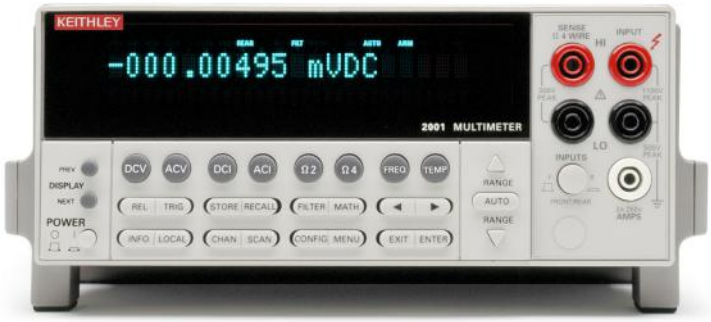
2001 7½-Digit High Performance Multimeter
2002 8½-Digit High Performance Multimeter

DATASHEET



DMM users whose applications demand exceptional resolution, accuracy, and sensitivity combined with high throughput now have two attractive alternatives to high priced, high end DMMs. Keithley's 7½-digit 2001 and 8½-digit 2002 High Performance Digital Multimeters not only deliver performance specifications usually associated with instruments that cost thousands more, but they also offer a broad range of functions not typically available from DMMs. The 2002 is based on the same superior measurement technology as the 2001, and the front panels of both instruments have the same look, feel, and response.

Key Features

- True 7½- (2001) or 8½-digit (2002) resolution
- Exceptional measurement integrity with high speed
- High speed function and range changing
- Broad range of built-in measurement functions
- Multiple measurement display
- Built-in 10 channel scanner option
- GPIB interface
- HP3458A emulation mode (2002)

True 7½- (or 8½-) Digit Resolution

While other DMMs may claim 7½- or 8½-digit resolution, they must average multiple readings to extend their resolution. The resolution specifications of the 2001 and 2002 are based on a 28-bit A/D converter that provides the resolution needed to discern smaller changes. This higher resolution also provides greater dynamic range, making it possible to measure from 1 µV to 20 V on a single range, thus avoiding range-shift errors and delays.

Built-In Scanner (Multiplexer) Options

With the addition of a plug-in scanner card, the 2001 or 2002 becomes a complete scan and measure system for applications involving up to ten measurement points. The additional resolution and measurement ranges provided by the 2002 make it an excellent choice for production test, design verification, and metrology applications where high accuracy is critical.

KEITHLEY
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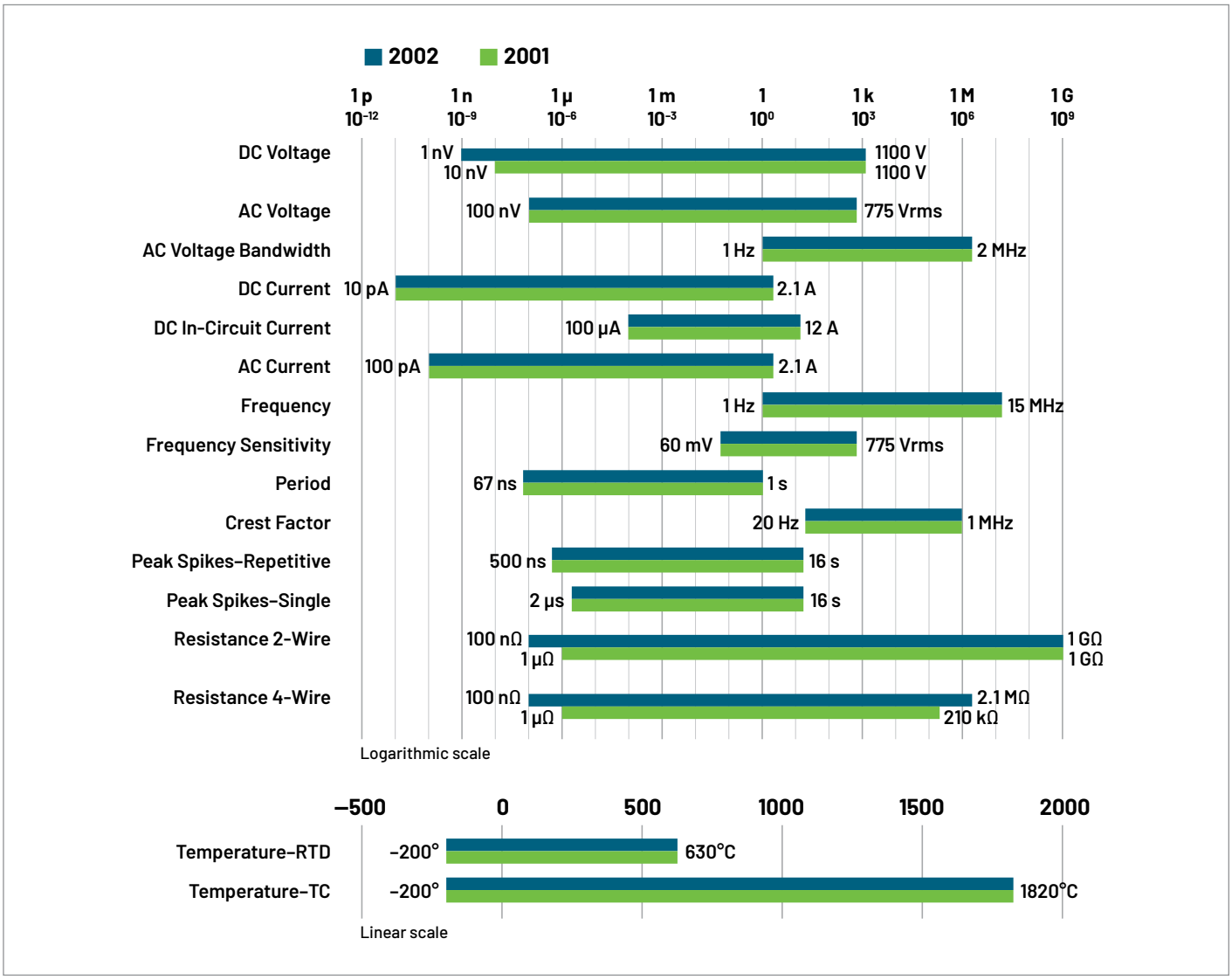
High Accuracy ACV Measurements

