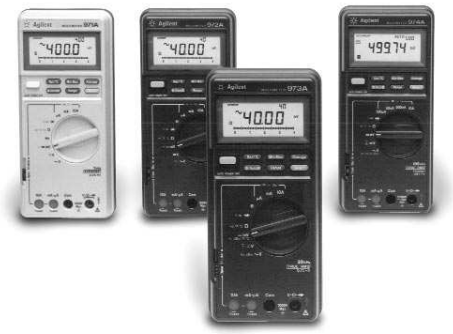
Agilent 970-Series Handheld Multimeters

Data Sheet



Benchtop features and performance with handheld convenience and price

- **3½ and 4½ digits with dcV accuracy to 0.05%**
- **1 kHz to 100 kHz frequency response**
- **Sophisticated math functions**
- **True rms, dB/dBm available**

Bench and field measurements

Agilent Technologies 970-series handheld multimeters give you much more than just the basics. These compact multimeters have the features you'd expect from a bench meter, like sophisticated math functions that allow relative difference or percent readings for checking tolerances and Min/Max with time stamp to monitor all types of measurements including high resolution temperature readings.

These DMMs also include a hold feature to let you save readings manually or automatically and a measurement averaging capability to use when you're working with noisy signals. An auto diode feature automatically reverses polarity for you when you're checking semiconductor junctions.

Measure with confidence

An innovative safety shutter prevents accidental connection to the current terminals. All models feature high-energy fuses and audible overload alarms. A selectable auto power off mode conserves batteries.

Use the rugged 971A in every environment

The 971A is designed to withstand the toughest environments. Like the other handhelds in the 970 series, the 971A provides ac/dc volts, and current, ohms, continuity, diode test, auto diode test, frequency volts and °F and °C high-resolution temperature measurements.

Measure low-level dc/ac volts or capacitance with the 972A

For measuring low-level signals, the 972A gives you 40 mV ranges for dc/ac voltage and the assurance of 20 kHz frequency response. For capacitance testing, the 972A measures from 10 pF to 1000 µF. A convenient dual display shows the range, elapsed time, or reference values, in addition to your reading.

The 973A gives you more ways to test and troubleshoot

The 3½-digit display (with 0.1% basic dc accuracy), 20 kHz frequency range, true rms and ac+dc readings let you measure sinusoidal and nonsinusoidal waveforms with confidence. The 973A also gives you dBm and relative dB with dynamic range of 57 dB (2 mV to 400 mV) or 74 dB (0.2 V to 1000 V), with 0.1 dB resolution. This DMM also features dual displays.

Use the 974A when extra precision is required

For precision measurements, the 974A gives you 4½ digits with a 49,999 count full scale, and basic dc accuracy of 0.05% for all ranges. It also offers true rms, 100 kHz frequency response, dBm /relative dBm readings, and ac+dc readings to accurately measure nonsinusoidal waveforms.

3-year warranty

With 970-series handheld multimeters you get a manual, a high-quality test lead set, a calibration certificate, spare fuse, rubber boot, and two installed AA batteries. Each instrument comes with a 3-year warranty.

Agilent Technologies

Innovating the HP Way

Agilent Technologies 970-series selection guide

Model*	971A	972A	973A	974A
Display Count	4,000	4,000	4,000	50,000
AC Volts Response	1kHz	20kHz	20kHz	100kHz
Basic dc Accuracy	0.3%	0.2%	0.1%	0.05%
Resolution, ACV, DCV	100µV	10µV	10µV	10µV
AC, DC Volts/Current	•	•	•	•
Frequency, Ohms	•	•	•	•
Continuity, Diode, Auto Diode	•	•	•	•
Thermistor Temperature	•	•	•	•
Thermocouple Temperature			•	
Relative and Percent	•	•	•	•
Min Max with Time Stamp	•	•	•	•
Data Hold/Auto Hold	•	•	•	•
Average of last 8 readings	•	•	•	•
Current Safety Shutter	•	•	•	•
600V, 15A Fuse, Ovld Alert	•	•	•	•
Auto Power Off	•	•	•	•
40 Segment Bargraph	•	•	•	
Capacitance to 1000µF		•	•	
Dual Digital Display		•	•	
TRUE RMS AC Response			•	•
dB and dBm			•	•

*See our value-priced handheld E2373A on page 6.

