Model 421 Gaussmeter

- Resolution to 4¾ digits (1 part out of ±30,000)
- Large vacuum fluorescent display
- Serial interface
- Analog voltage outputs
- Sort function (displays Pass/Fail message)
- Alarm with relay

Product Description
The Model 421 Hall Effect Gaussmeter is Lake Shore's answer to the need for high performance at an affordable price in the rapidly changing permanent magnet industry. The Model 421 offers faster update, higher resolution and more repeatable flux density measurements to meet the demands of manufacturing, quality assurance and R&D. As an added advantage, the Model 421 includes one of Lake Shore's Hall probes.

Performance
High-performance instrumentation is no longer the exclusive domain of research laboratories. Performance requirements are tightening in every magnetic measurement application. In response, the Model 421 offers improved accuracy, resolution, noise floor, and update rate.

Throughput
Throughput involves much more than update rate of an instrument. Usability of an instrument is just as important. The Model 421 has a large, bright, vacuum fluorescent display that can be seen easily in any lighting condition. The display updates quickly for fast feedback of probe or magnet positioning. The operation is straightforward with display prompts for the user. Max Hold, Alarm, and Sort features are included to streamline sorting and testing operations.

Automation
The Model 421 has a variety of interface features that are compatible with automated test configurations. The RS-232C serial computer interface can perform nearly every function of the instrument front panel. Two analog voltage outputs and an alarm relay facilitate automation without a computer.

Probes
The Model 421 is compatible with most Lake Shore gaussmeter Hall probes. When ordering the Model 421 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. Lake Shore can also custom design a probe to meet your specific application requirements.

Display
The Model 421 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 four examples of the various display configurations:

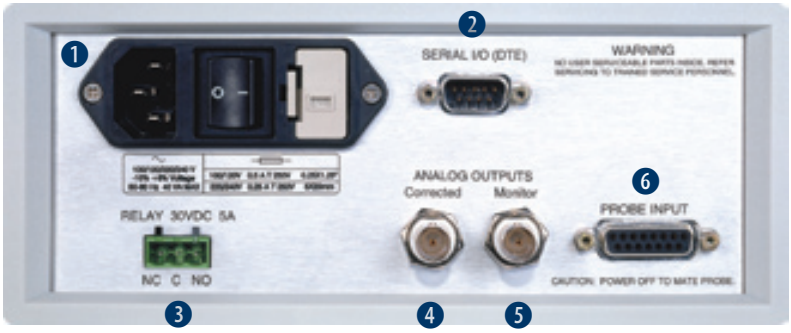
Normal Reading *– the default mode with the display of the live DC field reading.*

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 an 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.*

Sort On *– the live reading is shown in the upper display while the lower display contains the pass/fail (repetitive sorting or testing) message.*

Model 421 Rear Panel



1. Line Input Assembly
2. Serial I/O Interface
3. Relay Terminals
4. Corrected Analog Output
5. Monitor Analog Output
6. Probe Input

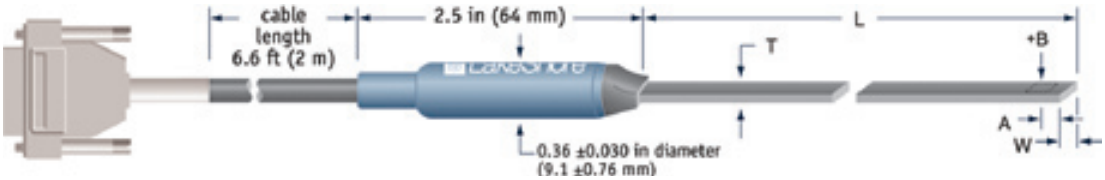
Gaussmeter Hall Probes

The Model 421 includes one of the Lake Shore probes listed below – specify probe model number when ordering. See page 25 for details on properly selecting a probe and for a complete listing of available probe models.