A patented circuit design makes the 2001 and 2002's AC measurements several times more accurate than competitive DMMs. In this circuit, the signal bypasses the prime error-contributing section of conventional rms converters. This increases the accuracy at almost any voltage level, and also increases sensitivity down to a guaranteed 1% of the selected range, compared to 5–10% for most other DMMs. The result is highly accurate measurements over a broad range of inputs.

Applications involving vibration, servo, guidance, shock, and control systems often require accurate low frequency ACV measurements. The 2001 and 2002 maintain very good accuracy (better than 0.1%) down to 1 Hz. The wide bandwidth of these DMMs allows for accurate measurements of high frequency AC signals without the need for a special AC meter. Both the 2001 and 2002 feature TRMS AC, average AC, peak AC, AC+DC, and crest factor measurement capability for a wide variety of applications.

High Speed for High Throughput

In applications where high throughput is critical, both the 2001 and 2002 provide more than 2000 readings per second at 4½-digit resolution. At 7½ digits, the 2002 maintains full rated accuracy at reading rates up to 44/second on DCV and ohms.



Both the 2001 and 2002 provide exceptional measurement range. In addition, the 2002 offers extended DCV and resistance measurement capabilities.

High Speed, High Precision Resistance Measurements

The 2002 uses a unique single-phase method for 4-wire ohms measurements. This makes it twice as fast for a given power line cycle rate. This also eliminates errors due to changing lead resistances that can result from fast test handlers. A built-in open-lead detection circuit also eliminates many production test problems.

Fast, Flexible Triggering

Trigger latency—the delay between trigger and measurement—is often a barrier to higher throughput. Also, variability in latency can complicate predicting measurement timing. The 2001 and 2002 trigger is less than 2 µs ± 1 µs, which is much faster than typical system DMMs.

The unique Trigger-Link feature included in the 2001 and 2002 and most Keithley test and measurement products can be used to coordinate the operation of two or more instruments. Trigger-Link combines six independent software selectable trigger lines on a single connector for simple, direct control over all instruments in a system.

Spot Trends with the Bar-Graph Display

The ability to track reading trends around a target value easily can be just as important as the absolute readings. A unique bar-graph display function in the 2001 and 2002 indicates data as a percentage of the selected range from ±0.01% to ±100%. Whether adjusting about zero or any other desired value, this display can replace a nulling differential voltmeter.

Capture Spikes Down to 1 µs

Both the 2001 and 2002 have internal peak detectors that can catch 1 µs spikes such as power supply spikes and transients, AC line power surges, and short-duration dropouts on components. These peak detectors operate up to 1 MHz for repetitive signals or down to 1 µs for single spikes, so there is no need for a separate scope. The DMMs can automatically display and store the highest value or display the maximum and minimum values of spikes.

Built-in Features and Capabilities

The 2001 and 2002 offer many built-in measurements that are typically unavailable in instruments of this type, including in-circuit current, temperature with thermocouples or RTDs, and peak spikes. Four separate outputs linked to limits simplify configuring the DMMs for use in binning operations.

