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**VOLTS**

Range	6½-digit resolution	Accuracy (1 year) <sup>1</sup> 18 °C to 28 °C ± (% reading + offset)	Temperature coefficient 0 °C to 18 °C and 28 °C to 50 °C ± (% reading + offset)/ °C
2 V	1 µV	0.025 + 40 µV	0.003 + 20 µV
20 V	10 µV	0.025 + 300 µV	0.002 + 100 µV
200 V	100 µV	0.06 + 3 mV	0.002 + 1 mV

**NMRR:** 2 V and 20 V range > 60 dB; 200 V range > 55 dB; 50 Hz or 60 Hz<sup>2</sup>

**CMRR:** > 120 dB at DC; 50 Hz or 60 Hz

**Input impedance:** > 200 TΩ in parallel with 20 pF, < 2 pF guarded (1 MΩ with zero check on)

**Small signal bandwidth at preamplifier output:** Typically 100 kHz (–3 dB)

**AMPS**

Range	6½-digit resolution	Accuracy (1 year) <sup>1</sup> 18 °C to 28 °C ± (% reading + offset)	Temperature coefficient 0 °C to 18 °C and 28 °C to 50 °C ± (% reading + offset)/ °C
20 pA	10 aA <sup>3</sup>	1 + 3 fA	0.1 + 500 aA
200 pA	100 aA <sup>3</sup>	1 + 5 fA	0.1 + 1 fA
2 nA	1 fA	0.2 + 300 fA	0.1 + 20 fA
20 nA	10 fA	0.2 + 500 fA	0.03 + 100 fA
200 nA	100 fA	0.2 + 5 pA	0.03 + 1 pA
2 µA	1 pA	0.1 + 100 pA	0.005 + 20 pA
20 µA	10 pA	0.1 + 500 pA	0.005 + 100 pA
200 µA	100 pA	0.1 + 5 nA	0.005 + 1 nA
2 mA	1 nA	0.1 + 100 nA	0.008 + 20 nA
20 mA	10 nA	0.1 + 500 nA	0.008 + 100 nA

**Input bias current:** < 3 fA at T<sub>cal</sub>; temperature coefficient = 0.5 fA/°C, 20 pA range

**Input bias current noise:** < 750 aA peak-to-peak (capped input), 0.1 Hz to 10 Hz bandwidth, damping on; digital filter = 40 readings, 20 pA range

<sup>1</sup> When properly zeroed, 6½-digit, 1 PLC (power line cycle), median filter on, digital filter = 10 readings.

<sup>2</sup> Line synchronization on.

<sup>3</sup> aA = 10<sup>-18</sup> A, fA = 10<sup>-15</sup> A.

**Input voltage burden at Tcal ± 1 °C:** < 20 µV on 20 pA, 2 nA, 20 nA, 2 µA, 20 µA ranges; < 100 µV on 200 pA, 200 nA, 200 µA ranges; < 2 mV on 2 mA range; < 5 mV on 20 mA range

**Temperature coefficient of input voltage burden:** < 10 µV/°C on pA, nA, µA ranges

**Preamplifier settling time (to 10% of final value) typical:** 0.5 s (damping off), 2.0 s (damping on) on pA ranges; 15 ms on nA ranges damping off, 1 ms on µA ranges damping off; 500 µs on mA ranges damping off

**NMRR:** > 60 dB on all ranges at 50 Hz or 60 Hz<sup>4</sup>

**COULOMBS**

Range	6½-digit resolution	Accuracy (1 year) <sup>5, 6</sup> 18 °C to 28 °C ± (% reading + offset)	Temperature coefficient 0 °C to 18 °C and 28 °C to 50 °C ± (% reading + offset)/°C
2 nC	1 fC	0.4 + 50 fC	0.04 + 30 fC
20 nC	10 fC	0.4 + 500 fC	0.04 + 100 fC
200 nC	100 fC	0.4 + 5 pC	0.04 + 1 pC
2 µC	1 pC	0.4 + 50 pC	0.04 + 10 pC