Specifications 971A, 972A, 973A

23° C ± 5° C, <80% RH, accuracy ± (% of reading + number of digits) 974A specifications on page 4

dc Voltage

Range	Resolution	971A	972A	973A	Input Resistance
40 mV	10 µV	–	0.3% + 5		10 MΩ
400 mV	100 µV	0.3% + 1	0.2% + 1	0.1% + 1	
4 V	1 mV				11 MΩ
40 V	10 mV				10 MΩ
400 V	100 mV				
1000 V	1V			0.2% + 1	

ac Voltage

		971A		972A				973A				Input
		Average		Average				True rms (ac + dc spec in parenthesis)				
Range	Resolution	40 Hz-500 Hz	500 Hz-1 kHz	40 Hz-50 Hz	50 Hz-1 kHz	1 kHz-5 kHz	5 kHz-20 kHz	40 Hz-50 Hz	50 Hz-1 kHz	1 kHz-5 kHz	5kHz-20kHz	Impedance
40 mV	10µV	–	–	1% +10		–		1% + 3 (N.A.)	1% + 3 (N.A.)	– (N.A.)		10 MΩ <70 pF
400 mV	100µV	1%+2	1.5% + 4	1% + 3								
4 V	1 mV					1.5% + 3	3% + 6	1%+3 (1% + 4)	0.7%+3 (1% + 4)	1.2%+4 (1.5% + 6)	2%+15 (3% + 18)	11 MΩ <50 pF
40 V	10 mV			1% + 2	0.5% + 2							10 MΩ <50 pF
400 V	100 mV											
1000 V	1V	1% + 2, 40 Hz - 500 Hz						1% + 4, 40 Hz - 500 Hz (1% + 6 dc, 40 Hz to 500 Hz)				

Specifications 971A, 972A, 973A

23° C ± 5° C, <80% RH, accuracy ± (% of reading + number of dig)

Resistance

Range	Resolution	971A	972A	973A	Test Current	Test Voltage
400 Ω	100 mΩ	0.5% + 1	0.2% + 1		.8mA	< 3.2 V
4 kΩ	1 Ω				<80 µA	<1.1V
40 kΩ	10 Ω				<10 µA	
400 kΩ	100 Ω				<1.1 µA	
4 MΩ	1 kΩ		0.5% + 1		<110 nA	
40 MΩ	10 kΩ	1% + 1				

Current, ac, dc

Range	Resolution	971A	972A	973A	971A	972A	973A	Input Resistance
		dc			40 to 500 Hz	40 Hz to 2 kHz		
400 µA	100 nA	0.5%+2	0.5%+2		1.5% + 5	1.5% + 4		<550Ω
4000 µA	1 µA	1.0% + 2	0.8% + 2					
40 mA	10 µA							<8Ω
400 mA	100 µA	1.2% + 2	1% + 2					
10 A	10 mA							<0.05Ω

Frequency, 971A

Range	Resolution	Accuracy	Input voltage	Input Impedence
5 Hz to 9999 Hz	1 Hz	0.02% + 1	0.1 V to 400 V rms	>1.2 MΩ, <50 pF
9.0 kHz to 99.99 kHz	10 Hz		0.8 V to 100 V rms	

Frequency, 972A/973A

Range	Resolution	Accuracy	Input voltage	Input Current
2 Hz to 99.99 Hz	0.01 Hz	0.02% + 1	0.2V to 400V	50 µA to 10A
90 Hz to 999.9 Hz	0.1 Hz			
900 Hz to 9999 Hz	1 Hz		0.4V to 400V	
9.00 kHz to 99.99 kHz	10 Hz		0.8V to 100V	–
90 kHz to 200 kHz	100 Hz		2V to 100V	

dBm 973A, (600Ω, 1 mW reference)

Function	Input dBm	Input Voltage	40Hz to 1kHz	1kHz to 5kHz	5kHz to 20kHz
ac mV	-51.8 dBm to -5.7 dBm	2.0 mV to 400 mV	0.3 dBm	–	
acV	-11.8 dBm to -5.7 dBm	0.2V to 0.4 V	0.2 dBm		
	-5.7 dBm to 53.3 dBm	0.4V to 360 V		0.2 dBm	0.7dBm
	53.3 dBm to 62.2 dBm	360V to 1000V	0.2 dBm, 40 Hz to 500 Hz	–	

Capacitance 972A/973A

Range	10 nF	100 nF	1,000 nF	10 µF	100 µF	1,000 µF
Resolution	10 pF	100 pF	1 nF	10 nF	100 nF	1 µF
Accuracy	2% + 3		1.2% + 2		3% + 2	

Temperature

	971A	972A	973A	
Calibrated element	Thermistor	Thermistor	Thermistor	Thermocouple
Measurement Range	-80 to 150°C -112 to 302°C			-50°C to 700°C -58°F to 1292°F
Resolution	0.1°C, 0.2°F			1°C, 1°F
Accuracy	0.5°C, 1°F	0.3°C, 0.5°F		2%+2°C, 2%+4°F

Note: Accuracy does not include the temperature probe error.