The built-in AC crest factor measurement helps ensure the accuracy of AC measurements. Other DMMs typically perform AC measurements for signals without excessive crest factor—the ratio of peak value to rms values. However, when crest factor rises, measurements may not meet specs. With a 2001 or 2002, there is no need for an oscilloscope to determine if the crest factor is acceptable—the DMM measures it directly.

While some DMMs calculate average AC from the rms value, these calculations apply only to sine wave inputs. The 2001 and 2002 measure peak value, average and true rms directly to obtain a complete characterization of the signal. This capability makes these DMMs ideal for AC circuit design or test applications and for verifying test voltages specified only in averages.

When measuring AC or digital signals, frequency is critical. The 2001 and 2002 accurately measure frequency up to 15 MHz. Accurate triggering on the signal is critical to measure frequency reliably. The frequency counters in the 2001 and 2002 have a fully adjustable trigger level for good measurements of noisy signals.

Multiple Measurement Display

The 2001 and 2002 can display DC and AC volts and the AC frequency from a single measurement connection simultaneously. Several other multiple-measurement displays are available, including crest factor and bar graph. By measuring sequentially and displaying simultaneously, the 2001/2002 operates as if three different meters are working together.

Option Slot Extends DMM Performance

An option slot in the back of the 2001 and 2002 opens the door to a wide range of measurement capabilities. Choose a 10-channel general-purpose scanner card or a 9-channel thermocouple scanner card to make measurements on multiple test points or devices. This can eliminate the need for a separate scanner and significantly reduce programming and setup time.

2001 Condensed Specifications

DC Volts

DCV Input Characteristics and Accuracy

Range	Full Scale	Resolution	Default Resolution	Input Resistance	Accuracy ±(ppm of reading + ppm of range)				
					5 Minutes[4]	24 Hours[1]	90 Days[2]	1 Year[2]	2 Years[2]
200 mV[3]	±210.00000 mV	10 nV	100 nV	>10 GΩ	3 + 3	10 + 6	25 + 6	37 + 6	50 + 6
2 V	±2.1000000 V	100 nV	1 µV	>10 GΩ	2 + 1.5	7 + 2	18 + 2	25 + 2	32 + 2
20 V	±21.000000 V	1 µV	10 µV	>10 GΩ	2 + 1.5	7 + 4	18 + 4	24 + 4	32 + 4
200 V	±210.00000 V	10 µV	100 µV	10 MΩ ±1%	2 + 1.5	13 + 3	27 + 3	38 + 3	52 + 3
1000 V	±1100.0000 V	100 µV	1 mV	10 MΩ ±1%	10 + 1.5	17 + 6	31 + 6	41 + 6	55 + 6

DC Volts Notes

1. For T_{CAL} ±1°C, following 55-minute warm-up. T_{CAL} is ambient temperature at calibration, which is 23°C from factory.
2. For T_{CAL} ±5°C, following 55-minute warm-up. Specifications include factory traceability to US NIST.
3. When properly zeroed using REL function.
4. DCV Transfer Stability typical applications are standard cell comparisons and relative accuracy measurements. Specs apply for 10 power line cycles, 20-reading digital filter, autozero on with type synchronous, fixed range following 2-hour warm-up at full scale to 10% of full scale, at T_{REF} ±1°C (T_{REF} is the initial ambient temperature). Specifications on the 1000 V range are for measurements within 5% of the initial measurement value and following measurement settling.

AC Volts

Range	Normal Mode RMS[1] 90 Days, ±2°C from last AC self-cal for 1% to 100% of range[2], ±(% of reading + % of range)									
	20–50 Hz	50–100 Hz	0.1–2 kHz	2–10 kHz	10–30 kHz	30–50 kHz	50–100 kHz	100–200 kHz	0.2–1 MHz	1–2 MHz
200 mV	0.25 + 0.015	0.07 + 0.015	0.03 + 0.015	0.03 + 0.015	0.035 + 0.015	0.05 + 0.015	0.3 + 0.015	0.75 + 0.025	2 + 0.1	5 + 0.2
2 V	0.25 + 0.015	0.07 + 0.015	0.03 + 0.015	0.03 + 0.015	0.035 + 0.015	0.05 + 0.015	0.3 + 0.015	0.75 + 0.025	2 + 0.1	5 + 0.2
20 V	0.25 + 0.015	0.07 + 0.015	0.04 + 0.015	0.06 + 0.015	0.08 + 0.015	0.1 + 0.015	0.3 + 0.015	0.75 + 0.025	4 + 0.2	7 + 0.2[4]
200 V[3]	0.25 + 0.015	0.07 + 0.015	0.04 + 0.015	0.06 + 0.015	0.08 + 0.015	0.1 + 0.015	0.3 + 0.015	0.75 + 0.025[4]	4 + 0.2[4]	
750 V[3]	0.25 + 0.015	0.1 + 0.015	0.08 + 0.015	0.09 + 0.015	0.12 + 0.015	0.15 + 0.015[4]	0.5 + 0.015[4]			

AC Volts Notes

1. Specifications apply for sinewave input, AC + DC coupling, 1 power line cycle, digital filter off, following 55 minute warm-up.
2. For 1% to 5% of range below 750 V range, and for 1% to 7% of 750 V range, add 0.01% to range uncertainty. For inputs from 200 kHz to 2 MHz, specifications apply above 10% of range.
3. Add 0.001% of reading × $(V_{IN}/100\ V)^2$ additional uncertainty above 100 V rms.
4. Typical values.