**Input bias current:** < 4 fA at T<sub>CAL</sub>; temperature coefficient = 0.5 fA/°C, 2 nC range

**OHMS**

Range	6½-digit resolution	Accuracy <sup>7</sup> (10 % to 100 % range) 18 °C to 28 °C (1 year) ± (% reading + offset)	Temperature coefficient (10 % to 100 % range) 0 °C to 18 °C and 28 °C to 50 °C ± (% reading + offset)/°C	Auto V source	Amps range
2 MΩ	1 Ω	0.125 + 10 Ω	0.01 + 10 Ω	40 V	200 µA
20 MΩ	10 Ω	0.125 + 100 Ω	0.01 + 100 Ω	40 V	20 µA
200 MΩ	100 Ω	0.15 + 1 kΩ	0.015 + 1 kΩ	40 V	2 µA
2 GΩ	1 kΩ	0.225 + 10 kΩ	0.035 + 10 kΩ	40 V	200 nA
20 GΩ	10 kΩ	0.225 + 100 kΩ	0.035 + 100 kΩ	40 V	20 nA
200 GΩ	100 kΩ	0.35 + 1 MΩ	0.110 + 1 MΩ	40 V	2 nA
2 TΩ	1 MΩ	0.35 + 10 MΩ	0.110 + 10 MΩ	400 V	2 nA
20 TΩ	10 MΩ	1.025 + 100 MΩ	0.105 + 100 MΩ	400 V	200 pA
200 TΩ	100 MΩ	1.15 + 1 GΩ	0.125 + 1 GΩ	400 V	20 pA

**Preamplifier settling time:** Add voltage source settling time to preamplifier settling time in current specification. Ranges over 20 GΩ require additional settling based on the characteristics of the load.

<sup>4</sup> Line sync on.

<sup>5</sup> Specifications apply immediately after charge acquisition. Add  $(4fA + \frac{IQ_{AV}}{RC})T_A$  where T<sub>A</sub> = period of time in seconds between the coulombs zero and measurement; Q<sub>AV</sub> = average charge measured over T<sub>A</sub>; and RC = 300,000 typical.

<sup>6</sup> When properly zeroed, 6½-digit, 1 PLC (power line cycle), median filter on, digital filter = 10 readings.

<sup>7</sup> Specifications are for auto V-source ohms, when properly zeroed, 6½ -digit, 1 PLC, median filter on, digital filter = 10 readings. If user-selectable voltage is required, use manual mode. Manual mode displays resistance (up to 10<sup>18</sup> Ω) calculated from measured current. Accuracy is equal to the accuracy of the V-source plus the accuracy of the selected current range.

**OHMS (alternating polarity method)**

The alternating polarity sequence compensates for the background (offset) currents of the material or device under test. Maximum tolerable offset up to full scale of the current range used.

**USING KEITHLEY MODEL 8002A OR 8009 FIXTURE**

**Repeatability:**  $\Delta I_{BG} \times R/V_{ALT} + 0.1\%$  ( $1\sigma$ ) (instrument temperature constant  $\pm 1\text{ }^\circ\text{C}$ )

**Accuracy:**  $(V_{SRCERR} + I_{MEASERR} \times R)/V_{ALT}$

$\Delta I_{BG}$  is a measured, typical background current noise from the sample and fixture

$V_{ALT}$  is the alternating polarity voltage used

$V_{SRCERR}$  is the accuracy (in volts) of the voltage source using  $V_{ALT}$  as the setting

$I_{MEASERR}$  is the accuracy (in amperes) of the ammeter using  $V_{ALT}/R$  as the reading

**VOLTAGE SOURCE**

Range	5½-digit resolution	Accuracy (1 year) 18 °C to 28 °C ± (% setting + offset)	Temperature coefficient 0 °C to 18 °C and 28 °C to 50 °C ± (% setting + offset)/°C
100 V	5 mV	0.15 +10 mV	0.005 + 1 mV
1000 V	50 mV	0.15 +100 mV	0.005 + 10 mV

**Maximum output current:**

100 V range:  $\pm 10\text{ mA}$ , hardware short circuit protection at  $< 14.0\text{ mA}$

1000 V range:  $\pm 1\text{ mA}$ , hardware short circuit protection at  $< 1.4\text{ mA}$

**Settling time:**

100 V range:  $< 8\text{ ms}$  to rated accuracy

1000 V range:  $< 50\text{ ms}$  to rated accuracy

**Noise (typical):** 10 Hz to 20 Mhz

100 V range:  $< 4.7\text{ mV}_{RMS}$

1000 V range:  $< 5.1\text{ mV}_{RMS}$

**TEMPERATURE (THERMOCOUPLE)**

Thermocouple type	Range	Accuracy (1 year) <sup>8</sup> 18 °C to 28 °C, $\pm$ (% reading + °C)
K	-25 °C to 150 °C	$\pm (0.3 + 1.5\text{ }^\circ\text{C})$

