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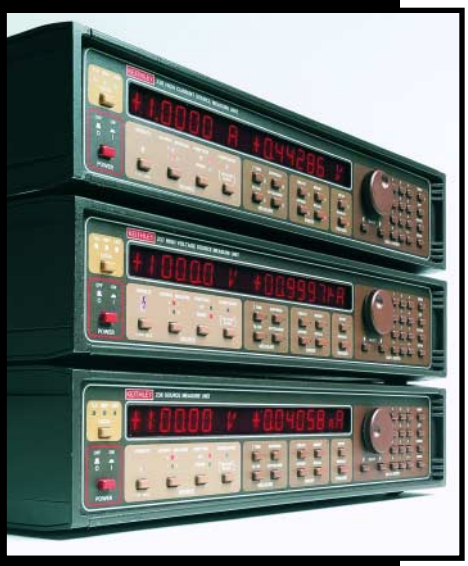
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Find the *Keithley 238* at our website: *Click HERE*

236
237
238

Source-Measure Unit
High Voltage Source-Measure Unit
High Current Source-Measure Unit

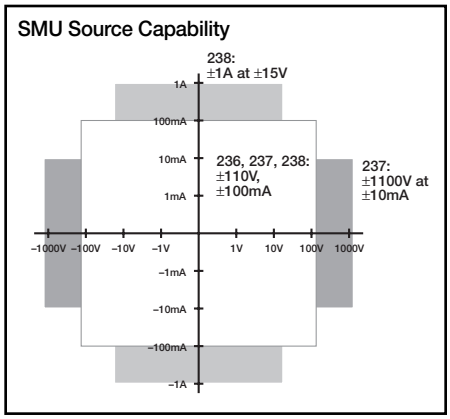


- Four instruments in one (voltage source, voltage measure, current source, current measure)
- 10fA, 10µV measurement sensitivity
- 1100V source and measure (237 only)
- 1A source and measure (238 only)
- Standard and custom sweep capability including pulse
- 1000 source/measurements per second
- Four quadrant source operation
- Internal 1000-reading memory

The 236, 237, and 238 Source-Measure Units (SMU) are fully programmable instruments, capable of sourcing and measuring voltage or current simultaneously. These systems are really four instruments in one: voltage source, current source, voltage measure, and current measure.

Applications

These instruments address a wide variety of applications, including the characterization of semiconductor devices and the measurement of leakage currents or insulation resistance. They are particularly useful as source and measuring instruments in automated test equipment (ATE).



Wide Dynamic Range

The Model 236 will source voltage from 100µV to 110V, and current from 100fA to 100mA. It can also measure voltage from 10µV to 110V and current from 10fA to 100mA. The Model 237 offers the same capabilities with a decade enhancement in voltage source and measure (1100V). In this higher voltage range, current source and measure is 10mA maximum. The Model 238 offers a decade enhancement in current source and measure (1A). In this higher current range, voltage source and measure is 15V maximum.

Selectable Sweeps of Voltage and Current

The 236, 237, and 238 can be programmed to perform source-measurements as a function of a stepped voltage or current. Voltage and current can be swept linearly, logarithmically, or pulsed. The START, STOP, STEP method of setting sweep parameters allows operators to become proficient at using the instrument very quickly. Sweep parameters may be appended (APPEND key) to obtain more complex test sequences.

Creating custom sweeps of voltage or current is facilitated by the use of three waveform operations: CREATE, APPEND, and MODIFY. These allow the user to select waveform parameters, combine multiple waveforms, and select and change any points in a waveform previously created or appended.

Fully-Guarded Four-Terminal Measurements

The Model 236, 237, and 238 outputs and inputs are fully guarded, and the units are configured to allow four-terminal measurements. Two-terminal measurements are also available for more standard test procedures. These outputs can be floated up to ±200V from ground.

ACCESSORIES AVAILABLE

CABLES AND CONNECTORS

237-TRX-NG	3-Slot Triax to 3-Lug Female Triax Connector
7078-TRX-3	3-Slot, Low Noise Triax Cable, 0.9m (3 ft)
7078-TRX-20	3-Slot, Low Noise Triax Cable, 6m (20 ft)

RACKS & RACK MOUNT KITS

1938	Fixed Rack Mount Kit
1939	Slide Rack Mount Kit

SOFTWARE

Metrics-ICS

Metrics-ICS-IV/TestPoint

Ordering Information

236	Source-Measure Unit
237	High Voltage Source-Measure Unit
238	High Current Source-Measure Unit

These products are available with an Extended Warranty.

