

Keysight Technologies

E4981A Capacitance Meter

Setting a new standard for ceramic capacitor production tests



A New Standard for Ceramic Capacitor Production Tests

The Keysight Technologies, Inc. E4981A capacitance meter provides the best performance for

ceramic capacitor manufacturing test. Offering fast measurement speed and outstanding accuracy, the E4981A is the new standard in this industry.

High-resolution LCD display

Full 7 digit display for clear and easy viewing

Easy-to-use hardkeys and softkeys

Users can set the measurement parameters easily.

USB interface (USB memory device only)

Users can save measurement state data logs, and screen captures easily to USB memory devices.



Compact size

Small size to fit in an auto handler system

- 370 (W) x 105 (H) x 350 (D) mm (with front handle kit)
- 4.3 kg

Wide range capacitance measurement

From small to large capacitance can be measured

A Complete Solution that Replaces the 4268A and 4288A

Key Features

Fast measurement speed – 2 ms

(From trigger to EOM at 1 MHz)

Accurate and repeatable measurements

- Basic accuracy
Capacitance: $\pm 0.07\%$ (typical $\pm 0.042\%$)
Dissipation Factor: ± 0.0005 (typical ± 0.0003)
- Repeatable measurements, even small capacitance can be measured.

Wide measurement range from small to large capacitance

0 F to 2.0 mF

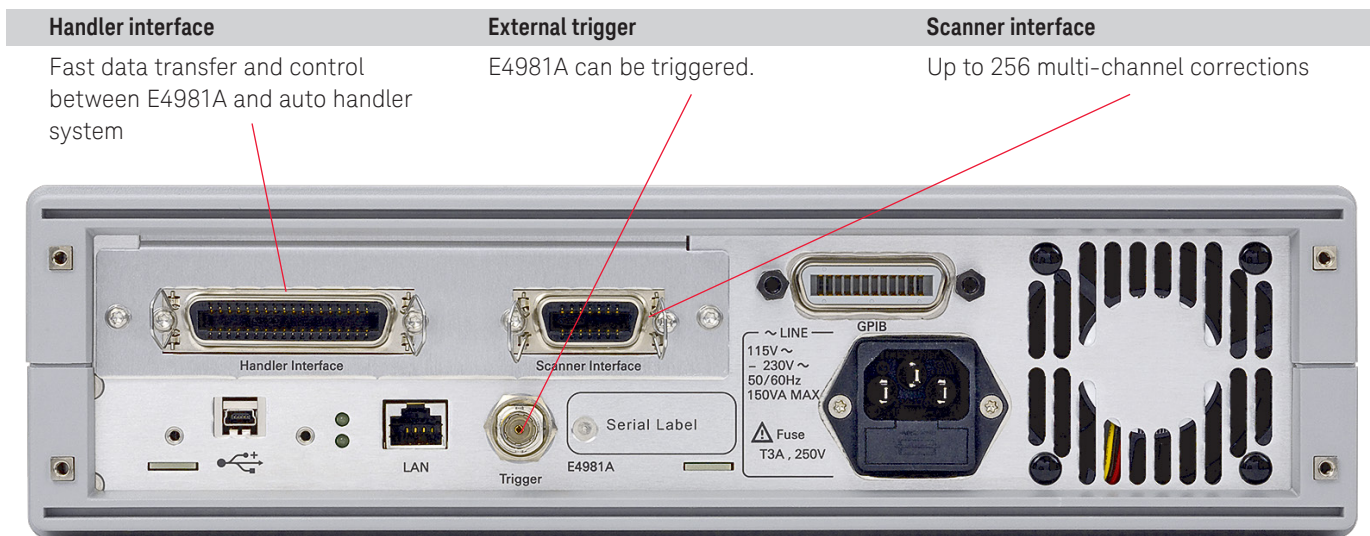
- (0 F to 1.5 nF/1 MHz)
- (68 pF to 200 nF/1 kHz)
- (6.8 nF to 2 mF/120 Hz)

Compatibility with the 4268A and 4288A

- SCPI commands
- Handler I/F
- Scanner I/F

Enhanced functions for production test

- Enhanced contact failure detections
- Synchronous source
- Frequency shift ($\pm 1\%$, $\pm 2\%$) at 1 MHz
- Faster data transfer



Handler interface

Fast data transfer and control between E4981A and auto handler system

External trigger

E4981A can be triggered.

