Quantum Design

Magnetometry

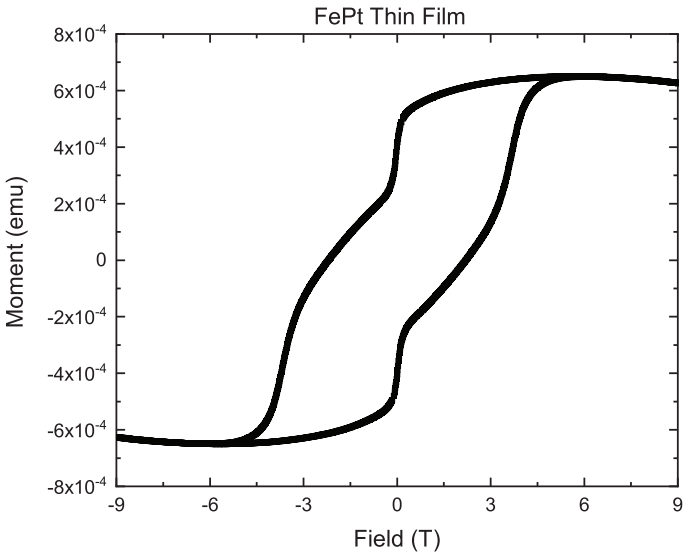
Vibrating Sample Magnetometer (VSM)

PPMS® DynaCool® (D525) / PPMS® VersaLab® (V525)

The Vibrating Sample Magnetometer (VSM) option employs a puck-based first-order gradiometer coil set and high-resolution linear transport motor that enables the DynaCool and VersaLab to operate as a sensitive magnetometer. The static (DC) magnetic moment of the sample can be measured as a function of temperature or field. With a typical 1 second averaging time per datum, data acquisition rates are comparatively fast. Furthermore, measurements as a function of sweeping the measurement temperature or field are possible. An included set of standard sample holders enables measurements of a wide variety of sample sizes and morphologies, such as: small single crystals, thin films (can be oriented with applied field in- or out-of film plane), sintered polycrystalline pieces, and loose powders.

Key Features

- Lock-in measurement technique isolates sample signal from external mechanical and electronic noise for precise measurement of sample moment
- Linear transport motor enables centering accuracy within ± 0.04 mm
- A temperature sensor integrated within the coil set provides sample thermometry via exchange gas coupling
- Standard sample holders included are a low-background quartz paddle and brass half-tube with quartz spacers and polycarbonate capsules



Room temperature major hysteresis loop of a high anisotropy FePt thin film with an in-plane saturation field of approximately 5 T and a coercivity of 2.2 T. Sample provided by Prof. Kai Liu, Georgetown University.

Vibrating Sample Magnetometer Specifications

(for standard bore in zero field, unless indicated)

Magnetic Moment [m]

Accuracy:	± 0.5%, using 2.8 mm dia. × 4 mm tall cylinder (shape of included Pd reference)
Noise Floor*:	$< 6.0 \cdot 10^{-7}$ emu @ 300 K
Additional Relative Noise*:	$3.0 \cdot 10^{-7}$ emu/T or 0.5%, whichever is greater $1.0 \cdot 10^{-6}$ emu/T or 0.5%, whichever is greater (EverCool II)
Max Measurable Moment:	m_{max} [emu] = 40/Peak Amplitude [mm]

Drive Parameters

Oscillation Amplitude:	0.1 to 5 mm peak, 2 mm (typical)
Oscillation Frequency:	10 to 60 Hz, 40 Hz (typical)
Averaging Time :	0.5 to 750 seconds, 1 second (typical)

Coil Set Dimensions

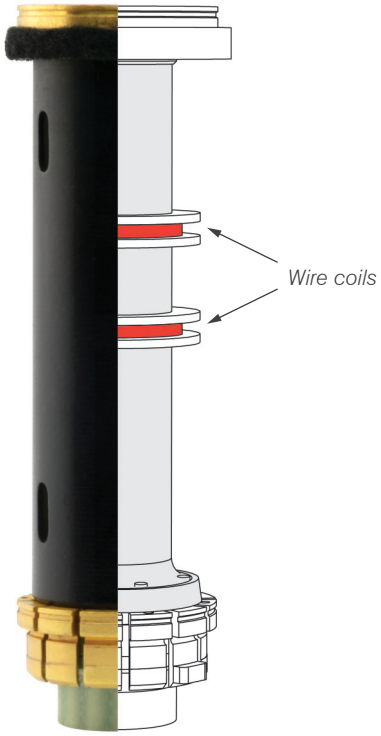
Bore Diameter:	6.3 mm
Coil Separation:	9 mm

Operational Range 1.8 to 400 K; 0 to 16 T

*Parameters are integration-time dependent; stated values are for integration times of 1 second at 40 Hz, 2 mm amplitude excitation. Total observed noise is the sum of the floor and relative components.

Specifications are subject to change without notice.

Also compatible with PPMS® (P525) legacy systems.



Schematic view of VSM coil set internal components showing the turns of wire comprising the first-order gradiometer.

Linear Transport Motor