Keysight U1401B Handheld
Multi-function Calibrator/Meter

Data Sheet

Calibrate while you measure with just one tool

KEYSIGHT TECHNOLOGIES

Introduction

The Keysight Technologies, Inc. handheld multi-function calibrator/meter has all you need for quick validation, servicing or troubleshooting of process control devices on the go. Travel and test easily with one rugged, feature-packed tool. Keysight now offers its latest handheld calibrator/meter, the U1401B in all-new orange, providing all the capabilities and functions you need.

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 U1401B, you can carry two tools in one—and calibrate while you measure. Slip the U1401B in its sturdy carrying case and you're ready to go.

Full-featured DMM functions

The U1401B 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.

Rugged and tested to stringent standards

The U1401B comes with a robust protective holster and is tested to stringent industrial standards.

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-to-USB cable
- Built-in charging capability

Take a Closer Look

Robust protective holster

Hold and Min/Max/Avg recordings

Built-in battery-charging capability

Bipolar voltage and current, square-wave, auto scan and ramp

Dual display with backlight

4 – 20 mA and 0 – 20 mA percentage scale readout

Easy function access through intuitive buttons and rotary switch

Voltage, current, resistance, temperature, frequency, pulse width, duty cycle, diode and continuity

Simultaneous source and measure

Input Specifications

The accuracy is given as ± (% of reading + counts of least significant digit (LSD)) at 23 °C ± 5 °C, with relative humidity less than 80% R.H. and after a warm-up period of at least five minutes. Without warm-up, an additional five counts of LSD need to be considered.

Voltage specifications

Function	Range	Resolution	Accuracy	Overload protection
DC voltage[1]	50 mV	1 µV	0.05% + 50[2]	250 Vrms
	500 mV	10 µV	0.03% + 5	
	5 V	0.1 mV		
	50 V	1 mV		
	250 V	10 mV		
AC voltage[3] (True-rms: From 5% to 100% of range)	50 mV	1 µV	45 Hz to 5 kHz: 0.7% + 40 5 kHz to 20 kHz: 1.5% + 40	
	500 mV	10 µV	45 Hz to 5 kHz: 0.7% + 20 5 kHz to 20 kHz: 1.5% + 20	
	5 V	0.1 mV		
	50 V	1 mV		
	250 V	10 mV		
AC+DC voltage[3] (True-rms: From 5% to 100% of range)	50 mV	1 µV	45 Hz to 5 kHz: 0.8% + 70 5 kHz to 20 kHz: 1.6% + 70	
	500 mV	10 µV	45 Hz to 5 kHz: 0.8% + 25 5 kHz to 20 kHz: 1.6% + 25	
	5 V	0.1 mV		
	50 V	1 mV		
	250 V	10 mV		

1. Input impedance: 10 MΩ (nominal) for the range of 5 V and above, and 1 GΩ (nominal) for the 50/500 mV range.
2. Accuracy can be improved to 0.05% + 5. Always use the Relative function to offset thermal effects before measuring the signal.
3. Input impedance: 1.1 MΩ in parallel with < 100 pF (nominal) for the range of 5 V and above, and 1 GΩ (nominal) for the 50/500 mV range. Crest factor ≤ 3.

Current specifications

Function	Range	Resolution	Accuracy	Burden voltage/shunt	Overload protection
DC current	50 mA	1 µA	0.03% + 5[1]	0.06 V (1 Ω)	250 V, 630 mA Quick acting fuse
	500 mA	10 µA	0.03% + 5[1]	0.6 V (1 Ω)	
AC current[2] (True-rms: From 5% to 100% of range)	50 mA	1 µA	45 Hz to 5 kHz: 0.6% + 20	0.06 V (1 Ω)	
	500 mA	10 µA	45 Hz to 5 kHz: 0.6% + 20	0.6 V (1 Ω)	
AC+DC current[2] (True-rms: From 5% to 100% of range)	50 mA	1 µA	45 Hz to 5 kHz: 0.7% + 25	0.06 V (1 Ω)	
	500 mA	10 µA	45 Hz to 5 kHz: 0.7% + 25	0.6 V (1 Ω)	

1. Always use the Relative function to offset thermal effects before measuring the signal. If this function is not used, accuracy could go down to 0.03% + 25. Thermal effects may be present due to:
   - Constant current, constant voltage, or square wave output.
   - Wrong operation. For example, resistance, diode, or mV measurement function is used to measure high voltage signals exceeding 250 V.
   - After battery charging has completed.
   - After measuring current greater than 50 mA.
2. Crest factor ≤ 3.

Input Specifications

Temperature specifications

Thermocouple type	Range	Resolution	Accuracy[1]	Overload protection
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. Accuracy is specified for meter operation only, excludes thermocouple probe tolerance and with the instrument placed in the operating area for at least one hour.

Resistance specifications

Range	Resolution	Accuracy	Minimum input current	Overload protection
500 W	0.01 W	0.15% + 8[2]	0.45 mA	250 Vrms
5 kW	0.1 W	0.15% + 5[2]	0.45 mA	
50 kW	1 W		45 µA	
500 kW	10 W		4.5 µA	
5 MW	0.1 kW		450 nA	
50 MW	1 kW	1% + 8[3]	45 nA	

2. Accuracy is specified after applying the Relative function to offset any test lead resistance and thermal effect.
3. Accuracy is specified for < 60% R.H.

Diode and continuity specifications

For diode test, the overload protection is 250 Vrms and the instrument will beep when the reading is below 50 mV (approximately). For continuity test, the instrument will beep when the resistance is less than 10.00 **Ω**.