Scanner interface

Up to 256 multi-channel corrections

Standard USB/LAN/GPIB interface

Flexible PC connectivity and fast transfer speed

- 10/100 Base-T LAN
- USB (USBTMC) interface
- GPIB

Fast, Accurate, and Repeatable Measurement

Faster measurement speed

- More than two times faster measurement speed than the 4268A and 4288A
- No additional time for bin-sorting, scanner and synchronous source

| Frequency | T1 | T2 (1*) | | T3 (Trigger wait time) | 4268A T2 | 4288A T2 |
|-----------|---------|------------------------|---------|---------------------------|-------------|-------------|
| | | Status register update | | | | |
| | | On | Off | | | |
| 1 MHz | 1.3 ms | 2.3 ms | 2.0 ms | 0 ms | NA | 6.5 ms |
| 1 kHz | 2.0 ms | 3.0 ms | 2.7 ms | | 22.5 ms | 6.5 ms |
| 120 Hz | 10.0 ms | 11.0 ms | 10.7 ms | | 22.5 ms | NA |

*1 tolerance is ± 0.5 ms

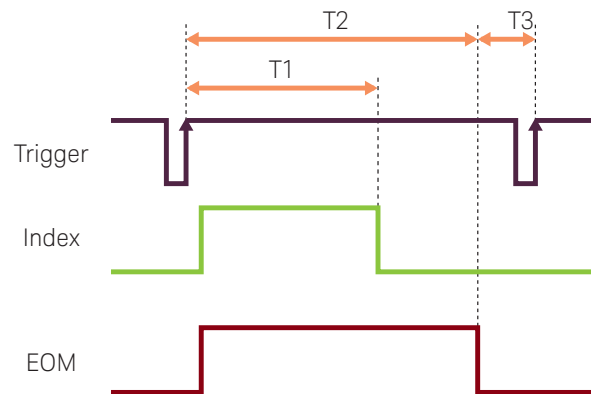


Figure 1. Measurement speed

Repeatable measurements

- Smaller fluctuation, especially in 1 pF range measurement.

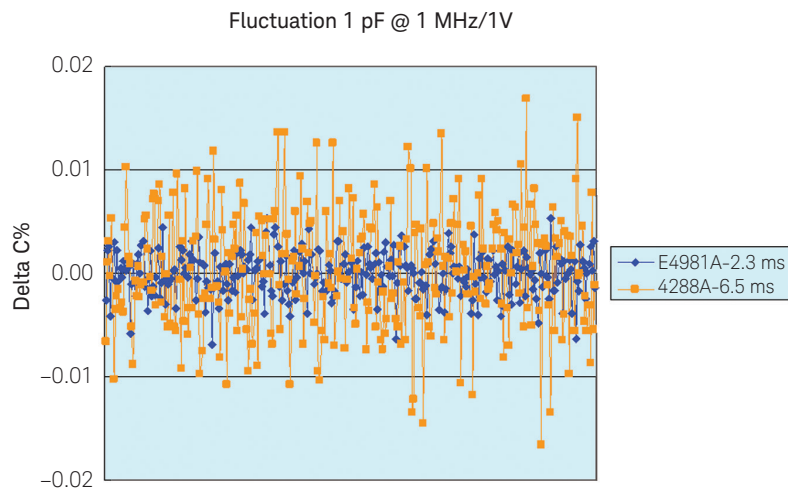


Figure 2. Measurement fluctuation comparison (Supplemental information)

Increased accuracy

Accurate capacitance measurement across all frequencies.

