Model 421 Gaussmeter

- Resolution to 4¾ Digits
- Large Vacuum Fluorescent Display
- Serial Interface
- Analog Voltage Outputs
- Max Hold and Relative Reading
- Alarm with Relay

**Product Description**
The Model 421 Hall Effect Gaussmeter is Lake Shore’s answer to the dynamic changes in the permanent magnet industry. Faster update, higher resolution and more repeatable flux density measurements are being demanded by manufacturing, quality assurance and R&D. The Model 421 is well suited to meet these requirements at an affordable price. As an added advantage, the Model 421 includes one of Lake Shore’s Hall probes (see following page for selection).

**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. Useability 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 includes one of Lake Shore’s Hall probes (see following page for selection). This group of probes covers a wide variety of application requirements. The Model 421 is also compatible with the extensive line of Lake Shore probes. Lake Shore probes are factory calibrated for accuracy and interchangeability. Calibration data is loaded into a PROM located in the probe connector so that it does not have to be entered by the user. Lake Shore can also custom design a probe to meet your specific application requirements.

**Normal Reading**

The Model 421 has a 2 line by 20 character vacuum fluorescent display, with resolution to 4¾ digits. The display can accommodate seven measurement ranges from 300.00 mG to 300.00 kG. Measurements can be displayed in either gauss or tesla.

**Max Hold On**

The largest field magnitude seen since the last max reset is displayed with the Max Hold function. The maximum value is shown in the lower display while the upper display contains the live 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 sort function allows the Model 421 to display pass or fail when it is used during repetitive testing or sorting. The live reading is shown in the upper display while the lower display contains the pass/fail message.
Model 421 Rear Panel

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

**Hall Probes**

**Axial Probes**

![Axial Probes Image]

<table>
<thead>
<tr>
<th>Model</th>
<th>L</th>
<th>D</th>
<th>A</th>
<th>Active area</th>
<th>Stem material</th>
<th>Frequency range</th>
<th>Usable full scale ranges</th>
<th>Corrected accuracy (% of reading)</th>
<th>Operating temperature range</th>
<th>Temperature coefficient (maximum) Zero</th>
<th>Temperature coefficient (maximum) Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMA-2502-VH</td>
<td>2&quot; ±0.063&quot;</td>
<td>0.25&quot; dia ±0.006&quot;</td>
<td>0.010&quot; ±0.005&quot;</td>
<td>0.030&quot; dia (approx)</td>
<td>Aluminum</td>
<td>DC and 10 Hz to 400 Hz</td>
<td>30 G, 300 G, 3 kG, 30 kG</td>
<td>±0.25% to 30 kG</td>
<td>0 °C to +75 °C</td>
<td>±0.09 °C/G°C</td>
<td>±0.04 °C/G°C</td>
</tr>
<tr>
<td>MNA-1904-VH</td>
<td>4&quot; ±0.125&quot;</td>
<td>0.187&quot; dia ±0.005&quot;</td>
<td>0.005&quot; ±0.003&quot;</td>
<td>Aluminum</td>
<td>Fiberglass epoxy</td>
<td>DC and 10 Hz to 400 Hz</td>
<td>300 G, 3 kG, 30 G</td>
<td>±0.15% to 30 kG</td>
<td>±5.13 °C/G°C</td>
<td>±0.005 °C/G°C</td>
<td></td>
</tr>
<tr>
<td>MMA-2502-VG</td>
<td>2&quot; ±0.063&quot;</td>
<td>0.25&quot; dia ±0.006&quot;</td>
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**Transverse Probes**

![Transverse Probes Image]

