Keithley’s Series 2400 Source Measure Unit (SMU) Instruments are designed specifically for test applications that demand tightly coupled sourcing and measurement. All SourceMeter models provide precision voltage and current sourcing as well as measurement capabilities. Each SourceMeter SMU instrument is both a highly stable DC power source and a true instrument-grade 6½-digit multimeter. The power source characteristics include low noise, precision, and readback. The multimeter capabilities include high repeatability and low noise. The result is a compact, single-channel, DC parametric tester. In operation, these instruments can act as a voltage source, a current source, a voltage meter, a current meter, and an ohmmeter. Manufacturers of components and modules for the communications, semiconductor, computer, automotive, and medical industries will find the SourceMeter SMU instruments invaluable for a wide range of characterization and production test applications.

**Advantages of a Tightly Integrated Instrument**

By linking source and measurement circuitry in a single unit, these instruments offer a variety of advantages over systems configured with separate source and measurement instruments. For example, they minimize the time required for test station development, setup, and maintenance, while lowering the overall cost of system ownership. They simplify the test process itself by eliminating many of the complex synchronization and connection issues associated with using multiple instruments. And, their compact half Rack size conserves precious “real estate” in the test rack or bench.

**Power of Five Instruments in One (IV Source, IVR Measure)**

The tightly coupled nature of a SourceMeter SMU instrument provides many advantages over solutions configured from separate instruments, such as a precision power supply and a digital multimeter. For example, it provides faster test times by reducing GPIB traffic and simplifies the remote programming interface. It also protects the device under test from damage due to accidental overloads, thermal runaway, etc. Both the current and voltage source are programmable with readback to help maximize device measurement integrity. If the readback reaches a programmed compliance limit, then the source is clamped at the limit, providing fault protection.

### ACCESSORIES AVAILABLE

<table>
<thead>
<tr>
<th>COMMUNICATION INTERFACE</th>
<th>TRIGGERING AND CONTROL</th>
<th>RACK MOUNT KITS</th>
<th>SOFTWARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIe-488LPA</td>
<td>4288-1</td>
<td>4288-1</td>
<td>LabTracer 2.0 Curve Tracing Software (downloadable)</td>
</tr>
<tr>
<td>PCIe-488LPA</td>
<td>8501-1</td>
<td>4288-2</td>
<td></td>
</tr>
<tr>
<td>PCIe-488LPA</td>
<td>8501-2</td>
<td>4288-4</td>
<td></td>
</tr>
<tr>
<td>PCIe-488LPA</td>
<td>8502</td>
<td>4288-5</td>
<td></td>
</tr>
<tr>
<td>PCIe-488LPA</td>
<td>8505</td>
<td>4288-9</td>
<td></td>
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<tr>
<td>PCIe-488LPA</td>
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</tr>
<tr>
<td>PCIe-488LPA</td>
<td></td>
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</tr>
</tbody>
</table>

**Tightly coupled precision sourcing and measurement**

- **Five instruments in one (IV Source, IVR Measure)**
- **Seven models: 20–100W DC, 1000W pulsed, 1100V to 1µV, 10A to 10pA**
- **Source and sink (4-quadrant) operation**
- **0.012% basic measure accuracy with 6½-digit resolution**
- **2-, 4-, and 6-wire remote V-source and measure sensing**
- **1700 readings/second at 4½ digits via GPIB**
- **Pass/Fail comparator for fast sorting/binning**
- **Available high speed sense lead contact check function**
- **Programmable DIO port for automation/handler/prober control (except Model 2401)**
- **Standard SCPI GPIB, RS-232 and Keithley Trigger Link interfaces**
- **Keithley LabTracer 2.0 I-V curve tracing application software (download)**

**TEST LEADS AND PROBES**

- 1751: 2-Wire Universal 10-Piece Test Lead Kit
- 5804: Kelvin (4-Wire) Universal 10-Piece Test Lead Kit
- 5805: Kelvin (4-Wire) Spring-Loaded Probes
- 5808: Low Cost Single-pin Kelvin Probe Set
- 5809: Low Cost Kelvin Clip Lead Set
- 8607: 2-Wire, 1000V Banana Cables, 1m (3 ft)
- CA18-1: Shielded Dual Banana Cable, 1m (4 ft)