| Range | Measurement speed | | |
|----------------|--|--|---------|
| | 1 MHz | 2.3 ms | 9.3 ms |
| 1 pF | C: $0.055 + 0.070 \times K$ D: $0.00035 + 0.00070 \times K$ | C: $0.055 + 0.030 \times K$ D: $0.00035 + 0.00030 \times K$ | |
| 2.2 pF | C: $0.055 + 0.045 \times K$ D: $0.00035 + 0.00045 \times K$ | C: $0.055 + 0.020 \times K$ D: $0.00035 + 0.00020 \times K$ | |
| 4.7 pF - 1 nF | C: $0.055 + 0.030 \times K$ D: $0.00035 + 0.00030 \times K$ | C: $0.055 + 0.015 \times K$ D: $0.00035 + 0.00015 \times K$ | |
| | 1 KHz | 3.0 ms | 10 ms |
| 100 pF | C: $0.055 + 0.070 \times K$ D: $0.00035 + 0.00070 \times K$ | C: $0.055 + 0.030 \times K$ D: $0.00035 + 0.00030 \times K$ | |
| 220 pF | C: $0.055 + 0.045 \times K$ D: $0.00035 + 0.00045 \times K$ | C: $0.055 + 0.020 \times K$ D: $0.00035 + 0.00020 \times K$ | |
| 470 pF - 10 uF | C: $0.055 + 0.030 \times K$ D: $0.00035 + 0.00030 \times K$ | C: $0.055 + 0.015 \times K$ D: $0.00035 + 0.00015 \times K$ | |
| | C: $0.4 + 0.060 \times K$ D: $0.004 + 0.00060 \times K$ | C: $0.4 + 0.030 \times K$ D: $0.004 + 0.00030 \times K$ | |
| | 120 Hz | 11.0 ms | 69.1 ms |
| 10 uF - 100 uF | C: $0.055 + 0.030 \times K$ D: $0.00035 + 0.00030 \times K$ | C: $0.055 + 0.015 \times K$ D: $0.00035 + 0.00015 \times K$ | |
| 220 uF - 1 mF | C: $0.4 + 0.060 \times K$ D: $0.004 + 0.00060 \times K$ | C: $0.4 + 0.030 \times K$ D: $0.004 + 0.00030 \times K$ | |

$K = 1/V_s \times Cr/C_x$

V_s : Signal level

Cr: Measurement range

Cx: Measured value

Useful Functions for Production Test

Bin sorting

- Up to 9 bins for C-D/Q/R/G pass/fail

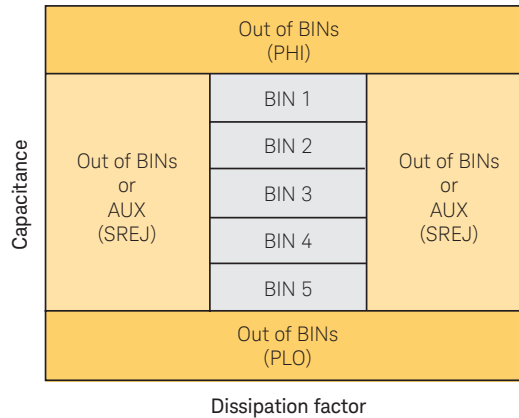


Figure 3. Bin sorting

Scanner interface

- Open/Short/Load channel-by-channel error correction up to 256 channels

Contact check function

The contact check function permits detection of possible contact failure. No additional time is required to perform it.

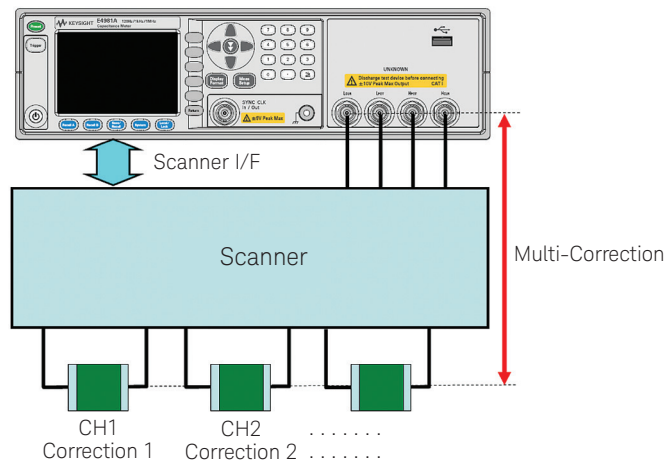


Figure 4. Scanner interface

Synchronous source

The test signal can be applied while a measurement is performed. This function reduces contact pin abrasion due to large test current, because the test signal is not applied at the moment the device is contacted and removed.

