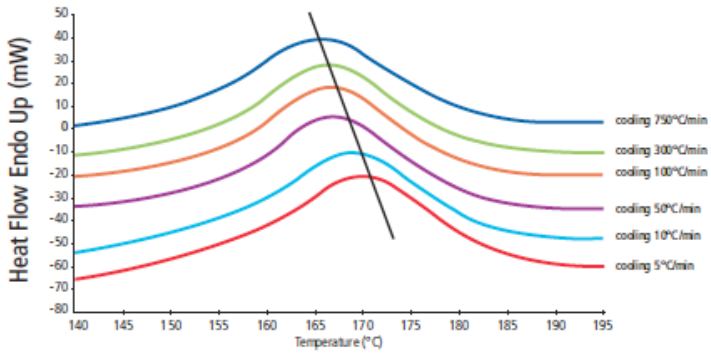
The thermal history of a sample is intrinsic to the properties of a polymer, including hardness, flexural resistance and strength. In many of the widely used processing methods in the polymers industry, the product undergoes much faster cooling rates than is possible with traditional DSC.

The PerkinElmer HyperDSC advantage

- Study the effects of fast cooling on crystallization kinetics of polymers
- Mimic real-world processes – heat and cool your sample at rates of 750 ºC/min



Sample temperature curve from DSC 8500 showing controlled cooling at 750 °C/minute.

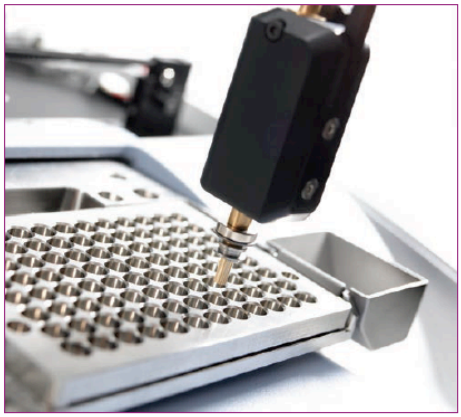


Heating curves of polypropylene after cooling at different rates. The shift in the melting peak shows the change in the material's crystallization behavior at different cooling rates. The heating rate was 500 °C/min.

COMPLETING YOUR DSC
LABORATORY SOLUTION

Realize new efficiencies with a DSC autosampler

All PerkinElmer DSC instruments come with optional autosamplers, so you can perform automated analyses with minimal effort. And with our Pyris™ Player software, setting up a run on one of our autosamplers is simple and quick – and you can run samples during and after business hours. Not sure if you need an autosampler today? Our autosamplers are available as upgrade options to meet the growing demands of your lab.



Pyris software guides you from setup to results

Powerful, flexible and proven – the Pyris software platform incorporates sophisticated DSC data acquisition, analyses and reporting.

With a broad range of options, you can grow from very simple routine materials testing to advanced kinetics and research as your requirements demand.

Temperature control options

Selecting the correct cooling accessory is vital to the performance and applications capabilities of your DSC instrument. We give you a wide range of cooling accessories to suit every cost, temperature and operating expense:

Instrument Cooling Accessory Chart

Cooling Accessory	Lowest Block Temperature	Instruments
Chiller	-20 °C	DSC 4000, 6000, 8000, 8500
Intracooler II	-70 °C	DSC 4000, 6000, 8000, 8500
Portable cooling device	-100 °C*	DSC 4000, 6000 without autosampler
Intracooler III	-100 °C	DSC 4000, 6000, 8000, 8500
CLN2	-180 °C	DSC 8000, 8500
Cryofill	-180 °C	DSC 6000 with autosampler

*DSC using Intracooler II

Consumables

Regardless of form, size or sampling requirement, PerkinElmer's broad range of sample pans and consumables will meet all your application needs. Pan materials include aluminum, platinum, alumina, copper and graphite – available for high and low volumes, high-pressure, solids, liquids and volatile samples.