Diode/Auto Diode 971/2/3A
Test current: 0.5 mA nominal @ 0.6 V, <3.2 V
Range; 0-2 V, 1 mV resolution
Accuracy: 1% + 2

Continuity (audible) 971/2/3A
Test Current; 0.8 mA nominal, < 3.2 V
Range 0-400 Ω, 0.1 Ω resolution
Threshold; < 20 Ω

Relative Measures the difference from a reference value.

Per Cent Displays the per cent change from reference.

Min/Max Records the minimum and maximum value of the input, with audible alert, and elapsed time; the 974A also computes long term average in Min/Max.

Average Dislays the average of the last 8 readings.

Data-Hold Holds the display reading. Shows input value on dual display (972A, 973A).

Auto Hold Stores last stable reading and displays it when probe is removed from test circuit.

Range Select auto ranging or manual ranging.

Auto Diode Choose normal diode test, or Auto Diode for automatic reversal of polarity.

Temperature Thermistor temperature for high accuracy and 0.1° C resolution and thermocouple (973A only) for high temperatures.

Dual Display 972/3A, one large main and a secondary display for two digital readouts.

Overload Alert Input overload alert provides audible tone when input is overloaded or in wrong terminal. Fuse check for 971/2/3A.

Safety Shutter Unique terminal shutter that helps prevent inadvertent use of current terminals.

Auto Power Off Turns off power to save batteries after 30 minutes of inactivity or choose to defeat auto power off.

Zero adjust Stores zero between function changes for critical measurements: Ohms zero (971/2/3/4A), dcV and Capacitance zero (972/3A).

ac+dc The 973A, 974A, displays ac+dc true rms.

dBm/dB The 973A, displays dBm and input voltage on dual display; the 974A has 0.01 dB resolution.

Specifications 974A 23° C ± 5° C, <80% RH, accuracy ± (% of reading + number of digits)

dc Voltage

Range	Resolution	Accuracy	Input Resistance
500 mV	10 µV	0.05% + 2	>1000 MΩ
5 V	100 µV		11 MΩ
50 V	1 mV		10 MΩ
500 V	10 mV		
1000 V	100 mV		

True rms ac Voltage Accuracy

Range	Resolution	20 Hz - 50 Hz	50 Hz- 10 kHz	10 kHz - 30 kHz	30 kHz- 50 kHz	50 kHz- 100 kHz	Input Impedence
500 mV	10 µV	1% + 30	0.7%+30	2%+50	–		11 MΩ <50 pF
5V	100 µV		0.5% + 30	1% + 40	2% + 70	3% + 300	
50V	1 mV						10 MΩ <50 pF
500V	10 mV						
750V	100 mV	1% + 30, 20 Hz to 1 kHz					

True rms ac + dc Voltage Accuracy

dc, 20 Hz - 10 KHz	dc, 10 kHz - 30 kHz	dc, 30 kHz - 50 kHz	dc, 50 kHz - 100 kHz
–			
1% + 30	1.2% + 40	2.5% + 70	3.5% + 300
1%+30 dc, 20 Hz - 1 kHz			

Resistance Accuracy

Range	Resolution	Accuracy	Test Current	Test Voltage
500 Ω	10 mΩ	0.06% + 2	<800 µA	<5.5V
5 kΩ	100 mΩ			
50 kΩ	1 Ω		<80 µA	<2.2V
500 kΩ	10 Ω		<15 µA	
5 MΩ	100 Ω	0.5% + 2	<1.5 µA	
50 MΩ	1 kΩ	1% + 2	<150 nA	

Current, ac, dc

Range	Resolution	Accuracy		Input Resistance
		dc	40 Hz to 1 KHz	
500 µA	10 nA	0.3% + 2	1% + 20	<1050Ω
50 mA	1 µA			<12Ω
500 mA	10 µA			<2.5Ω
10 A	1 mA	0.7%+2	–	<0.05Ω

Frequency 974A

Range	Resolution	Accuracy	Input Voltage
10 Hz to 99.99 Hz	0.01 Hz	0.05% + 1	0.45V to 500V
90 Hz to 999.9 Hz	0.1 Hz		
900 Hz to 9999 Hz	1 Hz		
900 kHz to 99.99 kHz	10 Hz		0.7V to 100V
90 kHz to 200 kHz	100 Hz		1.5V to 100V

