Agilent U1251A and U1252A Handheld Digital Multimeter

Data Sheet

Features

- **50,000 count dual display**
- **Up to 0.025% basic DC voltage accuracy**
- **True RMS measurement**
- **J-type and K-type temperature measurements**
- **Data storage capability with optional IR-USB link to PC**
- **20 MHz frequency counter**
- **Programmable square wave generator**
- **–20 ° C to +55 ° C operating temperature**
- **Safety certified with EN/IEC 61010-1 Category III 1000 V overvoltage protection**
- **Built-In battery charger capability**
- **Multi function tilt stand**

Introduction

The Agilent U1250A series handheld digital multimeter gives you 4.5 digit resolution with a 50,000 count full scale and basic DC voltage accuracy of up to 0.025%. These features give you the flexibility to perform quick validation measurements or perform tolerance checks and marginal failure troubleshooting. It also offers true RMS, dBm, and AC+DC readings to measure both sinusoidal and non-sinusoidal waveforms accurately.

Versatile functionality

The U1250A series handheld digital multimeter delivers many features that you would expect from a benchtop multimeter. These instruments come with all the basic measurement functions and added functionality needed in today's changing maintenance environment such as temperature measurements, frequency measurements, 4-20 mA process loop measurement with % readout, 20 MHz frequency counter (U1252A only), and dBm measurements.

More than just a measurement tool

The U1250A series expands users' capability beyond typical measurements. These instruments provide data storage capability which can be done both manually or automatedly with the optional PC interface cable. The accompanying Agilent Graphical User Interface (GUI) further extends the potential of these instruments by allowing you to customize your data logging needs. Other features include sophisticated math functions that allow users to manipulate the data obtained. The U1252A can be used as a programmable square wave generator that allows you to stimulate electronic circuits for debugging purposes.

Uncompromising ruggedness and safety

Use The U1250A series handheld digital multimeter with confidence in almost any environment. These instruments come in a robust package with shock absorbing overmold and operate within their rated specifications from –20 ° C right up to +55 ° C. Furthermore, these instruments are rated at Cat III 1000 V (IEC 61010 Compliant) which allows you to confidently make measurements on building electrical installations, at locations between the main circuit breaker and the mains socket-outlets, including measurements performed on equipment that is permanently connected to the mains circuits.

Visit our Web for more information on Agilent's Handheld Digital Multimeter at www.agilent.com

U1251A & U1252A DC SPECIFICATIONS

FUNCTION	RANGE	RESOLUTION	TEST CURRENT/ BURDEN VOLTAGE	ACCURACY ± (% of reading + No. of Least Significant Digit)	
				U1251A	U1252A
VOLTAGE[1]	50.000 mV	0.001 mV	-	0.05+50[2]	0.05+50[2]
	500.00 mV	0.01 mV	-	0.03+5	0.025+5
	1000.0 mV	0.1 mV	-		
	5.0000 V	0.0001 V	-		
	50.000 V	0.001 V	-		
	500.00 V	0.01 V	-		0.03+5
	1000.0 V	0.1 V	-		
RESISTANCE	500.00 Ω[3]	0.01 Ω	1.04 mA	0.08+10	0.05+10
	5.0000 kΩ[3]	0.0001 kΩ	416 µA	0.08+5	0.05+5
	50.000 kΩ	0.001 kΩ	41.2 µA		
	500.00 kΩ	0.01 kΩ	4.12 µA		
	5.0000 MΩ	0.0001 MΩ	375 nA	0.2+5	0.15+5
	50.000 MΩ[4]	0.001 MΩ	187 nA	1+10	1+5
	500.00 MΩ	0.01 MΩ	187 nA	N/A	3+10<200 MΩ/8+10>200 MΩ
	500 nS[5]	0.01 nS	187 nA	1+20	1+10
CURRENT	500.00 µA	0.01 µA	0.06 V (100 Ω)	0.1+5[6]	0.05+5[6]
	5000.0 µA	0.1 µA	0.6 V (100 Ω)	0.1+5[6]	0.05+5[6]
	50.000 mA	0.001 mA	0.09 V (1 Ω)	0.2+5[6]	0.15+5[6]
	440.00 mA	0.01 mA	0.9 V (1 Ω)	0.2+5[6]	0.15+5[6]
	5.0000 A	0.0001 A	0.2 V (0.01 Ω)	0.3+10	0.3+10
	10.000 A[7]	0.001 A	0.4 V (0.01 Ω)	0.3+10	0.3+5
DIODE TEST	-	0.1 mV	1.04 mA	0.05 + 5	

