

KEITHLEY

6514

The Keithley 6514 is a highly sensitive 5½-digit electrometer designed for low-current, high-resistance, voltage, and charge measurements. It combines state-of-the-art measurement performance with high reading speeds and a cost-effective design, making it an essential instrument for research and production testing of sensitive electronics and materials.

SPECIFICATIONS

General

Interfaces	GPIB (IEEE-488.2), RS-232, Digital I/O, Trigger Link
Display	5½-digit Vacuum Fluorescent Display (VFD)

Physical

Power Supply	90–134 V / 180–250 V AC, 50 Hz, 60 Hz, or 400 Hz (auto-sensing), <40 VA
Operating Temperature	0°C to 50°C °C
Dimensions (W×H×D)	214 mm × 90 mm × 369 mm mm
Weight	2.8 kg kg

Measurement Ranges and Resolution

Current Measurement Range	20 pA to 20 mA
Voltage Measurement Range	2 V to 200 V
Resistance Measurement Range	2 k Ω to 200 G Ω
Charge Measurement Range	20 nC to 20 μ C
Voltage Range - 2 V	Resolution: 10 μ V
Voltage Range - 20 V	Resolution: 100 μ V
Voltage Range - 200 V	Resolution: 1 mV
Current Range - 20 mA	Resolution: 100 nA
Charge Range - 20 nC	Resolution: 10 fC
Charge Range - 200 nC	Resolution: 100 fC
Charge Range - 2 μ C	Resolution: 1 pC
Charge Range - 20 μ C	Resolution: 10 pC
Resistance Range - 2 k Ω	Resolution: 10 m Ω
Resistance Range - 20 k Ω	Resolution: 100 m Ω
Resistance Range - 200 k Ω	Resolution: 1 Ω
Resistance Range - 2 M Ω	Resolution: 10 Ω
Resistance Range - 20 M Ω	Resolution: 100 Ω
Resistance Range - 200 M Ω	Resolution: 1 k Ω
Resistance Range - 2 G Ω	Resolution: 10 k Ω
Resistance Range - 20 G Ω	Resolution: 100 k Ω
Resistance Range - 200 G Ω	Resolution: 1 M Ω

Measurement Accuracy and Performance

Voltage Accuracy - 2 V Range	$\pm(0.025\%$ of reading + 4 counts)
Voltage Accuracy - 20 V Range	$\pm(0.025\%$ of reading + 3 counts)
Voltage Accuracy - 200 V Range	$\pm(0.06\%$ of reading + 3 counts)
Current Accuracy - 20 mA Range	$\pm(0.1\%$ of reading + 5 counts)
Charge Accuracy - 20 nC Range	$\pm(0.4\%$ of reading + 5 counts)
Charge Accuracy - 200 nC Range	$\pm(0.4\%$ of reading + 5 counts)
Charge Accuracy - 2 μ C Range	$\pm(0.4\%$ of reading + 5 counts)
Charge Accuracy - 20 μ C Range	$\pm(0.4\%$ of reading + 5 counts)
Resistance Accuracy - 2 k Ω Range	$\pm(0.20\%$ of reading + 10 counts)
Resistance Accuracy - 20 k Ω Range	$\pm(0.10\%$ of reading + 5 counts)
Resistance Accuracy - 200 k Ω Range	$\pm(0.10\%$ of reading + 5 counts)
Resistance Accuracy - 2 M Ω Range	$\pm(0.10\%$ of reading + 5 counts)
Resistance Accuracy - 20 M Ω Range	$\pm(0.15\%$ of reading + 5 counts)
Resistance Accuracy - 200 M Ω Range	$\pm(0.25\%$ of reading + 5 counts)
Resistance Accuracy - 2 G Ω Range	$\pm(1.5\%$ of reading + 5 counts)
Resistance Accuracy - 20 G Ω Range	$\pm(1.5\%$ of reading + 5 counts)
Resistance Accuracy - 200 G Ω Range	$\pm(1.5\%$ of reading + 5 counts)
Input Bias Current	<3 fA at 23°C
Input Impedance	>200 T Ω ($>2 \times 10^{14} \Omega$) in parallel with <20 pF
Normal Mode Rejection Ratio (NMRR)	>60 dB at 50 Hz or 60 Hz (with line sync enabled)
Common Mode Rejection Ratio (CMRR)	>120 dB at DC, 50 Hz or 60 Hz