Ohms

Two-Wire and Four-Wire Ohms (2W and 4W Ohms Functions)[6]

Range	Full Scale	Resolution	Default Resolution	Current Source[1]	Resistance Accuracy[3] ±(ppm of reading + ppm of range)			
					24 Hours[4]	90 Days[5]	1 Year[5]	2 Years[5]
20 Ω	21.000000 Ω	1 µΩ	10 µΩ	9.2 mA	29 + 7	52 + 7	72 + 7	110 + 7
200 Ω	210.00000 Ω	10 µΩ	100 µΩ	0.98 mA	24 + 7	36 + 7	56 + 7	90 + 7
2 kΩ	2100.0000 kΩ	100 µΩ	1 mΩ	0.98 mA	22 + 4	33 + 4	50 + 4	80 + 4.5
20 kΩ	21.000000 kΩ	1 mΩ	10 mΩ	89 µA	19 + 4	32 + 4	50 + 4	80 + 4.5
200 kΩ	210.00000 kΩ	10 mΩ	100 mΩ	7 µA	20 + 4.5	72 + 4.5	90 + 4.5	130 + 5
2 MΩ[2]	2.1000000 MΩ	100 mΩ	1 Ω	770 nA	50 + 4.5	110 + 4.5	160 + 4.5	230 + 5
20 MΩ[2]	21.000000 MΩ	1 Ω	10 Ω	70 nA	160 + 4.5	560 + 4.5	900 + 4.5	1100 + 5
200 MΩ[2]	210.00000 MΩ	10 Ω	100 Ω	4.4 nA	3000 + 100	10000 +100	20000 + 100	30000 + 100
1 GΩ[2]	1.0500000 GΩ	100 Ω	1 kΩ	4.4 nA	9000 + 100	20000 + 100	40000 + 100	60000 + 100

Ohms Notes

1. Current source is typically ±9% absolute accuracy.
2. For 2-wire mode.
3. Specifications are for 1 power line cycle, 10 reading digital filter, Auto Zero on, 4-wire mode, offset compensation on (for 20 Ω to 20 kΩ ranges).
4. For T_{CAL} ±1°C, following 55 minute warm-up. T_{CAL} is ambient temperature at calibration (23°C at the factory).
5. For T_{CAL} ±5°C, following 55-minute warm-up. Specifications include traceability to US NIST.
6. When measuring resistance of inductive loads, the inductance of that load must be 10 mH or less.

DC Amps

DCI Input Characteristics and Accuracy[4]

Range	Full Scale	Resolution	Default Resolution	Maximum Burden Voltage[6]	Accuracy[1] ±(ppm of reading + ppm of range)			
					24 Hours[2]	90 Days[3]	1 Year[3]	2 Years[3]
200 µA	210.00000 µA	10 pA	100 pA	0.25 V	63 + 25	300 + 25	500 + 25	1350 + 25
2 mA	2.1000000 mA	100 pA	1 nA	0.31 V	64 + 20	300 + 20	400 + 20	750 + 20
20 mA	21.000000 mA	1 nA	10 nA	0.4 V	65 + 20	300 + 20	400 + 20	750 + 20
200 mA	210.00000 mA	10 nA	100 nA	0.5 V	96 + 20	500 + 20	500 + 20	750 + 20
2 A	2.1000000 A	100 nA	1 µA	1.5 V	500 + 20	800 + 20	900 + 20	1350 + 20

DC Amps Notes

1. Specifications are for 1 power line cycle, Auto Zero on, 10 reading digital filter.
2. For T_{CAL} ±1°C, following 55 minute warm-up.
3. For T_{CAL} ±5°C, following 55 minute warm-up. Specifications include traceability to US NIST.
4. Add 50 ppm of range for current above 0.5 A for self heating.
5. Actual maximum voltage burden = (maximum voltage burden) × ($I_{MEASURED}$/$I_{FULL\ SCALE}$).