TEMPERATURE AND CAPACITANCE SPECIFICATIONS

FUNCTION	THERMOCOUPLE TYPE	RANGE	RESOLUTION	ACCURACY	MEASURING RATE AT FULL SCALE	MAX. DISPLAY
TEMPERATURE	K	–200 ~ 1372 °C/ –328 ~ 2502 °F	0.1 °C/0.1 °F	0.3% +3 °C/ 0.3%+6 °F	N/A	N/A
	J[8]	–210 ~ 1200 °C/ –346 ~ 2192 °F	0.1 °C/0.1 °F	0.3% +3 °C/ 0.3%+6 °F	N/A	N/A
CAPACITANCE	-	10.000 nF	0.001 nF	1%+8	4 times/sec.	11000 counts
	-	100.00 nF	0.01 nF	1%+5		
	-	1000.0 nF	0.1 nF			
	-	10.000 µF	0.001 µF			
	-	100.00 µF	0.01 µF			
	-	1000.0 µF	0.1 µF		1 time/sec.	
	-	10.000 mF	0.001 mF		0.1 times/sec.	
	-	100.00 mF	0.01 mF	3%+10	0.01 times/sec.	

[1] Input impedance: >1 GΩ for 50 mV~1000 mV ranges. For U1251A, input impedance is 10 MΩ (nominal) for 5 V~1000 V ranges. For U1252A, input impedance is 10 MΩ (nominal) in parallel with 1.1 MΩ at dual display.

[2] The accuracy could be 0.05%+10 for U1251A and 0.05%+5 for U1252A. Always use NULL function to zero out the thermal effect before measuring the signal.

[3] The accuracy of 500 Ω and 5 kΩ is specified after NULL function, which is used to subtract the test lead resistance and the thermal effect

[4] For the range of 50 MΩ, the R.H. is specified for <60%.

[5] The accuracy is specified for <50 nS and after NULL function with open test lead.

[6] Always use NULL function to zero out thermal effect with open test lead before measuring the signal. If NULL function is not used, an additional 20 counts needs to be added to the DC current accuracy. Thermal effect could occur due to the following:

- Wrong operation to measure the high voltage of 50 V ~ 1000 V for resistance, diode, and mV measurements.
- After battery-charging has completed.
- After measuring a current greater than 440 mA, it is suggested that the meter be left to cool down for twice the measuring time used.

[7] Current can be measured up to 10 A continuously. An additional 0.5% needs to be added to the specified accuracy if the signal measured is in the range of 10 A~20 A for 30 seconds maximum. After measuring a current of > 10 A, leave the meter to cool down for twice the measuring time used before application of low current measurement.

[8] Only available in U1252A.

U1251A AC SPECIFICATIONS

FUNCTION	RANGE	RESOLUTION	ACCURACY ± (% of reading + No. of Least Significant Digit) FREQUENCY			
			30 Hz ~ 45 Hz	45 Hz ~ 1 kHz	1 kHz ~ 10 kHz	10 kHz ~ 30 kHz
TRUE-RMS AC VOLTAGE	50.000 mV	0.001 mV	1+60	0.6+40	1.0+40	1.6+60
	500.00 mV	0.01 mV	1+60	0.6+25	1.0+40	1.6+60
	1000.0 mV	0.1 mV	1+60	0.6+25	1.0+25	1.6+40
	5.0000 V	0.0001 V	1+60	0.6+25	1.0+25	1.6+40
	50.000 V	0.001 V	1+60	0.6+25	1.0+25	1.6+40
	500.00 V	0.01 V	1+60	0.6+25	1.0+25	1.6+40[1]
	1000.0 V	0.1 V	1+60	0.6+40	1.0+40	N/A

