

HP 4279A 1MHz C-V Meter

Product Overview



- Measurement Time: 10ms/20ms/30ms
- Measurement Accuracy: 0.1% (20ms)
- Internal DC Bias: 0–±38V, 0.1% programmable sweep
- Measurement Range: 0.00001pF to 1280pF

High test throughput and reliability for Semiconductor C-V testing

The HP 4279A 1MHz C-V Meter offers the optimum solution for increasing quality and throughput when measuring the capacitance vs bias voltage characteristics of semiconductors. The HP 4279A measures capacitance over a range of 0.00001pF to 1280.00pF with a basic accuracy of 0.1% and a 6 digit display resolution while sweeping the dc bias voltage. An internal, programmable dc bias sweep source with a 0.1% voltage accuracy throughout the $\pm 38V$ range assures very low measurement error due to bias voltage uncertainty. It makes the HP 4279A ideal for the precise characterization and testing of varactor diodes, MOS diodes, etc. Measurement time can be selected from three modes of 10ms, 20ms and 30ms/meas to maximize productivity. The HP 4279A's very fast ranging and high speed HP-IB data transfer capabilities reduce test time. The automatic bias polarity control feature allows quick selection of the correct polarity bias voltage for the device under test. This new function eases manual testing of samples in incoming/outgoing inspection and provides a simple method of polarity control for automatic test systems.

APPLICATIONS

- C-V measurement for performing doping profile of wafers.
- C-V characterization and sorting of varactor diodes.
- Capacitance testing of rf mixer and switching diodes.
- Testing capacitors with an applied dc bias for incoming inspection.

4279A Key Specifications

Measurement Parameters		C, DF, Q, ESR, G		
Test Frequency		1MHz		
Test Signal Level		20mV, 50mV, 100mV, 200mV, 500mV and 1Vrms		
Measurement Range	C	0.00001 ~ 1280.00pF		
	DF	0.00001 ~ 9.99999(Q displays 1/DF)		
Measurement Accuracy¹		0.1%		
Measurement Time²		10ms(SHORT)/20ms(MEDIUM)/30ms(LONG)		
Test Cable Length		0m, 1m, 2m		
Internal DC Bias³	Voltage	Resolution	Basic Accuracy	
	0 to $\pm 38V$	1mV	$\pm(0.1\% + 1mV)$	
Bias Sweep		51 points max. HP-IB programmable		
Interface		HP-IB		

*Notes:

1. Accuracy specified at ambient temperature of $23C \pm 5C$
2. Measurement time is supplemental performance data (not specified).
3. Resolution and accuracy apply to bias voltage below 4V.

MEASUREMENT DISPLAY OUTPUT

Basic measurement accuracy of 0.1% and 6 digit display resolution.

LARGE LCD DISPLAY

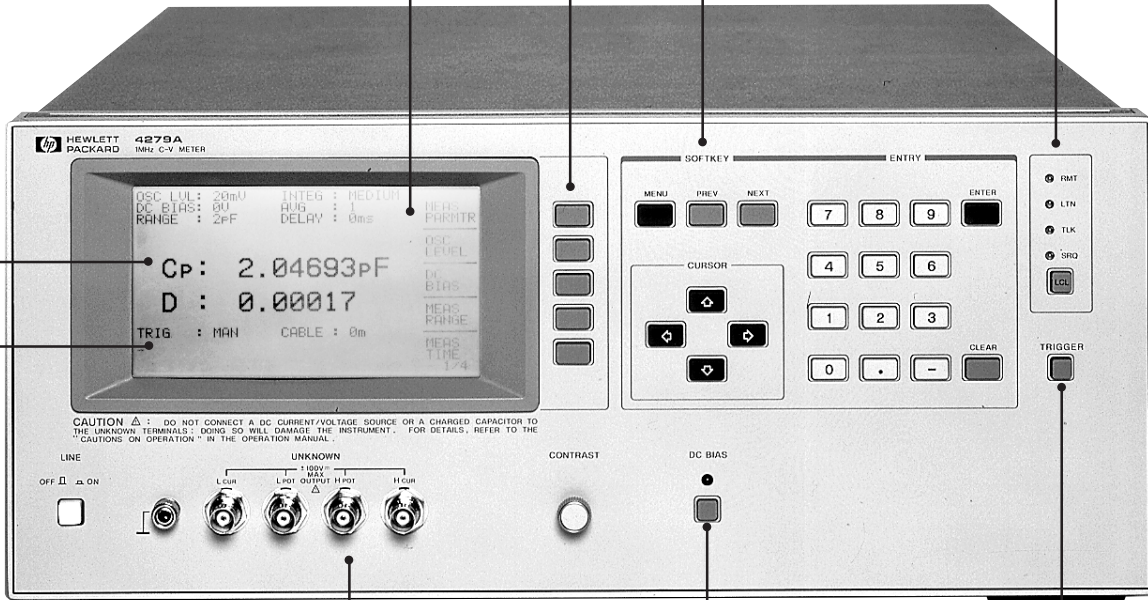
For easy viewing of instrument settings and measurement results.

