Quantum Design

Thermal Measurements

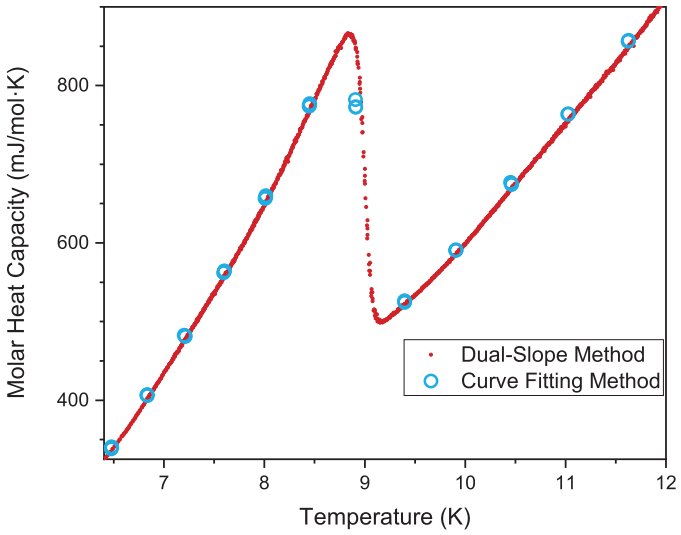
Heat Capacity

PPMS® DynaCool® (D650) / PPMS® VersaLab® (V650)

The Heat Capacity Option leverages a puck-based microcalorimeter design capable of measuring sample heat capacity across the full range of temperature and field afforded by the DynaCool and VersaLab. Operating in high vacuum, a sample is subjected to a thermal pulse and its temperature response is recorded as in a traditional semi-adiabatic relaxation technique. Fitting algorithms based on a model of the thermal circuit extract sample heat capacity from this curve. Typical measurements collect heat capacity as a function of temperature; measurements under a constant field are possible after using the automated field calibration function of the software.

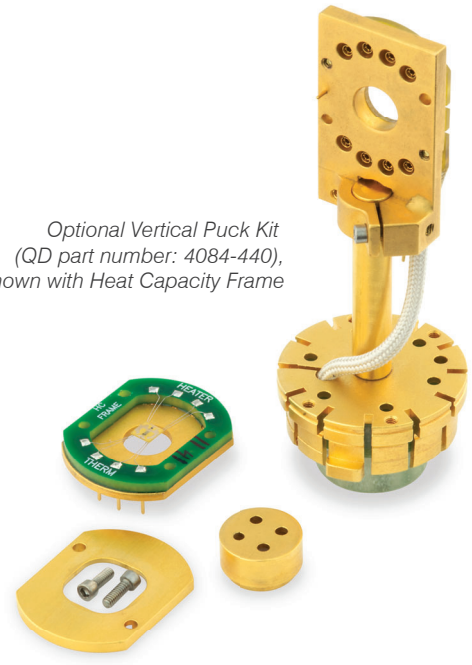
Key Features:

- Software-automated addenda (background) signal collection and subtraction
- Advanced fitting algorithms measure and account for finite thermal conduction between the calorimeter and sample for improved measurement accuracy
- Measurement heat pulse duration is determined by the sample time constant τ, dynamically adapting to changes in sample heat capacity as it evolves with temperature
- Unique mounting station hardware ensures hassle-free sample mounting and minimizes the risk of damage to delicate calorimeter wiring
- Alternate slope-fitting analysis mode available in post processing for high resolution sampling of sharp first-order transitions
- Units system can be user-specified to report intrinsic properties like specific heat capacity



A superconducting transition is shown for a sample of NbTi alloy near 9 K. The open blue circles indicate data collected using the default curve fitting technique on a number of small heat pulses while the smaller closed red points were acquired using the slope-fitting analysis of a single large heat pulse.

Heat Capacity Puck installed in the Sample Mounting Station



Optional Vertical Puck Kit (QD part number: 4084-440), shown with Heat Capacity Frame

Heat Capacity Specifications (for Zero Field)

Heat Capacity [C_p]

Accuracy:	± 5% for 2 K to 300 K; ± < 2% typical
Resolution:	10 nJ/K @ 2 K

Addenda Characteristics

Calorimeter Platform Area (maximum sample footprint):	3 mm × 3 mm
Typical Addenda Magnitude:	0.2 μJ/K @ 2 K; 15 mJ/K @ 400 K

Operational Range	1.8 to 400 K; 0 to 16 T

Specifications are subject to change without notice.

Also compatible with PPMS® (P650) legacy systems.