FUNCTION	RANGE	RESOLUTION	ACCURACY ± (% of reading + No. of Least Significant Digit) FREQUENCY		
			30 Hz ~ 45 Hz	45 Hz ~ 2 kHz	2 kHz ~ 20 kHz
AC CURRENT	500.00 µA[2]	0.01 µA	1.5+50	0.8+20	3+80
	5000.0 µA	0.1 µA	1.5+40	0.8+20	3+60
	50.000 mA	0.001 mA	1.5+40	0.8+20	3+60
	440.00 mA	0.01 mA	1.5+40	0.8+20	3+60
	5.0000 A	0.0001 A	2+40[4]	0.8+20	3+60 <3 A/5 kHz
	10.000 A[3]	0.001 A	2+40[4]	0.8+20	

U1252A AC SPECIFICATIONS

FUNCTION	RANGE	RESOLUTION	ACCURACY ± (% of reading + No. of Least Significant Digit) FREQUENCY				
			20 Hz ~ 45 Hz	45 Hz ~ 1 kHz	1 kHz ~ 10 kHz	10 kHz ~ 20 kHz	20 kHz~100 kHz[5]
TRUE-RMS AC VOLTAGE	50.000 mV	0.001 mV	1.5+60	0.4+40	0.7+40	0.75+40	3.5+120
	500.00 mV	0.01 mV	1.5+60	0.4+25	0.4+25	0.75+40	3.5+120
	1000.0 mV	0.1 mV	1.5+60	0.4+25	0.4+25	0.75+40	3.5+120
	5.0000 V	0.0001 V	1.5+60	0.4+25	0.4+25	0.75+40	3.5+120
	50.000 V	0.001 V	1.5+60	0.4+25	0.4+25	0.75+40	3.5+120
	500.00 V	0.01 V	1.5+60	0.4+25	0.4+25	1.5+40	3.5+120[1]
	1000.0 V	0.1 V	1.5+60	0.4+40	0.4+40	1.5+40[1]	N/A

FUNCTION	RANGE	RESOLUTION	ACCURACY ± (% of reading + No. of Least Significant Digit) FREQUENCY			
			20 Hz ~ 45 Hz	45 Hz ~ 1 kHz	1 kHz ~ 20 kHz	20 kHz ~ 100 kHz[5]
AC CURRENT	500.00 µA[2]	0.01 µA	1.0+20	0.7+20	0.75+20	5+80
	5000.0 µA	0.1 µA	1.0+20	0.7+20	0.75+20	5+80
	50.000 mA	0.001 mA	1.0+20	0.7+20	0.75+20	5+80
	440.00 mA	0.01 mA	1.0+20	0.7+20	1.5+20	5+80
	5.0000 A	0.0001 A	1.5+20[4]	0.7+20	3+60 <3 A/5 kHz	N/A
	10.000 A[3]	0.001 A	1.5+20[4]	0.7+20		

[1] The input signal is lower than the product of 20,000,000 V-Hz (product of voltage and frequency).

[2] Input current >35 µArms.

[3] Current can be measured from 2.5 A up to 10 A continuously. An additional 0.5% needs to be added to the specified accuracy if the signal measured is in the range of 10 A ~ 20 A for 30 seconds maximum. After measuring a current of >10 A, leave the meter to cool down for twice the measuring time used before application of low current measurement.

[4] Input current < 3 Arms.

[5] The additional error to be added as frequency >20 kHz and signal input <10% of range: 3 counts of LSD per kHz.

U1252A AC+DC SPECIFICATIONS

FUNCTION	RANGE	RESOLUTION	ACCURACY ± (% of reading + No. of Least Significant Digit) FREQUENCY				
			30 Hz ~ 45 Hz	45 Hz ~ 1 kHz	1 kHz ~ 10 kHz	10 kHz ~ 20 kHz	20kHz~100kHz[1]
VOLTAGE	50.000 mV	0.001 mV	1.5+80	0.4+60	0.7+60	0.8+60	3.5+220
	500.00 mV	0.01 mV	1.5+65	0.4+30	0.4+30	0.8+45	3.5+125
	1000.0 mV	0.1 mV	1.5+65	0.4+30	0.4+30	0.8+45	3.5+125
	5.0000 V	0.0001 V	1.5+65	0.4+30	0.4+30	0.8+45	3.5+125
	50.000 V	0.001 V	1.5+65	0.4+30	0.4+30	0.8+45	3.5+125
	500.00 V	0.01 V	1.5+65	0.4+30	0.4+30	1.5+45	3.5+125[2]
	1000.0 V	0.1 V	1.5+65	0.4+45	0.4+45	1.5+45[2]	N/A

