



Agilent U1401A Handheld Multi-function Calibrator/Meter

Datasheet

Calibrate while you measure with just one tool

Agilent U1401A handheld multi-function calibrator/meter has all you need for quick validation, servicing or troubleshooting of process components on the go: easy traveling and testing with one rugged, feature-packed tool.

Features

- Dual display with bright LCD backlight
- Simultaneous source and measure
- Bipolar voltage and current, square-wave, auto scan and ramp outputs
- Full-span DMM capability, including temperature and frequency measurements
- Hold and Min/Max/Average recordings
- Data logging to PC with optional IR-USB cable



The 2-in-1 that helps you travel light

More often than not, the calibration of process control parts requires simultaneous measurements with a DMM. With the U1401A, you can carry two tools in one—and calibrate while you measure. Slip the U1401A in its sturdy carrying case and you're ready to go.

Rugged and tested to stringent standards

The U1401A comes in a robust overmold and tested to stringent industrial standards. Each U1401A is also sealed with a three-year warranty and the assurance that you can test your components with confidence.

Full-featured DMM functions

The U1401A is packed with a full span of DMM measurement functions, including AC+DC voltage and current, resistance, temperature, frequency, diode and continuity tests. It also equips you with recording functions such as Hold, Min/Max/Average and data logging to PC.



Agilent Technologies

Agilent U1401A Handheld Multi-Function Calibrator/Meter

Take a closer look

User-defined Auto SCAN and RAMP output modes

51,000 counts resolution with electroluminescent backlight

Constant voltage, constant current and square-wave outputs



Secondary display

Maximum, Minimum and Average values recording

Temperature measurement

Frequency, duty cycle and pulse width measurements

0.5 Hz to 4.8 kHz square-wave output

Voltage, current and resistance measurements; diode and continuity tests

Simultaneous source and measure

Input Specifications

The accuracy is given as \pm (% of reading + counts of least significant digit) at 23 °C \pm 5 °C, with relative humidity less than 80% R.H., and warmed up for at least five minutes.

Without warming up, an additional five counts of LSD will have to be added to the accuracy.

DC specifications

Table 8-1 DC mV/voltage specifications

Function	Range	Resolution	Accuracy	Overload protection
DC mV/voltage ^[1] 50 mV	50 mV	1 μ V	0.05% + 50 ^[2]	250 Vrms
	500 mV	10 μ V	0.03% + 5	
	5 V	0.1 mV		
	50 V	1 mV		
	250 V	10 mV		

[1] Input impedance: 10 M Ω (nominal) for the range of 5 V and above, and 1 G Ω (nominal) for the 50/500 mV range.

[2] The accuracy could be improved to 0.05% + 5. Always use the relative function to offset the thermal effect (short the test leads) before measuring the signal.

Table 8-2 DC current specifications

Function	Range	Resolution	Accuracy	Burden voltage/shunt	Overload protection
DC current	50 mA ^[1]	1 μ A	0.03% + 5	0.06 V (1 Ω)	250 V, 630 mA
	500 mA ^[1]	10 μ A		0.6 V (1 Ω)	Quick acting fuse

[1] Always use the relative function to offset the thermal effect before measuring the signal. If this function is not used, the accuracy will be 0.03% + 25. The thermal effect could be present in the following conditions:

- Constant current, constant voltage, or square wave output.
- Wrong operation — where the resistance, diode, or mV measurement function is used to measure high voltage signals exceeding 250 V.
- After battery charging has completed.
- After measuring a current greater than 50 mA.

AC specifications

Table 8-3 AC mV/voltage specifications

Function	Range	Resolution	Accuracy		Overload protection
			45 Hz to 5 kHz	5 kHz to 20 kHz	
AC mV/voltage ^[1] (True-rms: From 5% to 100% of range)	50 mV	1 μ V	0.7% + 40	1.5% + 40	250 Vrms
	500 mV	10 μ V	0.7% + 20	1.5% + 20	
	5 V	0.1 mV			
	50 V	1 mV			
	250 V	10 mV			

[1] Input impedance: 1.1 M Ω in parallel with <100 pF (nominal) for the range of 5 V and above, and 1 G Ω (nominal) for the 50/500 mV range. Crest factor: ≤ 3 .

