

Setting the Standard in Magnetic Measurement



High-Field Magnetic Measurement System

Model 110
Hysteresis (BH) Loop Tracer
Magnetoresistance (MR/GMR),
Magnetostriction



Producing Industry-Leading Magnetic

Shb Instruments has been producing a line of industry-leading Magnetic Measurement Systems since 1976. The Model 110 extends the convenience and accuracy of a hysteresis loop tracer into new realms:

- Samples as large as 8" (200 mm) diameter
- Fields to 15,000 Oe
- Real-time loop display and measurements
- Unprecedented sensitivity

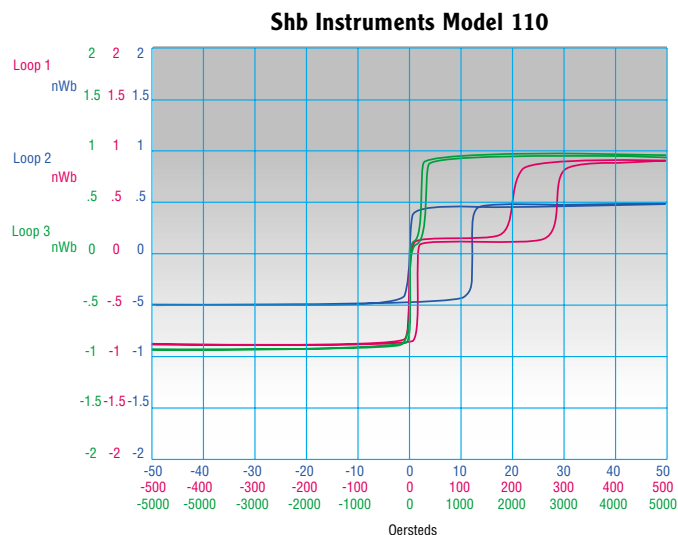
This latest-generation instrument is fully computer-controlled, and capable of displaying and measuring hysteresis loops, magnetoresistance and magnetostriction. Precise, repeatable measurements can be made on ultra-thin films in real time, without the need to cut the wafer into pieces.

The Model 110 is controlled by a Pentium PC, and uses internal digital signal processors for high-speed waveform generation, digitization and filtering. The all-new ShbWin control software for the Model 110 brings a new level of flexibility and functionality to instrument operation.

Computer-optimized water-cooled solenoid drive coil assemblies and state-of-the-art switching power supplies and amplifiers allow generation of very intense and uniform magnetic fields.

Shb's patented symmetric pickup designs are key to achieving stable performance when measuring very thin films at high drive fields.

The Model 110 is the only instrument of its type that can make measurements in the frequency range of 10 Hz and below. Competing units operate with more-easily generated 60 Hz drive fields, which can result in substantial measurement errors.



TEST	MEASUREMENT	CONSTANT	DRIVE	AVERAGES	FREQ	SIGMA
Hc 1	6.414 Oe		49.62 Oe	10 F16	5 Hz	.0312 Oe
Bs 1	.4890 nWb		49.65 Oe	10 F16	5 Hz	.0029 nWb
Bs 2	.8910 nWb		495.6 Oe	10 F16	5 Hz	.0022 nWb
Bs 3	1.013 nWb		4956.0 Oe	10 F16	5 Hz	.0144 nWb

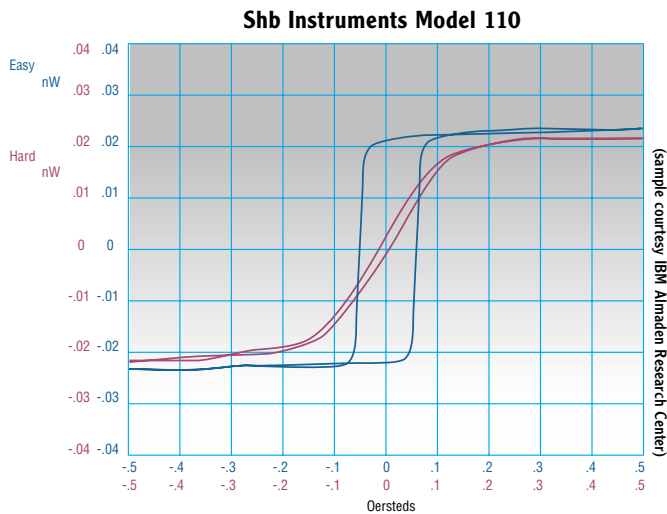
Above:
A typical set of digitized waveforms for MR material (including hysteresis loops and deltaR) as well as measurement results.

All instruments are equipped with a "pattern memory" feature, to digitally cancel ambient magnetic fields and allow for operation at extremely high sensitivities, even in relatively noisy magnetic environments. With the Digital Signal Processing feature, any remaining noise can be dramatically reduced by sophisticated digital filtering algorithms.

Shb Instruments, Inc.
Model 110 Water-cooled
Solenoid Drive Coils



Magnetic Measurement Systems Since 1976



The above waveform is from a 3\AA thick sample, only 18 mm in diameter. On other hysteresis loop tracers, a sample with this tiny amount of magnetic material would show only noise, but the Model 110 with Digital Signal Processing option is capable of producing quality hysteresis loops.