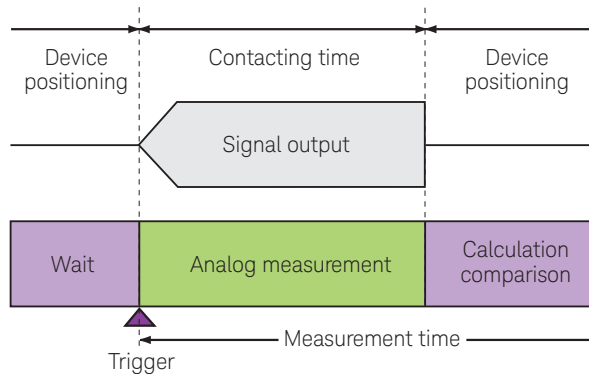


Figure 5. Synchronous source

Faster data transfer

- Faster GPIB/USB data transfer

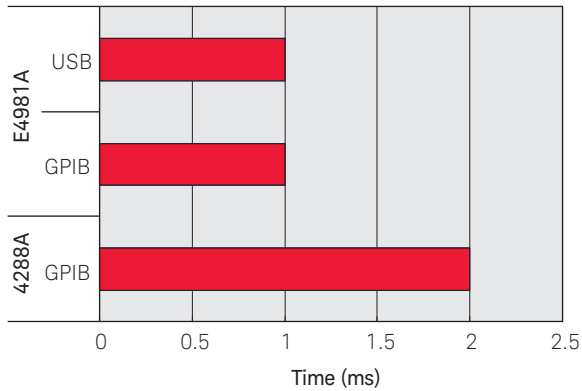


Figure 6. Data transfer speed comparison (4288A vs. E4981A)

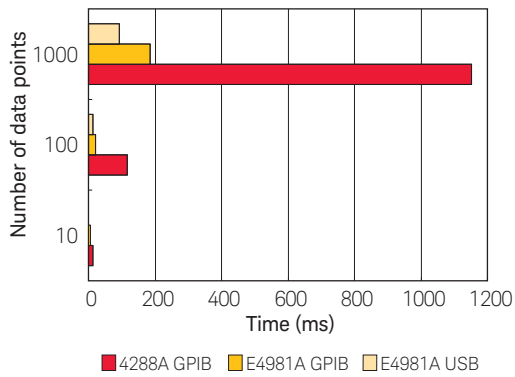


Figure 7. Buffered data transfer speed comparison (4288A vs. E4981A)

Test frequency shift at 1 MHz

- Frequency shift -2%, -1%, +1% and +2% is available. When two or more capacitance meters are needed to integrate into an auto handler system, such as the array-type capacitor test system, this function eliminates the interference between adjacent measurement terminals. The fluctuation in measurements can be reduced.

Modern Storage Device and PC Connectivity

Measurement setup/data save

- 10 measurement setups can be saved in internal memory and external USB memory
- Measurement result log can be saved in an external USB memory



Figure 9. USB memory

PC connection

- GPIB/LAN/USB Interfaces are standard
- Interactive remote operation using web browser through LAN is available.



Figure 10. Interactive remote operation using web browser

The E4981A Provides Even Greater Value

Not only does the E4981A provide increased performance, transitioning to the E4981A is seamless as the 4268A and 4288A functions and SCPI commands are compatible with the E4981A. For detailed migration information, refer to the migration guide available on our web site.

