Table 8-3. Specifications (Sheet 1 of 13)

GENERAL

OPERATING ENVIRONMENT:

Temperature: 5°C to 45°C

Relative Humidity: ≤95% RH @ 40°C.
Condensation must be avoided.

STORAGE ENVIRONMENT:

Temperature: -20°C to +60°C

Relative Humidity: ≤95% RH @ 40°C.

SAFETY:

Based on IEC-348, CSA-BULLETIN-556B and UL-1244

POWER REQUIREMENTS:

Line Voltage: 100, 120, and 220VAC ±10%, 240VAC +5% -10%

Line Frequency: 48 to 66Hz

Power Consumption: 200VA max.

DIMENSIONS:

Approximately 426W by 177H by 498D (mm)

WEIGHT:

Approximately 15kg (33lb., standard)

DISPLAY:

Dot-matrix liquid crystal display (LCD). Displays measurement values with a resolution of 4, 5, or 6 digits (max. 999999 counts), front panel control settings, comparator limits, and the comparator's decision output.

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme à la norme NMB-001 du Canada.

Table 8-3. Specifications (Sheet 2 of 13)

BASIC SPECIFICATIONS

PARAMETER MEASURED:

C_P-D, C_P-Q, C_P-G, C_S-D, C_S-Q, and **C_S-ESR**

Where:

C_P is the capacitance in parallel circuit mode
C_S is the capacitance in series circuit mode
D is the dissipation factor
Q is the quality factor (=1/**D**)
G is the conductance in the parallel circuit mode
ESR is equivalent series resistance

MEASUREMENT CIRCUIT MODE:

Parallel equivalent circuit (**C_P-D, C_P-Q,** and **C_P-G**)

Series equivalent circuit (**C_S-D, C_S-Q,** and **C_S-ESR**)

RANGING:

Auto, Manual, and Program

TEST FREQUENCY:

1MHz ±0.02%

TEST SIGNAL LEVEL:

20mV, 50mV, 100mV, 200mV, 500mV, 1000mVrms, ±10% (The test signal is specified when the **UNKNOWN** Terminals are opened.)

MEASUREMENT TERMINAL:

Four-terminal pair, guarded

TEST CABLE LENGTH:

Selection of 0m, 1m, and 2m

COMPENSATION:

Compensation Data Storage:

A maximum of sixteen sets of compensation data can be stored in the 4279A's internal memory. Only one compensation data set can be used per measurement (sweep).

OPEN Compensation:

The open compensation function compensates for the stray admittance of the test fixture.

SHORT Compensation:

The short compensation function compensates for the residual impedance of the test fixture.

Standard Compensation:

The standard compensation function is used to compensate for other errors by using the standard's reference value and the actual measurement value.

Temperature Compensation:

The temperature compensation function is used to minimize the temperature induced measurement error portion of the analog measurement error.

OFFSET FUNCTION:

Arithmetic compensation for measurement offset errors is performed by entering the proper compensation value.

MEASUREMENT TIME MODE:

Integration Time: SHORT, MEDIUM, and LONG

Trigger Delay Time:

The time delay between the trigger and the start of a measurement can be set between 0 to 1000ms, in 1ms steps.

Averaging:

Displays or outputs the averaged value as the measurement data. The choice of averaging rates is -- 1, 2, 4, 8, 16, 32, 64, 128, and 256.

TRIGGER MODE:

Internal, External, and Manual

SELF TEST:

Checks basic instrument operation.

MEASUREMENT RANGE & RESOLUTION:

PARAMETER	Meas. Range		
C_P, C_S	0.00001pF	to	1280.00pF
D	0.00001	to	9.99999
Q	0.1	to	99999.9
G	0.0001μS	to	9.99999mS
ESR	0.001Ω	to	999.999kΩ

Q is displayed as the result of 1/**D**. The **C** ranges apply when **D**≤0.2. The **ESR** and **G** ranges depend on the measured value of **C** . Up to 125% of full scale can be measured at **D**≤0.2.

MEASUREMENT ACCURACY:

Specified at the front panel **UNKNOWN** connectors or at the ends of the standard 1m or 2m test leads when all of the following conditions are satisfied.

(1) Warm up time ≥ 10 minutes

(2) Ambient temperature 23°C ±5°C: rate of temperature change <0.2°C/minute

(3) Test cable length set to 0, 1 or 2m (HP 16048A/B/D)

(4) **OPEN** / **SHORT** compensation and temperature compensation have been performed.

(5) Copen << Cdut

Where Copen: Capacitance of measurement terminal with no connections, before performing the open compensation.

