

# Keysight Technologies

## E4980A Precision LCR Meter

20 Hz to 2 MHz

An industry standard  
LCR meter



## An Industry Standard LCR Meter

Keysight Technologies' E4980A precision LCR meter provides the best combination of accuracy, speed, and versatility for a wide range of component measurements. Offering fast measurement speed and

outstanding performance at both low and high impedance ranges, the E4980A is the ultimate tool for general R&D and manufacturing test of components and materials.

### Fast measurement speed

The E4980A offers excellent speed:

- 5.6 ms (SHORT)<sup>2</sup>
- 88 ms (MED)<sup>2</sup>
- 220 ms (LONG)<sup>2</sup>

### Accurate measurements

Exceptionally low noise at both low and high impedance for evaluating the characteristics of inductors and capacitors with excellent accuracy and repeatability.

- 0.05% basic impedance accuracy
- 1/2/4m cable extension capability
- Open/Short/Load correction

### High-resolution LCD display

Full, 7-digit display and 6 display modes for clear and easy viewing.

### Simple and intuitive operation

Easily configure measurements with soft keys (same interface as Keysight's 4284A LCR), one-touch front panel keys and an intuitive user interface.

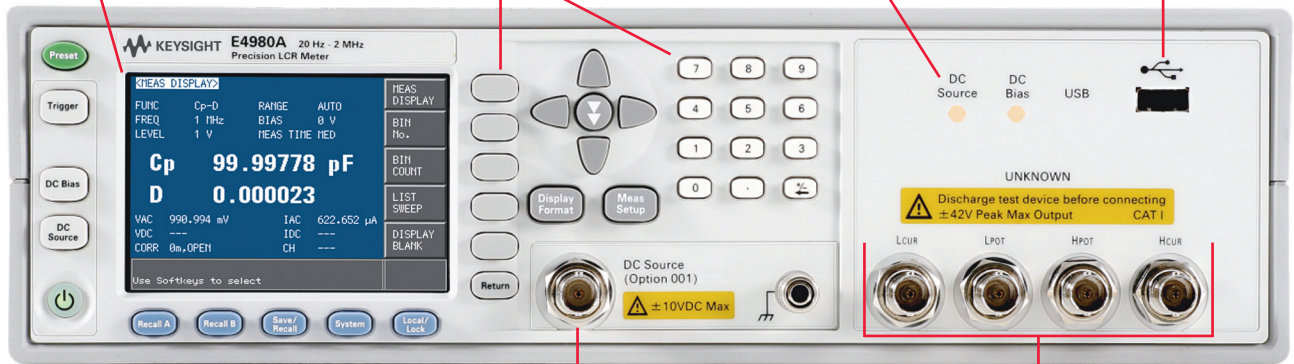
### LED status lights

Conveniently view DC bias, DC source, and USB memory status.

### USB interface

(memory devices only)

Easily save measurement states, data logs, and screen captures to USB memory devices.



### DC source<sup>1</sup>

Low noise DC source port provides more measurement flexibility. The DC source enables a one-box solution, making an additional DC source or multimeter unnecessary.

- 0 to  $\pm 10$  V<sup>1</sup>

### 100 $\mu$ V to 2 Vrms/20 Vrms<sup>1</sup> variable test signals

Provides high signal levels to evaluate the AC voltage characteristics of your devices.

### DC bias

Built-in, wide, DC-voltage-bias-range source provides accurate bias dependency evaluation for semiconductor wafer, C, L, and material measurements.

- 1.5 V and 2 V (standard)
- 0 to  $\pm 40$  V<sup>1</sup>
- Auto bias polarity control<sup>1</sup>

1. Option E4980A-001 required.

2. Measurement time at 1 MHz. Supplemental information. For additional details, refer to the E4980A/E4980AL data sheet (literature number 5989-4435EN).

## Key Features

### Accurate measurements

Exceptionally low noise at both low and high impedance to improve test quality.

- 0.05 % basic impedance accuracy
- Open/Short/Load compensation support
- Cable extension (1/2/4m) support

### Fast measurement speed<sup>1</sup>

Fast speed provides more throughput reducing cost of test.

