

Introduction

Differential Scanning Calorimeter (DSC) has been used widely in polymer and pharmaceutical labs. Traditionally there are two kinds of DSC depending on different operation principles. One is called Heat flux DSC which measures the temperature difference between sample side and reference side and then calculates the heat flow to the sample. The other is called power controlled DSC which measures the heat flow to the sample side directly while maintaining the sample temp the same as the reference side temperature. Besides this, there are also some significant differences in design. For example, the heat flux DSC has a single, big furnace which has a long response time as a result. The power controlled DSC has two independent small platinum furnace which is much light with a much short response time. The small furnace also enables very fast heating and cooling rates than conventional DSC.

This poster will highlight some important design features of new DSC 8000/8500. The relationship between instrument design and function will be discussed.



Picture of DSC8000/8500 with Autosampler

Innovations Outline

- Furnace
- Block-shroud assembly
- Mass flow controller
- Brand-new Autosampler
- Four Cooling options
- Electronics

Furnace

- 27% Lighter than Diamond DSC
- 100% more conductive than Diamond DSC
- 70% Flatter than Diamond DSC



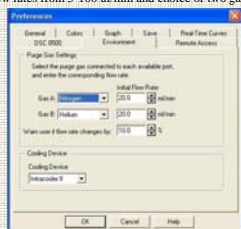
DSC 8000/8500 Furnaces

Block-shroud assembly

- Extensive CFD (Computational Fluid Design) analysis performed to increase performance:
 - Symmetric thermal design
 - Containing losses
 - Superior Ambient Rejection design approach
- Flexure design borrowed from optical mounts.
 - Provides 3 point contact for expansion and contraction of block, strength and accurate positioning while minimizing thermal contact.
 - block thermally isolated from environment with more stable performance
- The larger the N₂ gap between block and shroud, the less losses. The combination of the N₂ gap and Flexures insulation provides DSC 8000/8500 superior ambient rejection.

Mass flow controller

Better purge gas control achieved with mass flow controller on DSC8000/8500. User selectable flow rates from 5-100 ul/min and choice of two gases.



Preference in Pyris software showing the purge gas setting. Two purge gases can be selected and the flow rate can be adjusted in preference. The switch between these two gases can be easily done on the Pyris control panel.

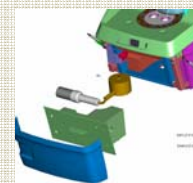
Brand-new Autosampler

- Key Features include:
- Super reliable
 - Picks up all PerkinElmer Pans
 - Auto-Aligning
 - Touch off detection calculates location of Tray, lids and cups
 - Smart design
 - Drop pan prevention
 - Continuous Vacuum detection
 - New Micro Titer Plate Tray format (pharma-standard)
 - 96 sample capability (8X12 array on 9mm spacing)
 - Multiple tray formats with smart recognition
 - User install-able
 - Compact design



Four cooling options

- Chiller.
 - New uniform puck design
 - Intracooler 2 (-90C)
 - New feature to control On/Off by Pyris
 - New Vacuum Tube = Frost Free
 - Intracooler 3 (-130C)
 - New feature to control On/Off by Pyris
 - New Vacuum Tube = Frost Free
 - CLN2
 - New feature to control On/Off by Pyris
 - Dial-a-temp feature -190 C to +35 C
 - New Vacuum Tube = Frost Free
- All are changeable by the customer
- Change out time < 1hr.

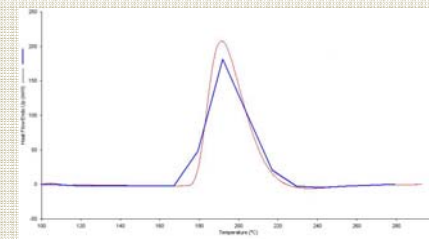


Simple assembly for easy exchange

Picture of CLN2 cooling accessory, featuring "dial-a-temperature". The cooling block temperature can be set from -190 C to +35 C which enables the full method temperature range on DSC 8000/8500 from -180 C to +750 C. Depending on the cooling block temperature setting, nitrogen can be used as purge gas instead of helium, which may reduce the operation cost significantly.

Electronics

- Entirely new layout for:
 - Optimal DSC Performance
 - Serviceability
 - Safety and Code Compliance
- Four printed circuit boards
 - New Controller board
 - increased sampling rates----100 points/second for superior HyperDSC.
 - Increased program voltage resolution for lower noise
 - Ethernet interface to Pyris application
 - Supports remote diagnostics
 - ROHS compliant to meet today's environmental requirements
 - New Sample Head Board
 - New System Motherboard
 - New Calorimeter board
 - Thoroughbred performance, optimized for Low noise: Hyper DSC, Ballistic Cooling
- New control panels
- New power supply tray
 - Modular design for easy servicing
 - Superior AC line filtering and heat removal
 - Larger supply for 750°C operation



10mg indium melting peak on DSC 8500 at 750 °C/min heating rate showing the difference between fast data rate and slow data rate. The red curve is from fast data rate (100 point/second) and the blue curve is from slow data rate (1 point/second). Note the fast data rate is able to capture the complete melting peak while the slow data rate can not and gives wrong onset temperature, peak height and area.

Summary

The all new DSC8000/8500 uses the 3rd generation power controlled design. It has incorporated numerous new features. It pushes the performance to a new level and at the same time makes the operation more convenient.