**SWITCHING HARDWARE**

- 7001: Two-Slot Switch System
- 7002: Ten-Slot Switch System
- 7010-C: 6-Wire Ohms Switch Card
- 7053: High-Current Switch Card

**CABLES/ADAPTERS**

- 7007-1: Shielded GPIB Cable, 1m (3.3 ft)
- 7007-2: Shielded GPIB Cable, 2m (6.6 ft)
- 7009-5: RS-232 Cable
- 8620: Shorting Plug

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A Greater Measure of Confidence

A Tektronix Company
I-V Characteristics

All SourceMeter SMU instruments provide four-quadrant operation. In the first and third quadrants they operate as a source, delivering power to a load. In the second and fourth quadrants they operate as a sink, dissipating power internally. Voltage, current, and resistance can be measured during source or sink operation.

Series 2400 SourceMeter SMU Instruments

- **Model 2400**
  - 200V, 1A, 20W
  - SourceMeter SMU Instrument

- **Model 2401**
  - 20V, 1A, 20W SourceMeter SMU Instrument

- **Model 2410**
  - 1100V, 1A, 20W SourceMeter SMU Instrument

- **Model 2410-C**
  - 1100V, 1A, 20W SourceMeter SMU Instrument with Contact Check

- **Model 2420**
  - 60V, 3A, 60W SourceMeter SMU Instrument

- **Model 2420-C**
  - 60V, 3A, 60W SourceMeter SMU Instrument with Contact Check

- **Model 2425**
  - 100V, 3A, 100W SourceMeter SMU Instrument

- **Model 2425-C**
  - 100V, 3A, 100W SourceMeter SMU Instrument with Contact Check

- **Model 2430**
  - 100V, 10A, 1000W Pulse Mode SourceMeter SMU Instrument

- **Model 2430-C**
  - 100V, 10A, 1000W Pulse Mode SourceMeter SMU Instrument with Contact Check

- **Model 2440**
  - 40V, 5A, 50W SourceMeter SMU Instrument

- **Model 2440-C**
  - 40V, 5A, 50W SourceMeter SMU Instrument with Contact Check

**Accessories Supplied**
- Model 8605 Test Leads
- LabVIEW Software Driver (downloadable)
- LabTracer Software (downloadable)

A Greater Measure of Confidence
Automation for Speed
A SourceMeter SMU instrument streamlines production testing. It sources voltage or current while making measurements without needing to change connections. It is designed for reliable operation in non-stop production environments. To provide the throughput demanded by production applications, the SourceMeter SMU instrument offers many built-in features that allow it to run complex test sequences without computer control or GPIB communications slowing things down.

Standard and Custom Sweeps
Sweep solutions greatly accelerate testing with automation hooks. Three basic sweep waveforms are provided that can be programmed for single-event or continuous operation. They are ideal for I/V, I/R, V/I, and V/R characterization.
- Linear Staircase Sweep: Moves from the start level to the stop level in equal linear steps
- Logarithmic Staircase Sweep: Done on a log scale with a specified number of steps per decade
- Custom Sweep: Allows construction of special sweeps by specifying the number of measurement points and the source level at each point
- Up to 1700 readings/second at 4½ digits to the GPIB bus
- 5000 readings can be stored in the non-volatile buffer memory

Built-In Test Sequencer (Source Memory List)
The Source Memory list provides faster and easier testing by allowing you to setup and execute up to 100 different tests that run without PC intervention.
- Stores up to 100 instrument configurations, each containing source settings, measurement settings, pass/fail criteria, etc.
- Pass/fail limit test as fast as 500µs per point
- Onboard comparator eliminates the delay caused when sending data to the computer for analysis
- Built-in, user definable math functions to calculate derived parameters

Example Test Sequence
Digital I/O Interface
The digital I/O interface can link a SourceMeter SMU instrument to many popular component handlers, including Aetrium, Aeco, and Robotronics. Other capabilities of the interface include:

- Tight systems integration for applications such as binning and sorting
- Built-in component handler interface
- Start of test and end of test signals
- 5V, 300mA power supply
- Optional expander accessory (Model 2499-DIGIO) adds 16 digital I/O lines

The digital I/O interface is available on all Series 2400 SourceMeter instruments except the Model 2401.