- 5.6 ms (SHORT)
- 88 ms (MED)
- 220 ms (LONG)

### Measurement versatility

- 20 Hz to 2 MHz test frequency with 4-digit resolution at any frequency
- 16 impedance parameters
- 100  $\mu$ V to 2 Vrms, 1  $\mu$ A to 20 mA
- variable test signal
- Auto-level control
- 201 points of programmable list sweep

### Option E4980A-001 power and DC bias enhancement

- 0 to 20 Vrms/100 mArms test signal
- Built-in 40 V DC bias with 0.3 mV resolution
- Built-in 10 V DC source
- DC resistance, DC current, and DC voltage measurement capability

### Compact and light weight

Small size for easy transportation

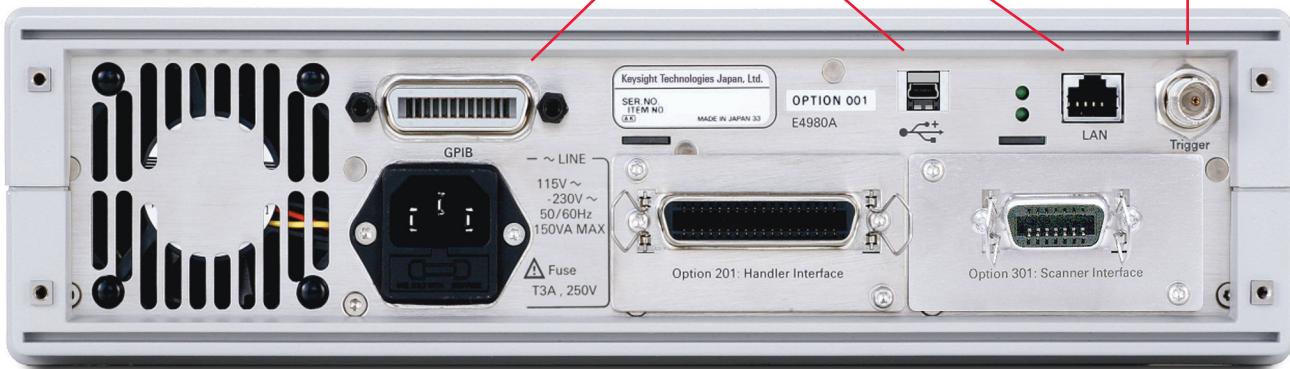
- 370 (W) x 105 (H) x 390 (D) mm
- 5.3 kg (11.7 lb.)

### Standard LAN/USB/GPIB interface

Flexible PC connectivity and fast transfer speed

- 10/100 Base-T LAN
- USB (USBTMC) interface
- GPIB for robust instrument control and test automation

### External trigger



### Optional handler and scanner interface

Two interface options to choose from:

- Handler interface with 9 BIN outputs (Option E4980A-201)
- Scanner interface with 128 multi-channel corre (Option E4980A-301)



1. Measurement time at 1 MHz. Supplemental information. For additional details, refer to the E4980A data sheet (literature number 5989-4435EN).

## Accurate, Fast Measurements up to 2 MHz

### Accurate measurements provide design and test confidence

#### Broad range impedance measurements

The E4980A LCR meter offers excellent performance for all impedance measurements.

Reliable measurement performance is needed to meet the test requirements of today's latest devices. Only the E4980A offers fast measurement speed and outstanding performance within "both" low and high impedance ranges with exceptional dissipation factor accuracy.

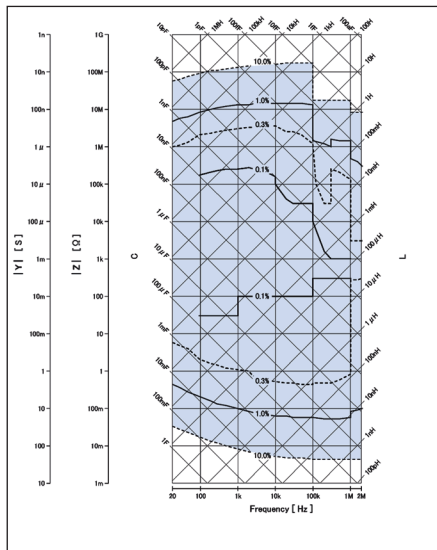


Figure 1. 10% impedance measurement accuracy range. Test signal 1 Vrms, MED mode, cable 0m.