FEATURES:

- High sensitivity
- Excellent repeatability
- Advanced DSP signal processing
- Accommodates wide range of sample sizes and thicknesses
- Magnetoresistance (MR/GMR)
- Magnetostriction
- Measurements:
 - Br
 - Bs
 - R
 - $\Delta R/R$
 - Hc
 - He
 - Hk
 - Magnetostriction
 - Dispersion
 - Skew
- Low-frequency sinewave sweeps (0.05 to 10 Hz)
- 0.1 to 4000 Oe/division horizontal sensitivity range
- 0.01 to 10,000 nW/division vertical sensitivity range
- Digital pattern memory to cancel ambient fields
- Earth's field cancellation
- Two-axis drive coils
- Optional dual sets of drive coils
- Dedicated LCD loop display
- Cursor for detailed waveform measurements
- ShbWin control software
 - Fully-compiled 32-bit Visual Basic 6 implementation
 - Password protected operating modes
 - Microsoft OCX object model support allows user programming in Visual Basic, C++ or Java
 - **Autotest** for point and click measurement selection
 - Real-time on-screen waveform display
 - Remote diagnosis
 - **Autotrim** makes all instrument adjustments with one menu selection
 - GEM/SECS option



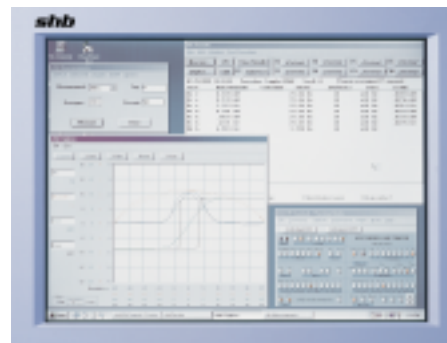
SPECIFICATIONS:

Substrate diameter:	< 18mm to 8 inch, depending on instrument model and pickup size
Model 110T:	1 inch (25 mm)
Model 110M:	6 inches (150 mm)
Model 110L:	8 inches (200 mm)
Sample holders matched to customer sample size and shape	
Magnetizing (H) Field Display:	0.1 to 4000 Oersteds/division
Maximum Magnetizing Field:	
Model 110T:	15,000 Oersteds Normal axis (water-cooled); 200 Oersteds Transverse axis
Model 110M:	10,000 Oersteds Normal axis (water-cooled); 100 Oersteds Transverse axis
Model 110L:	5000 Oersteds Normal axis (water-cooled); 100 Oersteds Transverse axis
Other sizes and field ranges available by special order	
Induction (B) Fields:	0.01 to 10,000 nanoWeber/division
Repeatability:	< 0.25%
Accuracy:	1% or better (can be calibrated to customer standard)
Resolution:	0.008% of full scale
Sweep Frequency Range:	0.05 to 10Hz
Drive Amplifiers:	High-reliability switching amplifiers producing precision sinewave drive fields
Computer System:	Pentium Processor with CDRom, floppy and Zip drive LCD flat-panel monitor Color inkjet printer and internal modem
Computer Software:	Microsoft Windows 98 or Windows 2000; Shb Instruments ShbWin Visual Basic programming and control Package; Remote control and diagnostic software
Dimensions:	Instrument with Coil Table 75 in. (190 cm) H x 60 in. (152 cm) W x 56 in. (142 cm) D
Power Requirements:	115 Volts AC, 30 amps, 50/60 Hz 208 Volts AC 3-phase, 50-125 amps (depending on version), 50/60 Hz
Cooling:	Facilities water at 15 degrees C



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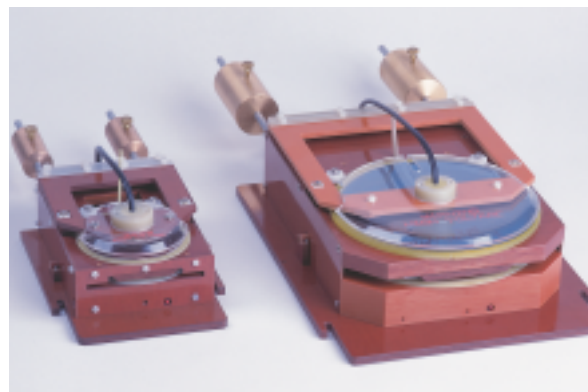
FEATURES AND OPTIONS



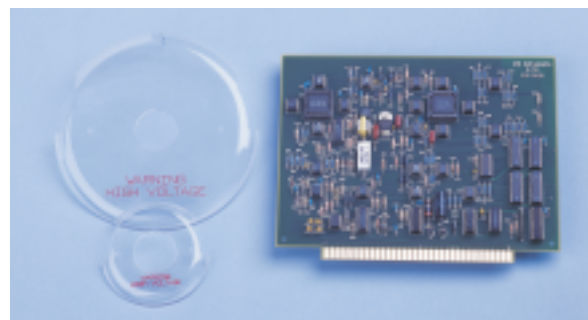
ShbWin Software



LCD Loop Display



Magnetostriction Pickups



High Voltage R/dR Electronics