Trigger Link Interface
All SourceMeter SMU instruments include Keithley’s unique Trigger Link interface which provides high-speed, seamless communications with many of Keithley’s other instruments. For example, use the Trigger Link interface to connect a SourceMeter SMU instrument with a Series 7000 Switching System for a complete multi-point test solution. With Trigger Link, the Series 7000 Switching Systems can be controlled by a SourceMeter SMU instrument during a high-speed test sequence independent of a computer and GPIB.

Optional Contact Check Function
The Contact Check function makes it simple to verify good connections quickly and easily before an automated test sequence begins. This eliminates measurement errors and false product failures associated with contact fatigue, breakage, contamination, loose or broken connection, relay failures, etc. Some capabilities of this function are:

- 350µs verification and notification process time
- The output of the SourceMeter SMU instrument is automatically shut off after a fault and is not re-activated until good contact is verified, protecting the device under test from damage and the operator from potential safety hazards.
- 3 pass/fail threshold values: 2Ω, 15Ω, and 50Ω
- No energy passes through the device under test during the operation.
- Enabled either from the front panel or remotely over the GPIB
- 3 fault notification methods

Unique 6-Wire Ohms Technique
SourceMeter SMU instruments can make standard 4-wire, split Kelvin, and 6-wire, guarded ohms measurements and can be configured for either the constant current or constant voltage method. The 6-wire ohms technique:

- Uses guard and guard sense leads in addition to the 4-wire sense and source leads.
- Locks out parallel current paths when measuring resistor networks or hybrid circuits to isolate the component under test.
- Allows users to configure and plot data easily from Series 2400 SourceMeter SMU instruments, making characterization of two, three, and four terminal devices a snap.

Free LabTracer 2.0 device characterization software (downloadable)
Series 2400

SourceMeter® SMU Instruments

Voltage Accuracy (Local or Remote Sense)

<table>
<thead>
<tr>
<th>Model</th>
<th>Range</th>
<th>Programming Resolution</th>
<th>Source(^\circ) Accuracy (1 Year) 23°C±5°C (\pm(% , \text{rdg.} , + , \text{volts}))</th>
<th>Default Measurement Resolution</th>
<th>Measurement(^\circ) Accuracy (1 Year) 23°C±5°C (\pm(% , \text{rdg.} , + , \text{volts}))</th>
<th>Output Slew Rate (\pm(30%))</th>
<th>Source/Sink Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400, 2400-C, 2401</td>
<td>200.000 mV</td>
<td>5 (\mu)V</td>
<td>0.02% ± 600 (\mu)V</td>
<td>1 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>±21 V @ ±0.05 A</td>
<td>±210 V @ ±105 mA(^*)</td>
</tr>
<tr>
<td>2400, 2400-C, 2401</td>
<td>20.000 V</td>
<td>50 (\mu)V</td>
<td>0.02% ± 600 (\mu)V</td>
<td>10 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>±21 V @ ±0.05 A</td>
<td>±1100 V @ ±21 mA</td>
</tr>
<tr>
<td>2410, 2410-C</td>
<td>200.000 mV</td>
<td>5 (\mu)V</td>
<td>0.02% ± 600 (\mu)V</td>
<td>1 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>±21 V @ ±0.05 A</td>
<td>±21 V @ ±105 A</td>
</tr>
<tr>
<td>2410, 2410-C</td>
<td>2.0000 V</td>
<td>50 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>10 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>±21 V @ ±0.05 A</td>
<td>±1100 V @ ±21 mA</td>
</tr>
<tr>
<td>2420, 2420-C</td>
<td>20.000 V</td>
<td>50 (\mu)V</td>
<td>0.02% ± 600 (\mu)V</td>
<td>10 (\mu)V</td>
<td>0.015% ± 1 (\mu)V</td>
<td>±21 V @ ±3.15 A</td>
<td>±63 V @ ±1.05 A</td>
</tr>
<tr>
<td>2420, 2420-C</td>
<td>2.0000 V</td>
<td>50 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>10 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>±21 V @ ±3.15 A</td>
<td>±63 V @ ±1.05 A</td>
</tr>
<tr>
<td>2425, 2425-C</td>
<td>60.000 V</td>
<td>1.5 mV</td>
<td>0.02% ± 7 (\mu)V</td>
<td>1 (\mu)V</td>
<td>0.015% ± 3 (\mu)V</td>
<td>±21 V @ ±3.15 A</td>
<td>±105 V @ ±1.05 A</td>
</tr>
<tr>
<td>2430, 2430-C</td>
<td>200.000 mV</td>
<td>5 (\mu)V</td>
<td>0.02% ± 600 (\mu)V</td>
<td>1 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>±105 V @ ±1.05 A</td>
<td>±105 V @ ±1.05 A (pulse mode only)</td>
</tr>
<tr>
<td>2440, 2440-C</td>
<td>2.0000 V</td>
<td>50 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>10 (\mu)V</td>
<td>0.012% ± 500 (\mu)V</td>
<td>±105 V @ ±1.05 A</td>
<td>±105 V @ ±1.05 A (pulse mode only)</td>
</tr>
</tbody>
</table>