#### Stable small ESR/low impedance measurements

The equivalent series resistance (ESR) of capacitors is becoming smaller and smaller to meet high-speed and low power-consumption circuit needs; and is difficult to measure. The E4980A provides exceptional measurement stability.

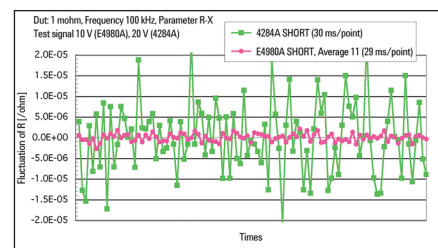


Figure 2. Low impedance evaluation (1 mΩ at 100 kHz).

#### Exceptionally accurate, high impedance measurements

The capacitance values of chip-capacitors and semiconductor wafers are now down to femto-farad (fF) range. Thus, very stable and accurate high impedance measurements are required for higher yields and design reliability. Surpassing Keysight's previous industry-standard LCR meter (4284A), the E4980A further improves measurement stability for these small capacitance devices.

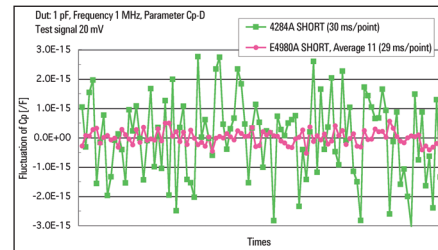


Figure 3. High impedance evaluation (1 pF at 1 MHz).

### Offering the industry's best combination of speed and accuracy

#### Fast measurement speed for more throughput in manufacturing

- 5.6 ms per point at 1 MHz with SHORT mode<sup>1</sup>
- 88 ms per point at 1 MHz with MED mode<sup>1</sup>
- 220 ms per point at 1 MHz with LONG mode<sup>1</sup>

#### Average function (up to 999)

Enables users to improve measurement repeatability.

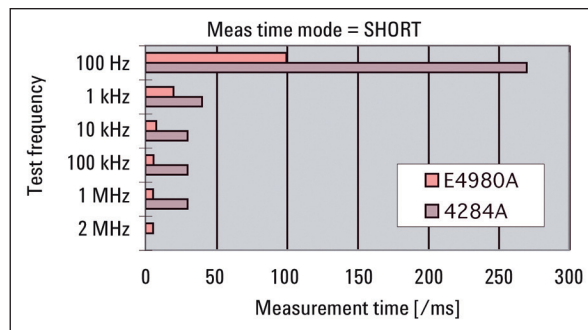


Figure 4. Measurement time<sup>1</sup>: standard E4980A LCR vs. 4284A LCR.

1. Measurement time at 1 MHz. Supplemental information. For additional details, refer to the E4980A data sheet (literature number 5989-4435EN).

# Versatile Measurement Capability to Meet your Application Needs

Powerful features increase test reliability and efficiency



Figure 5. Select one of six display modes

Six convenient display modes  
Select one of six display modes to suit your particular measurement needs.

- Normal view for a data overview
- Large display view for enhanced readability
- BIN No. view for measurement comparison and device sorting
- BIN count view for statistical evaluation
- LIST sweep view for continuous data
- Blank page view for ultimate speed (Turns off display to save refresh time.)

## 201 points list sweep

Frequency, measurement range, and stimulus conditions, can be set as list parameters (max 201 points). You can choose two parameters independently to test under a variety of measurement conditions.

## DC resistance measurement

For inductor measurement, Ls or Lp and Rdc parameters can be measured at the same time.

## E4980A power and DC bias enhancement (Option E4980A-001)

20 Vrms test signal (Opt. 001)

A powerful AC test signal provides up to 20 Vrms, 100 mArms (maximum). This allows you to evaluate AC level dependency without an external amplifier.

DC parameter measurement (Opt. 001)

Simultaneously measure DC voltage and DC current as well as impedance. Leakage current measurements are available for capacitance evaluation.