Table 8-4 AC current specifications

Function	Range	Resolution	Accuracy		Overload protection
			45 Hz to 5 kHz	Burden voltage/shunt	
AC current ^[1] (True-rms: From 5% to 100% of range)	50 mA	1 μ A	0.6% + 20	0.06 V (1 Ω)	250 V, 630 mA Quick acting fuse
	500 mA	10 μ A		0.6 V (1 Ω)	

[1] Crest factor: ≤ 3

AC+DC specifications

Table 8-5 AC+DC mV/voltage specifications

Function	Range	Resolution	Accuracy		Overload protection
			45 Hz to 5 kHz	5 kHz to 20 kHz	
AC+DC mV/ voltage [1] (True-rms: From 5% to 100% of range)	50 mV	1 μ V	0.8% + 70	1.6% + 70	250 Vrms
	500 mV	10 μ V	0.8% + 25	1.6% + 25	
	5 V	0.1 mV			
	50 V	1 mV			
	250 V	10 mV			

[1] Input impedance: 1.1 M Ω in parallel with <100 pF (nominal) for 5 V range and above, and 1 G Ω (nominal) for 50/500 mV range. Crest factor: ≤ 3

Table 8-6 AC+DC current specifications

Function	Range	Resolution	Accuracy 45 Hz to 5 kHz	Burden voltage/shunt	Overload protection
AC+DC current ^[1] (True-rms: From 5% to 100% of range)	50 mA	1 μ A	0.7% + 25	0.06 V (1 Ω)	250 V, 630 mA
	500 mA	10 μ A		0.6 V (1 Ω)	Quick acting fuse

[1] Crest factor: ≤ 3

Temperature specifications

Table 8-7 Temperature specifications

Function	Thermocouple type	Range	Resolution	Accuracy	Overload protection
Temperature [1]	K	-40 °C to 1372 °C	0.1 °C	0.3% + 3 °C	250 Vrms
		-40 °F to 2502 °F	0.1 °F	0.3% + 6 °F	

[1] The accuracy is defined for meter operation only and excludes the tolerance of thermocouple probe. The instrument should be placed in the operating area for at least one hour with the slide switch set at the M position for meter operation only.

Frequency specifications

Table 8-8 Frequency specifications

Range	Resolution	Accuracy	Minimum input frequency	Overload protection
100 Hz	0.001 Hz	0.02% + 3	1 Hz	250 Vrms
1 kHz	0.01 Hz			
10 kHz	0.1 Hz			
100 kHz	1 Hz			
200 kHz	10 kHz			

Frequency sensitivity and trigger level for voltage measurement

For the maximum input voltage- frequency product (V- Hz) and input impedance, refer to AC voltage measurement.

Table 8-9 Frequency sensitivity and trigger level specifications for voltage measurement

Input range (Maximum input for specified accuracy = 10 × range or 250 V)	Minimum sensitivity (rms sine wave)		Trigger level for DC coupling	
	1 Hz to 100 kHz	>100 kHz	<20 kHz	20 kHz to 200 kHz
50 mV	15 mV	25 mV	20 mV	30 mV
500 mV	35 mV	50 mV	60 mV	80 mV
5 V	0.3 V	0.5 V	0.6 V	0.8 V
50 V	3V	5 V	6 V	8 V
250 V	30 V	—	60 V	—

Duty cycle ^[1]

Table 8-10 Duty cycle specifications

Mode	Range	Accuracy at full scale
DC coupling	0.1% to 99.9%	0.3% per kHz + 0.3%
AC coupling	5% to 95%	

Pulse width ^[1, 2]

Table 8-11 Pulse width specifications

Range	Accuracy at full scale
0.01 ms to 1999.9 ms	0.2% + 3

[1] The accuracy for duty cycle and pulse width is based on a 5 V square wave input to the DC 5 V range.

[2] Pulse width must be greater than 10 μ s and its range is determined by the frequency of the signal.

Frequency sensitivity for current measurement

For maximum input, refer to AC voltage measurement.

