

Keithley Instruments, Inc.
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System SourceMeter® Specifications

1. SPECIFICATION CONDITIONS

This document contains specifications and supplemental information for the Keithley Instruments Models 2601 and 2602 System SourceMeters®. Specifications are the standards against which the Models 2601 and 2602 are tested. Upon leaving the factory, the Models 2601 and 2602 meet these specifications. Supplemental and typical values are nonwarranted, apply at 23°C, and are provided solely as useful information.

The source and measurement accuracies are specified at the SourceMeter CHANNEL A (2601 and 2602) or SourceMeter CHANNEL B (2602) terminals under the following conditions:

1. 23°C ± 5°C, <70% relative humidity.
2. After two-hour warm-up.
3. Speed normal (1 NPLC).
4. A/D auto-zero enabled.
5. Remote sense operation or properly zeroed local operation.
6. Calibration period: one year.

2. SOURCE SPECIFICATIONS

Voltage Programming Accuracy¹

Range	Programming resolution	Accuracy (1 year) 23°C ± 5°C ± (% rdg.+ volts)	Typical noise (peak-peak) 0.1Hz-10Hz
100.000mV	5µV	0.02% + 250µV	20µV
1.00000V	50µV	0.02% + 400µV	50µV
6.00000V	50µV	0.02% + 1.8mV	100µV
40.0000V	500µV	0.02% + 12mV	500µV

Temperature coefficient (0°C–18°C and 28°C–50°C): $\pm(0.15 \times \text{accuracy specification})/^{\circ}\text{C}$.

Maximum output power and source/sink limits:² 40.4W per channel maximum. $\pm 40.4\text{V}$ at $\pm 1.0\text{A}$, $\pm 6.06\text{V}$ at $\pm 3.0\text{A}$, four-quadrant source or sink operation.

Voltage regulation: Line: 0.01% of range. **Load:** $\pm(0.01\%$ of range + 100µV).

Noise 10Hz–20MHz (peak-peak): 25mV typical into a resistive load.

Current limit/compliance:³ Bipolar current limit (compliance) set with single value. Minimum value is 10nA. Accuracy same as current source.

Overshoot: $\leq \pm(0.1\% + 10\text{mV})$ typical (step size = 10% to 90% of range, resistive load, maximum current limit/compliance).

Guard offset voltage: $<10\text{mV}$ typical ($I_{\text{out}} \leq 100\text{mA}$).

1 Add 50µV to source accuracy specifications per volt of HI lead drop.

2 Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to Section 8, "Operating boundaries" in the Series 2600 Reference Manual for additional power derating information.

3 For sink mode operation (quadrants II and IV), add 12% of limit range and $\pm 0.02\%$ of limit setting to corresponding current limit accuracy specifications. For 1A range, add an additional 40mA of uncertainty.

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Current Programming Accuracy

Range	Programming resolution	Accuracy (1 year) 23°C ± 5°C ± (% rdg.+amps)	Typical noise (peak-peak) 0.1Hz-10Hz
100.000nA	1pA	0.06% + 100pA	5pA
1.00000µA	10pA	0.03% + 600pA	25pA
10.0000µA	100pA	0.03% + 2nA	60pA
100.000µA	1nA	0.03% + 30nA	3nA
1.00000mA	10nA	0.03% + 200nA	6nA
10.0000mA	100nA	0.03% + 3µA	200nA
100.000mA	1µA	0.03% + 20µA	600nA
1.00000A	10µA	0.05% + 900µA	70µA
3.00000A	10µA	0.06% + 1.5mA	150µA

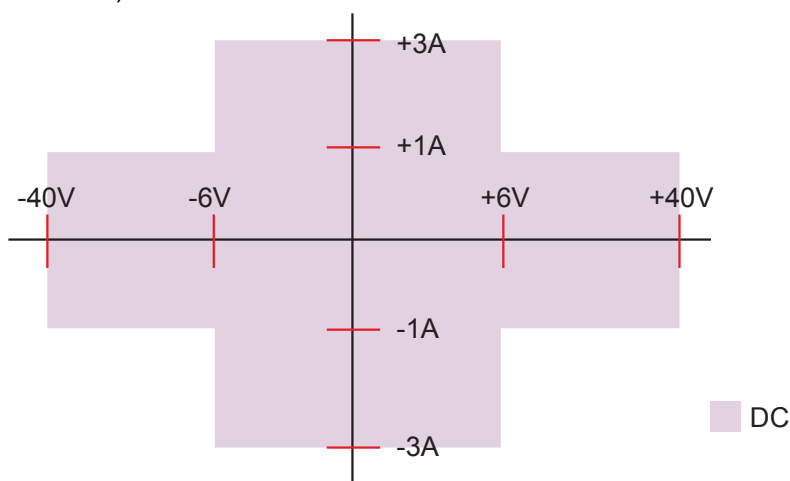
Temperature coefficient (0°C–18°C and 28°C–50°C): $\pm(0.15 \times \text{accuracy specification})/^{\circ}\text{C}$.