40 V DC bias (Opt. 001)

Built-in, wide range ( $\pm 40$  Vdc/100 mA) DC bias source enables accurate DC bias verses impedance evaluation.

DC source (Opt. 001)

Provides an additional, independent DC source port to expand the flexibility of DC control and bias applications. For example, this option enables measurement of three terminal devices, allowing you to control your DUT, add extra bias, and control additional devices at the same time.

<LIST SWEEP DISPLAY>					PREV PAGE
MODE	SEQ				NEXT PAGE
No.	FREQ[Hz]	Cp[F]	D[-]	CHP	
191	119.1 k	999.442 f	2.02263 m		
192	119.2 k	999.434 f	2.06183 m		
193	119.3 k	999.486 f	2.04843 m		
194	119.4 k	999.476 f	2.01826 m		
195	119.5 k	999.497 f	2.02726 m		
196	119.6 k	999.466 f	2.00342 m		
197	119.7 k	999.477 f	2.07176 m		
198	119.8 k	999.496 f	2.08966 m		
199	119.9 k	999.488 f	2.04773 m		
200	120 k	999.457 f	2.02296 m		

Use Softkeys to select

Figure 6. List sweep mode

<MEAS DISPLAY>				MEAS DISPLAY
FUNC	Rs-Rdc	RANGE	AUTO	BIN
FREQ	1 MHz	BIAS	0 V	No.
LEVEL	1 V	MEAS TIME	MED	BIN COUNT
<b>Ls</b>		<b>5.631952 nH</b>		LIST SWEEP
<b>Rdc</b>		<b>100.4456 mΩ</b>		DISPLAY BLANK
VAC	1.10536 mV	IAC	10.0482 mA	
VDC	---	IDC	---	
CORR	0m, OPEN	CH	---	

Use Softkeys to select

Figure 7. DCR measurement

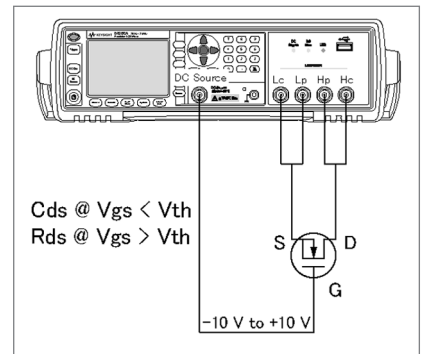


Figure 9. Measurement using DC source

<MEAS DISPLAY>				MEAS DISPLAY
FUNC	Vdc-Idc	RANGE	AUTO	BIN
FREQ	1 MHz	BIAS	1 V	No.
LEVEL	1 V	MEAS TIME	MED	BIN COUNT
<b>Vdc</b>		<b>2.828286 mV</b>		LIST SWEEP
<b>Idc</b>		<b>9.995973 mA</b>		DISPLAY BLANK
VAC	---	IAC	---	
VDC	2.82829 mV	IDC	9.99597 mA	
CORR	0m, OPEN	CH	---	

Use Softkeys to select

Figure 8. Vdc Idc measurements

## Exceeding Expectations in Productivity

### Support for a large variety of test fixtures

The E4980A can be used with over twenty fixtures to meet a variety of evaluation needs; from materials to SMD components. Also, built-in compensation functions minimize the influence of test fixtures.

### USB memory support

The front panel USB memory interface allows you to quickly and easily save state files, measurement log data, and display images to an external USB memory device (mass storage).



Figure 11. Example of use with USB storage device

### PC connectivity

Standard GPIB/LAN/USB control interfaces provide a variety of paths for controlling the instrument. Using a LAN cable, you can even control the E4980A with a computer and Web browser.

### Scanner or handler interface options

The E4980A offers an optically-isolated 9-BIN handler (Option 201) for integration into handler systems. A 128-channel scanner interface (Option 301) facilitates applications requiring a component scanner. Both interfaces have standard compatibility with other LCR system instruments (e.g. 4284A/88A/78A, etc.) for easy integration into systems. The multi-compensation function enables open/short/load compensations to perform scanning measurements independently in each scanner channel. This minimizes inconsistency in measured values between channels for more accurate measurements throughout the scanner system.