AC Amps

Range	ACI Accuracy[1, 2] 90 Days, 1 Year or 2 Years, T_{CAL} ±5°C, for 5% to 100% of range, ±(% of reading + % of range)						
	20 Hz–50 Hz	50 Hz–200 Hz	200 Hz–1 kHz	1 kHz–10 kHz	10 kHz–30 kHz[3]	30 kHz–50 kHz[3]	50 kHz–100 kHz[3]
200 µA	0.35 + 0.015	0.2 + 0.015	0.4 + 0.015	0.5 + 0.015			
2 mA	0.3 + 0.015	0.15 + 0.015	0.12 + 0.015	0.12 + 0.015	0.25 + 0.015	0.3 + 0.015	0.5 + 0.015
20 mA	0.3 + 0.015	0.15 + 0.015	0.12 + 0.015	0.12 + 0.015	0.25 + 0.015	0.3 + 0.015	0.5 + 0.015
200 mA	0.3 + 0.015	0.15 + 0.015	0.12 + 0.015	0.15 + 0.015	0.5 + 0.015	1 + 0.015	3 + 0.015
2 A	0.35 + 0.015	0.2 + 0.015	0.3 + 0.015	0.45 + 0.015	1.5 + 0.015	4 + 0.015	

AC Amps Notes

1. Specifications apply for sinewave input, AC+DC coupling, 1 power line cycle, digital filter off, following 55 minute warm-up.
2. Add 0.005% of range uncertainty for current above 0.5 A rms for self-heating.
3. Typical values.

Frequency Counter

AC Voltage Input	1 Hz–15 MHz.
Accuracy	±(0.03% of reading).

DC In-Circuit Current

Typical Ranges	**Current:** 100 µA to 12 A. **Trace Resistance:** 1 mΩ to 10 Ω typical.
Accuracy	±(5% + 2 counts). For 1 power line cycle, Auto Zero on, 10 reading digital filter, T_{CAL} ±5°C, after being properly zeroed. 90 days, 1 year or 2 years.

Temperature

	Built-in linearization for J, K, N, T, E, R, S, B thermocouple types to ITS-90 and 100 Ω platinum RTDs DIN 43 760 or IPTS-68.

General

Power	**Voltage:** 90–134 V and 180–250 V, universal self-selecting. **Frequency:** 50 Hz, 60 Hz, or 400 Hz self-identifying. **Consumption:** <55VA.
Environmental	**Operating Temperature:** 0° to 50°C. **Storage Temperature:** –40° to 70°C. **Humidity:** 80% R.H., 0° to 35°C, per MIL-T-28800E1 Para 4.5.5.1.2.
Physical	**Case Dimensions:** 90 mm high × 214 mm wide × 369 mm deep (3½ in. × 8½ in. × 14½ in.). **Net Weight:** <4.2 kg (<9.2 lbs.). **Shipping Weight:** <9.1 kg (<20 lbs.).
Standards	**EMI/RFI:** Conforms to VDE 0871B (per Vfg 1046/1984), IEC 801-2. Meets FCC part 15 Class B, CISPR-22 (EN55022). **Safety:** Conforms to IEC348, CAN/CSA-C22.2. No. 231, MIL-T-28800E1. Designed to UL1244. **Note 1:** For MIL-T-28800E, applies to Type III, Class 5, Style E.

For complete specifications, refer to the 2001 Technical Data book.

2002 Condensed Specifications

DC Volts

DCV Input Characteristics and Accuracy

Enhanced Accuracy[1] – 10 PLC, DFILT 10				Relative Accuracy ±(ppm of reading + ppm of range)				
Range	Full Scale	Resolution	Input Resistance	Transfer[5]	24 Hours[2]	90 Days[3]	1 Year[3]	2 Years[3]
200 mV[4]	±210.000000 mV	1 nV	>100 GΩ	0.4 + 1.5	3.5 + 3	15 + 8	19 + 9	23 + 10
2 V[4]	±2.10000000 V	10 nV	>100 GΩ	0.2 + 0.15	1.2 + 0.3	6 + 0.8	10 + 0.9	14 + 1
20 V	±21.0000000 V	100 nV	>100 GΩ	0.1 + 0.05	1.2 + 0.1	6 + 0.15	10 + 0.15	14 + 0.15
200 V	±210.000000 V	1 µV	10 MΩ ±1%	0.5 + 0.08	5 + 0.4	14 + 2	22 + 2	30 + 2
1000 V[6]	±1100.00000 V	10 µV	10 MΩ ±1%	1 + 0.05	5 + 0.08	14 + 0.4	22 + 0.4	30 + 0.4