Maximum output power and source/sink limits:² 40.4W per channel maximum. $\pm 1.01\text{A}$ at $\pm 40.0\text{V}$, $\pm 3.03\text{A}$ at $\pm 6.0\text{V}$, four quadrant source or sink operation.

Current regulation: Line: 0.01% of range. **Load:** $\pm(0.01\%$ of range + 100pA).

Voltage limit/compliance:⁴ Bipolar voltage limit (compliance) set with a single value. Minimum value is 10mV. Accuracy same as voltage source.

Overshoot: <0.1% typical (step size = 10% to 90% of range, resistive load; see “Current source output settling time” for additional test conditions).



Models 2601 and 2602 I-V capability

⁴ For sink mode operation (quadrants II and IV), add 10% of compliance range and $\pm 0.02\%$ of limit setting to corresponding voltage source specification. For 100mV range, add an additional 60mV of uncertainty.

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Additional Source Specifications

Transient response time: <70 μ s for the output to recover to 0.1% for a 10% to 90% step change in load.

Voltage source output settling time: Time required to reach 0.1% of final value, when changing from 10% to 90% of range, after source level command is processed on a fixed range.

100mV, 1V ranges: <50 μ s typical.

6V Range: <100 μ s typical.

40V Range: <150 μ s typical.⁵

Current source output settling time: Time required to reach 0.1% of final value, when changing from 10% to 90% of range, after source level command is processed on a fixed range. Values below for $I_{out} \cdot R_{load} = 2V$ unless noted.

3A–10mA ranges: <80 μ s typical (current less than 2.5A, $R_{load} > 1.5\Omega$).

1mA range: <100 μ s typical.

100 μ A range: <150 μ s typical.

10 μ A range: <500 μ s typical.

1 μ A range: <2.5ms typical.

100nA range: <25ms typical.

DC floating voltage: Output can be floated up to $\pm 250VDC$ from chassis ground.

Remote sense operating range:¹

Maximum voltage between HI and SENSE HI = 3V.

Maximum voltage between LO and SENSE LO = 3V.

Voltage output headroom:

40V range: Max. output voltage = 42V – total voltage drop across source leads (maximum 1 Ω per source lead).

6V range: Max. output voltage = 8V – total voltage drop across source leads.

Over temperature protection: Internally sensed temperature overload puts unit in standby mode.

Voltage source range change overshoot: Overshoot into a 100k Ω load, 20MHz BW, 300mV typical.

Current source range change overshoot: <5% of larger range + 300mV/ R_{load} typical.

(see “CURRENT SOURCE OUTPUT SETTLING TIME” for additional test conditions).

⁵ Add 150 μ s when measuring on the 1A range.

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System SourceMeter[®] Specifications**3. METER SPECIFICATIONS****Voltage Measurement Accuracy⁶**

Range	Display resolution ⁷	Input resistance	Accuracy (1 year) 23°C ± 5°C ± (% rdg.+ volts)
100.000mV	1μV	>10GΩ	0.015% + 150μV
1.00000V	10μV	>10GΩ	0.015% + 200μV
6.00000V	10μV	>10GΩ	0.015% + 1mV
40.0000V	100μV	>10GΩ	0.015% + 8mV

Temperature coefficient (0°C–18°C and 28°C–50°C): ±(0.15 × accuracy specification)/°C.

Current Measurement Accuracy

Range	Display resolution ⁷	Voltage burden ⁸	Accuracy (1 year) 23°C ± 5°C ± (% rdg.+amps)
100.000nA	1pA	<1mV	0.05% + 100pA
1.00000μA	10pA	<1mV	0.025% + 300pA
10.0000μA	100pA	<1mV	0.025% + 1.5nA
100.000μA	1nA	<1mV	0.02% + 25nA
1.00000mA	10nA	<1mV	0.02% + 200nA
10.0000mA	100nA	<1mV	0.02% + 2.5μA
100.000mA	1μA	<1mV	0.02% + 20μA
1.00000A	10μA	<1mV	0.03% + 1.5mA
3.00000A	10μA	<1mV	0.05% + 3.5mA

Temperature coefficient (0°C–18°C and 28°C–50°C): ±(0.15 × accuracy specification)/°C.