Figure 10. The E4980A LCR meter offers support for a wide variety of test fixtures



Figure 12. The E4980A LCR meter can conveniently be controlled over LAN with a computer and a Web browser

## Materials measurements with N1500A measurement suite

The N1500A Option 006 supports the E4980A with the 16451B and 16452A for materials measurements. The N1500A's easy-to-use user interface for calibration, limit test, and report generation functions provide versatility when making materials measurements. The N1500A can run on an external PC.

## Upgradability

Upgrade options such as E4980AU-001 (power and DC bias enhancement), E4980AU-201 (handler interface), E4980AU-301 (scanner interface) allow you to maximize the ROI. Refer to the configuration guide for more details.



## To our 4284A/4279A LCR Users, the E4980A Provides Even Greater Value!

### Enhanced test efficiency

Both the Keysight 4284A Precision LCR Meter and 4279A 1 MHz C-V Meter have long been recognized as industry standard equipment for a wide range of impedance measurement applications.

The E4980A LCR combines fast, accurate measurements with powerful features to enhance your measurement efficiency and make your job easier.

### High compatibility to ease migration

Almost all E4980A functions are compatible with the 4284A and 4279A, enabling users to migrate to the E4980A with ease. For detailed migration information, refer to the technical overview, Migrating from a Keysight 4284A to a Keysight E4980A Precision LCR Meter and Migrating from a Keysight 4279A to a Keysight E4980A Precision LCR Meter available on our Web site. [www.keysight.com/find/E4980A](http://www.keysight.com/find/E4980A)

## Key specifications and function compatibility

	E4980A Precision LCR	4284A Precision LCR	4279A C-V meter
<b>Frequency</b>	20 Hz to MHz	20Hz to 1 KHz	1 MHz
<b>Test signal level</b>	0 to 2 Vrms/0 to 20 mArms 0 to 2 Vrms/0 to 100 mArms <sup>1</sup>	0 to 2 Vrms/0 to 20 mArms 0 to 2 Vrms/0 to 200 mArms <sup>2</sup>	20 m, 50 m, 100 m, 200 m, 500 m, 1 Vms
<b>Auto level control (ALC)</b>	Yes	Yes	No
<b>DC bias capability</b>	Built-in 1.5 V, 2 V ± 40 V <sup>1</sup>	Built-in 1.5 V, 2 V ± 40 V <sup>2</sup>	Built-in ± 38 V External bias input
<b>DC source</b>	± 10 V <sup>1</sup>	No	No
<b>Programmable list sweep</b>	201 points	10 points	51 points
<b>Remote control</b>	GPIB, LAN, USB	GPIB	GPIB
<b>Web browser control</b>	Yes	No	No
<b>Control commands</b>	4284A compatible	4284A unique	4279A unique
<b>Basic accuracy</b>	0.1% @ SHORT 0.05% @ MED/LONG	0.1% @ SHORT 0.05% @ MED/LONG	0.1% @ SHORT
<b>Parameters</b>	Cp-D/Q/G/Rp, Cs-D/Q/Rs, Lp-D/Q/G/Rp, Ls-D/Q/Rs, R-X, Z-∅d/∅r, G-B, Y-∅/∅r Lp-Rdc, Ls-Rdc, Vdc-I <sub>dc</sub> <sup>1</sup>	Cp-D/Q/G/Rp, Cs-D/Q/Rs, Lp-D/Q/G/Rp, Ls-D/Q/Rs, R-X, Z-∅d/∅r, G-B, Y-∅/∅r	C-D/Q/ESR/G
<b>Measurement time mode (SHORT/MED)</b>	Standard model 330 ms/380 ms @ 20 Hz 20 ms/110 ms @ 1 kHz 7.7 ms/92 ms @ 10 kHz 5.7 ms/89 ms @ 100 kHz 5.6 ms/88 ms @ 1 MHz 5.6 ms/88 ms @ 2 MHz  Entry model (E4980A-005) 1040 ms / 1150 ms @ 20 Hz 240 ms / 380 ms @ 100 Hz 37 ms / 200 ms @ 1 kHz 25 ms / 180 ms @ 10 kHz 23 ms / 180 ms @ 100 kHz 23 ms / 180 ms @ 1 MHz 23 ms / 180 ms @ 2 MHz	1500 ms / 1500 ms @ 20 Hz 270 ms / 400 ms @ 100 Hz 40 ms / 190 ms @ 1 kHz 30 ms / 180 ms @ 10 kHz 30 ms / 180 ms @ 100 kHz 30 ms / 180 ms @ 1 MHz	10 ms @ 1 MHz (List sweep mode, bias ON)
<b>Storage devices</b>	Internal/USB memory	Internal/memory card	Internal
<b>Cable lengths</b>	0, 1, 2, 4, m	0, 1, 1 <sup>3</sup> , 4 <sup>3</sup> , m	0, 1, 2, m
<b>Cabinet dimensions (mm)</b>	370 (W) x 105 (H) x 390 (D) mm	426 (W) x 177 (H) x 498 (D) mm	426 (W) x 177 (H) x 498 (D) mm
<b>Weight</b>	5.3 kg	15 kg	15 kg