PERKINELMER: THE INVENTORS OF DSC

In 2012 PerkinElmer celebrate 50 years since their invention of Differential scanning calorimetry.

When buying an analytical instrument it is reassuring to know that the provider you are purchasing from is an expert in the technology. Who better therefore than the inventors of the technique?

In 1962 Watson and O'Neil of the PerkinElmer corporation filed a patent, Fig. 1, for a new type of differential thermal analysis system which corrected for a number of disadvantages with existing techniques. The technique directly measured the energy required to keep the temperature difference of the sample and reference materials constant while programming the sample with a temperature gradient. This gave the ability to measure the energy of any transition at any temperature without calibration close to the transition, and was a major advance in the science of calorimetry. This new technique would be launched onto the market in 1963 as Differential Scanning Calorimetry or DSC, which was a registered trade name of the PerkinElmer Corporation.

The instrument was unveiled to widespread acclaim with PerkinElmer continuing to offer new and innovative DSCs up to the present day with the fast scanning, double furnace DSC 8000 and 8500 instruments and the single furnace DSC 4000 and 6000 systems

DIFFERENTIAL MICROCALORIMETER

Emmett S. Watson, Ridgefield, and Michael J. O'Neill, West Redding, Conn., assignors to The Perkin-Elmer Corporation, Norwalk, Conn., a corporation of New York

Filed Apr. 4, 1962, Ser. No. 185,499
24 Claims. (Cl. 73—15)

1. The method of performing an analysis which comprises varying the environment of a sample material; measuring the resulting difference in temperature between said sample material and a reference material; varying the relative flow of thermal energy between both said sample and said reference material relative to at least one external energy source in response to said difference in temperature in such manner as to equalize the temperature of said sample and said reference material; and independently varying an additional heat flow to both said sample and reference material in such manner as to cause them both to attain the same desired temperature; and measuring said first-mentioned relative flow of thermal energy.

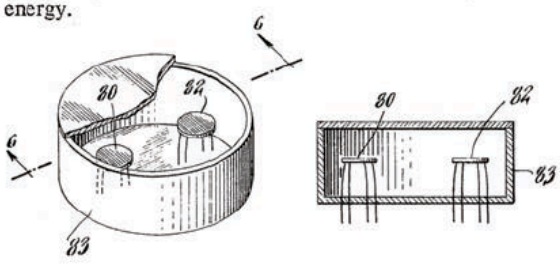


Figure 1: Extracts from DSC patent filed in 1962.

50 Years of PerkinElmer DSC

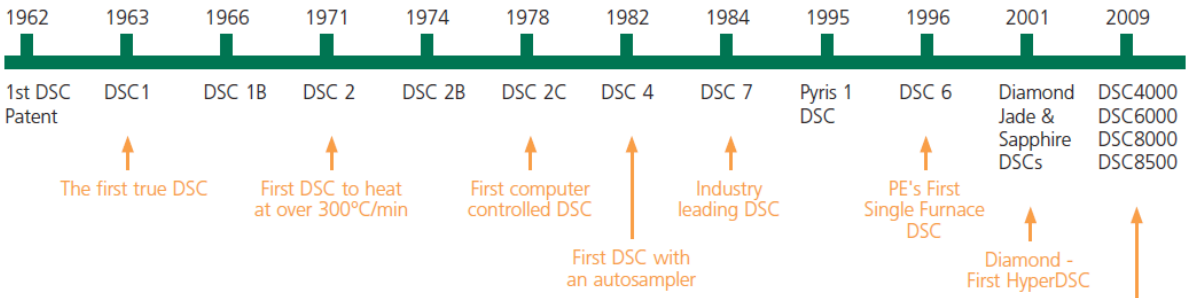


Figure 2: Timeline of PerkinElmer DSC innovation

Figure 3: PerkinElmer DSC 1B shown with a DSC 8500