<table>
<thead>
<tr>
<th>Model</th>
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<th>Operating temperature range</th>
<th>Temperature coefficient (maximum) Zero</th>
<th>Temperature coefficient (maximum) Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMT-6J04-VH</td>
<td>4&quot; ±0.125&quot;</td>
<td>0.061&quot; max</td>
<td>0.189&quot; ±0.005&quot;</td>
<td>0.190&quot; ±0.005&quot;</td>
<td>0.044&quot; dia (approx)</td>
<td>Aluminum</td>
<td>DC and 10 Hz to 400 Hz</td>
<td>30 G, 300 G, 3 kG, 30 G</td>
<td>±0.25% to 30 kG</td>
<td>0 °C to +75 °C</td>
<td>±0.09 °C/G°C</td>
<td>±0.04 °C/G°C</td>
</tr>
<tr>
<td>MNT-4E04-VH</td>
<td>4&quot; ±0.125&quot;</td>
<td>0.044&quot; max</td>
<td>0.150&quot; ±0.005&quot;</td>
<td>0.150&quot; ±0.005&quot;</td>
<td>0.044&quot; dia (approx)</td>
<td>Rigid glass epoxy</td>
<td>DC and 10 Hz to 400 Hz</td>
<td>300 G, 3 kG, 30 G</td>
<td>±0.15% to 30 kG</td>
<td>±5.13 °C/G°C</td>
<td>±0.005 °C/G°C</td>
<td></td>
</tr>
<tr>
<td>MMT-6J04-VG</td>
<td>4&quot; ±0.125&quot;</td>
<td>0.061&quot; max</td>
<td>0.189&quot; ±0.005&quot;</td>
<td>0.190&quot; ±0.005&quot;</td>
<td>0.044&quot; dia (approx)</td>
<td>Aluminum</td>
<td>DC and 10 Hz to 400 Hz</td>
<td>300 G, 3 kG, 30 G</td>
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<td></td>
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<td>MNT-4E04-VG</td>
<td>4&quot; ±0.125&quot;</td>
<td>0.044&quot; max</td>
<td>0.150&quot; ±0.005&quot;</td>
<td>0.150&quot; ±0.005&quot;</td>
<td>0.044&quot; dia (approx)</td>
<td>Rigid glass epoxy</td>
<td>DC and 10 Hz to 400 Hz</td>
<td>300 G, 3 kG, 30 G</td>
<td>±0.15% to 30 kG</td>
<td>±5.13 °C/G°C</td>
<td>±0.005 °C/G°C</td>
<td></td>
</tr>
</tbody>
</table>

**Flexible Transverse Probes**

*L* = 3", *S* = 0.375

![Flexible Transverse Probes Image]

<table>
<thead>
<tr>
<th>Model</th>
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<th>Frequency range</th>
<th>Usable full scale ranges</th>
<th>Corrected accuracy (% of reading)</th>
<th>Operating temperature range</th>
<th>Temperature coefficient (maximum) Zero</th>
<th>Temperature coefficient (maximum) Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFT-3E03-VH</td>
<td>0.135&quot; max</td>
<td>0.025&quot; max</td>
<td>0.125&quot; ±0.006&quot;</td>
<td>0.044&quot; dia (approx)</td>
<td>Flexible tubing</td>
<td>DC and 10 Hz to 400 Hz</td>
<td>30 G, 300 G, 3 kG, 30 G</td>
<td>±0.25% to 30 kG</td>
<td>0 °C to +75 °C</td>
<td>±0.09 °C/G°C</td>
<td>±0.04 °C/G°C</td>
</tr>
<tr>
<td>MFT-3E03-VG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The Model 421 includes one of the Lake Shore probes listed above. Please specify probe model number when ordering.
Model 421 Specifications

**General Measurement**
- Number of Inputs: 1
- Update Rate: 5 readings per second on display; up to 18 readings per second with serial interface
- Probe Compatibility: Standard and custom probes, including Model 420 probes
- Probe Features: Linearity Correction, Auto Probe Zero
- Measurement Features: Auto Range, Max Hold, Relative Mode, Filter
- Probe Connector: 15 pin D style

