Tq-Mag chip

Torque Magnetometer (Tq-Mag)

DynaCool (D550) / PPMS (P550) / VersaLab (V550)

The torque magnetometer (Tq-Mag) measures the torque ($\tau = \mathbf{m} \times \mathbf{B}$) exerted on a magnetic sample with moment, $\mathbf{m}$, by an applied field, $\mathbf{B}$. By definition, a torque is only present if a component of $\mathbf{m}$ is orthogonal to $\mathbf{B}$. Therefore, torque magnetometry is a powerful tool in the study of small anisotropic single crystals and thin films. The torsion is measured using piezoresistive elements on a calibrated cantilever chip as a function of magnetic field, temperature, or angular orientation. The automated calibration procedure substantially minimizes offsets from gravity and temperature to the measured torque.

Key Features
- Piezoresistive elements comprising a Wheatstone bridge are fabricated directly on the cantilever chip
- Integrated calibration loop on the cantilever chip
- Sample mounting entails only a small amount of vacuum grease to hold the sample to the cantilever with no additional wiring required
- Two chip variants are available:
  (i) High-sensitivity chip for low noise ($1 \cdot 10^{-9}$ N·m)
  (ii) Large-moment chip which extends the upper range of the measurement to $1 \cdot 10^{-4}$ N·m
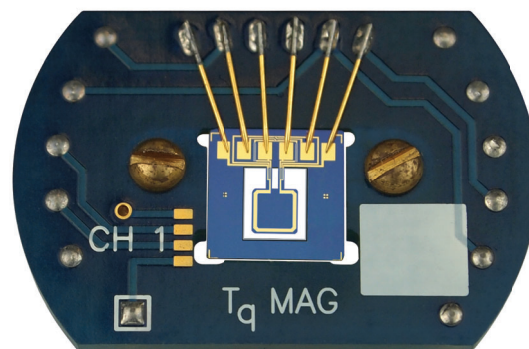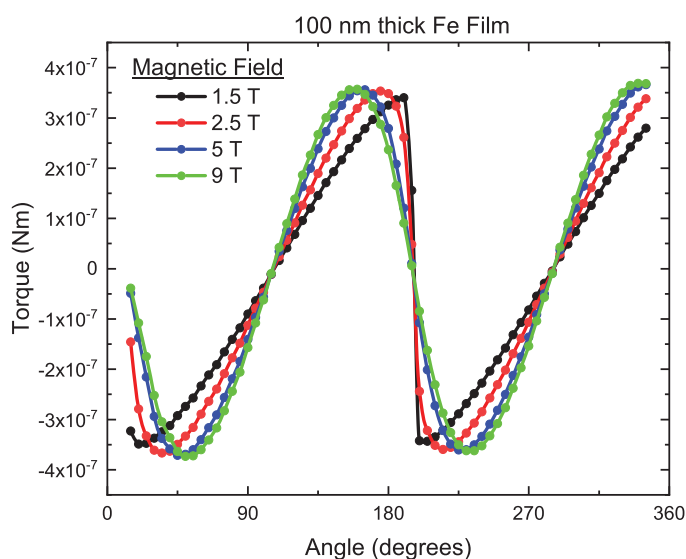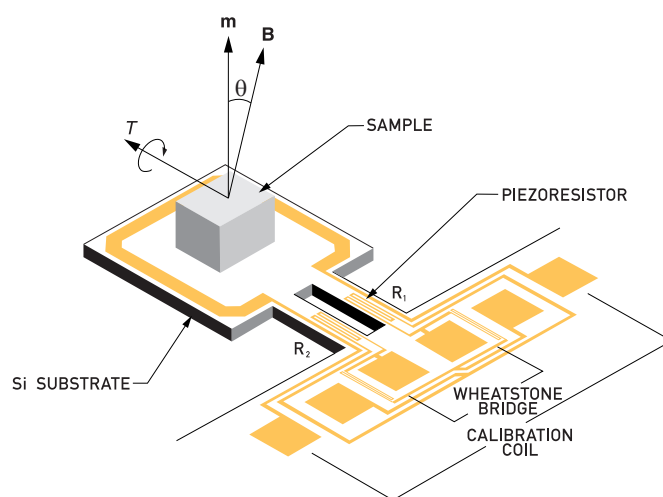
Torque curves measured at room temperature of a 100 nm thick Fe film as a function of the angle of the applied field (with respect to the film normal). At high fields the curves reflect the uniaxial anisotropy of the sample.

Torque Magnetometer Specifications

Torque [τ]

Noise Floor:	$1 \cdot 10^{-9}$ N·m (high sensitivity chip)
	$2 \cdot 10^{-8}$ N·m (large moment chip)
Maximum Torque:	$1 \cdot 10^{-5}$ N·m (high sensitivity chip)
	$1 \cdot 10^{-4}$ N·m (large moment chip)

Physical Parameters

Chip Size:	6 mm × 6 mm × 1 mm
Available Sample Volume:	1.5 mm × 1.5 mm × 1.5 mm
Maximum Sample Weight:	10 mg

Operational Range   1.8 to 400 K; 0 to 16 T

*Stated value is for a 40 second sampling time

Specifications are subject to change without notice.