\(^*\)Not available on Model 2401.

**TEMPERATURE COEFFICIENT (0°C–18°C and 28°C–50°C): ±(0.15 × accuracy specification)°C.**

**VOLTAGE REGULATION:** Line: 0.01% of range. Load: 0.01% of range + 100 \(\mu\)V.

**OVER VOLTAGE PROTECTION:** User selectable values, 5% tolerance. Factory default = none.

**CURRENT LIMIT:** Bipolar current limit (compliance) set with single value. Min. 0.1% of range.

**OVERSHOT:** <0.1% typical (full scale step, resistive load, 10mA range).

**ADDITIONAL SOURCE SPECIFICATIONS (All Models)**

**TRANIENT RESPONSE TIME:** 30 \(\mu\)s minimum for the output to recover to its spec following a step change in load.

**COMMAND PROCESSING TIME:** Maximum time required for the output to begin to change following the receipt of SourceVoltage[CURRent]<ret> command. Autorange Off: 10ms. Autorange On: 10ms.

**OUTPUT SETTLING TIME:** Time required to reach 0.1% of final value after command is processed. 100 \(\mu\)s typical. Resistive load. 10A to 100mA range.

**DC FLOATING VOLTAGE:** Output can be floated up to \(\pm250\text{VDC} \) (Model 2440 \(\pm40\text{VDC}\)) from chassis ground.

**REMOTE SENSE:** Up to 1V drop per load lead.

**COMPLIANCE ACCURACY:** Add 0.3% of range and ±0.02% of reading to base specification.

**OVER TEMPERATURE PROTECTION:** Internally sensed temperature overload puts unit in standby mode.

**RANGE CHANGE OVERSHOOT:** Overshoot into a fully resistive 100kΩ load, 10Hz to 1MHz BW, adjacent ranges. 100mV typical, except 20V/200V/20V/200V on Model 2420, 20V/100V on Model 2425 and 2430, range boundary, and Model 2440.

**MINIMUM COMPLIANCE VALUE:** 0.1% of range.

**ADDITIONAL PULSE MODE SOURCE SPECIFICATIONS (2430 and 2430-C only)**

**MAXIMUM DUTY CYCLE:** 8%, hardware limited, 10A range only. All other ranges 100%.

**MAXIMUM PULSE WIDTH:** 5ms from 90% rising to 90% falling edge. 2.5ms 10A range.

**MINIMUM PULSE WIDTH:** 150µs.

**MINIMUM PULSE RESOLUTION:** 50µs typical, 70µs max., limited by system jitter.

**SOURCE ACCURACY:** Determined by settling time and source range specifications.

**OUTPUT SETTLING TIME 0.1%:**

800µs typ, source I = 10A into 10Ω2, limited by voltage slew rate.

500µs typ, source I = 10A into 1Ω2, limited by voltage slew rate.

**OUTPUT SLEW RATE:**

Voltage: (10µs load): 0.25V/µs ±50% on 100% range. 0.08V/µs ±50% on 20V range. 10A range.

Current: (1µs load): 250mA/µs ±50% on 100% range. 80mA/µs ±50% on 20V range. 10A range.

**NOTES**

1. 2400, 2401, 2410 Only: Specifications valid for continuous output currents below 105mA. For operation above 10mA continuous for >1 minute, derate accuracy 10%,/5mA above 10mA.

2. Speed = Normal (1 PLC). For 0.1 PLC, add 0.005% of range to offset specifications, except 20mA. 10A ranges, add 0.05%. For 0.01 PLC. add 0.05% of range to offset specifications, except 20mA. 10A ranges, add 0.5%.