**DC Measurement**
- DC Display Resolution: 4½ digits with filter, 3½ digits without filter

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution w/ Filter</th>
<th>Resolution w/out Filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>HST Probe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 kG</td>
<td>0.01 kG</td>
<td>0.1 kG</td>
</tr>
<tr>
<td>30 kG</td>
<td>0.001 kG</td>
<td>0.01 kG</td>
</tr>
<tr>
<td>3 kG</td>
<td>0.0001 kG</td>
<td>0.001 kG</td>
</tr>
<tr>
<td>300 G</td>
<td>0.01 G</td>
<td>0.01 G</td>
</tr>
<tr>
<td>HSE Probe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 kG</td>
<td>0.001 kG</td>
<td>0.01 kG</td>
</tr>
<tr>
<td>3 kG</td>
<td>0.0001 kG</td>
<td>0.001 kG</td>
</tr>
<tr>
<td>300 G</td>
<td>0.01 G</td>
<td>0.01 G</td>
</tr>
<tr>
<td>30 G</td>
<td>0.01 G</td>
<td>0.01 G</td>
</tr>
<tr>
<td>UHS Probe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 G</td>
<td>0.001 G</td>
<td>0.01 G</td>
</tr>
<tr>
<td>3 G</td>
<td>0.0001 G</td>
<td>0.001 G</td>
</tr>
<tr>
<td>300 mG</td>
<td>0.01 mG</td>
<td>0.1 mG</td>
</tr>
</tbody>
</table>

DC Accuracy: ±0.20% of reading ±0.05% of range
DC Temperature Coefficient: ±0.05% of reading ±0.03% of range/°C

**AC RMS Measurement**
- AC Display Resolution: 3½ digits

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>HST Probe</td>
<td></td>
</tr>
<tr>
<td>300 kG</td>
<td>0.1 kG</td>
</tr>
<tr>
<td>30 kG</td>
<td>0.01 kG</td>
</tr>
<tr>
<td>3 kG</td>
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<td>UHS Probe</td>
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<tr>
<td>3 G</td>
<td>0.001 G</td>
</tr>
<tr>
<td>300 mG</td>
<td>0.1 mG</td>
</tr>
</tbody>
</table>

AC Frequency Range: 10 Hz – 400 Hz
AC Accuracy: ±2% of reading (50 Hz – 60 Hz)
AC Frequency Response: 0 to -3.5% of reading (10 Hz – 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 ±4% digits
- Display Update Rate: 5 readings per second
- Displays Units: Gauss (G), Tesla (T)
- Units Multipliers: µ, m, k
- Annunciators: RMS, AC input signal
- DC, DC input signal
- MAX, Max Hold value
- ▲, 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
- 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 per second
- Accuracy: ±0.35%
  - Minimum Load Resistance: 1 kΩ (short circuit protected)
  - Connector: BNC

**General**
- Ambient Temperature: 15 – 35 °C at rated accuracy. 5 – 40 °C with reduced accuracy
- Power Requirement: 100, 120, 220, 240 VAC (+5%, -10%), 50 or 60 Hz, 20 watts
- Size: 217 mm W x 90 mm H x 317 mm D, half rack (8.5” x 3.5” x 12.5”)
- Weight: 3 kg (6.6 lbs)
- Approval: CE Mark

**Ordering Information**
- Part number | Description
- Instrument
- 421 | Model 421 Gaussmeter plus one probe (Specify line voltage and probe model number)

**Accessories Included**
- 106-741 | Terminal block for relay outputs
- 115-006 | Detachable line cord (U.S.)
- 4060 | Zero gauss chamber

**Accessories Available**
- RM-1/2 | Rack mount kit for one 1/2 rack gaussmeter in 482.60 mm (19") rack
- RM-2 | Rack mount kit for two 1/2 rack gaussmeters in 482.60 mm (19") rack
- MCBL-6 | User programmable cable with PROM (6’ long)
- MPEC-10 | Probe extension cable with EEPROM (10’ long)
- MPEC-25 | Probe extension cable with EEPROM (25’ long)
- MPEC-50 | Probe extension cable with EEPROM (50’ long)
- MPEC-100 | Probe extension cable with EEPROM (100’ long)
  - (Extension cables must be matched to probes)

**One Probe Included** (Additional probes ordered separately)

**Custom Probes Available** (Consult Lake Shore for more information)

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