Normal Accuracy[7] – 1PLC, DFILT off				Relative Accuracy ±(ppm of reading + ppm of range)			
Range	Full Scale	Resolution	Input Resistance	24 Hours[2]	90 Days[3]	1 Year[3]	2 Years[3]
200 mV[4]	±210.00000 mV	10 nV	>100 GΩ	3.5 + 6	15 + 11	19 + 12	23 + 13
2 V[4]	±2.1000000 V	100 nV	>100 GΩ	1.2 + 0.6	6 + 1.1	10 + 1.2	14 + 1.3
20 V	±21.000000 V	1 µV	>100 GΩ	3.2 + 0.35	8 + 0.4	12 + 0.4	16 + 0.4
200 V	±210.00000 V	10 µV	10 MΩ ±1%	5 + 1.2	14 + 2.8	22 + 2.8	30 + 2.8
1000V[6]	±1100.0000 V	100 µV	10 MΩ ±1%	5 + 0.4	14 + 0.7	22 + 0.7	30 + 0.7

DC Volts Notes

1. Specifications are for 10 power line cycles, synchronous autozero, 10-reading repeat digital filter, autorange off, except as noted.
2. For T_{CAL} ±1°C, following 4-hour warm-up. T_{CAL} is ambient temperature at calibration (23°C at the factory). Add 0.5ppm of reading uncertainty if the unit is power cycled during this interval.
3. For T_{CAL} ±5°C, following 4-hour warm-up.
4. Care must be taken to minimize thermal offsets due to operator cables.
5. Specifications apply for 20-reading repeat digital filter, T_{REF} ±0.5°C (T_{REF} is the initial ambient temperature), and for measurements within 10% of the initial measurement value and within 10 minutes of the initial measurement time.
6. Add 20 ppm × $(V_{IN}/1000\ V)^2$ additional uncertainty for inputs above 200 V, except in transfer accuracy specifications.
7. Specifications are for 1 power line cycle, normal autozero, digital filter off, autorange off.

AC Volts Normal Mode RMS[1]

	90 Days, 1 Year or 2 Years, ±2°C from last AC self-cal, for 1% to 100% of range[2] ±(% of reading + % of range)									
Range	20–50 Hz	50–100 Hz	0.1–2 kHz	2–10 kHz	10–30 kHz	30–50 kHz	50–100 kHz	100–200 kHz	0.2–1 MHz	1–2 MHz
200 mV	0.25 + 0.015	0.07 + 0.015	0.02 + 0.02	0.02 + 0.02	0.025 + 0.02	0.05 + 0.01	0.3 + 0.015	0.75 + 0.025	2 + 0.1	5 + 0.2
2 V	0.25 + 0.015	0.07 + 0.015	0.02 + 0.02	0.02 + 0.02	0.025 + 0.02	0.05 + 0.01	0.3 + 0.015	0.75 + 0.025	2 + 0.1	5 + 0.2
20 V	0.25 + 0.015	0.07 + 0.015	0.03 + 0.015	0.04 + 0.015	0.05 + 0.015	0.07 + 0.015	0.3 + 0.015	0.75 + 0.025	4 + 0.2	7 + 0.2[4]
200 V[3]	0.25 + 0.015	0.07 + 0.015	0.03 + 0.015	0.04 + 0.015	0.05 + 0.015	0.07 + 0.015	0.3 + 0.015	0.75 + 0.025[4]	4 + 0.2[4]	
750 V[3]	0.25 + 0.015	0.1 + 0.015	0.05 + 0.015	0.06 + 0.015	0.08 + 0.015	0.1 + 0.015[4]	0.5 + 0.015[4]			

AC Volts Notes

1. Specifications apply for sinewave input, AC + DC coupling, 1 power line cycle, autozero on, digital filter off, following 55-minute warm-up.
2. For 1% to 5% of range below 750 V range, and for 1% to 7% of 750V range, add 0.01% of range uncertainty. For inputs from 200 kHz to 2 MHz, specifications apply above 10% of range.
3. Add 0.001% of reading × $(V_{IN}/100\ V)^2$ additional uncertainty for inputs above 100 V rms.
4. Typical values.