Table 8-12 Frequency sensitivity specifications for current measurement

Input range	Minimum sensitivity (rms sine wave) 30 Hz to 20 kHz
50 mA	2.5 mA
500 mA	25 mA

1 ms peak hold specifications

Table 8-13 Peak hold specifications

Signal width	Accuracy for DC mV/voltage/current
Single event >1 ms	2% + 400 for all ranges

Resistance specifications

The following resistance specifications are valid if the maximum open voltage is less than +4.8 V. For continuity test, the instrument will beep when the resistance is less than 10.00 Ω .

Table 8-14 Resistance specifications

Range	Resolution	Accuracy	Minimum input current	Overload protection
500 Ω ^[1]	0.01 Ω	0.15% + 8	0.45 mA	250 V rms
5 k Ω ^[1]	0.1 Ω	0.15% + 5	0.45 mA	
50 k Ω	1 Ω		45 μ A	
500 k Ω	10 Ω		4.5 μ A	
5 M Ω	0.1 k Ω		450 nA	
50 M Ω ^[2]	1 k Ω	1% + 8	45 nA	

[1] The accuracy of 500 Ω and 5 k Ω is specified after applying the relative function, which is used to offset the test lead resistance and the thermal effect.

[2] For the 50 M Ω range, the R.H. is specified for <60%.

Diode check and audible continuity specifications

The overload protection is 250 Vrms and the instrument will beep when the reading is below 50 mV (approximate).

Table 8-15 Diode check specifications

Range	Resolution	Accuracy	Test current	Open voltage
Diode	0.1 mV	0.05% + 5	Approximately 0.45 mA	< +4.8 VDC

Output Specifications

Accuracy is given as \pm (% of output + counts of least significant digit) at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, with relative humidity less than 80% R.H., and warmed up for at least five minutes.

Constant voltage and constant current outputs

Table 8-16 Constant voltage (CV) output specifications

Function	Range	Resolution	Accuracy	Minimum output current ^[2]
Constant voltage (CV) ^[1]	$\pm 1.500\text{ V}$	0.1 mV	0.03% + 3	25 mA or above
	$\pm 15.000\text{ V}$	1 mV		

[1] The maximum input voltage protection is 30 VDC.

[2] Loading coefficient: 0.012 mV/mA for 1.5 V output.

Table 8-17 Constant current (CC) output specifications

Function	Range	Resolution	Accuracy	Minimum output voltage ^[2]
Constant current (CC) ^[1]	$\pm 25.000\text{ mA}$	1 μA	0.03% + 5	12 V or above ^[3]

[1] The maximum input voltage protection is 30 VDC.

[2] Loading coefficient: 1 $\mu\text{A}/\text{V}$, the minimum output voltage is based on 20 mA into a 600 Ω load.

[3] If the current loop has a 24 V power, a minimum output voltage of 24 V is achievable with a 20 mA current in a 1200 Ω load, using the special yellow lead.

Square wave output

The maximum input voltage protection is 30 VDC.

Table 8-18 Square wave output specifications

Output	Range	Resolution	Accuracy
Frequency (Hz)	0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 120, 150, 200, 240, 300, 400, 480, 600, 800, 1200, 1600, 2400, 4800	0.01	0.005% + 1
Duty Cycle (%) ^[1]	0.39% to 99.60%	0.390625%	0.01% + 0.2% ^[2]
Pulse Width (ms) ^[1]	1/ Frequency	Range/256	0.01% + 0.3 ms
Amplitude (V)	5 V, 12 V ±5 V, ±12 V	0.1 V	2% + 0.2 V 2% + 0.4 V

[1] The positive or negative pulse width must be greater than 50 μs for adjusting the duty cycle or pulse width under different frequency. Else, the accuracy and range will be different from the definition.

[2] For signal frequencies greater than 1 kHz, an addition of 0.1% per kHz is added to the accuracy.