**HUMIDITY**

Range	Accuracy (1 year) <sup>9</sup> 18 °C to 28 °C, $\pm$ (% reading + % relative humidity)
0 % to 100 %	$\pm (0.3 + 0.5)$

<sup>8</sup> Excluding probe errors,  $T_{CAL} \pm 5\text{ }^\circ\text{C}$ , 1 PLC integration time.

<sup>9</sup> Humidity probe accuracy must be added. This is  $\pm 3\%$  relative humidity, for Model 6517RH, up to 65 °C probe environment, not to exceed 85 °C.

## IEEE-488 BUS IMPLEMENTATION

**Implementation:** SCPI (IEEE-488.2, SCPI-1999.0)

**Trigger to reading done:** 150 ms typical, with external trigger

**RS-232 implementation:** Supports SCPI 1991.0; baud rates: 300, 600, 1200, 2400, 4800, 9600, 19.2 k, 38.4 k, 57.6 k, and 115.2 k

**Flow control:** None, Xon/Xoff

**Connector:** DB-9 TXD/RXD/GND

## GENERAL

**Display:** 6½-digit vacuum fluorescent multiline

**Overrange indication:** Display reads `OVERFLOW`; for readings > 105 % of range, the display reads `OUT OF LIMIT` for excessive overrange conditions

**Ranging:** Automatic or manual

**Conversion time:** Selectable 0.01 PLC to 10 PLC

**Programs:** Provide front-panel access to IEEE address, choice of engineering units or scientific notation

**Maximum input:** 250 V<sub>peak</sub> DC to 60 Hz sine wave; 10 s per minute at maximum input on mA ranges (one-sixth duty cycle)

**Maximum common mode voltage (DC to 60 Hz sine wave):** Electrometer, 500 V<sub>peak</sub>; V-source, 750 V<sub>peak</sub>

**Isolation (meter COMMON to chassis):** > 10<sup>10</sup> Ω, < 500 pF

**Input connector:** Three-lug triaxial on rear panel

**2 V analog output:** 2 V for full range input; noninverting in volts mode, inverting when measuring amperes, ohms, or coulombs; output impedance 10 kΩ nominal

**Preamplifier output:** Provides a guard output for voltage measurements; can be used as an inverting output or with external feedback in Amps and Coulombs modes

**External trigger:** TTL-compatible external trigger and electrometer complete

**Guard:** Switchable voltage guard available

**Digital I/O and trigger line:** Available, see manual for usage

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

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

**Test sequences:** Device-characterization (diode, capacitor, cable, resistor), resistivity, surface-insulation resistance, sweep

**Reading storage:** 50,000

### Reading rate:

To internal buffer	425	readings/second <sup>11</sup>
To IEEE-488 bus	400	readings/second <sup>10, 11</sup>
Bus transfer	3300	readings/second <sup>11</sup>

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<sup>10</sup> 0.01 PLC, digital filters off, front panel off, temperature + relative humidity off, line sync off.

<sup>11</sup> Binary transfer mode.

**Digital filter:** Median and averaging

**Environment:** Operating: 0 °C to 50 °C; relative humidity 70% noncondensing, up to 35 °C; storage: -25 °C to +65 °C; for indoor use only

**Altitude:** Maximum 2000 m (6562 ft) above sea level per EN61010-1

**Warm-up:** 1 hour to rated accuracy (see manual for recommended procedure)

**Power:** User selectable 100 V ac, 120 V ac, 220 V ac, 240 V ac, 50 Hz/60 Hz, 100 VA maximum

**PHYSICAL**

**Case dimensions:** 90 mm × 214 mm × 369 mm (3½ in. × 8½ in. × 14½ in.)

**Working dimensions:** From front of case to rear, including power cord and IEEE-488 connector: 397.7 mm (15.5 in.)

**Net weight:** 5.4 kg (11.8 lbs)

**Shipping weight:** 6.9 kg (15.1 lbs)