Ohms

Two-Wire and Four-Wire Ohms

Range	Full Scale	Resolution	Current Source[1]	Relative Accuracy[3] ±(ppm of reading + ppm of range)				
				Transfer[7]	24 Hours[4]	90 Days[5]	1 Year[5]	2 Years[5]
20 Ω	21.000000 Ω	100nΩ	7.2 mA	2.5 + 3	5 + 4.5	15 + 6	17 + 6	20 + 6
200 Ω	210.00000 Ω	1 µΩ	960 µA	2.5 + 2	5 + 3	15 + 4	17 + 4	20 + 4
2 kΩ	2100.0000 kΩ	10 µΩ	960 µA	1.3 + 0.2	2.5 + 0.3	7 + 0.4	9 + 0.4	11 + 0.4
20 kΩ	21.000000 kΩ	100µΩ	96 µA	1.3 + 0.2	2.5 + 0.3	7 + 0.4	9 + 0.4	11 + 0.4
200 kΩ	210.00000 kΩ	1 mΩ	9.6 µA	2.5 + 0.4	5.5 + 0.5	29 + 0.8	35 + 0.9	40 + 1
2 MΩ	2.1000000 MΩ	10 mΩ	1.9 µA	5 + 0.2	12 + 0.3	53 + 0.5	65 + 0.5	75 + 0.5
20 MΩ[2]	21.000000 MΩ	100 mΩ	1.4 µA[6]	15 + 0.1	50 + 0.2	175 + 0.6	250 + 0.6	300 + 0.6
200 MΩ[2]	210.00000 MΩ	1 Ω	1.4 µA[6]	50 + 0.5	150 + 1	500 + 3	550 + 3	600 + 3
1 GΩ[2]	1.0500000 GΩ	10 Ω	1.4 µA[6]	250 + 2.5	2250 + 5	3500 + 15	3550 + 15	3600 + 15

Ohms Notes

1. Current source has an absolute accuracy of ±5%.
2. For two-wire mode add an additional 0.0075% for 20 MΩ, 0.2% for 200 MΩ and 1.75% for 1 GΩ when operating between 45% to 50%.
3. Specifications are for 10 power line cycles, 10-reading repeat digital filter, synchronous autozero, autorange off, 4-wire mode, offset compensation on (for 20 Ω to 20 kΩ ranges), except as noted.
4. For T_{CAL} ±1°C, following 4-hour warm-up. T_{CAL} is ambient temperature at calibration (23°C at the factory).
5. For T_{CAL} ±5°C, following 4-hour warm-up.
6. Current source is paralleled with a 10 MΩ resistance.
7. Specifications apply for 20-reading repeat digital filter, T_{REF} ±0.5°C (T_{REF} is the initial ambient temperature), and for measurements within 10% of the initial measurement value and within 10 minutes of the initial measurement time.

DC Amps

DCI Input Characteristics and Accuracy

Range	Full Scale	Resolution	Maximum Burden Voltage[3]	Relative Accuracy ±(ppm of reading + ppm of range)			
				24 Hours[1]	90 Days[2]	1 Year[2]	2 Years[2]
200 µA	210.00000 µA	10 pA	0.25 V	50 + 6	275 + 25	350 + 25	500 + 25
2 mA	2.1000000 mA	100 pA	0.3 V	50 + 5	275 + 20	350 + 20	500 + 20
20 mA	21.000000 mA	1 nA	0.35 V	50 + 5	275 + 20	350 + 20	500 + 20
200 mA	210.00000 mA	10 nA	0.35 V	75 + 5	300 + 20	375 + 20	525 + 20
2 A	2.1000000 A	100 nA	1.1 V	350 + 5	750 + 20	750 + 20	1000 + 20

DC Amps Notes

1. For T_{CAL} ±1°C, following 55-minute warm-up. T_{CAL} is ambient temperature at calibration (23°C at the factory).
2. For T_{CAL} ±5°C, following 55-minute warm-up.
3. Actual maximum burden voltage = (maximum burden voltage) × ($I_{MEASURED}$/$I_{FULL\ SCALE}$).

AC Amps

Range	ACI Accuracy[1,2] 90 Days, 1 Year or 2 Years, T_{CAL} ±5°C, for 5% to 100% of range, ±(% of reading + % of range)						
	20 Hz–50 Hz	50 Hz–200 Hz	200 Hz–1 kHz	1 kHz–10 kHz	10 kHz–30 kHz[3]	30 kHz–50 kHz[3]	50 kHz–100 kHz[3]
200 µA	0.35 + 0.015	0.2 + 0.015	0.4 + 0.015	0.5 + 0.015			
2 mA	0.3 + 0.015	0.15 + 0.015	0.12 + 0.015	0.12 + 0.015	0.25 + 0.015	0.3 + 0.015	0.5 + 0.015
20 mA	0.3 + 0.015	0.15 + 0.015	0.12 + 0.015	0.12 + 0.015	0.25 + 0.015	0.3 + 0.015	0.5 + 0.015
200 mA	0.3 + 0.015	0.15 + 0.015	0.12 + 0.015	0.15 + 0.015	0.5 + 0.015	1 + 0.015	3 + 0.015
2 A	0.35 + 0.015	0.2 + 0.015	0.3 + 0.015	0.45 + 0.015	1.5 + 0.015	4 + 0.015	

AC Amps Notes

1. Specifications apply for sinewave input, AC+DC coupling, 1 power line cycle, autozero on, digital filter off, following 55-minute warm-up.
2. Add 0.005% of range uncertainty for current above 0.5 A rms for self-heating.
3. Typical values.