3. Accuracy applies to 2- or 4-wire mode when properly zeroed.

4. In pulse mode, limited to 0.1 PLC measurement.

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A Greater Measure of Confidence
### Series 2400 SourceMeter® SMU Instruments

#### Current Accuracy (Local or Remote Sense)

<table>
<thead>
<tr>
<th>Model</th>
<th>Range</th>
<th>Programming Resolution</th>
<th>SourceMetro Accuracy (1 Year) 23°C ±25°C ±(% rdg. +amps)</th>
<th>Source/Sink Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400, 2400-C, 2401</td>
<td>10000 µA</td>
<td>50 pA</td>
<td>0.035% + 2 nA</td>
<td>±1.05A @ ±21 V, ±105 mA @ ±210 V²</td>
</tr>
<tr>
<td></td>
<td>10000 µA</td>
<td>500 pA</td>
<td>0.035% + 2 nA</td>
<td>±0.027% + 700 pA, ±0.027% + 60 nA</td>
</tr>
<tr>
<td></td>
<td>10000 µA</td>
<td>5 nA</td>
<td>0.035% + 2 nA</td>
<td>±0.025% + 6 nA, ±0.025% + 6 nA</td>
</tr>
<tr>
<td>2440, 2440-C</td>
<td>2440, 2440-C</td>
<td>10000 µA</td>
<td>0.035% + 2 nA</td>
<td>±1.05A @ ±21 V, ±105 mA @ ±210 V²</td>
</tr>
<tr>
<td></td>
<td>2440, 2440-C</td>
<td>10000 µA</td>
<td>0.035% + 2 nA</td>
<td>±0.027% + 700 pA, ±0.027% + 60 nA</td>
</tr>
<tr>
<td></td>
<td>2440, 2440-C</td>
<td>10000 µA</td>
<td>0.035% + 2 nA</td>
<td>±0.025% + 6 nA, ±0.025% + 6 nA</td>
</tr>
</tbody>
</table>

#### Temperature coefficient (°C–18°C and 28°C–50°C): ±(0.15% accuracy specification)/°C.

#### Literature Range Limit: 0.01% of range. Load: 0.01% of range (except Model 2440 5A range 0.05% + 100µA).

#### Voltage Limit: Bipolar voltage limit (compliance) set with single value. Min. 0.1% of range.

#### Overshoot: <0.1% (typical) (1mA step, RL = 10kΩ; 20V range for Model 2440, 2401, 2410, 2420, 2440, 2430). (10V range for Model 2440).

#### Contact Check Specifications (requires -C version)

(Not available for Model 2401)

**Speed:** 350µs for verification and notification.

**Contact Check:**

- **2 Ω**
- **15 Ω**
- **50 Ω**

<table>
<thead>
<tr>
<th>Contact Check</th>
<th>1000 Ω</th>
<th>1500 Ω</th>
<th>5000 Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>No contact check failure</td>
<td>&lt;100 Ω</td>
<td>&lt;155 Ω</td>
<td>&lt;675 Ω</td>
</tr>
<tr>
<td>Always contact check failure</td>
<td>&gt;5000 Ω</td>
<td>&gt;1655 Ω</td>
<td>&gt;5025 Ω</td>
</tr>
</tbody>
</table>

#### Notes:

1. **2400, 2401, 2401:** Specifications valid for continuous output currents below 105mA. For operation above 105mA continuous for >1 minute, derate accuracy 10%/35mA above 105mA.

2. **Full operation (1A) regardless of load to 90°C (90°C for Model 2420 and 2440): above 90°C (90°C for Model 2420 and 2440) ambient, derate 5mA/°C. and prozone 5mA/4Ω load. 1-wire mode. For current sink operation on 1A, 3A, or 5A ranges, maximum continuous power is limited to approximately 1/2 rated power or less, depending on current, up to 50°C ambient. See power equations in the User’s Manual to calculate allowable duty cycle for specific conditions.