1. Option E4980A-001 required. 2. Option 4284A-001 required. 3. Option 4284A-006 required.

## Ordering Information

**E4980A** Precision LCR Meter, 20 Hz to 2 MHz (ultimate accuracy and speed)

**E4980A-005** Entry Model Precision LCR Meter, 20 Hz to 2 MHz (same accuracy, less speed)

### Power and DC bias enhancement option

**E4980A-001** Power and DC bias enhancement

### DCR measurement option (mandatory)

**E4980A-200** DCR measurement

### Interface options

**E4980A-710** No interface

**E4980A-201** Handler interface

**E4980A-301** Scanner interface

### Additional options

**E4980A-ABA** Add hardcopy user's guide (English)

**E4980A-ABJ** Add hardcopy users guide (Japanese)

**E4980A-1A7** Add ISO 17025 compliant calibration

**E4980A-1CM<sup>1</sup>** Add rack mount kit

## Power/DC bias related options (select one of two options below)

Features	E4980A Standard model	E4980A-001 Power and DC bias enhancement
<b>AC test signal</b>	0 to 2 Vrms, 20 mArms	0 to 2 Vrms, 20 mArms
<b>DC bias</b>	1.5 V and 2 V	0 to $\pm 40$ V, $\pm 100$ mA
<b>DC Source</b>	-	Yes ( 0 to $\pm 10$ V)
<b>DCR/DCI/DCV measurement</b>	-	Yes
<b>Auto bias polarity control</b>	-	Yes

## Interface related options (select two of three options below)<sup>2</sup>

Options	E4980A-710 No Interface	E4980A-201 Handler interface	E4980A-301 Scanner interface
<b>Function</b>	Blank panel	Enables connection to handler system	Enables connection to scanner system

## Web Resources

Visit our E4980A Web site for additional product information and literature.  
[www.keysight.com/find/E4980A](http://www.keysight.com/find/E4980A)

LCR meters & Impedance Measurement Products  
[www.keysight.com/find/impedance](http://www.keysight.com/find/impedance)

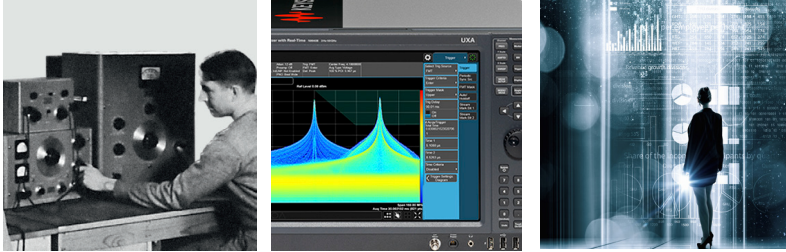
1. A carrying handle is included with the standard option.
2. Two interface slots on the rear panel must be filled by selecting two different interface options: E4980A, -201, -301 and -710. However, if only a GPIB interface is required, two blank panels



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For other unlisted countries:

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Published in USA, February 12, 2018  
5989-4235EN  
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