Temperature

Calibrated Element	Measurement Range	Resolution	Accuracy
Thermistor	-80 to 150° C, -112 to 302° F	0.1° C, 0.1° F	0.2° C, 0.4° F

dBm 974A, (600Ω, 1 mW reference)			Accuracy			
	Input dBm	Input Voltage	20 Hz to 10 kHz	10 kHz to 30 kHz	30 kHz to 50 kHz	50 kHz to 100 kHz
acV	-29.82 dBm to -23.80 dBm	25 mV to 50 mV	0.2 dBm	0.50 dBm	Not Specified	
	-23.80 dBm to -3.80 dBm	50 mV to 499.99 mV	0.15 dBm	0.30 dBm		
	-3.80 dBm to 55.28 dBm	0.5 V to 450 V	0.1 dBm	0.20 dBm	0.50 dBm	1.00 dBm
	55.28 dBm to 59.72 dBm	450 V to 750 V	0.15 dBm, 20 Hz to 1 kHz	Not Specified		

General Specifications

Display	
971/2/3A	4 digit LCD display max. reading of "4000" (9999 for Hz, 5656 for ac+dc), 40 segment bargraph with dc zero center.
974A	5 digit LCD display, max. reading of 49999 (70700 for ac+dc)
Sampling, dcV	
971/2/3A	2.3 times per second, 23 Bargraph samples/sec
974A	2-4 times per second
Operating Temperature	
971/2/3A	-10° C to 50° C (14°F to 122°F)
974A	0°C to 40° C (32°F to 104°F)

Humidity	80% RH, 0° C - 40° C
Battery	1.5V, AA size X 2
Battery life (typical)	
971A	1000 hrs
972/3A	600 hrs
974A	120 hrs
Size (W x H x D)	87 mm x 190 mm x 39 mm (3.4 in x 7.5 in x 1.55 in)
Weight	440 g (1 lb) approx.

Ordering Information

971A Handheld Multimeter
972A Handheld Multimeter
973A Handheld Multimeter
974A Handheld Multimeter

970-series handheld multimeters come with alkaline batteries, rubber boot, Certificate of Calibration, spare fuse, operating manual and test leads.

Options

Opt. W50 Additional 2-year warranty (5-year total)

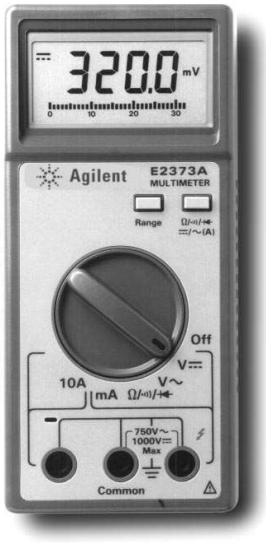
Accessories

34300A	40 kV ac/dc high voltage probe
34301A	700 MHz RF detector probe
34302A	Clamp-on ac/dc current probe (100 A)
34330A	30 A current shunt
E2304A	handheld multimeter padded carrying case
E2306A	deluxe test lead kit
E2305A	2 pairs spare test leads
E2301A	surface type-k thremocouple probe[1,2]
E2303A	SMP-to-dual banana plug adapter[2]
E2307A	type-k thermocouple bead temperature probe[2]
E2308A	thermistor temperature probe

[1]Requires E2303A thermocouple probe adapter.
[2]For use with the 973A multimeter only.

Agilent E2373A Handheld Multimeter

Data Sheet



Low-cost multimeter with the basic test capabilities you need

- **dc and ac volts, dc and ac current, resistance, audible continuity, and diode test**
- **Auto or manual ranging**
- **Basic Vdc accuracy of 0.7%**
- **Maximum 1 kV dc, 750 V rms, 10 A**

Basic handheld multimeter provides all-around testing

When low cost is crucial, the Agilent Technologies E2373A handheld multimeter is an ideal tool for troubleshooting and making portable basic measurements. This versatile multimeter measures dc and ac volts, dc and ac current, resistance, and provides diode test and audible continuity. With basic Vdc accuracy of 0.7 percent and a choice of auto or manual ranging, this low-cost meter is an excellent choice for measurements in the field or in the lab.

Easy to use

The 2373A features a large 3½ digit display (0.85 in./22 mm high LCD) as well as a trend-indicating analog bar graph that's great for observing peaks. Other features that make it easy to use include a convenient tilt stand and autoranging. The unit is powered by two AA batteries which typically last for 2,500 hours of use.

Display annunciators are included for all functions as well as for low battery indication, overload conditions, and range hold.

3-year warranty

The E2373A multimeter is warranted for a full three years. The unit comes with test leads, batteries, a spare fuse (0.5A/250V) and an operating manual.

