

Model 450 Gaussmeter

- Resolution to 5 $\frac{3}{4}$ digits (1 part out of $\pm 300,000$)
- Accuracy to $\pm 0.10\%$ of reading
- Two line display
- Peak capture
- Analog voltage outputs
- IEEE-488 and serial interface



Product Description

Designed for demanding laboratory and materials analysis applications, the Model 450 High Precision Hall Effect Gaussmeter has high resolution and low noise floor. High performance is combined with ease of use – frequently used features can be accessed by one or two keystrokes, the message-based display is bright and the keypad well-defined. As an added advantage, the Model 450 includes a Lake Shore Hall probe.

Measurement Modes

The Model 450 operates in DC, RMS, and Peak modes, with superior accuracy and resolution in DC measurement mode. Measurements to 5 $\frac{3}{4}$ digits are possible due to the low noise floor. With low noise and high stability, the Model 450 is ideal for field control or mapping applications. Changing fields that are often used in material analysis systems can also be measured up to 18 times per second over computer interface with excellent resolution.

Best suited for linear power supply measurements or measurements of magnets and solenoids driven at line frequency, RMS mode measures periodic AC fields from 10 Hz to 400 Hz. Instrument circuitry accommodates wave forms with crest factors up to 7, with true RMS conversion.

Peak circuitry in the Model 450 captures single event peaks or monitors the peak amplitude of periodic wave forms from 10 Hz to 400 Hz, with reproducible single peak measurements to 5 ms rise time. Instrument software accommodates indefinite hold time with no decay. The Model 480 Fluxmeter is a good choice if faster peak or RMS measurements are required.

Range and Resolution

When used with appropriate probes, the Model 450 offers full scale ranges from 300 mG to 300 kG. With 5 $\frac{3}{4}$ digit resolution, DC field variations approaching 0.010 mG can be detected; in larger DC fields, resolution to 1 part in 300,000 is possible. For RMS and peak measurements, resolution is 4 $\frac{3}{4}$ digits or 1 part in 30,000. The filter feature of the Model 450 improves resolution in noisy environments by taking a running average of field readings. DC mode requires filtering to achieve 5 $\frac{3}{4}$ digit resolution.

Interface

The Model 450 is equipped with parallel (IEEE-488) and serial (RS-232C) computer interfaces for command and data exchange; maximum reading rate can be achieved with the IEEE-488 interface. Nearly every function of the Model 450 front panel can be performed *via* computer interface. The Model 450 also provides one corrected and one monitor analog voltage output. Corrected for sensor linearity, offset, and temperature effects, the corrected output is a DC voltage proportional to the display reading. The monitor output is a real-time analog voltage proportional to the field.

Probes and Sensors

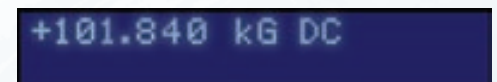
The Model 450 is compatible with most Lake Shore gaussmeter Hall probes. When ordering the Model 450 with one of the gaussmeter Hall probes on the following page, a discounted package price is available. Lake Shore probes are factory calibrated for accuracy and interchangeability. Factory-calibrated probes feature a programmable read-only memory (PROM) in the probe connector so that calibration data can be read automatically by the instrument. If the

probe is equipped with a temperature sensor, the Model 450 reads both temperature and field signal and continuously adjusts the calculated field value. Lake Shore can also custom design a probe to meet your specific application requirements.

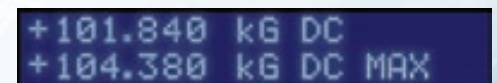
Display

The Model 450 has a two line by 20 character vacuum fluorescent display. During normal operation, the display is used to report field readings and give results of other features such as max/min or relative. When setting instrument parameters, the display gives the operator meaningful prompts and feedback to simplify operation. The operator can also control display brightness.

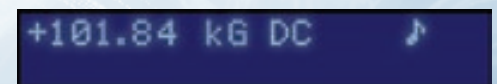
Following are three examples of the various display configurations:



Normal Reading – the default mode with the display of the live DC field reading.