Cdut: Capacitance of the DUT after performing the open/short compensation.

(6) D≤0.1

Accuracies are relative to the calibration standards.

For the temperature range between 5°C and 18°C, or between 28°C and 45°C, the measurement accuracy is given by multiplying the values shown in Table A to D by two.

Table A. **C** Measurement Accuracy

C range (Cf)	OSC level			
	20mV	50mV	100mV	200mV-1V
1024pF 512pF 128pF	0.15%+0.05% 0.07%+0.03% 0.07%+0.03%	0.15%+0.05% 0.07%+0.03% 0.07%+0.03%	0.15%+0.05% 0.07%+0.03% 0.07%+0.03%	0.1%+0.05% 0.07%+0.03% 0.07%+0.03%
32pF	0.15%+0.08% 0.06%+0.04% 0.07%+0.03%			
8pF	0.15%+0.15% 0.06%+0.08% 0.06%+0.05%	0.15%+0.08% 0.06%+0.04% 0.07%+0.03%		
2pF	0%+0.5% 0%+0.3% 0%+0.2%	0%+0.3% 0%+0.15% 0%+0.1%	0%+0.2% 0%+0.1% 0.06%+0.04%	0.1%+0.05%* 0.06%+0.04% 0.06%+0.04%

[1] Accuracy is read as:

C: ±(% of reading + % of full scale)

[2] Accuracies in the table represent: SHORT MODE
MEDIUM MODE
LONG MODE

* Accuracy as follows when set to 2pF range, 200mV, and SHORT mode.

0.1% ÷ 0.07%

Table B. **D** Measurement Accuracy

C range (Cf)	OSC level			
	20mV	50mV	100mV	200mV-1V
1024pF	0.0015+0.0005/α 0.0005+0.0005/α 0.0007+0.0003/α	0.0015+0.0005/α 0.0005+0.0005/α 0.0007+0.0003/α	0.0015+0.0005/α 0.0005+0.0005/α 0.0007+0.0003/α	0.001+0.0005/α 0.0005+0.0005/α 0.0007+0.0003/α
512pF 128pF	0.0015+0.0005/α 0.0005+0.0005/α 0.0004+0.0003/α	0.0015+0.0005/α 0.0005+0.0005/α 0.0004+0.0003/α		
32pF	0.0015+0.0008/α 0.0005+0.0005/α 0.0004+0.0003/α		0.0015+0.0005/α 0.0005+0.0005/α 0.0004+0.0003/α	0.001+0.0005/α 0.0005+0.0005/α 0.0004+0.0003/α
8pF	0.0015+0.0015/α 0.0004+0.0008/α 0.0004+0.0007/α	0.0015+0.0008/α 0.0005+0.0005/α 0.0004+0.0004/α		
2pF	0.007/α 0.005/α 0.003/α	0.005/α 0.002/α 0.0015/α	0.003/α 0.0005+0.001/α 0.0005+0.0005/α	0.001+0.0005/α* 0.0005+0.0005/α 0.0005+0.0005/α

[1] Accuracy is read as:

D: ±(absolute value of **D**)

[2] Accuracies in the table represent: SHORT MODE
MEDIUM MODE
LONG MODE

[3] $\alpha = C_X/C_F$

Where C_X: Reading of **C** (pF)
C_F: Full scale of **C** range (pF)

[4] Accuracy of **Q** is as shown below (when $(Q_X)(D_E) < 1$):

$$\pm \left(\frac{(Q_X{}^2)(D_E)}{1 \mp (Q_X)(D_E)} \right)$$

Where Q_X: Reading of **Q**
D_E: Accuracy of **D**

For example, for the conditions (Q_X: 200, Reading of **C**: 100pF, measurement range: 128pF, and INTEG.TIME: LONG), the accuracy of **Q** is as follows.

$D_E = 0.0004 + 0.0003 \times 128/100 = 0.000784$

Accuracy of **Q** = $\pm \left(\frac{(200)^2 \times 0.000784}{1 \mp 200 \times 0.000784} \right)$