SOFTKEYS

Softkeys for user friendly, fast and convenient instrument setup.

HP-IB INTERFACE

For high speed data acquisition and instrument control.



MONITOR DISPLAY and SYSTEM MESSAGES

Allows verification of measurement setup and instrument operation.

INTERNAL DS BIAS SWEEP SOURCE

Precise bias voltage sweep with a voltage setting accuracy of 0.1%, is obtained by downloading an HP-IB sweep program. Auto polarity bias eliminates the need of checking the polarity of the DUTs.

0m/1m/2m TEST CABLES, and ERROR COMPENSATION

Enables accurate measurements even on the low capacitance ranges when using test cables. OPEN/SHORT and Standard compensation eliminates measurement errors due to test cabling and fixturing.

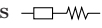

HIGH SPEED MEASUREMENT

Three measurement time modes (10ms/20ms/30ms) allow you to optimize test throughput and accuracy.

SPECIFICATIONS

MEASUREMENT FUNCTION

Parameters measured: C-DF, C-Q, C-ESR, C-G

Measurement circuit modes: series  and parallel 

Ranging modes: Auto, Manual and Program

Measurement terminals: 4-terminal pair

Test cable length: 0, 1, and 2 meters

Integration time: SHORT, MEDIUM and

LONG (refer to supplemental performance data for measurement time)

Trigger: Internal, External and Manual

Trigger delay: programmable delay from the trigger command to the start of the measurement, 0 to 1000ms in 1 ms steps.

Averaging: 1, 2, 4, ..., 128, and 256, programmable

Error-correction: Zero OPEN and SHORT adjustments, offset compensation, and STD compensation (which improves measurement accuracy by using a standard capacitor as a reference.)

• TEST SIGNAL

Test frequency and accuracy: 1MHz, $\pm 0.02\%$

Signal level (unknown terminal open): 20mV, 50mV, 100mV, 200mV, 500mV, and 1Vrms, selectable.

• DISPLAY

LCD Dot-matrix display. Capable of displaying measured values, control settings, self test messages, and annunciations.

Display digits: 4, 5, 6 digits, selectable, maximum display 999999

• HP-IB INTERFACE

Remote control and ASCII or binary data output.

Packed data output when the swept bias measurements are made.

MEASUREMENT RANGE

C	0.00001pF to 1280.00pF
DF	0.00001 to 9.99999
Q	0.1 to 99999.9
ESR	0.001 Ω to 999.999k Ω
G	0.0001 μ S to 9.99999mS

Notes:

- 6 C ranges 2pF to 1024pF full scale. 25% overranging on all ranges, when $DF \leq 0.2$.
- Q displays 1/DF
- ESR and G ranges depend on the capacitance value.

MEASUREMENT ACCURACY

Specified at the UNKNOWN terminals and at the end of the standard 1m or 2m test leads under the following conditions:

- Warm-up time: ≥ 10 minutes
- Ambient temperature is $23 \pm 5^\circ\text{C}$ and short term drift is less than $0.2^\circ\text{C}/\text{minute}$.
- Test cable length is 0,1 or 2 meters (HP 16048A/B/D).
- Zero OPEN/SHORT compensation has been performed.
- $DF \leq 0.2$

Error tolerances double when ambient temperature is within the 5 to 18°C or 28 to 45°C range.

Accuracies are relative to the calibration standards.

• C-DF MEASUREMENT ACCURACY

C RANGE (Cf)	TEST SIGNAL LEVEL		
	20mV	500mV, 1V	
1024pF 512pF 128pF	0.15% + 0.05%	0.1% + 0.05%	
	0.07% + 0.03%		
	0.07% + 0.03%		
0.0004 + 0.0003/ α^*	0.07% + 0.03%		
32pF	0.15% + 0.08%		0.07% + 0.03%
	0.06% + 0.04%		0.07% + 0.03%
	0.07% + 0.03%	0.0004 + 0.0003/ α^*	
8pF	0.15% + 0.15%	0.0004 + 0.0003/ α^*	
	0.06% + 0.08%		
	0.06% + 0.05%		
2pF	0.0004 + 0.0007/ α	0.1% + 0.05%	
	0% + 0.5%	0.06% + 0.04%	
	0% + 0.3%	0.06% + 0.04%	
	0% + 0.2%	0.0005 + 0.0005/ α	
	0.003/ α		

Notes:

- The above accuracy table provides SHORT, MEDIUM and LONG integration accuracy equations.

C	accuracy in SHORT
C	accuracy in MEDIUM
C	accuracy in LONG
DF	accuracy in LONG

- Accuracy equations are read as follows:

C: $\pm(\% \text{ of reading} + \% \text{ of full scale})$

DF: $\pm(\text{absolute DF value})$

$$3. \alpha = \frac{Cx}{Cf}$$

where, Cx is the capacitance reading and Cf is the full scale value of selected capacitance range.