Max DC Hold On – the maximum value is shown in the lower display while the upper display contains the live DC field reading.

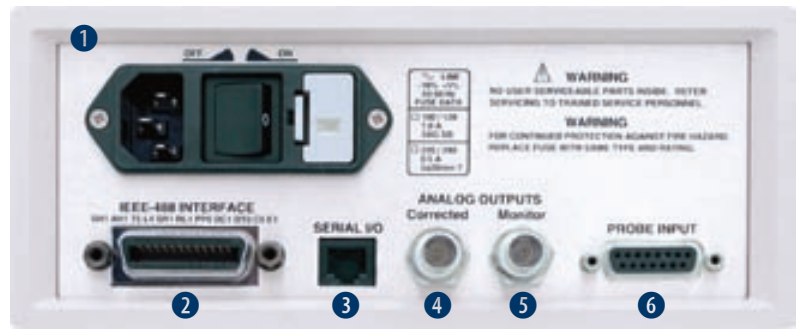


Alarm On – the alarm gives audible and visual indication of when the field value is selectively outside or inside a user specified range. An output relay facilitates pass/fail actuation.

Model 450 Gaussmeter

Model 450 Rear Panel

- ① Line Input Assembly
- ② IEEE-488 Interface
- ③ Serial I/O Interface
- ④ Corrected Analog Output
- ⑤ Monitor Analog Output
- ⑥ Probe Input



Gaussmeter Hall Probes

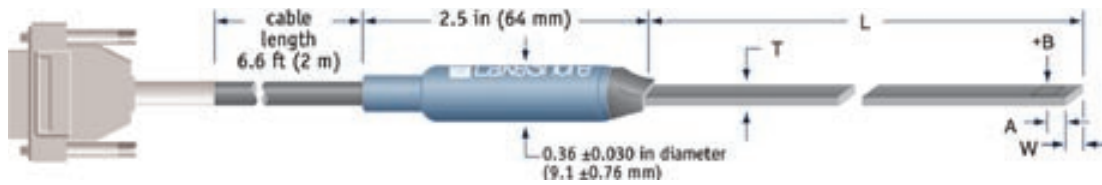
The Model 450 includes one of the Lake Shore probes listed below – specify probe model number when ordering. See page 24 for details on properly selecting a probe and for a complete listing of available probe models.

Axial Probes



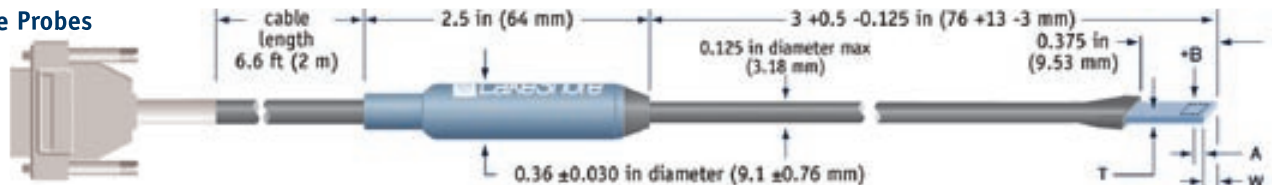
	L	D	A	Active area	Stem material	Frequency range	Usable full scale ranges	Corrected accuracy (% rdg)	Operating temp range	Temp coefficient (max) zero	Temp coefficient (max) calibration
MMA-2502-VH ¹	2 in ±0.063 in	0.25 in dia ±0.006 in	0.015 in ±0.005 in	0.030 in dia (approx)	Aluminum	DC and 10 Hz to 400 Hz	30 G, 300 G, 3 kG, 30 kG	±0.25% to 30 kG	0 °C to +75 °C	±0.09 G/°C	±0.015%/°C
MNA-1904-VH ¹	4 in ±0.125 in	0.187 in dia ±0.005 in	0.005 in ±0.003 in		Fiberglass epoxy		300 G, 3 kG, 30 kG				
MMA-2502-VG	2 in ±0.063 in	0.25 in dia ±0.006 in	0.015 in ±0.005 in		Aluminum						
MNA-1904-VG	4 in ±0.125 in	0.187 in dia ±0.005 in	0.005 in ±0.003 in		Fiberglass epoxy						