General Specifications

Display	<ul style="list-style-type: none"> • Both primary and secondary displays are 5-digit liquid crystal display (LCD) with a maximum reading of 51,000 counts and automatic polarity indication.
Power Consumption	<ul style="list-style-type: none"> • Charging battery: 9.3 VA typical • DC constant current at 25 mA, maximum load: 5.5 VA typical (on 24 V DC adapter) or 2.4 VA typical (on 9.6 V batteries) • Meter only: 1.8 VA typical (on 24 V DC adapter) or 0.6 VA typical (on 9.6 V batteries)
Power Supply	<ul style="list-style-type: none"> • Rechargeable batteries — 1.2 V × 8 pieces (Ni-MH), no cadmium, lead or mercury. • External switching adapter, AC 100 V to 240V , 50/60 Hz input and DC 24 V/2.5 A output.
Operating Environment	<ul style="list-style-type: none"> • Full accuracy at 0 °C to 40 °C (32 °F to 104 °F) • Full accuracy up to 80% Relative Humidity (RH) for temperature up to 31 °C, decreasing linearly to 50% RH at 40 °C
Storage Compliance	<ul style="list-style-type: none"> • -20 °C to 60 °C (-4 °F to 140 °F) with batteries removed.
Safety Compliance	<ul style="list-style-type: none"> • IEC 61010-1:2001/EN61010-1:2001 (2nd Edition) • Canada : CAN/CSA-C22.2 No. 61010-1-04 • USA: ANSI/UL 61010-1:2004
Measurement Category	<ul style="list-style-type: none"> • CAT-II 150V, Pollution Degree 2 Environment.
EMC Compliance	<ul style="list-style-type: none"> • IEC61326-2-1:2005/EN61326-2-1:2006 • Canada: ICES-001:2004 • Australia/New Zealand: AS/NZS CISPR11:2004
Measurement	<ul style="list-style-type: none"> • 3 times per second (AC+DC: 1 time per second) • 1 time per second for frequency or duty cycle measurement. (>1 Hz) • 0.25 to 1 time per second for Pulse Width measurements. (>1 Hz)
Common Mode Rejection Ratio (CMRR)	<ul style="list-style-type: none"> • > 90 dB at DC, 50/60 Hz ± 0.1% (1 kΩ unbalanced)
Normal Mode Rejection Ratio (NMRR)	<ul style="list-style-type: none"> • > 60 dB at DC, 50/60 Hz ± 0.1%
Temperature Coefficient	<ul style="list-style-type: none"> • Input: 0.15 * (specified accuracy)/ °C (from 0 °C to 18 °C or 28 °C to 40 °C) • Output: ± (50ppm output + 0.5dgt)/ °C
Dimensions	<ul style="list-style-type: none"> • H = 192 mm • W = 90 mm • D = 54 mm
Weight	<ul style="list-style-type: none"> • 0.98 kg with holster and batteries

Battery Life

- Approximately 20 hours for meter functions only, four hours for meter/source. (Assuming fully charged Ni-MH 1300 mA batteries are used.)
- Low battery indicator (🔋) appears when the series battery voltage drops below 9V (approximate).

Charging Time

- Approximately three hours, in an environment of 10 °C to 30 °C. (If the battery has been fully discharged, a prolonged charging time is required to bring the battery back to full capacity.)

Warranty

- 3 years for main unit
 - 3 months for standard accessories unless otherwise specified
-

Standard shipped items



- Quick Start Guide
- Certificate of Calibration (CoC)
- Calibrator/Meter standard test lead kit
- Yellow test lead for mA simulation
- Protective holster
- Carrying case
- Rechargeable battery pack
- AC power adapter & power cord (according to country)
- Product Reference CD
- Data logging software (included in Product Reference CD)

Optional accessories:

- U5481A IR-to-USB cable
- U1186A K-type thermocouple and adapter
- U1181A Immersion temperature probe
- U1183A Air temperature probe
- U1182A Industrial surface temperature probe
- U1160A Standard test lead kit
- U1161A Extended test lead kit
- U1162A Alligator clips
- U1184A Temperature probe adapter



IR-to-USB cable



K-type thermocouple and adapter



Immersion/Air/
Industrial surface
temperature probes



Standard test lead kit

More accessories at: www.agilent.com/find/handheld-calibrator-meter



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