FUNCTION	RANGE	RESOLUTION	ACCURACY ± (% of reading + No. of Least Significant Digit) FREQUENCY		
			30 Hz ~ 45 Hz	45 Hz ~ 1 kHz	1 kHz ~ 20 kHz
CURRENT	500.00 µA[3]	0.01 µA	1.1+25	0.8+25	0.8+25
	5000.0 µA	0.1 µA	1.1+25	0.8+25	0.8+25
	50.000 mA	0.001 mA	1.2+25	0.9+25	0.9+25
	440.00 mA	0.01 mA	1.2+25	0.9+25	0.9+25
	5.0000 A	0.0001 A	1.8+30[5]	0.9+30	3.3+70 <3 A/5 kHz
	10.000 A[4]	0.001 A	1.8+30[5]	0.9+25	

U1251A & U1252A FREQUENCY SPECIFICATIONS[2]

RANGE	RESOLUTION	ACCURACY	MINIMUM INPUT FREQUENCY
99.999 Hz	0.001 Hz	0.02%+3 <600 kHz	1 Hz
999.99 Hz	0.01 Hz		
9.9999 kHz	0.0001 kHz		
99.999 kHz	0.001 kHz		
999.99 kHz	0.01 kHz		

[1] The additional error to be added as frequency >20 kHz and signal input <10%of range: 3 counts of LSD per kHz.

[2] The input signal is lower than the product of 20,000,000 V-Hz (product of voltage and frequency).

[3] Input current >35 µArms.

[4] Current can be measured from 2.5 A up to 10 A continuously. An additional 0.5% needs to be added to the specified accuracy if the signal measured is in the range of 10 A ~ 20 A for 30 seconds maximum. After measuring a current of >10 A, leave the meter to cool down for twice the measuring time used before application of low current measurement.

[5] Input current < 3 Arms.

U1251A FREQUENCY SENSITIVITY DURING VOLTAGE MEASUREMENT

FREQUENCY SENSITIVITY AND TRIGGER LEVEL FOR U1251A				
INPUT RANGE	MINIMUM SENSITIVITY (R.M.S. Sine-Wave)		TRIGGER LEVEL FOR DC COUPLING	
(Maximum input for specified accuracy = 10 x Range or 1000 V)	20 Hz-100 kHz	>100 kHz ~ 200 kHz	< 100 kHz	>100 kHz ~ 200 kHz
50.000 mV	10 mV	15 mV	10 mV	15 mV
500.00 mV	25 mV	35 mV	60 mV	70 mV
1000.0 mV	40 mV	50 mV	100 mV	150 mV
5.0000 V	0.25 V	0.5 V	0.5 V / 1.25 V (< 100 Hz)	0.6 V
50.000 V	2.5 V	5 V	5 V	6 V
500.00 V	25 V	N/A	50 V	N/A
1000.0 V	50 V	N/A	300 V	N/A

U1252A FREQUENCY SENSITIVITY DURING VOLTAGE MEASUREMENT

FREQUENCY SENSITIVITY AND TRIGGER LEVEL FOR U1252A				
INPUT RANGE	**MINIMUM SENSITIVITY (R.M.S. Sine-Wave)**		**TRIGGER LEVEL FOR DC COUPLING**	
(Maximum input for specified accuracy = 10 x Range or 1000 V)	**20 Hz-200 kHz**	**>200 kHz ~ 500 kHz**	**< 100 kHz**	**>100 kHz ~ 500 kHz**
50.000 mV	10 mV	25 mV	10 mV	25 mV
500.00 mV	70 mV	150 mV	70 mV	150 mV
1000.0 mV	120 mV	300 mV	120 mV	300 mV
5.0000 V	0.3 V	1.2 V	0.6 V	1.5 V
50.000 V	3 V	5 V	6 V	15 V
500.00 V	30 V < 100 kHz	N/A	60 V	N/A
1000.0 V	50 V < 100 kHz	N/A	120 V	N/A