3. **For sink mode, 1mA to 100mA range. accuracy is Model 2400, 2401: ±(0.05% + offset)±. Models 2410, 2420, 2430, 2440: ±(0.05% + offset)±. For 1A range, accuracy is Model 2400, 2401: ±(1% + offset)±. Models 2410, 2420, 2430, 2440: ±(1% + offset)±.**

4. **10A range only in pulse mode. Limited to 2.5ms pulse width maximum. 10% duty cycle maximum. Speed = Normal (1 PLC). For 0.1 PLC, add 0.005% of range to offset specifications, except 200mA. 1A, 10A ranges, add 0.5%. For 0.01 PLC, add 0.05% of range to offset specifications, except 200mA. 1A, 10A ranges, add 0.5%.**

5. **Accuracy applies to 2- or 4-wire mode when properly zeroed.**

6. **In pulse mode, limited to 0.1 PLC measurement.**

7. **Model 2400 and 2400-C only.**

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## Series 2400 SourceMeter® SMU Instruments

### Resistance Measurement Accuracy (Local or Remote Sense)¹, ², ⁵

<table>
<thead>
<tr>
<th>Range</th>
<th>Default Resolution</th>
<th>Default Test Current 2400, 2401, 2410</th>
<th>Default Test Current 2420, 2425, 2430, 2440</th>
<th>Normal Accuracy (23°C ±5°C) 1 Year, ±(% rdg. + ohms)</th>
<th>Enhanced Accuracy (23°C ±5°C)² 1 Year, ±(% rdg. + ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.20Ω</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>2.00Ω</td>
<td>10 µΩ</td>
<td>-</td>
<td>1 A</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>20.00Ω</td>
<td>100 µΩ</td>
<td>-</td>
<td>10 mA</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>200.00Ω</td>
<td>1 mΩ</td>
<td>-</td>
<td>10 mA</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>2.000Ω</td>
<td>10 mΩ</td>
<td>-</td>
<td>1 mΩ</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>20.000Ω</td>
<td>100 mΩ</td>
<td>-</td>
<td>0.08% + 0.3 %</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>200.000Ω</td>
<td>1000 µΩ</td>
<td>-</td>
<td>0.07% + 0.5 %</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>2.0000Ω</td>
<td>1000 µΩ</td>
<td>-</td>
<td>0.06% + 0.3 %</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>20.0000Ω</td>
<td>10000 µΩ</td>
<td>-</td>
<td>0.07% + 0.5 %</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
<tr>
<td>200.0000Ω</td>
<td>100000 µΩ</td>
<td>-</td>
<td>0.06% + 0.3 %</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
<td>Source I&lt;sub&gt;ACC&lt;/sub&gt; + Meas. V&lt;sub&gt;ACC&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

**TEMPERATURE COEFFICIENT (0°C–18°C and 28°C–50°C): ±(0.15 × accuracy specification)/°C.**

**SOURCE 1 MODE, MANUAL OHMS:** Total uncertainty = 1 source accuracy + V measurement accuracy (4-wire remote sense).

**SOURCE V MODE, MANUAL OHMS:** Total uncertainty = V source accuracy + 1 measurement accuracy (4-wire remote sense).

**WIRE OHMS MODE:** Available using active ohms guard and guard sense. Max. Guard Output Current: 50mA (except 1A range). Accuracy is load dependent. Refer to White Paper no. 2035 for calculation formula.

**GUARD OUTPUT IMPEDANCE:** <0.1Ω in ohms mode.

**NOTES**

1. Speed = Normal (1 PLC). For 0.1 PLC, add 0.005% of range to offset specifications, except 200mV, 1A, 10A ranges, add 0.05%. For 0.01 PLC, add 0.05% of range to offset specifications, except 200mV, 1A, 10A ranges, add 0.5%.
2. Accuracies apply to 2- or 4-wire mode when properly zeroed.
3. Manual ohms only – except 2420, 2425, 2430, 2440 for 2 A range and 2400, 2401, or 2410 for 200mA range.
4. Source readback enabled, offset compensation ON. Also available on 2410, 2420, 2425, 2430, and 2440 for similar accuracy enhancement.
5. In pulse mode, limited to 0.1 PLC measurement.
6. Except 2440, default test current is 5µA.