Transverse Probes



	L	T	W	A	Active area	Stem material	Frequency range	Usable full scale ranges	Corrected accuracy (% rdg)	Operating temp range	Temp coefficient (max) zero	Temp coefficient (max) calibration
MMT-6J04-VH ¹	4 in ±0.125 in	0.061 in max	0.180 in ±0.005 in	0.150 in ±0.050 in	0.040 in dia (approx)	Aluminum	DC	30 G, 300 G, 3 kG, 30 kG	±0.25% to 30 kG	0 °C to +75 °C	±0.09 G/°C	±0.015%/°C
MNT-4E04-VH ¹		0.045 in max	0.150 in ±0.005 in			Rigid glass epoxy	DC and 10 Hz to 400 Hz	300 G, 3 kG, 30 kG				
MMT-6J04-VG		0.061 in max	0.180 in ±0.005 in			Aluminum	DC					
MNT-4E04-VG		0.045 in max	0.150 in ±0.005 in			Rigid glass epoxy	DC and 10 Hz to 400 Hz					

Flexible Transverse Probes



	W	T	A	Active area	Stem material	Frequency range	Usable full scale ranges	Corrected accuracy (% rdg)	Operating temp range	Temp coefficient (max) zero	Temp coefficient (max) calibration
MFT-3E03-VH ¹	0.135 in max	0.025 in max	0.125 in ±0.005 in	0.040 in dia (approx)	Flexible plastic tubing	DC and 10 Hz to 400 Hz	30 G, 300 G, 3 kG, 30 kG	±0.25% to 30 kG	0 °C to +75 °C	±0.09 G/°C	±0.015%/°C
MFT-3E03-VG							300 G, 3 kG, 30 kG				

¹Temperature compensated probes

Model 450 Specifications

General Measurement

Number of inputs: 1
Update rate: 5 rdg/s on display; up to 18 rdg/s with IEEE-488 interface
Measurement modes: DC, RMS, Peak
Probe compatibility: Standard and custom probes
Probe features: Linearity Correction, Temperature Correction, Auto Probe Zero
Measurement features: Auto Range, Max Hold, Relative Mode, Filter
Probe connector: 15-pin D style

DC Measurement

DC display resolution: 5¼ digits with filter, 4¾ digits without filter

Probe type Range	Resolution w/ Filter	Resolution w/out Filter
HST Probe		
300 kG	0.001 kG	0.01 kG
30 kG	0.0001 kG	0.001 kG
3 kG	0.00001 kG	0.0001 kG
300 G	0.001 G	0.01 G
HSE Probe		
30 kG	0.0001 kG	0.001 kG
3 kG	0.00001 kG	0.0001 kG
300 G	0.001 G	0.01 G
30 G	0.0001 G	0.001 G
UHS Probe		
30 G	0.0001 G	0.001 G
3 G	0.00001 G	0.0001 G
300 mG	0.001 mG	0.01 mG

DC accuracy: ±0.10% of reading ±0.005% of range
DC temperature coefficient: ±0.05% of reading ±0.003% of range per °C
DC precision: No filter – ranges ≤30 G ±0.013%, ranges ≥300 G ±0.003%;
 Filter¹ – ranges ≤30 G ±0.0025%, ranges ≥300 G ±0.0007%

AC RMS & Peak Measurement

AC display resolution: 4¾ digits

Probe type Range	RMS Resolution	Peak Resolution
HST Probe		
300 kG	0.01 kG	0.01 kG
30 kG	0.001 kG	0.001 kG
3 kG	0.0001 kG	0.0001 kG
300 G	0.01 G	×
HSE Probe		
30 kG	0.001 kG	0.001 kG
3 kG	0.0001 kG	0.0001 kG
300 G	0.01 G	0.01 G
30 G	0.001 G	×
UHS Probe		
30 G	0.001 G	0.001 G
3 G	0.0001 G	0.0001 G
300 mG	0.01 mG	×