Accessories Supplied

7078-TRX-10 3-Slot Low Noise Triax Cables, 3m (10 ft) (2)

236-ILC-3 Interlock Cable, 3m (10 ft)

237-ALG-2 Low Noise Triax Cable, 2m (6.6 ft)

Source and measure voltage and current simultaneously

LOW I/HIGH R PRODUCTS

1.888.KEITHLEY (U.S. only)

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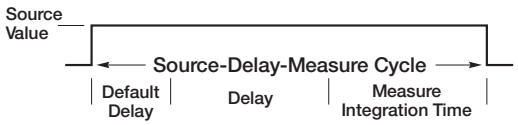
A GREATER MEASURE OF CONFIDENCE

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236
237
238

Source-Measure Unit
High Voltage Source-Measure Unit
High Current Source-Measure Unit

SOURCE-DELAY-MEASURE CYCLE:



Default Delay: Fixed delay for instrument settling.

User Delay: Additional delay for device under test or system capacitance.

MEASURE:

Integration Time			
Fast	416	µs	4-digit resolution
Medium	4	ms	5-digit resolution
Line Cycle	16.67	ms (60 Hz)	5-digit resolution
	20.00	ms (50 Hz)	

EXECUTION SPEED

MINIMUM SOURCE-DELAY-MEASURE CYCLE TIME: 1ms.

RESPONSE TO IEEE-488 COMMAND (as a source): 25ms.

MEASUREMENT RATE: 1ms per point into internal buffer.

CONTINUOUS MEASUREMENT SPEED (source DC value over IEEE-488 bus): 110 readings per second.

TRIGGER LATENCY TIME: <2ms.

GENERAL

LOAD CAPACITANCE: Stable into 20,000pF typical.

REMOTE SENSE: Corrects for up to 2V drop in each output lead. Maximum 1kΩ per sense lead for rated accuracy. Residual output resistance (as a voltage source) is 0.5Ω.

GUARD: Output Resistance: ≤12kΩ.

Maximum Output Current: ±2mA.

Offset Relative to Output HI: ±2mV max.

ISOLATION (Output LO to chassis): Typically $>10^{10}\Omega$ in parallel with 500pF (650pF on Model 238).

MAXIMUM COMMON MODE VOLTAGE: 200V

CONNECTORS: Outputs: 3-lug triax.

Trigger Input/Output: BNC.

Interlock: 3-pin miniature DIN.

TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C): ±(0.1 × applicable accuracy specification)/°C.

ENVIRONMENT:

Operating: 0°–50°C, 70% relative humidity up to 35°C. Linearly derate 3% RH/°C, 35°–50°C.

Storage: –25° to 65°C.

EMC: Conforms to European Union Directive 89/336/EEC.

SAFETY: Conforms to European Union Directive 73/23/EEC (meets EN61010-1/IEC 1010).

WARM-UP: One hour to rated accuracy.

COOLING: Internal fan forced air cooling.

POWER: 105–125 or 210–250V AC (external switch selectable), 90–110V and 180–220V version available. 100VA max. (120VA max. on Model 238).

DIMENSIONS, WEIGHT: 89mm high × 435mm wide × 448mm deep (3½ in × 17⅛ in × 17⅝ in). Net weight 9kg (19.75 lb).