- DF accuracy at 1024pF range is $0.0007 + 0.0003/\alpha$

(contact the nearest HP sales office for more detailed accuracy specifications.)

• MULTI CHANNEL ERROR-CORRECTION:

Zero OPEN/SHORT adjustments and STD compensation for each measurement path (max. 16 channels).

DC BIAS

Internal bias: 0 to $\pm 38\text{V}$

Bias voltage range	Resolution	Accuracy ($23 \pm 5^\circ\text{C}$)
$\pm(0.000 \sim 4.000)\text{V}$	1mV	$\pm(0.1\% \text{ of setting} + 1\text{mV})$
$\pm(4.002 \sim 8.000)\text{V}$	2mV	$\pm(0.1\% \text{ of setting} + 2\text{mV})$
$\pm(8.005 \sim 20.000)\text{V}$	5mV	$\pm(0.1\% \text{ of setting} + 3\text{mV})$
$\pm(20.01 \sim 38.00)\text{V}$	10mV	$\pm(0.1\% \text{ of setting} + 10\text{mV})$

Bias voltage sweep: max. 51 sweep points can be programmed via HP-IB.

Step delay: programmable delay from the step (up or down) in bias voltage to the start of the measurement, 3 to 1000ms in 1ms steps.

External bias: 0 to $\pm 100\text{V}$

• GENERAL

Operating temperature and humidity:

5°C to 45°C , $\leq 95\% \text{ RH}$ at 40°C

Power requirements: 100/120/220V $\pm 10\%$, 240V+5%-10%; 48 to 66Hz; 200VA maximum

Size: 177(H) \times 426(W) \times 498(D)mm

Weight: approximately 15kg

• OPTION

Option 003: 1% test frequency shift.

Prevents possible test signal interference from other 1MHz signal sources.

SUPPLEMENTAL PERFORMANCE CHARACTERISTICS

Measurement time: programmable bias sweep measurement time is given by the following equations when the trigger delay and step delay times are set to the minimum values and the display is set to the BLANK mode.

SHORT: approx. $(3+7.5 \times N)$ ms

MEDIUM: approx. $(3+16 \times N)$ ms

LONG: approx. $(3+28 \times N)$ ms

where, N is the number of bias sweep points.
Includes bias setting time and ranging time.
Measurement display adds 5ms per bias sweep point.

Ranging time: ≤ 3 ms in program mode, ≤ 20 ms/range in auto ranging mode.

Internal bias voltage setting time: ≤ 3 ms to reach 99.9% of bias voltage setting.

Auto bias polarity switching time: ≤ 4 ms after triggered.

ORDERING INFORMATION

HP 4279A 1MHz C-V Meter
Furnished accessory: None

Options:

- Opt 003: 1 % Test Frequency Shift
- Opt 0B0: Delete manual set
- Opt 0B1: Add manual set
- Opt 1BQ: Calibrate to mil standard 45662
- Opt 907: Front Handle Kit
- Opt 908: Rack Mount Kit
- Opt 909: Rack Mount & Front Handle Kit
- Opt ABA: U.S. - English Localization(manual)
- Opt ABJ: Japan - Japanese Localization(manual)
- Opt UK6: Commercial cal. certificate with test data

Accessories:

- HP 16048A: BNC Test Leads (1m)
- HP 16048B: BNC to SMC Test Leads (1m)
- HP 16048D: BNC Test Leads (2m)

For more information, call your local HP sales office listed in your telephone directory or an HP regional office listed below for the location of your nearest sales office.

<http://www.hp.com/go/tmdir>. You can also contact one of the following centers and ask for a test and measurement sales representative.

United States:

Hewlett-Packard Company
Test and Measurement Call Center
P.O. Box 4026
Englewood, CO 80155-4026
1 800 452 4844

Canada:

Hewlett-Packard Canada Ltd.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
(905) 206 4725

Europe:

Hewlett-Packard
European Marketing Centre
P.O. Box 999
1180 AZ Amstelveen
The Netherlands
(31 20) 547 9900

Japan:

Hewlett-Packard Japan Ltd.
Measurement Assistance Center
9-1, Takakura-Cho, Hachioji-Shi,
Tokyo 192, Japan
Tel: (81) 426 56 7832
Fax: (81) 426 56 7840

Latin America:

Hewlett-Packard
Latin American Region Headquarters
5200 Blue Lagoon Drive
9th Floor
Miami, Florida 33126
U.S.A.
Tel: (305) 267-4245
(305) 267-4220
Fax: (305) 267-4288

Australia/New Zealand:

Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
Australia
Tel: 1 800 629 485 (Australia)
0800 738 378 (New Zealand)
Fax: (61 3) 9210 5489

Asia Pacific:

Hewlett-Packard Asia Pacific Ltd.
17-21/F Shell Tower, Times Square,
1 Matheson Street, Causeway Bay,
Hong Kong
Tel: (852) 2599 7777
Fax: (852) 2506 9285