Model EV1-TRQ option for the EV VSM series
and
Model ET7, ET9 and ET11 Torque systems

DESCRIPTION

The EV Torque Magnetometers are designed to automatically measure the force on magnetic samples as a function of rotation angle and applied field and from this data determine the magnetic anisotropy of materials. The advanced design has made operation and interpretation on test results efficient and uncomplicated.

RUGGED MECHANICAL DESIGN

Fragile torque balance mechanisms have hampered the use of torque magnetometers since their invention. Most conventional mechanisms used galvanometer movements, quartz fibers, or thin wires to suspend the sample in the magnetic field. The MicroSense design has overcome the fragility problem by using an ultra-low friction air bearing assembly to suspend the sample with virtually zero friction. The air bearing assembly is rugged and capable of withstanding several pounds of lateral or vertical force without damage.

WIDE DYNAMIC RANGE

The dynamic range of conventional torque balances in limited to 40 to 60 dB because of the friction and hysteresis effects shown by their suspension systems. The air bearing torque balance has a practical measurement range of from 0.05 dyne-cm to 500 dyne-cm, or 80 dB. Other systems require several torque mechanisms to cover such a wide range of samples, whereas the MicroSense system only needs one mechanism.

EASY AND ACCURATE CALIBRATION

While in theory the torque may be calculated from the Y signal data of a torque simulation method using vector coils, this vector method has many large disadvantages. The Y signal in most vector coils system can not be calibrated directly because no field can be applied in the Y direction. Because of this, the Y calibration is always an indirect calibration. When the sample is not rotation symmetric or if the sample rotation is not 100% concentric, the sensitivity of the coils becomes an angle dependent function. Small variations in sample placement can aggravate this situation.

Because the torque data has to be determined from a sample that is very close to saturated, the Y signal in those cases is always very low and as a result, the torque has to be determined from a very small signal that is prone to errors. The combination of angular

sensitivity variations, potential angular dependent background signals and low Y signals near saturation cause a very cumbersome calibration process.

In contrast, the EV1-TRQ is a true torque magnetometer that measures the actual force on the sample. The calibration is a quick single step procedure using a sample of known torque. This eliminates all uncertainty and accuracy issues associated with vector coil based torque simulation systems.

SIGNAL PROCESSING SOFTWARE

The rotational hysteresis energy loss for each cycle of torque vs. angle, rotational hysteresis energy integral [Rh], and all fourier coefficients of the torque curves are calculated. A plot of the rotational hysteresis energy loss vs. inverse field may be generated.
Torque vs. angle data may be harmonically filtered to further reduce displayed noise, if desired.

INFINITE FIELD EXTRAPOLATION [MIYAJIMA METHOD]

In samples with very high anisotropy, the maximum available field may be insufficient to obtain a correct value for the anisotropy constant. A peak torque test at 45° from the easy axis may be automatically executed by the MicroSense system, and the correct value of the anisotropy obtained by infinite field extrapolation [Miyajima method].

TORQUE ONLY OR TORQUE VSM SYSTEM

The torque system may be purchased as a stand alone system or in combination with a VSM system. The Torque option can also be purchased as an add-on option for an existing VSM system.

SPECIFICATIONS:

Noise without averaging:	< 50 mdyn-cm RMS
Noise with averaging:	< 5 mdyn-cm RMS
Torque friction:	< 50 mdyn-cm
Rotation Angle:	-180º to + 540º

Maximum field (with sample ≤8 mm diameter): ET7 > 2.4T; ET9 > 2.8T; ET11 > 3.4T

* Maximum fields may be further increased using custom pole faces. Please ask a sales person for possibilities.