6 Add 50μV to source accuracy specifications per volt of HI lead drop.

7 Applies when in single channel display mode.

8 Four-wire remote sense only.

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System SourceMeter® Specifications**Contact Check⁹**

Speed	Maximum measurement time to memory for 60Hz (50Hz)⁹	Accuracy (1 year) 23°C \pm 5°C \pm (% rdg.+ ohms)
Fast	1 (1.2)ms	5% + 10
Medium	4 (5)ms	5% + 1
Slow	36 (42)ms	5% + 0.3

Additional Meter Specifications

Load impedance: Stable into 10,000pF typical.

Common mode voltage: 250VDC.

Common mode isolation: >1G Ω , <4500pF.

Over-range: 101% of source range, 102% of measure range.

Maximum sense lead resistance: 1k Ω for rated accuracy.

Sense input impedance: >10G Ω .

⁹ Includes measurement of SENSE HI to HI and SENSE LO to LO contact resistances.

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System SourceMeter® Specifications**4. GENERAL**

Host Interfaces: Computer control interfaces.

IEEE-488: IEEE-488.1 compliant. Supports IEEE-488.2 common commands and status model topology.

RS-232: Baud rates from 300 bps to 115200 bps. Programmable number of data bits, parity type, and flow control (RTS/CTS hardware or none). When not programmed as the active host interface, the SourceMeter can use the RS-232 interface to control other instrumentation.

Expansion interface: The TSP-Link expansion interface allows TSP-enabled instruments to trigger and communicate with each other.

Cable type: Category 5e or higher LAN crossover cable.

Length: 3 meters maximum between each TSP-enabled instrument.

Digital I/O interface:

Connector: 25-pin female D.

Input/Output pins: 14 open drain I/O bits.

Absolute maximum input voltage: 5.25V.

Absolute minimum input voltage: -0.25V.

Maximum logic low input voltage: 0.7V, +850 μ A max.

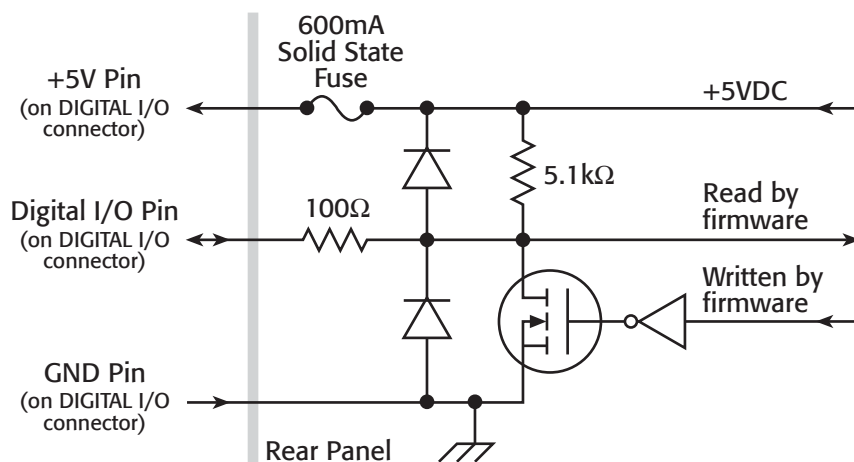
Minimum logic high input voltage: 2.1V, +570 μ A.

Maximum source current (flowing out of digital I/O bit): +960 μ A.

Maximum sink current at maximum logic low voltage (0.7V): -5.0mA.

Absolute maximum sink current (flowing into digital I/O pin): -11mA.

5V power supply pin: Limited to 600mA, solid state fuse protected.



Output enable pin: Active high input pulled down internally to ground with 10k Ω resistor. When the Output Enable input function has been activated, each SourceMeter channel will not turn on unless the output enable pin is driven to >2.1V (nominal current = 2.1V / 10k Ω = 210 μ A).

Power Supply: 100V to 250VAC, 50Hz–60Hz (auto sensing), 250VA max.

Cooling: Forced air. Side intake and rear exhaust. One side must be unobstructed when rack-mounted.



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Warranty: 1 year.

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

Safety: Conforms to European Union Directive 73/23/EEC, EN 61010-1, and UL 61010-1.

Dimensions: 89mm high × 213mm wide × 460mm deep (3 1/2 in × 8 3/8 in × 17 1/2 in). Bench configuration (with handle & feet): 104mm high × 238mm wide × 460mm deep (4 1/8 in × 9 3/8 in × 17 1/2 in).

Weight: **2601:** 4.75kg (10.4 lbs). **2602:** 5.50kg (12.0 lbs).

Environment: For indoor use only.

Altitude: Maximum 2000 meters above sea level.

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

Storage: –25°C to 65°C.