VOLTAGE

	SOURCE V			MEASURE V		
	RANGE (Max. Value)	STEP SIZE	ACCURACY (1 Year, 18°–28°C)	RESOLUTION 4-Digit	RESOLUTION 5-Digit	ACCURACY (1 Year, 18°–28°C)
236, 237	±1.1000 V	100 µV	±(0.033% + 650 µV)	100 µV	10 µV	±(0.028% + 300 µV)
	±11.000 V	1 mV	±(0.033% + 2.4 mV)	1 mV	100 µV	±(0.025% + 1 mV)
	±110.00 V	10 mV	±(0.033% + 2.4mV)	10 mV	1 mV	±(0.025% + 10 mV)
237 Only	±1100.0 V	100 mV	±(0.04 % + 240 mV)	100 mV	10 mV	±(0.035%+100 mV)
238 Only	±1.5000 V	100 µV	±(0.033% + 800 µV)	100 µV	10 µV	±(0.028% + 450 µV)
	±15.000 V	1 mV	±(0.033% + 2.7 mV)	1 mV	100 µV	±(0.025% + 1 mV)
	±110.00 V	10 mV	±(0.033% + 24 mV)	10 mV	1 mV	±(0.025% + 10 mV)

COMPLIANCE: Bipolar current limit set with single value.

Maximum: ±100mA (except ±10mA on 1100V range in Model 237 and ±1A on 15V range in Model 238).

Minimum: ±1% of range, except 0.5% of 1.1V range.

Accuracy, Step Size: Same as current source.

NOISE (p-p):

RANGE	0.1–10Hz	DC–20MHz
110 V – 1100 V	< 3ppm of range	40 mV
11 V (15 V on 238)	< 3ppm of range	15 mV
1.1 V (1.5 V on 238)	<10ppm of range	15 mV

WIDEBAND NOISE: 0.1 to 20MHz, 8mV p-p typical.

OVERSHOOT: <0.01% (110V step, 10mA range).

SETTLING TIME: <500µs to 0.01% (110V step, 10mA range).

NMRR: >60dB at 50 or 60Hz (LINE CYCLE integration time selected).

CMRR: >120dB at DC, 50 or 60Hz (LINE CYCLE integration time selected).

INPUT IMPEDANCE (as a voltmeter): $>10^{14}\Omega$ paralleled by <20pF.

CURRENT

	SOURCE I			MEASURE I		
	RANGE (Max. Value)	STEP SIZE	ACCURACY (1 Year, 18°–28°C)	RESOLUTION 4-Digit	RESOLUTION 5-Digit	ACCURACY (1 Year, 18°–28°C)
All	±1.0000 nA	100 fA	±(0.3 %+ 450 fA)	100 fA	10 fA	±(0.3 % + 100 fA)[1]
	±10.000 nA	1 pA	±(0.3 %+ 2 pA)	1 pA	100 fA	±(0.3 % + 1 pA)
	±100.00 nA	10 pA	±(0.21%+ 20 pA)	10 pA	1 pA	±(0.21 % + 6 pA)
	±1.0000 µA	100 pA	±(0.05%+ 200 pA)	100 pA	10 pA	±(0.04 % + 60 pA)
	±10.000 µA	1 nA	±(0.05%+ 2 nA)	1 nA	100 pA	±(0.035% + 700 pA)
	±100.00 µA	10 nA	±(0.05%+ 20 nA)	10 nA	1 nA	±(0.035% + 6 nA)
	±1.0000 mA	100 nA	±(0.05%+ 200 nA)	100 nA	10 nA	±(0.035% + 60 nA)
	±10.000 mA	1 µA	±(0.05%+ 2 µA)	1 µA	100 nA	±(0.038% + 600 nA)
	±100.00 mA	10 µA	±(0.1 %+ 20 µA)	10 µA	1 µA	±(0.1 % + 6 µA)
238 Only	±1.0000 A	100 µA	±(0.12%+ 700 nA)	100 µA	10 µA	±(0.12 % + 300 µA)

COMPLIANCE: Bipolar voltage limit set with single value.

Maximum: ±1100V (except ±110V in Model 238 and on 100mA range in Model 237).

Minimum: ±0.1% of selected current range.

Accuracy, Step Size: Same as voltage source.

NOISE (p-p of range): 0.1–10Hz: <3ppm (<20ppm on 1nA and 10nA ranges and on 1A range in Model 238).

OVERSHOOT: <0.01% typical (10mA step, R_L = 10kΩ).

SETTLING TIME: <500µs to 0.01% (10mA step, R_L = 10kΩ).

OUTPUT R, C: $>10^{14}\Omega$ paralleled by <20pF (on 1nA range).

[1] Offset specification applies for 20°C ±1°C with suppression. Temperature coefficient 50fA/°C.

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