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

1 ms peak hold specifications

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

Input Specifications

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

Input range	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	3 V	5 V	6 V	8 V
250 V	30 V	–	60 V	–

Frequency sensitivity for current measurement

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

Duty cycle and pulse width

Function	Mode	Range	Accuracy at full scale[1]
Duty cycle	DC coupling	0.1% to 99.9%	0.3% per kHz + 0.3%
	AC coupling	5% to 95%	
Pulse width[2]	–	0.01 ms to 1999.9 ms	0.2% + 3

1. Accuracy is based on a 5-V square-wave input to the 5 VDC range.
2. Pulse width must be greater than 10 µs and its range is determined by the frequency of the signal.

Output Specifications

Accuracy is given as ± (% of output + counts of least significant digit (LSD)) at 23 °C ± 5 °C, with relative humidity less than 80% R.H. and after a warm-up period of at least five minutes. The maximum input voltage protection is 30 VDC.

Constant voltage and current outputs

Function	Range	Resolution	Accuracy	Maximum output
Constant voltage (CV)	± 1.5000 V	0.1 mV	0.03% + 3	25 mA or above[1]
	± 15.000 V	1 mV		
Constant current (CC)	± 25.000 mA	1 µA	0.03% + 5	12 V or above[2, 3]

1. Loading coefficient: 0.012 mV/mA for 1.5 V output.
2. Loading coefficient: 1 µA/ 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 into a 1200-Ω load (applicable only in Simulation Mode).

Square wave output

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 (%)[4]	0.39% to 99.60%	0.390625%	0.01% + 0.2%[5]
Pulse Width (ms)[4]	1/Frequency	Range/256	0.01% + 0.3 ms
Amplitude (V)	5 V, 12 V	0.1 V	2% + 0.2 V
	±5 V, ±12 V	0.1 V	2% + 0.4 V

4. The positive or negative pulse width must be greater than 50 µs to enable adjustment of duty cycle or pulse width under different frequencies. Otherwise, the accuracy and range will be different from the specifications defined.
5. For signal frequencies greater than 1 kHz, add an addition of 0.1% per kHz.

General Specifications

Display	Both primary and secondary displays are 5-digit on the liquid crystal display (LCD) with a maximum resolution of 50,000 counts and automatic polarity indication. Backlight available.
Power supply	– 9.6 V Ni-MH rechargeable batteries: 1.2 V x 8 pieces. No cadmium, lead or mercury. – External switching adapter: AC 100 V to 240 V, 50/60 Hz input and DC 24 V/2.5 A output.
Power consumption	– Battery charging: 9.3 VA typical – Sourcing of constant current at 25 mA, maximum load: 5.5 VA typical on 24 V DC adapter, 2.4 VA typical on 9.6 V batteries – Meter only: 1.8 VA typical on 24 V DC adapter, 0.6 VA typical on 9.6 V batteries
Battery life	Assuming fully-charged Ni-MH batteries: Meter only: 20 hours (approximately) Source/Meter: 4 hours (approximately) ⊟ will appear when voltage drops below 9 V (approximately)
Charging time	Three hours (approximately) in 10 °C to 30 °C environment NOTE: Prolonged charging is required if battery is fully discharged
Measurement rate	Three readings/second, except for: – AC+DC: 1 reading/second – Frequency and duty cycle (> 1 Hz): 1 reading/second – Pulse width (> 1 Hz): 0.25 to 1 reading/second
Common Mode Rejection Ratio (CMRR)	> 90 dB at DC, 50/60 Hz ± 0.1% (1 kΩ unbalanced)
Normal Mode Rejection Ratio (NMRR)	> 60 dB at DC, 50/60 Hz ± 0.1%
Operating environment	0 °C to 40 °C; up to 80% relative humidity (R.H.) for temperatures up to 31 °C, decreasing linearly to 50% R.H. at 40 °C
Storage environment	–20 °C to 60 °C with batteries removed; 5% to 80% R.H. non-condensing
Altitude	0 to 2000 m
Safety compliance	IEC 61010-1:2001/EN61010-1:2001 (2nd Edition), CAN/CSA-C22.2 No. 61010-1-04, ANSI/UL 61010-1:2004, CAT II 150 V Overvoltage Protection, Pollution Degree 2
EMC compliance	IEC61326-2-1:2005/EN61326-2-1:2006, ICES-001:2004, AS/NZS CISPR11:2004
Temperature coefficient	– Input: 0.15 x (specified accuracy)/°C (from 0 °C to 18 °C or 28 °C to 40 °C) – Output: ± (50 ppm output + 0.5 digit)/°C
Dimensions (H x W x D)	192 mm x 90 mm x 54 mm
Weight	0.98 kg with holster and batteries
Calibration	One-year calibration cycle recommended

Ordering Information

U1401B

Standard shipped accessories

- Quick Start Guide
- Certificate of calibration (CoC)
- Calibrator/meter standard test lead kit
- Yellow test lead for mA simulation
- Protective holster
- Rechargeable battery pack
- AC power adapter and cord (according to country)

Optional accessories

U5481A		IR-to-USB cable
U1186A		K-type thermocouple and adapter
U1181A U1182A U1183A		– Immersion temperature probe – Industrial surface temperature probe – Air temperature probe
U1168A		Standard test lead kit
U5491A		Soft carrying case
U5402A		Yellow test lead for mA simulation

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

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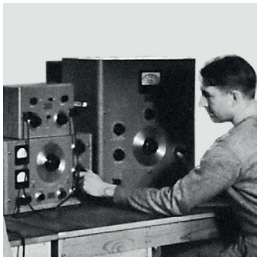
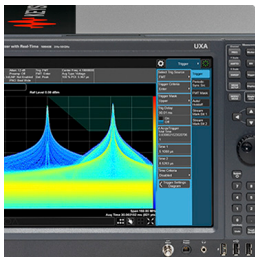


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