Therefore accuracy of **Q**: +37.2, -27.1

* Accuracy as follows at 2pF range, 200mV, and SHORT mode

$$0.001 + 0.001/\alpha$$

Table C. **ESR** Measurement Accuracy

C range (Cf)	OSC level			
	20mV	50mV	100mV	200mV-1V
1024pF	(239+80/α)/Cx Ω (80+80/α)/Cx Ω (112+48/α)/Cx Ω	(239+80/α)/Cx Ω (80+80/α)/Cx Ω (112+48/α)/Cx Ω	(239+80/α)/Cx Ω (80+80/α)/Cx Ω (112+48/α)/Cx Ω	(160+80/α)/Cx Ω (80+80/α)Cx Ω (112+48/α)/Cx Ω
512pF 128pF	(239+80/α)/Cx Ω (80+80/α)/Cx Ω (64+48/α)/Cx Ω	(239+80/α)/Cx Ω (80+80/α)/Cx Ω (64+48/α)/Cx Ω	(239+80/α)/Cx Ω (80+80/α)/Cx Ω (64+48/α)/Cx Ω	(160+80/α)/Cx Ω (80+80/α)/Cx Ω (64+48/α)/Cx Ω
32pF	(239+128/α)/Cx Ω (80+80/α)/Cx Ω (64+48/α)/Cx Ω			
8pF	(239+239/α)/Cx Ω (64+128/α)/Cx Ω (64+112/α)/Cx Ω	(239+128/α)/Cx Ω (80+80/α)Cx Ω (64+64/α)/Cx Ω		
2pF	2229/Cx^2 Ω 1592/Cx^2 Ω 955/Cx^2 Ω	1592/Cx^2 Ω 637/Cx^2 Ω 478/Cx^2 Ω	955/Cx^2 Ω (80+160/α)/Cx Ω (80+80/α)/Cx Ω	(160+80/α)/Cx Ω* (80+80/α)/Cx Ω (80+80/α)/Cx Ω

[1] Accuracy is read as:

ESR: ±(absolute value of **ESR**)

[2] Accuracies in the table represent:

SHORT MODE
MEDIUM MODE
LONG MODE

[3] $\mathbf{C}_X$: Reading of **C** (pF)
$\mathbf{C}_F$: Full scale of C range (pF)
$\alpha = \mathbf{C}_X/\mathbf{C}_F$

* Accuracy as follows at 2pF range, 200mV, and SHORT mode

$$(160 + 160/\alpha)/\mathbf{C}_X\ \Omega$$

Table D. G Measurement Accuracy

C range (Cf)	OSC level			
	20mV	50mV	100mV	200mV-1V
1024pF	(0.0095Cx+3.22)μS (0.0032Cx+3.22)μS (0.0044Cx+1.93)μS	(0.0095Cx+3.22)μS (0.0032Cx+3.22)μS (0.0044Cx+1.93)μS	(0.0095Cx+3.22)μS (0.0032Cx+3.22)μS (0.0044Cx+3.22)μS	(0.0063Cx+3.22)μS (0.0032Cx+3.22)μS (0.0044Cx+1.93)μS
512pF	(0.0095Cx+1.61)μS (0.0032Cx+1.61)μS (0.0026Cx+0.97)μS	(0.0095Cx+1.61)μS (0.0032Cx+1.61)μS (0.0026Cx+0.97)μS	(0.0095Cx+1.61)μS (0.0032Cx+1.61)μS (0.0026Cx+0.97)μS	(0.0063Cx+1.61)μS (0.0032Cx+1.61)μS (0.0026Cx+0.97)μS
128pF	(0.0095Cx+0.4)μS (0.0032Cx+0.4)μS (0.0026Cx+0.24)μS	(0.0095Cx+0.4)μS (0.0032Cx+0.4)μS (0.0026Cx+0.24)μS	(0.0095Cx+0.4)μS (0.0032Cx+0.4)μS (0.0026Cx+0.24)μS	(0.0063Cx+0.4)μS (0.0032Cx+0.4)μS (0.0026Cx+0.24)μS
32pF	(0.0095Cx+0.16)μS (0.0032Cx+0.1)μS (0.0026Cx+0.06)μS	(0.0095Cx+0.1)μS (0.0032Cx+0.1)μS (0.0026Cx+0.06)μS	(0.0095Cx+0.1)μS (0.0032Cx+0.1)μS (0.0026Cx+0.06)μS	(0.0063Cx+0.1)μS (0.0032Cx+0.1)μS (0.0026Cx+0.06)μS
8pF	(0.0095Cx+0.076)μS (0.0026Cx+0.04)μS (0.0026Cx+0.035)μS	(0.0095Cx+0.04)μS (0.0032Cx+0.025)μS (0.0026Cx+0.02)μS	(0.0095Cx+0.025)μS (0.0032Cx+0.025)μS (0.0026Cx+0.015)μS	(0.0063Cx+0.025)μS (0.0032Cx+0.025)μS (0.0026Cx+0.015)μS
2pF	0.088μS 0.063μS 0.038μS	0.063μS 0.025μS 0.019μS	0.038μS (0.0032Cx+0.0126)μS (0.0032Cx+0.0063)μS	(0.0063Cx+0.0063)μS* (0.0032Cx+0.0063)μS (0.0032Cx+0.0063)μS