General Specifications

Features
Large 0.85 in (22mm) display
Autorange or Manual Range
Continuity, and Diode function
Long Battery life
10A range

Display
3 1/2 digit display to 3200 counts
33 segment bargraph with DC zero center.

Calibration
1 yr interval

Sampling, DCV
2 times per second,
Bargraph 12/sec

Operating Temperature
0° C to 40° C (32° F to 104° F)
20-80% RH, 0° C - 40° C

Storage Temperature
20-70% R.H. -20° C to 40° C
and no condensation

Battery
2 x 1.5 V, AA size

Battery life (typical)
2500hrs

Size
3 in W x 6.5 in H x 1.3 in D
76mm W x 164mm H x 33mm D

Weight
240 g approx.

Accessories supplied
1 pair test leads, multi language manual, batteries installed, 500 mA spare fuse

Warranty
3 years

Specifications

23° C±5 °C, <80% RH, accuracy ± (% of reading + number of digits)
Temperature Coefficient: specified accuracy x 0.1/° C (0-18° C, 28-40° C)

DC Voltage

Range	Resolution	Accuracy	Input Resistance	Maximum Input
300 mV	100 µV	0.5% + 2	>1000 MΩ	
4 mV	1 mV	0.7% + 1	11 MΩ	
40 V	10 mV	0.7% + 1	10 MΩ	
400V	100 mV	0.7% + 1	10 MΩ	
1000 V	1V	0.7% + 1	10 MΩ	

AC Voltage, average responding

Range	Resolution	Accuracy	Input Resistance	Max Input
3 V	1 mV	1.2% + 4	1 MΩ < 50 pF	± 1000 Vdc or 750 Vrms
30 V	10 mV	1.2% + 4	10 MΩ < 50 pF	
300 V	100 mV	1.2% + 4	10 MΩ < 50 pF	
750 V	1 V	1.2% + 4	10 MΩ < 50 pF	

Current, AC, DC

Range	Resolution	DC	AC 40-500 Hz	Burden Voltage	Maximum Input
30 mA	10 µA	1.0% + 2	2.0% + 5	<0.25V <2.5V	0.5A; 500 mA/250 Volt fuse
300 mA	100 µA	1.5% + 2	2.0% + 5		0.5A; 500 mA/250 Volt fuse
10 A	10 mA			<0.6V	10A (unfused)

Resistance

Range	Resolution	Accuracy	Maximum Test Current	Test Voltage	Input Protection
300 Ω	100 mΩ	0.7% + 2	<0.7 mA		
3 kΩ	1 Ω	0.7% + 1	<130 µA		
30 kΩ	10 Ω	0.7% + 1	<13 µA	<1.3 V	250 Vrms
300 kΩ	100 Ω	0.7% + 1	<1.3 µA		
3 MΩ	1 kΩ	1.5% + 1	<130 nA		
30 MΩ	10 kΩ	3% + 1	<130 nA		

Diode Test

Test current:	0.6 mA nominal @ 0.6V, <3.3V
Display:	0-2V, 1 mV resolution
Accuracy:	3% + 2

Continuity (audible)

Test current:	0.8 mA nominal @ 0.6V, <1.3V
Display:	0-320 Ω, 0.1 Ω resolution, threshold <20 Ω

Ordering Information

E2373A Handheld Multimeter
Comes with alkaline batteries, spare fuse, operating manual and test leads.

Options
Opt. W50 Additional 2-year warranty (5-year total)

Accessories
11060A Surface Mount Device (SMD) test probes
E2304A handheld multimeter padded carrying case
E2305A 2 pairs spare test leads
E2306A deluxe test lead kit

Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

"Our Promise" means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

"Your Advantage" means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

By internet, phone, or fax, get assistance with all your test and measurement needs.

Online Assistance

www.agilent.com/find/assist

Phone or Fax

United States:
(tel) 1 800 452 4844

Canada:
(tel) 1 877 894 4414
(fax) (905) 206 4120

Europe:
(tel) (31 20) 547 2323
(fax) (31 20) 547 2390

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Latin America:
(tel) (305) 267 4245
(fax) (305) 267 4286

Australia:
(tel) 1 800 629 485
(fax) (61 3) 9272 0749

New Zealand:
(tel) 0 800 738 378
(fax) (64 4) 495 8950

Asia Pacific:
(tel) (852) 3197 7777
(fax) (852) 2506 9284

Product specifications and descriptions in this document subject to change without notice.

Printed in U.S.A. 5/00
5967-6368EN

Agilent Technologies

Innovating the HP Way