### SERVICES AVAILABLE

- **2400-3Y-EW** 1-year factory warranty extended to 3 years from date of shipment
- **2400-3Y-C** 1-year factory warranty extended to 3 years from date of shipment
- **2401-3Y-EW** 1-year factory warranty extended to 3 years from date of shipment
- **2410-3Y-EW** 1-year factory warranty extended to 3 years from date of shipment
- **2420-3Y-EW** 1-year factory warranty extended to 3 years from date of shipment
- **2425-3Y-EW** 1-year factory warranty extended to 3 years from date of shipment
- **2430-3Y-EW** 1-year factory warranty extended to 3 years from date of shipment
- **2440-3Y-EW** 1-year factory warranty extended to 3 years from date of shipment
- **2440-3Y-C** 1-year factory warranty extended to 3 years from date of shipment

- **C/2400-1-C** Source: Unleashing the Power of Your SourceMeter SMU Instrument
- **C/2400-3Y-ISO** (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2400, 2400-C, 2400-LV*¹
- **C/2401-3Y-ISO** (ISO-17025 accredited) calibrations within 3 years of purchase for Model 2401*²
- **C/2410-3Y-ISO** (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2410, 2410-C*³
- **C/2420-3Y-ISO** (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2420, 2420-C*³
- **C/2425-3Y-ISO** (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2425, 2425-C*³
- **C/2430-3Y-ISO** (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2430, 2430-C*³
- **C/2440-3Y-ISO** (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2440, 2440-C*³

*Not available in all countries
## Series 2400 SourceMeter® SMU Instruments

### System Speeds

**MEASUREMENT**

MAXIMUM RANGE CHANGE RATE: 75 second.
MAXIMUM MEASURE AUTORANGE TIME: 40ms (fixed source).

### Sweep Operation

<table>
<thead>
<tr>
<th>Speed</th>
<th>NPLC/Trigger Origin</th>
<th>Measure to GPIB</th>
<th>Source-Measure Pass/Fail Test</th>
<th>Source-Memory Pass/Fail Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast</td>
<td>0.01 / internal</td>
<td>2081 (2030)</td>
<td>1551 (1515)</td>
<td>902 (900)</td>
</tr>
<tr>
<td>IEEE-488.1 Mode</td>
<td>0.01 / internal</td>
<td>129 (1200)</td>
<td>1018 (990)</td>
<td>850 (850)</td>
</tr>
<tr>
<td>Fast</td>
<td>0.01 / internal</td>
<td>2081 (2030)</td>
<td>1551 (1515)</td>
<td>902 (900)</td>
</tr>
<tr>
<td>IEEE-488.2 Mode</td>
<td>0.01 / internal</td>
<td>129 (1200)</td>
<td>1018 (990)</td>
<td>850 (850)</td>
</tr>
<tr>
<td>Medium</td>
<td>0.10 / external</td>
<td>510 (433)</td>
<td>470 (469)</td>
<td>389 (343)</td>
</tr>
<tr>
<td>IEEE-488.2 Mode</td>
<td>0.10 / external</td>
<td>458 (380)</td>
<td>409 (360)</td>
<td>374 (335)</td>
</tr>
<tr>
<td>Normal</td>
<td>1.00 / internal</td>
<td>59 (49)</td>
<td>58 (48)</td>
<td>56 (47)</td>
</tr>
<tr>
<td>IEEE-488.2 Mode</td>
<td>1.00 / external</td>
<td>57 (48)</td>
<td>57 (48)</td>
<td>56 (47)</td>
</tr>
</tbody>
</table>

### Single Reading Operation

<table>
<thead>
<tr>
<th>Speed</th>
<th>NPLC/Trigger Origin</th>
<th>Measure to GPIB</th>
<th>Source-Measure Pass/Fail Test</th>
<th>Source-Memory Pass/Fail Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast (488.1)</td>
<td>0.01 / internal</td>
<td>537</td>
<td>140</td>
<td>155</td>
</tr>
<tr>
<td>Fast (488.2)</td>
<td>0.01 / internal</td>
<td>256 (250)</td>
<td>79 (85)</td>
<td>79 (85)</td>
</tr>
<tr>
<td>Medium</td>
<td>0.10 / internal</td>
<td>167 (166)</td>
<td>72 (70)</td>
<td>69 (70)</td>
</tr>
<tr>
<td>Normal</td>
<td>1.00 / internal</td>
<td>49 (42)</td>
<td>54 (51)</td>
<td>55 (50)</td>
</tr>
</tbody>
</table>

