2100

6-1/2-Digit USB Digital Multimeter Datasheet

Overview

The 2100 USB Digital Multimeter is a member of Keithley's family of high performance DMMs . Its high accuracy (38ppm), 6½-digit resolution is ideal for critical measurements. The 2100 features 11 measurement functions and 8 math functions to easily accommodate the most commonly measured parameters . All accessories, such as USB cable, probes, and software, are included with the 2100 . With its unique combination of high precision and low total cost of ownership, the 2100 is an unbeatable value for R&D engineers, test engineers, scientists, and students making basic precision measurements on the bench and in system applications.

High Precision, Low Cost

The 2100 provides stability, accuracy, and speed at a very low cost. It has 0.0038% 1-year basic DC voltage accuracy on the 10 V range and 0 .013% 1-year basic resistance accuracy on the 10kΩ range. At 6½ digits, the 2100 delivers 50 triggered readings/s through the USB remote interface. At the fast 4½ digit setting, it reads over 2000 readings/s into its 2000-reading internal buffer.

The 2100 provides a wide number of measurement ranges and functions:

- DC voltage: 0 .1 V, 1 V, 10 V, 100 V, and 1000 V
- AC voltage: 0 .1 V, 1 V, 10 V, 100 V, and 750 V
- DC current: 10 mA, 100 mA, 1 A, and 3 A
- AC current: 1 A and 3 A
- Two- and four-wire resistance: 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ, and 100 MΩ
- Frequency: From 3 Hz to 300 kHz
- Period measurement
- Diode measurement
- Programmable A-D converter and filter settings for signal to noise optimization

Additionally, eight mathematical operations can be performed on measurement readings: RATIO, %, Min/Max, NULL, Limits, mX+b, dB, and dBm testing. Microsoft Office, Word, and Excel add-in tools allow remote storage and recall of the measured values from these applications. A graphing utility enables charting of measurements versus time for trending and noise observations .

The TMC compliant USB remote interface enables control from a PC for consistent test/calibration procedure execution and easy re-use of existing SCPI programs, including Agilent Model 34401A command emulation.

Simple to Use

The 2100 can be set up quickly and is easy to use. It has a high-contrast front panel and keypad that are intuitive and user-friendly. An easy to read 5×7 dot matrix, vacuum fluorescent display (VFD) offers three-color annunciators so users can easily distinguish each function symbol by its color.

Strength and Versatility

With its rugged construction and rubber bumpers, the 2100 has the durability to withstand bench, portable, or stacking applications. A sturdy carrying handle facilitates transportability.

Key Features

- 11 measurement functions cover most commonly measured parameters
- Fully specified accuracies on all functions for ISO-compliant results
- Included PC software utilities for graphing and data sharing in both Microsoft® Word and Excel
- Rugged construction for durability in bench/portable applications
- Selectable front/rear inputs facilitate bench or rack use
- Includes all accessories, such as startup software, USB cable, power cable, and safety test lead, for lowest total cost
- CE compliant and UL listed
- TMC compliant USB 2.0 interface for use with SCPI test programs

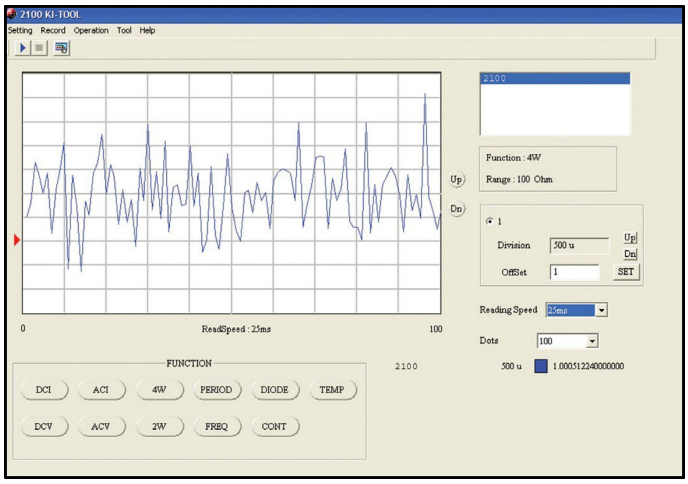
Applications

The 2100 USB Digital Multimeter is ideal for applications in electronic device, circuit, module, and product testing; low-cost production testing of electrical and electronic components, sub-assemblies, and end products; and student lab assignments. Typical applications include:

- **Test Engineers:** Manual and semi-automatic electrical functional test
- **Development Engineers:** Electrical/electronic circuit and product validation
- **Service/Calibration Technicians:** Electronic product repair and calibration
- **Research Scientists:** Electrical and physics experiments testing
- **Engineering Students:** Electronic device and circuits experiment testing

Startup Software, PC Utilities Included

The KI-Tool application provides charting and graphing capabilities without programming to simplify setup, checkout, and basic measurement applications that require graphical data representation. Scale, offset, and level can be adjusted to fine-tune images for visual evaluation of signal and noise elements over time. It also includes tabular data and SCPI command prompt windows for maximum flexibility. Data sets can also be saved to disk files.