Input and Guarding Characteristics

Input Connector Type	3-lug Triaxial (rear panel)
Maximum Input Voltage (Normal Mode)	250 V peak
Maximum Input Voltage (Common Mode)	500 V peak (between LO and chassis ground)
Isolation (LO to Chassis)	$>10^{10} \Omega$ in parallel with 150 pF

Measurement Speed and Memory

Reading Rate to Internal Buffer	Up to 1200 readings/second (at 4½ digits)
Reading Rate to IEEE-488 Bus	Up to 1150 readings/second (at 4½ digits)
Internal Buffer Memory Capacity	2500 readings

System Interfaces and Control

Analog Output Full Scale	± 2 V
Analog Output Impedance	1 k Ω
Digital I/O Port Configuration	4 outputs (open collector), 1 input
Programming Language	SCPI (Standard Commands for Programmable Instruments)

Environmental and Standards Compliance

Storage Temperature Range	-25°C to 65°C
Warm-up Time	1 hour to rated accuracy

Accessories and Software

Included Accessories	Model 237-ALG-2 Low Noise Triaxial Cable
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Input Specifications

Input Capacitance	< 20 pF
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Measurement Resolution

Maximum Voltage Resolution	10 μ V
Maximum Current Resolution	100 aA
Maximum Resistance Resolution	10 m Ω
Maximum Charge Resolution	10 fC

Analog Outputs

Preamp Output Impedance	1 k Ω
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Connectivity

Preamp and Analog Output Connector	BNC
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Power Specifications

Power Consumption	100 VA
Line Voltage Range	90–125 V AC / 180–250 V AC
Line Frequency Range	50 Hz / 60 Hz

Environmental Specifications

Operating Humidity Range	0% to 70% RH up to 35 °C (linearly derated 3% RH/°C from 35 °C to 50 °C)
Maximum Operating Altitude	2000 m

Compliance & Safety

Safety Certifications	Conforms to European Union Directive 73/23/EEC, EN 61010-1
EMC Certifications	Conforms to European Union Directive 89/336/EEC, EN 61326-1

Current Measurement

Voltage Burden (20 pA to 2 μ A ranges)	< 20 μ V
Voltage Burden (20 μ A to 200 μ A ranges)	< 100 μ V
Voltage Burden (2 mA range)	< 1 mV
Voltage Burden (20 mA range)	< 5 mV

Resistance Measurement

Test Current (2 kΩ range)	1 mA
Test Current (20 kΩ range)	100 μA
Test Current (200 kΩ range)	10 μA
Test Current (2 MΩ range)	1 μA
Test Current (20 MΩ range)	100 nA
Test Current (200 MΩ range)	10 nA
Test Current (2 GΩ range)	1 nA
Test Current (20 GΩ range)	100 pA
Test Current (200 GΩ range)	10 pA

Guard Output

Guard Output Impedance	< 1 Ω
Guard Output Maximum Current	2 mA
Guard Output Offset Voltage	< 1 mV

Outputs

Preamp Output Voltage Range	±2 V for full-scale input
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Interfaces & I/O

GPIO Connector Type	24-pin IEEE-488.1
RS-232 Connector Type	9-pin D-sub
Digital I/O Connector Type	9-pin D-sub
Trigger Link Connector Type	8-pin micro DIN
RS-232 Baud Rates	300, 600, 1200, 2400, 4800, 9600, 19200 bps
Digital I/O Configuration	4 open-collector outputs, 1 TTL input
Digital I/O Max Sink Current	100 mA
Digital I/O Max Pull-up Voltage	30 V

Integration

Aperture Integration Range	0.01 NPLC to 10 NPLC
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Power

Line Voltage Selection Method	Rear panel manual slide switch
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TECHNOLOGY

Solid-state electrometer

APPLICATIONS

Low-current, high-impedance electrical characterization

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