DUTY CYCLE[1]

MODE	RANGE	ACCURACY AT FULL SCALE
DC Coupling	0.01% ~ 99.99%	0.3% per kHz + 0.3%

PULSE WIDTH[1]

MODE	RANGE	ACCURACY AT FULL SCALE
500 ms	0.01 ms	0.2% + 3
2000 ms	0.1 ms	0.2% + 3

[1] Positive or negative pulse width must be greater than 10 µs and the range of duty cycle should be considered. The range of pulse width is determined by the frequency of the signal.

U1251A & U1252A FREQUENCY SENSITIVITY DURING

CURRENT MEASUREMENT

INPUT RANGE	MINIMUM SENSITIVITY (R.M.S. Sine-Wave) 20 Hz - 20 kHz
500.00 µA	100 µA
5000.0 µA	250 µA
50.000 mA	10 mA
440.00 mA	25 mA
5.0000 A	1 A
10.000 A	2.5 A

PEAK HOLD (Capturing changes)

SIGNAL WIDTH	ACCURACY FOR DC mV/VOLTAGE/CURRENT
Single event > 1 ms	2% + 400 for all ranges
Repetitive > 250 µs	2% + 1000 for all ranges

U1252A FREQUENCY COUNTER SPECIFICATIONS

Divide 1 (secondary display "-1-")

RANGE	RESOLUTION	ACCURACY	SENSITIVITY	MIN. INPUT FREQUENCY
99.999 Hz	0.001 Hz	0.02%+3	100 mV R.M.S.	0.5 Hz
999.99 Hz	0.01 Hz	0.002%+5, <2 MHz		
9.9999 kHz	0.0001 kHz			
99.999 kHz	0.001 kHz			
999.99 kHz	0.01 kHz		200 mV R.M.S.	
9.9999 MHz	0.0001 MHz			

Divide 100 (secondary display "-100-")

RANGE	RESOLUTION	ACCURACY	SENSITIVITY	MIN. INPUT FREQUENCY
9.9999 MHz	0.0001 MHz	0.002%+5, <20 MHz	400 mV R.M.S.	1 MHz
99.99 MHz	0.001 MHz		600 mV R.M.S.	

U1252A SQUARE WAVE OUTPUT

OUTPUT[1]	RANGE	RESOLUTION	ACCURACY
FREQUENCY	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 Hz	0.01Hz	0.005% +2
DUTY CYCLE[2]	0.39% ~ 99.60%	0.390625%	0.4% of full scale[3]
PULSE WIDTH[2]	1/Frequency	Range/256	0.2 ms+ Range/256
AMPLITUDE	Fixed 0~+2.8 V	0.1 V	0.2 V

[1] Output impedance: 3.5 kΩ maximum.
[2] 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.
[3] For signal frequencies greater than 1 kHz, an addition of 0.1% per kHz is added to the accuracy.

OPERATING CHARACTERISTICS

Measuring rate

Function	Times/second
ACV	7
ACV + dB	7
DCV	7
ACV	7
AC + DC V	2
Ω/nS	14
Diode	14
Capacitance	4 (< 100 µF)
DCI	7
ACI	7
AC + DC I	2
Temperature	6
Frequency	2 (>10 Hz)
Duty cycle	1 (>10 Hz)
Pulse width	1 (>10 Hz)