[1] Accuracy is read as:

G: ±(absolute value of **G**)

[2] Accuracies in the table represent: SHORT MODE
MEDIUM MODE
LONG MODE

[3] $\mathbf{C}_X$: Reading of **C** (pF)

* Accuracy as follows at 2pF range, 200mV, and SHORT mode

$$(0.0063\mathbf{C}_X + 0.0126)\mu\mathbf{S}$$

DC BIAS:

Internal dc bias: 0V to ±38V

BIAS (V)	Resolution	Accuracy (23±5°C)
±(0.000 to 4.000)V	1mV	±(0.1% of setting + 1mV)
±(4.002 to 8.000)V	2mV	±(0.1% of setting + 2mV)
±(8.005 to 20.000)V	5mV	±(0.1% of setting + 3mV)
±(20.01 to 38.00)V	10mV	±(0.1% of setting + 10mV)

Auto Bias Polarity Control:

This function is used to automatically control the polarity of the bias voltage according to the polarity of the DUT.

Programming Sweep: Max.51 points (via HP-IB)

Step Delay Time:

The delay time between applying the bias voltage and the start of a measurement can be set between 3ms to 1000ms, in 1ms steps.

External DC bias: 0V to ±100V

HP-IB INTERFACE:

Remote control and data output (ASCII and binary) via HP-IB. Based on IEEE-STD488 and ANSI-MC1.1.

Remote control all the front panel controls and program of the dc bias voltage except for the power line switch

Table 8-3. Specifications (Sheet 11 of 13)

OPTIONS

Option 003 -- 1% Frequency Shift:

Test frequency is 1% higher than the standard unit to prevent possible test signal interference when the component test contacts are located close to those of other test units.

Option 009 -- Delete Manual

Option 907 -- Front Handle Kit

Option 908 -- Rack Flange Kit

Option 909 -- Rack Flange/Handle Kit

Option 910 -- Extra Manual

ACCESSORIES

FURNISHED ACCESSORIES:

Power Line Fuse	Depends on the line voltage selection. Refer to Section 1.
Power Cable	Depends on what country the 4279A is being used in. Refer to Section 1.

AVAILABLE ACCESSORIES:

Test Fixtures, Test Leads:

HP 16334A (1m, Tweezer-type for Chip Components)

HP 16034E (0m, Test fixture for Chip Components)

HP 16047A (0m, Test fixture for General Purpose)

HP 16047C (0m, Test fixture for General Purpose)

HP 16048A (1m, BNC)

HP 16048B (1m, SMC)

HP 16048D (2m, BNC)

HP-IB Interconnection Cables:

HP 10833A	HP-IB Cable, 1m
HP 10833B	HP-IB Cable, 2m
HP 10833C	HP-IB Cable, 4m
HP 10833D	HP-IB Cable, 0.5m

Table 8-3. Specifications (Sheet 13 of 13)

Impedance Standards:

HP 16380A	Standard Air Capacitor Set (1, 10, 100, and 1000pF)
HP 16074A	Calibration R-L Standard (0.1, 1, 10, and 100Ω and 1, 10, and 100kΩ, OPEN and SHORT, 100mH and 100μH)

Maintenance Accessories:

PN 04278-66596	Extender Board (Half size board)
PN 04278-66597	Extender Board (Digital board)
PN 04278-66598	Extender Board (Analog Board)

Table 8-4. Supplemental Performance Characteristics

SUPPLEMENTAL CHARACTERISTICS

MEASUREMENT TIME:

With the 4279A set up as follows: (trigger delay time: 0ms, step delay time: 0ms, display format: BLANK page), the measurement times for a programmed sweep are as follows.

SHORT mode: approximately (3 + 7.5 × bias point number) ms
MEDIUM mode: approximately (3 + 16 × bias point number) ms
LONG mode: approximately (3 + 28 × bias point number) ms

Measurement time includes the internal bias settling time and ranging time. The time required to display each measurement result is approximately 5ms.

Ranging time:

≤3ms (program mode), ≤20ms/range (auto range)

Internal bias settling time:

≤3ms (time required to reach the 99% bias voltage of the setting bias voltage)

Auto bias polarity switching time:

≤4ms (after the 4279A is triggered)

Settling time after test signal level:

1.5s (typical value)

HP-IB:

Data output: Max. 100 bytes/ms, depending on the controller being used.

Handshake: Typical 2 to 3ms (when used with an HP 9826/9836)