Key specification and function compatibility

| Item | E4981A | 4288A | 4268A |
|--------------------------------------|--|-------------------------------|-------------------------------|
| Measurement parameter | Cs-D, Cs-Q, Cs-Rs Cp-D, Cp-Q, Cp-Rp, Cp-G | <— | <— |
| Frequency | 120 Hz, 1 kHz, 1 MHz | 1 kHz, 1 MHz | 120 Hz, 1 kHz |
| Frequency shift @ 1 MHz | 2%, 1%, -1%, -2% | 2%, 1%, -1% | NA |
| Sync source | Yes | No | Yes |
| Signal level | 0.1 V to 1 V | <— | <— |
| Measurement time (Trigger to EOM) | 2.3/3.3/5.3/7.3/9.3 ms @ 1 MHz 3.0/4.0/6.0/8.0/10.0 @ 1 kHz 11.0/19.3/35.9/52.5/69.1 ms @ 120 Hz | 6.5/16.5 ms @ 1 k/1 MHz | 22.5/40.5/56.5 ms @ 120/1 kHz |
| Measurement accuracy | | | |
| 120 Hz (@ 100 uF, 0.5 V) | C: 0.085%, D: 0.00065 | | C: 0.440%, D: 0.0018 |
| 1 kHz (@ 10 nF, 1 V) | C: 0.07%, D: 0.0005 | C: 0.07%, D: 0.0005 | C: 0.440%, D: 0.0018 |
| 1 MHz (@ 10 pF, 1 V) | C: 0.07%, D: 0.0005 | C: 0.07%, D: 0.0005 | |
| Compensation | OPEN/SHORT/LOAD | <— | <— |
| Multi-compensation | Yes | <— | <— |
| Contact check function | Yes | No | Yes |
| Cable length | 0 m, 1 m, 2 m | <— | <— |
| Comparator | 9 bin | <— | <— |
| Interface | GPIB, USB, LAN | GPIB | GPIB |
| Handler F | Yes | Yes | Yes |
| Scanner F | Yes (256ch) | Yes (64ch) | Option (64ch) |
| Resume function | No (auto recall is available) | Yes | Yes |
| Size | 320 (W) x 90 (H) x 374 (D) mm (without handle/front rear bumper) | 320 (W) x 90 (H) x 300 (D) mm | 320 (W) x 90 (H) x 422 (D) mm |

Ordering information

E4981A Capacitance Meter

Frequency Option

E4981A-001 120 Hz/1 kHz/1 MHz
E4981A-002 120 Hz/1 kHz

Additional Option

E4981A-ABA Add hardcopy user's guide (English)
E4981A-ABJ Add hardcopy user's guide (Japanese)
E4981A-1CM Rack mounts kit
E4981A-600 Delete front handle kit
E4981A-A6J ANSI Z540 compliant calibration
E4981A-1A7 ISO 17025 compliant calibration

Related Products

The E4980A and E4981A for ceramic capacitor measurement

E4980A Precision LCR Meter

The E4980A Precision LCR meter is equipped with various frequencies, higher signal level and DC bias, and higher capacitance measurement capability.



| Items | E4980A | E4981A |
|--|--|---|
| Frequency | 20 to 2 MHz | 120/1 k/1 MHz |
| Measurement accuracy 1 kHz (@10 nF, 1V) | C: $\pm 0.08\%$ D: ± 0.0006 | C: $\pm 0.07\%$ D: ± 0.0005 |
| Signal level | 0 to 2 Vrms (standard) 0 to 20 Vrms (Option 001) | 0.1 to 1 V |
| DC bias | 0 V/1.5 V/2 V (standard) 0 V to 40 V (Option 001) | None |
| Max measurement speed | 100 Hz: 100 ms 1 kHz: 20 ms 1 MHz: 5.6 ms | 120 Hz: 11 ms 1 kHz: 3 ms 1 MHz: 2.3 ms |

Web Resources

Visit our E4981A web site for additional product information and literature.
www.keysight.com/find/E4981A

LCR meters
www.keysight.com/find/lcrmeters

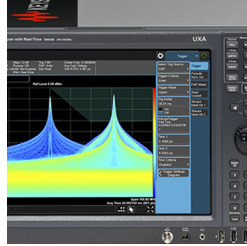
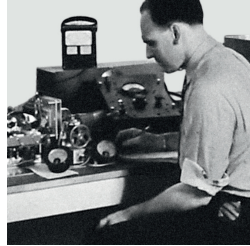
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1939



THE FUTURE

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