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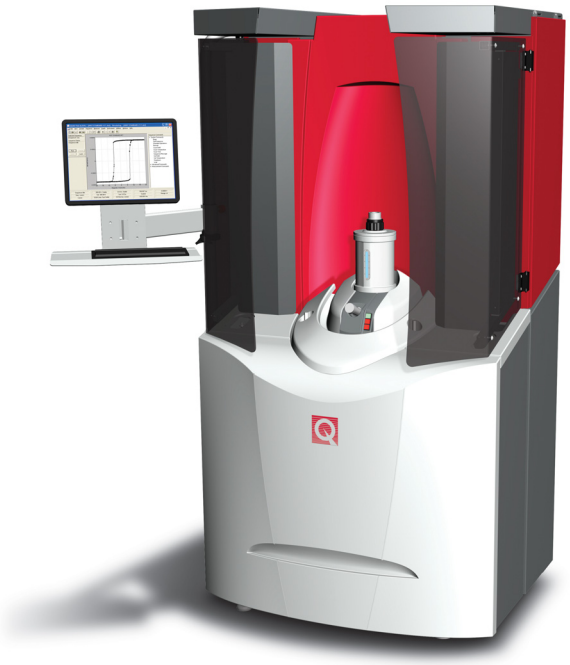
Product Description

MPMS® SQUID VSM

(Features/Specifications)

Quantum Design proudly presents its new **MPMS SQUID VSM** dc Magnetometer. This new member to the MPMS magnetometer family offers you $\leq 10^{-8}$ emu sensitivity. By combining the speed of a Vibrating Sample Magnetometer with the sensitivity of a SQUID (Superconducting QUantum Interference Device) magnetometer, this new system ushers in new levels of performance in magnetic research. Joining the popular MPMS XL line, the MPMS SQUID VSM gives researchers the choice between the world's most versatile SQUID magnetometer and the fastest.

The new MPMS SQUID VSM incorporates major advances in data acquisition, temperature control and magnetic field control.



Data Acquisition

The FastLab™ data acquisition combines Quantum Design's dc SQUID sensor and novel Vibrating Sample Magnetometer technology thus providing the ability to achieve $<1 \times 10^{-8}$ emu sensitivity at zero magnetic field. Further noise reduction in the design allows this system to achieve an unprecedented $<8 \times 10^{-8}$ emu sensitivity at the full field of 7 tesla.

Temperature Control

The MPMS SQUID VSM uses the newly designed RapidTemp™, an innovative temperature control design that allows you to cool samples from room temperature to a stable 1.8 K in <30 minutes.

The temperature control insert of the MPMS SQUID VSM is a vacuum-insulated chamber into which cold helium is drawn, through a variable flow valve, for purposes of cooling the sample chamber with pumped helium to temperatures as low as 1.8 K. A finely tuned flow impedance and sophisticated temperature control software allows continuous operation at 1.8 K as well as smooth temperature control through the 4.2 K liquid helium boiling point. Heaters on the sample chamber can raise the temperature as high as 400 K. A thermal shield, anchored to a liquid nitrogen tank, intercepts heat from a warm sample chamber and minimizes liquid helium consumption when operating at higher temperatures. By flattening the thermal gradient along the cold end of the temperature control insert, this shield also allows the entire insert to be constructed with a relatively short geometry,

minimizing heat capacitance and enabling rapid temperature control. The diameter of the temperature control insert was selected to allow a 9 mm sample bore and to provide the smallest diameter pickup coils possible to optimize the magnetometer's sensitivity.

Magnet Control

The MPMS SQUID VSM utilizes a 7 Tesla, superconducting, helium-cooled magnet and a hybrid digital/analog magnet controller designed specifically for the SQUID VSM to achieve precise, quiet control of the magnetic field. SQUID precision in a magnetic measurement requires a stable magnetic field. The SQUID VSM accomplishes rapid switching between charging and discharging states and stable fields with a unique superconducting switching element called the QuickSwitch™ (patent pending), which changes between superconducting and normal states in less than one second. This allows rapid collection of high precision data.

The high open state resistance and low thermal mass of the QuickSwitch design also helps to minimize liquid helium consumption when ramping magnetic field, as compared to more traditional superconducting persistent switch technology. Further aiding the instrument's low helium consumption is the use of high temperature superconductor (HTS) magnet leads anchored to a liquid nitrogen tank. The nitrogen shield in this design absorbs a large amount of room temperature heat that would otherwise be conducted to the helium bath. Quantum Design is proud of the contributions made to HTS research and development, and is excited to add this new member to the MPMS family—to the benefit of future researchers.

The MPMS SQUID VSM comes with an integrated Environmental Magnet Shield. This shield allows sensitive measurements to be made in locations with excessive magnetic noise by creating a locally quiet environment. It also serves as a return path for the system's superconducting magnet, permitting use of the system in close proximity to other sensitive devices,

System Specifications
(Standard system specification apply to non-EverCool base configuration):

Temperature control
Feature: New TCM design, Rapid Temp™
- Operating Range: 1.8 K to 400 K
- Cooling Rate: 30 K/min (300 K to 10 K stable in 15 min.); 10 K/min (10 K to 1.8 K stable in 5 min.)
- Temperature Stability: +/- 0.5%
- Temperature Accuracy: lesser of +/- 1% or 0.5 K
- Sample Chamber I.D.: 9 mm

Magnetic field control
Feature: QuickSwitch™
- Magnetic Field Range: -70 kOe to +70 kOe
- Field Uniformity: 0.01% over 4 cm
- Field Charging Rate: 4 Oe/sec to 700 Oe/sec
- Field Charging Resolution: 0.33 Oe
- Remanent Field: ~5 Oe (typical) when oscillating from full field back to zero

Magnetization measurements
Feature: SQUID based VSM FastLab™
- Maximum DC moment: 10 emu
- Sensitivity: $\leq$ 2,500 Oe: $< 1 \times 10^{-8}$ emu (with less than 10 second averaging)
  > 2,500 Oe: $< 8 \times 10^{-8}$ emu (with less than 10 second averaging)
- Variable drive amplitude: 0.1 to 8 mm (peak)

General System Details
- Power Requirements: 200 VAC - 230 VAC, 50/60 Hz, 10A Max.
- Liquid Helium Usage: 4 liters/day (typical) + 0.05 liters per sample cooldown
- Liquid Helium Capacity: 65 liters
- Liquid Nitrogen Usage: 5 liters/day (typical)
- Liquid Nitrogen Capacity: 60 liters
- Maximum Hold Time: 12 days (typical)