AC RMS frequency range: 10 Hz to 400 Hz
AC RMS accuracy: ±2% of reading (50 Hz to 60 Hz)
AC RMS frequency response: 0 to -3.5% of reading (10 Hz to 400 Hz)
 (All AC specifications for sinusoidal input >1% of range)
AC peak accuracy: ±5% typical
AC peak speed: 5 ms

Front Panel

Display type: 2 line × 20 character, vacuum fluorescent
Display resolution: To ±5¼ digits
Display update rate: 5 rdg/s
Displays units: Gauss (G), Tesla (T)
Units multipliers: μ, m, k
Annunciators: RMS: AC input signal, DC: DC input signal, MAX: Max Hold value, s: Relative reading, R: Remote operation, !: Alarm on
Keypad: 21 full travel keys
Front panel features: Intuitive operation, display prompts, front panel lockout, brightness control

¹Filter set averaging 8 readings over 1.6 s

Interfaces

RS-232C capabilities

Baud: 300, 1200, 9600
Connector: RJ-11
Update rate: Up to 15 rdg/s

IEEE-488 capabilities

Complies with IEEE-488.2 SH1, AH1, SR1, RL1, PP0, DC1, DT0, C0, E1
Software support: LabView™ driver
Update rate: Up to 18 rdg/s

Alarm

Settings: High and low set point, Inside/Outside, Audible
Actuators: Display annunciator, beeper

Monitor analog output

Configuration: Real time analog voltage output
Scale: ±3 V = ±FS on selected range
Frequency response: DC to 400 Hz
Accuracy: Probe dependent
Minimum load resistance: 1 kΩ (short circuit protected)
Connector: BNC

Corrected analog output

Configuration: Voltage output generated by DAC
Range: ±3 V; ±10 V for the Model 450-10
Scale: User defined
Resolution: 0.366 mV
Update rate: 5 rdg/s on display; up to 18 rdg/s with IEEE-488 interface
Accuracy: ±0.1% of full scale in addition to measurement error
Minimum load resistance: 1 kΩ (short circuit protected)
Connector: BNC

General

Ambient temperature: 15 to 35 °C at rated accuracy; 5 to 40 °C with reduced accuracy
Power requirement: 100, 120, 220, 240 VAC (+5%, -10%), 50 or 60 Hz, 20 VA
Size: 216 mm W × 89 mm H × 318 mm D (8.5 in × 3.5 in × 12.5 in), half rack
Weight: 3 kg (6.6 lb)
Approval: CE mark

Ordering Information

Part number	Description
450	Model 450 Gaussmeter plus one probe
450-10	Model 450 Gaussmeter (with corrected analog output set to ±10 V instead of ±3 V)

Select a power configuration

VAC-100	100 VAC, includes U.S. power cord
VAC-120	120 VAC, includes U.S. power cord
VAC-220	220 VAC, includes universal Europe power cord
VAC-240	240 VAC, includes universal Europe power cord
VAC-120-ALL	120 VAC, includes U.S. & universal Europe power cords & all fuses

Accessories included

115-006	Detachable line cord (U.S.)
115-007	Detachable line cord (European)
4060	Zero gauss chamber
MAN-450	Model 450 user manual

Accessories available

4001	RJ-11 4-wire cable assembly used with RS-232C interface – cable is 4.3 m (14 ft) long
4002	RJ-11 to DB-25 adapter – connects computer to RS-232C port
4003	RJ-11 to DE-9 adapter – connects computer to RS-232C port
4004	IEEE-488 interface cable connects computer to IEEE-488 interface – cable is 1 m (3.3 ft) long
CAL-450-CERT	Instrument recalibration with certificate
CAL-450-DATA	Instrument recalibration with certificate and data
CAL-N5-DATA	Calibration data for a new Model 450
RM-½	Rack mount kit for one ½-rack gaussmeter in 483 mm (19 in) rack
RM-2	Rack mount kit for two ½-rack gaussmeter in 483 mm (19 in) rack

One probe included (additional probes ordered separately)
 Custom probes available – consult Lake Shore