### Component for 60Hz (50Hz)

<table>
<thead>
<tr>
<th>Speed</th>
<th>NPLC/Trigger Origin</th>
<th>Measure to GPIB</th>
<th>Source-Measure Pass/Fail Test</th>
<th>Source-Memory Pass/Fail Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast</td>
<td>0.01 / external</td>
<td>1.04 ms (1.08 ms)</td>
<td>0.5 ms (0.5 ms)</td>
<td>4.82 ms (5.3 ms)</td>
</tr>
<tr>
<td>Medium</td>
<td>0.10 / internal</td>
<td>2.55 ms (2.9 ms)</td>
<td>0.5 ms (0.5 ms)</td>
<td>6.27 ms (7.1 ms)</td>
</tr>
<tr>
<td>Normal</td>
<td>1.00 / internal</td>
<td>17.53 ms (20.9 ms)</td>
<td>0.5 ms (0.5 ms)</td>
<td>21.31 ms (25.0 ms)</td>
</tr>
</tbody>
</table>

### Notes

1. Reading rates applicable for voltage or current measurements. Auto zero off, autorange off, filter off, display off, trigger delay = 0, and binary reading format.
2. Purely resistive load. 1µA and 10µA range <65ms.
3. 3000 point sweep was characterized with the source on a fixed range.

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**GENERAL**

**Noise Rejection:**

<table>
<thead>
<tr>
<th>NPLC</th>
<th>NMRR</th>
<th>CMRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast</td>
<td>0.01</td>
<td>80 dB</td>
</tr>
<tr>
<td>Medium</td>
<td>0.1</td>
<td>80 dB</td>
</tr>
<tr>
<td>Slow</td>
<td>1</td>
<td>60 dB</td>
</tr>
</tbody>
</table>

1. Except lowest 2 current ranges = 90dB.

**LOAD IMPEDANCE:** Stable into 20,000pF typical.

**COMMON MODE VOLTAGE:** 250V DC +/−10V DC (Model 2410/40).

**COMMON MODE ISOLATION:** >10GΩ.

**OVERRANGE:** 105% of range, source and measure.

**MAX. VOLTAGE DROP BETWEEN INPUT/OUTPUT AND SENSE TERMINALS:** 5V.

**MAX. SENSE LEAD RESISTANCE:** 1Ω for rated accuracy.

**SENSE INPUT IMPEDANCE:** >10GΩ.

**GUARD OFFSET VOLTAGE:** <15µV, typical (300µV for Models 2430, 2440).

**SOURCE OUTPUT MODES:**

- Pulse (Model 2410 only)
- Fixed DC level
- Memory List (mixed function)
- Stair (linear and log)

**MEMORY BUFFER:** 5,000 readings @ 5 digits (two 2,500 point buffers). Includes selected measured value(s) and time stamp. Lithium battery backup (3 yr+ battery life).

**SOURCE MEMORY LIST:** 100 points max.

**PROGRAMMABILITY:** IEEE-488 (SCPI-1995.0), RS-232, 5 user-definable power-up states plus factory default and "*RST".

**DIGITAL INTERFACE:**

- Interlock: Active low input.
- Handler Interface: Start of test, end of test, 3 category bits +5V@300mA supply.
- Not available on Model 2410.

**POWER SUPPLY:** 100V to 240V rms, 50–60Hz (automatically detected at power up).

**COOLING:** Model 2401: Convection. Model 2410, 2420, 2425, 2430, 2440: Forced air, variable speed.

**EMC:** Conforms to European Union Directive 89/336/EEC, EN 61326-1.

**SAFETY:** UL listed to UL 61010-1:2003; Conforms to European Union Low Voltage Directive.

**VIBRATION:** MIL-PRF-28800F Class 3 Random.

**WARM-UP:** 1 hour to rated accuracies.

**DIMENSIONS:** 89mm high × 213mm wide × 570mm deep (3% in × 8% in × 14% in). Bench Configuration (with handle and feet): 10mm high × 258mm wide × 570mm deep (4% in × 9% in × 14% in).

**WEIGHT:** 2.12kg (7.08 lbs) (Model 2425, 2430, 2440: 3.44kg, 7.60 lbs).

**ENVIRONMENT:** Operating: 0–50°C, 70% R.H. up to 35°C. Derate 3% R.H./°C, 35–50°C.

**Storage:** −25°C to 65°C.