The Microsoft Excel Add-In utility is also included and provides quick data import into a standard Microsoft Excel spreadsheet, including selectable graphing, instrument settings, and number of data points collected. Data can then be analyzed through standard or optional Microsoft Excel functions, including graphical, statistical, and trend charting. A version supporting Microsoft Word is also included for direct data import into reports.

Specifications

DC Characteristics

Accuracy ±(% of reading + % of range)

Specifications valid:

- After two hour warm-up.
- ADC set for continuous trigger operation.
- Input bias current <30 pA at 25°C..
- Input protection 1000 V all ranges (2 W input).
- Measurement rate set to 1 PLC.

DC Voltage

Range	Resolution	Input Resistance	1 Year, 18°C to 28°C
100.0000 mV	0.1 µV	>10 GΩ	0.0055 + 0.0040
1.000000 V	1.0 µV	>10 GΩ	0.0045 + 0.0008
10.00000 V	10 µV	>10 GΩ	0.0038 + 0.0006
100.0000 V	100 µV	10 MΩ	0.0050 + 0.0007
1000.000 V	1 mV	10 MΩ	0.0055 + 0.0010

DC Current (DCI)

Range	Resolution	Shunt Resistance	1 Year, 18°C to 28°C
10.00000 mA	10 nA	5.1 Ω	0.055 + 0.025
100.0000 mA	100 nA	5.1 Ω	0.055 + 0.006
1.000000 A	1 µA	0.1 Ω	0.120 + 0.015
3.00000 A	10 µA	0.1 Ω	0.150 + 0.025

Resistance

Specifications for 4-wire ohms mode. For 2-wire ohms, use zero null or subtract lead resistance from displayed reading. Maximum lead resistance 10% of range per lead for 100 Ω and 1 kΩ ranges; add 1 kΩ per lead for all other ranges.

Range	Resolution	Test Current	1 Year, 18°C to 28°C
100.0000 Ω	100 µΩ	1 mA	0.015 + 0.005
1.000000 kΩ	1 mΩ	1 mA	0.015 + 0.002
10.00000 kΩ	10 mΩ	100 µA	0.013 + 0.002
100.0000 kΩ	100 mΩ	10 µA	0.015 + 0.002
1.000000 MΩ	1 Ω	5 µA	0.017 + 0.002
10.00000 MΩ	10 Ω	500 nA	0.045 + 0.002
100.0000 MΩ	100 Ω	500 nA||10 MΩ	1.00 + 0.020

Diode Test

Range	Resolution	Test Current	1 Year, 18°C to 28°C
1.0000 V	10 µV	1 mA	0.040 + 0.020

Continuity

Range	Resolution	Test Current	1 Year, 18°C to 28°C
1000.00 Ω	10 mΩ	1 mA	0.024 + 0.030

Measurement Noise Rejection DC (60Hz/50Hz)

Rate	Digits	CMRR For 1 kΩ unbalance in LO lead	NMRR For line frequency ±0.1%
10 PLC	6½	140 dB	60 dB
1 PLC	5½	140 dB	60 dB

Temperature (RTD)

Range	Resolution	4-Wire Accuracy, 1 Year, 18°C to 28°C Excluding probe errors
−100°C to +100°C −200°C to +630°C	0.001°C 0.001°C	±0.1°C ±0.2°C

RTD Type: 100 Ω platinum (PT100), D100, F100, PT385, or PT3916.

Maximum Lead Resistance (each lead): 12 Ω (to achieve rated accuracy).

Sensor Current: 1 mA (pulsed).

AC Characteristics

Accuracy ±(% of reading + % of range). Specifications valid after two hour warm-up at 6½ digit with slow AC filter (3 Hz bandwidth) and pure sine wave input greater than 5% of range.