DECIBEL (dB) CALCULATION

dB BASE	REFERENCE	DEFAULT REFERENCE
1 mW (dBm)	1-9999 Ω	50 Ω
1 V (dBV)	1 V	1 V

GENERAL SPECIFICATIONS

DISPLAY Both primary and secondary displays are 5-digit liquid crystal display (LCD) with maximum reading of 50,000 counts. Automatic polarity indication.
POWER CONSUMPTION 105 mVA / 420 mVA (with backlit) maximum (U1251A) 165 mVA / 480 mVA (with backlit) maximum (U1252A)
OPERATING ENVIRONMENT Full accuracy at –20 ° C to 55 ° C Full accuracy to 80% RH for temperature up to 35 ° C, decreasing linearly to 50% RH at 55 ° C Altitude: 0 - 2000 meters per IEC 61010-1 2nd Edition CAT III, 1000 V 2000 - 3000 meters per IEC 61010-1 2nd Edition CAT III, 600 V
STORAGE COMPLIANCE –40 ° C to 70 ° C
SAFETY COMPLIANCE Certified by CSA for IEC/EN/CSA/UL 61010-1 2nd Edition
MEASUREMENT CATEGORY CAT III 1000 V Overvoltage Protection up to 2000 m, Pollution degree 2
EMC COMPLIANCE Certified to IEC/EN 61326: 2002, CISPR 11, and equivalents for Group 1, Class A
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%
TEMPERATURE COEFFICIENT 0.15 x (specified accuracy) ° C (from –20 ° C to 18 ° C or 28 ° C to 55 ° C)
SHOCK and VIBRATION Tested to IEC/EN 60068-2
DIMENSION (HxWxD) 203.5 mm x 94.4 mm x 59.0 mm
WEIGHT 504±5 grams with battery (U1251A) 527±5 grams with battery (U1252A)
CHARGING TIME (only U1252) <220 minutes approximately at the environment of 10 ° C to 30 ° C.
WARRANTY 1 year factory + 2 years extended warranty

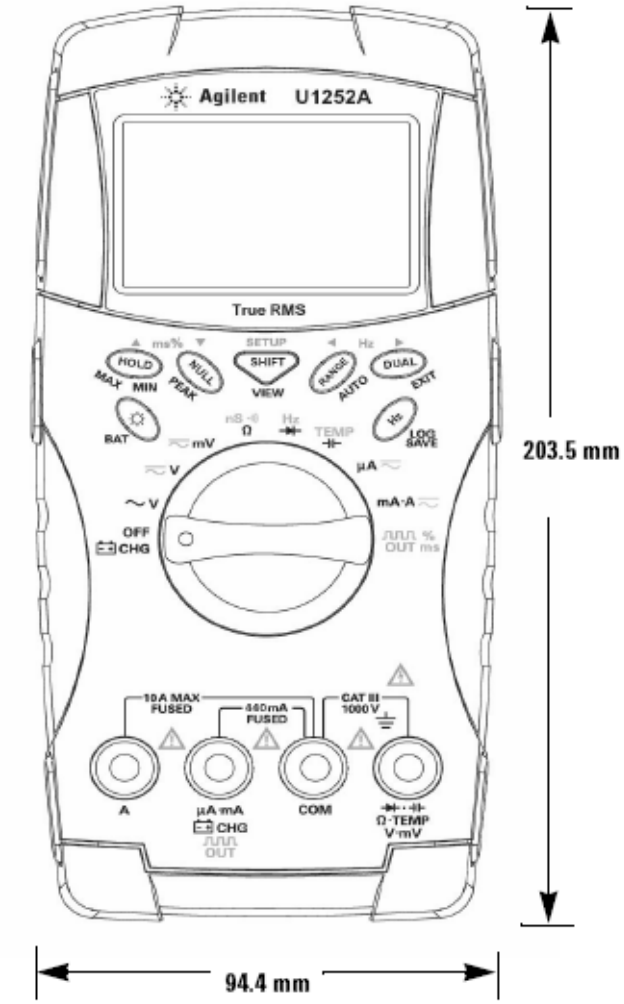
Accessories Included

- Soft carrying case
- Alkaline 9 V battery (U1251A only)
- Rechargeable 7.2 V battery (U1252A only)
- Power cord & AC adaptor (U1252A only)
- U1160A Standard Test Lead Kit
- Quick Start Guide
- Reference CD containing the user's guide, application software and instrument drivers
- Certificate of Calibration (CoC)
- Test report

Optional Accessories (Sold seperately)

- U1161A Extension Test Lead Kit
- U1173A IR to USB cable
- U1180A Thermocouple Lead Kit

DIMENSION



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