Axial Probes

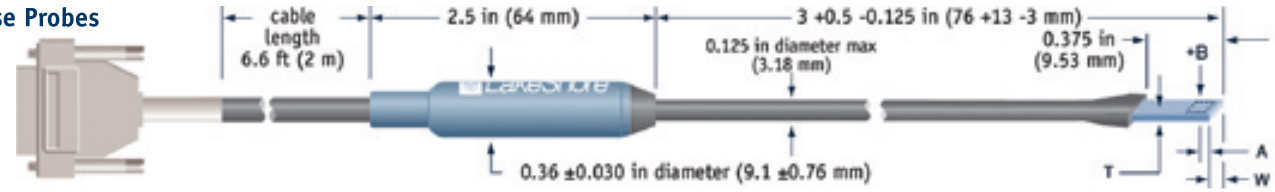
	L	D	A	Active area	Stem material	Frequency range	Usable full scale ranges	Corrected accuracy (% rdg)	Operating temp range	Temp coefficient (max) zero	Temp coefficient (max) calibration
MMA-2502-VH	2 in ±0.063 in	0.25 in dia ±0.006 in	0.015 in ±0.005 in	0.030 in dia (approx)	Aluminum	DC and 10 Hz to 400 Hz	30 G, 300 G, 3 kG, 30 kG	±0.25% to 30 kG	0 °C to +75 °C	±0.09 G/°C	-0.04%/°C
MNA-1904-VH	4 in ±0.125 in	0.187 in dia ±0.005 in	0.005 in ±0.003 in		Fiberglass epoxy						
MMA-2502-VG	2 in ±0.063 in	0.25 in dia ±0.006 in	0.015 in ±0.005 in		Aluminum		300 G, 3 kG, 30 kG	±0.15% to 30 kG		±0.13 G/°C	-0.005%/°C
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	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	-0.04%/°C
MNT-4E04-VH	4 in ±0.125 in	0.045 in max	0.150 in ±0.005 in			Rigid glass epoxy	DC and 10 Hz to 400 Hz					
MMT-6J04-VG	4 in ±0.125 in	0.061 in max	0.180 in ±0.005 in			Aluminum	DC	300 G, 3 kG, 30 kG	±0.15% to 30 kG		±0.13 G/°C	-0.005%/°C
MNT-4E04-VG	4 in ±0.125 in	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	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	-0.04%/°C
MFT-3E03-VG							300 G, 3 kG, 30 kG	±0.15% to 30 kG		±0.13 G/°C	-0.005%/°C

Model 421 Specifications

General Measurement

Number of inputs: 1
Update rate: 5 rdg/s on display; up to 18 rdg/s with serial interface
Probe compatibility: Standard and custom probes, including Model 420 & 450 probes
Probe features: Linearity Correction, Auto Probe Zero
Measurement features: Autorange, Max Hold, Relative Mode, Filter
Probe connector: 15-pin D style

DC Measurement

DC display resolution: 4¾ digits with filter, 3¾ digits without filter

Probe type Range	Resolution with filter	Resolution without filter
HST Probe		
300 kG	0.01 kG	0.1 kG
30 kG	0.001 kG	0.01 kG
3 kG	0.0001 kG	0.001 kG
300 G	0.01 G	0.1 G
HSE Probe		
30 kG	0.001 kG	0.01 kG
3 kG	0.0001 kG	0.001 kG
300 G	0.01 G	0.1 G
30 G	0.001 G	0.01 G
UHS Probe		
30 G	0.001 G	0.01 G
3 G	0.0001 G	0.001 G
300 mG	0.01 mG	0.1 mG

DC accuracy: ±0.20% of reading ±0.05% of range
DC temperature coefficient: ±0.05% of reading ±0.03% of range per °C

AC RMS Measurement

AC display resolution: 3¾ digits

Probe type Range	Resolution
HST probe	
300 kG	0.1 kG
30 kG	0.01 kG
3 kG	0.001 kG
300 G	0.1 G
HSE probe	
30 kG	0.01 kG
3 kG	0.001 kG
300 G	0.1 G
30 G	0.01 G
UHS probe	
30 G	0.01 G
3 G	0.001 G
300 mG	0.1 mG

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

Front Panel

Display type: Large 2-line by 20-character, vacuum fluorescent display
Display resolution: To ±4¾ digits
Display update rate: 5 rdg/s
Display 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: 12-key membrane
Front panel features: Intuitive operation, display prompts, front panel lockout, brightness control

Interfaces

RS-232C capabilities
- **Baud:** 300, 1200, 9600
- **Connector:** DE-9, DTE configuration
- **Software support:** LabView™ driver (consult Lake Shore for availability); compatible with Model 420 command set

Alarm
- **Settings:** High and low set point, Inside/Outside, Audible, Sort
- **Actuators:** Display annunciator, sort message, beeper, relay

Relay
- **Number:** 1
- **Contacts:** Normally open (NO), normally closed (NC) and common (C)
- **Contact rating:** 30 VDC at 2 A
- **Operation:** Follows alarm
- **Connector:** Detachable terminal block

Monitor analog output
- **Configuration:** Real time analog voltage output
- **Range:** ±3 V
- **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
- **Scale:** ±3 V = ±FS on selected range
- **Resolution:** 1.25 mV
- **Update rate:** 5 updates/s
- **Accuracy:** ±0.35%
- **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
421	Model 421 gaussmeter plus one probe
Specify line power option	
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	
106-741	Terminal block for relay outputs
115-006	Detachable line cord (U.S.)
115-007	Detachable line cord (European)
4060	Zero gauss chamber
MAN-421	Model 421 user manual
Accessories available	
106-741	Terminal block mating connector: 3-pin connector for alarm relay
CAL-421-CERT	Instrument recalibration with certificate
CAL-421-DATA	Instrument recalibration with certificate and data
CAL-N5-DATA	Calibration data for a new Model 421
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