Frequency and Period

Range	Frequency (Hz)	1 Year (% of reading) 18°C to 28°C
100 mV to 750 V 750 VAC range is limited to 100 kHz	3 to 5	0.10
	5 to 40	0.05
	40 to 300,000	0.01

ACV (AC TRMS Voltage)

Range	Resolution	Frequency (Hz)	1 Year, 18°C to 28°C
100.0000 mV	0.1 µV	3 to 5	1.15 + 0.05
		5 to 10	0.45 + 0.05
		10 to 20,000	0.08 + 0.05
		20,000 to 50,000	0.15 + 0.06
		50,000 to 100,000	0.70 + 0.09
		100,000 to 300,000	4.25 + 0.60
1.000000 V to 750.000 V 750 VAC range is limited to 100 kHz	1.0 µV to 1 mV	3 to 5	1.10 + 0.04
		5 to 10	0.4 + 0.04
		10 to 20,000	0.08 + 0.04
		20,000 to 50,000	0.14 + 0.06
		50,000 to 100,000	0.70 + 0.08
		100,000 to 300,000	4.35 + 0.50

ACI (AC TRMS Current)

Range	Resolution	Frequency (Hz)	1 Year, 18°C to 28°C
1.000000 A	1 µA	3 to 5	1.10 + 0.05
		5 to 10	0.40 + 0.05
		10 to 5000	0.15 + 0.05
3.000000 A	10 µA	3 to 5	1.25 + 0.07
		5 to 10	0.45 + 0.07
		10 to 5000	0.20 + 0.07

2100 rear panel

General

AC CMRR	70 dB (for 1 kΩ unbalance LO lead).
Power Supply	120 V/220 V/240 V.
Power Line Frequency	50/60 Hz auto detected.
Power Consumption	25 VA maximum.
Digital I/O Interface	USB-compatible Type B connection.
Environment	For indoor, non-residential use only.
Operating Temperature	5°C to 40°C.
Operating Humidity	Maximum relative humidity 80% for temperature up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
Storage Temperature	−25°C to 65°C.

Operating Altitude	Up to 2000 m above sea level.
Bench Dimensions	With handles and feet: 112 mm high × 256 mm wide × 375 mm deep (4.4 in. × 10.1 in. × 14.75 in.).
Weight	4.1 kg (9 lbs.).
Safety	Conforms to European Union Directive.
EMC	Conforms to European Union Directive.
Warranty	One year.

Ordering Information

2100/100	6½-digit USB Digital Multimeter (100 V)
2100/120	6½-digit USB Digital Multimeter (120 V)
2100/220	6½-digit USB Digital Multimeter (220 V)
2100/230-240	6½-digit USB Digital Multimeter (230 V to 240 V)

Supplied Accessories

	USB Cable
	LabVIEW, IVI Drivers, and the Keithley I/O Layer (available at tek.com)
	Power Cable
	Safety Test Leads
	KI-Tool
	KI-Link Add-in, which includes Microsoft Word and Excel versions

Available Accessories

4299-3	Single unit universal rack mount kit
5805	Kelvin probes, 0.9 m (3 ft)
5805-12	Kelvin probes, 3.6 m (12 ft)
8620	Shorting plug

Contact Information:

Australia 1 800 709 465
Austria* 00800 2255 4835
Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777
Belgium* 00800 2255 4835
Brazil +55 (11) 3530-8901
Canada 1 800 833 9200
Central East Europe / Baltics +41 52 675 3777
Central Europe / Greece +41 52 675 3777
Denmark +45 80 88 1401
Finland +41 52 675 3777
France* 00800 2255 4835
Germany* 00800 2255 4835
Hong Kong 400 820 5835
India 000 800 650 1835
Indonesia 007 803 601 5249
Italy 00800 2255 4835
Japan 81 (3) 6714 3086
Luxembourg +41 52 675 3777
Malaysia 1 800 22 55835
Mexico, Central/South America and Caribbean 52 (55) 88 69 35 25
Middle East, Asia, and North Africa +41 52 675 3777
The Netherlands* 00800 2255 4835
New Zealand 0800 800 238
Norway 800 16098
People's Republic of China 400 820 5835
Philippines 1 800 1601 0077
Poland +41 52 675 3777
Portugal 80 08 12370
Republic of Korea +82 2 565 1455
Russia / CIS +7 (495) 6647564
Singapore 800 6011 473
South Africa +41 52 675 3777
Spain* 00800 2255 4835
Sweden* 00800 2255 4835
Switzerland* 00800 2255 4835
Taiwan 886 (2) 2656 6688
Thailand 1 800 011 931
United Kingdom / Ireland* 00800 2255 4835
USA 1 800 833 9200
Vietnam 12060128
*** European toll-free number. If not accessible, call:** +41 52 675 3777

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