Frequency Counter

AC Voltage Input	1 Hz–15 MHz.
Accuracy	±(0.03% of reading).

DC In-Circuit Current

Typical Ranges	**Current:** 100 µA to 12 A. **Trace Resistance:** 1 mΩ to 10 Ω.
Accuracy	±(5% + 500 µA). For 1 power line cycle, autozero on, 10-reading digital filter, T_{CAL} ±5°C, 90 days, 1 year or 2 years.

Temperature

Built-in linearization for J, K, N, T, E, R, S, B thermocouple types to ITS-90 and 100 Ω platinum RTDs DIN 43760, IPTS-68, and ITS-90.

General

Power	**Voltage:** 90–134 V and 180–250 V, universal self-selecting. **Frequency:** 50 Hz, 60 Hz, or 400 Hz self-identifying at power-up. **Consumption:** <55 VA.
Environmental	**Operating Temperature:** 0° to 45°C. **Storage Temperature:** –40° to 70°C. **Humidity:** 80% R.H., 0° to 35°C.
Physical	**Case Dimensions:** 90 mm high × 214 mm wide × 369 mm deep (3½ in. × 8½ in. × 14½ in.). **Net Weight:** <4.2 kg (<9.2 lbs.). **Shipping Weight:** <9.1 kg (<20 lbs.).
Standards	**EMI/RFI:** Conforms to European Union EMC directive. **Safety:** Conforms to European Union Low Voltage directive. **Note 1:** For MIL-T-28800E, applies to Type III, Class 5, Style E.

2001 and 2002 Condensed Specifications

Available Accessories

Test Leads and Probes

5805	Kelvin Probes, 0.9 m (3 ft)
5805-12	Kelvin Probes, 3.6 m (12 ft)
5808	Low Cost, Single Pin, Kelvin Probes
5809	Low Cost, Kelvin Clip Lead Set
8502	Micro-DIN to 6 BNCs Adapter Box with 8501-1 Cable
8530	Centronics Adapter
8605	High Performance 2-Wire Modular Test Leads
8606	High Performance Modular Probe Kit
8610	Low Thermal Shorting Plug
8680	RTD Probe Adapter
8681	Low Cost RTD

Cables/Adapters

7007-1	Shielded GPIB Cable, 1 m (3.3 ft)
7007-2	Shielded GPIB Cable, 2 m (6.6 ft)
8501-1	Trigger-Link Cable, 1 m (3.3 ft)
8501-2	Trigger Link Cable, 2 m (6.6 ft)
8502	Trigger Link Adapter Box
8610	Low Thermal Shorting Plug
8620	4-Wire DMM Shorting Plug

Rack Mount Kits

4288-1	Single Fixed Rack Mount Kit
4288-4	Side-by-Side Rack Mount Kit

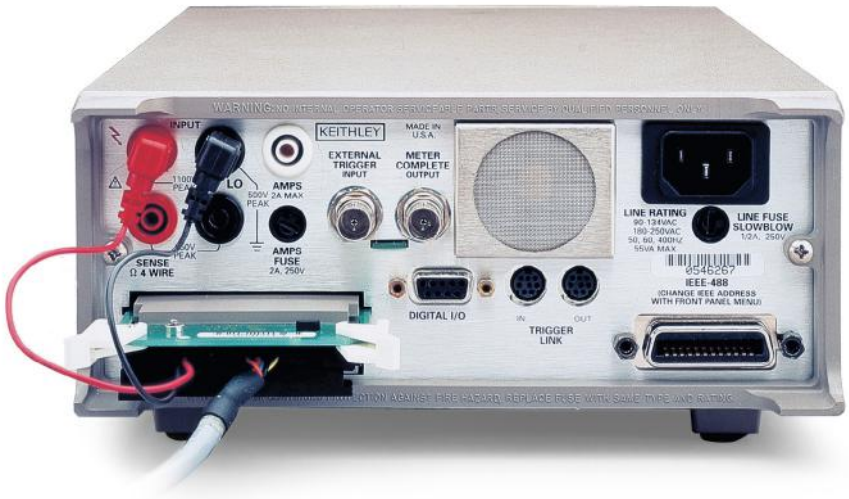
GPIB Interfaces

KPCI-488LPA	IEEE-488 Interface Controller for the PCI Bus
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter

Available Services

2000-SCAN-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2001/MEM1-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2001/MEM2-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2001-SCAN-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2001-TCSCAN-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2001-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2002/MEM1-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2002/MEM2-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2002-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
C/2000-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase for 2000-SCAN*
C/2001-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase for 2001, 2001/MEM1, 2001/MEM2, 2001-SCAN, 2001-TCSCAN*
C/2002-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase for 2002, 2002/MEM1, 2002/MEM2*

*Not available in all **countries**



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