Model 7404 Vibrating Sample Magnetometer

Introduction

Lake Shore Vibrating Sample Magnetometers perform magnetic measurements for materials research and development, quality control, and production testing.

The Model 7404 is capable of characterizing a variety of particulate and continuous magnetic media materials, including audio, video, and digital data tapes; flexible media; magneto-optical materials; and sputtered and plated thin film materials, including multilayer GMR, CMR, exchange-bias, and spin valve materials.

Measurements

The following parameters are either measured directly or can easily be derived through the software

- Hysteresis loops
  - Saturation magnetization (M_{SAT}), retentivity or remanent magnetization (M_{REM})
  - Coercivity (H_c), S*, slope at H_C, value of dM/dH or differential susceptibility at H_c
  - Switching field distribution (SFD)
  - Flatness, squareness ratio (SQR)
- Minor hysteresis loops
- Initial magnetization curve
- DC remanence
- AC remanence
- Vector measurements (m_x and m_y)
- Magnetization data as a function of time

Lake Shore Cryotronics, Inc. 575 McCorkle Blvd Westerville, Ohio 43082
Tel: (614) 891-2244 Fax: (614) 818-1600 e-mail: sales@lakeshore.com www.lakeshore.com

Materials

All types of magnetic materials:

- Diamagnetic, paramagnetic, ferromagnetic, ferrimagnetic, antiferromagnetic, and anisotropic materials
- Particulate and continuous magnetic recording materials and GMR, CMR, exchange biased and spin-valve materials
- Magnetic-optical materials
- Bulk materials, powders, thin films, single crystals, and liquids are readily accommodated

Features

- Noise floor/sensitivity to 0.1 µemu at 16.2 mm (0.64 in) air gap, corresponding to <3.5 mm (0.14 in) sensing coil gap, and 10 s/pt averaging
- Variable magnet air gap permits magnet/coil adjustments to suit samples and provide field strengths to 21.7 kOe while only occupying 8 square feet of space
- Water-cooled magnet coils provide excellent field stability when high power is required to achieve the maximum field capability
- Bipolar power supply provides smooth continuous transition through zero field
- Fast data acquisition – average sample run (hysteresis loop) over full field range typically requires only minutes
- Computer-automated data collection system with Windows® NT/2000 menu driven color graphic software for system operation, data acquisition, and analysis. System software includes operation and control of the magnet power supply, VSM control unit, and gaussmeter. Real-time feedback of processed magnetic moment measurement data can be displayed in either graphical or tabular format.

System Specifications

General

Moment Measurement range	0.1×10^{-6} emu to 1000 emu
Time constants (TC)	0.1 s, 0.3 s, 1.0 s, 3.0 s, or 10.0 s
Output stability	Better than ±0.05% of full scale per day for fixed coil geometry at constant field and temperature
Absolute accuracy	Better than 1% of reading ±0.2% of full scale (when test sample and calibrant are geometrically identical)
Reproducibility	Better than ±1%, or ±0.15% of full scale, whichever is greater, fixed rotation angle
Field accuracy in gauss	1% of reading or ±0.05% of full scale

Performance Specifications

Magnet pole face diameter	51 mm (2 in)	
Coil set	740EMSC – 1 in mini pickup coils	
Magnet air gap range	**Minimum**	**Maximum**
	16.2 mm (0.64 in)	38.1 mm (1.5 in)
Sample access	<3.5 mm (0.14 in)	<25.4 mm (1.0 in)
Magnetic field	21.7 kOe	11.8 kOe

Noise Floor/Sensitivity at 16.2 mm operating air gap

0.1 µemu at 0.1 s TC, 10 s/pt averaging
0.4 µemu at 0.1 s TC, 1.0 s/pt averaging
0.75 µemu at 0.1 s TC, 0.1 s/pt averaging

Equipment

Model 736 VSM Electronics with integrated gaussmeter

Resolution	±1 part out of 300,000
Precision	Up to 0.0007% of full scale for 350 G and above ranges

Model 740EMSC mini pick-up coils
Model 731 Mechanical VSM head drive assembly and mounting structure
Instrumentation console

Model EM4-HV Variable Gap Electromagnet

Pole diameter	102 mm (4 in)
Pole face diameter	51 mm (2 in)
Cooling water requirements	Tap water or closed cooling system (optional chiller available)
Flow rate	3.8 L/m (1 gal/min) at 45 to 75 psi

Model 662 Bipolar Power Supply

Maximum output	±70 A / ±35 V / 2.4 kW
AC line input; current draw	208/220 VAC, 50-60 Hz; 12 A 380/400 VAC, 50-60 Hz; 6 A
Power consumption	4.5 kVA
Cooling water requirements	Tap water or closed cooling system, between +15 °C to +24 °C
Flow rate	6 L/m (1.6 gal/min) at 45 to 75 psi

Model 740927 Sample tail kit

(1) 740933: One-piece fiberglass, 3.5 mm air gap, thin-film side
(1) 740934: One-piece fiberglass, 3.5 mm air gap, thin-film bottom
(1) 740935: Sample tail only, fiberglass
- (3) 730931: Bulk/Powder upper and bottom sample cup, Kel-F
- (3) 730933: Thin-film side sample holder, Kel-F
- (3) 730934: Thin-film bottom sample holder, Kel-F
- (Liquid holders are purchased separately)

Computer
≥2.6 GHz Intel® processor, ≥40 GB hard drive, ≥256 MB of RAM, 32 MB USB Memory Stick, CD-ROM, LCD monitor, Windows® NT/2000, and National Instruments® GPIB/IEEE-488 interface.

VSM Software
Windows™ NT/2000 menu driven, enhanced color-graphic software for system operation, data acquisition and analysis. System software includes operation and control of the magnet power supply, VSM control unit, and gaussmeter. Real-time feedback of processed magnetic moment measurement data can be displayed in either graphical or tabular format.

Printer HP InkJet printer

Shipping weight Three (3) crates totaling 903 kg (1990 lb)