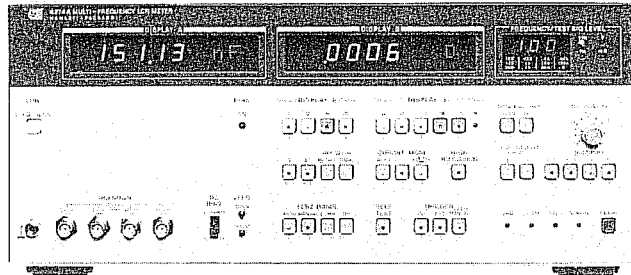


COMPONENT MEASUREMENT

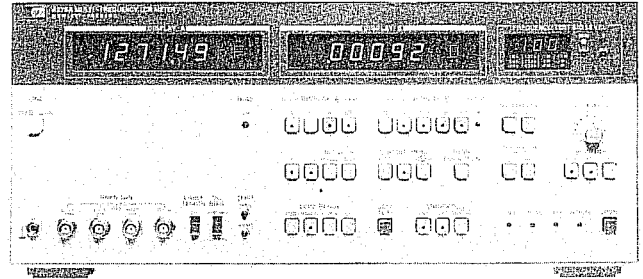
Multi-Frequency LCR Meters

Models 4274A & 4275A

- Test frequencies – HP 4274A: 100 Hz to 100 kHz
HP 4275A: 10 kHz to 10 MHz
- Test signal level – HP 4274A: 1 mV to 5 Vrms
HP 4275A: 1 mV to 1 Vrms
- 0.1% basic accuracy
- High resolution – 5½ digit; D=0.00001
- Measure L/C – D/Q/ESR/G; $|Z| - \theta$,
R-X/B/L/C; $\Delta LCRZ$, $\Delta\%$



HP 4274A



HP 4275A



Description

The HP 4274A and HP 4275A Multi-frequency LCR Meters, microprocessor-based impedance measuring instrumentation. Both instruments offer LCR components, complex components, electronic circuits "tested under actual working conditions", and semiconductor materials. A measurement under conditions similar to the intended use contributes to the improvements in quality and reliability of electronic components, devices and circuits.

Reliable Measurements with 5½ Digit Resolution

The HP 4274A and HP 4275A measure only the value of the component and/or device under test, with 5½ resolution and 0.1% basic accuracy by reducing the possibility of errors due to self or mutual inductance, stray capacitance and/or residual inductance in the test leads or test fixture used. This measurement is obtained by a state-of-the-art four terminal pair configuration and a built-in automatic ZERO-offset capability to compensate for these errors.

The fast measurement speed, high resolution, and high accuracy can make major contributions for the component manufacturer and user who is concerned about reducing his costs, improving quality, and throughput efficiency. In these areas, the HP 4274A and the HP 4275A are ideal for D-measurements of film capacitors or insulation material (with the high resolution of 0.00001), the C-G measurements of semiconductors (with maximum resolutions of 0.01 fF, 0.01 nS, respectively), and for the low impedance measurement of aluminum electrolytic capacitors (with a maximum resolution of 0.001 mΩ).

Multi-Frequency Capability

To insure the high reliability in circuits and devices, it is most important that they be tested and evaluated at test signals similar to those of actual operating conditions.

The HP 4274A covers the wide frequency range of 100 Hz to 100 kHz in 11 spot frequencies and the HP 4275A has 10 spot frequencies from 10 kHz to 10 MHz, in 1-2-4 step sequence with 1-3-5 as an option. This feature produces the frequency characteristics of components or devices. In addition, two optional special frequencies (for example, 455 kHz and 10.7 MHz) are available within the frequency

range of each instrument. This wide frequency range selection offers evaluation of circuit design with a continuously variable test signal over the range of 1 mV to 5 Vrms (to 1 Vrms for the HP 4275A), and with internal dc bias optionally available with 1 mV maximum resolution. The test voltage or current values can be monitored on the 3-digit display for accurately setting the actual conditions under which the device-under-test will operate.

Multi-Parameter Measurements

The HP 4274A and HP 4275A measure equivalent series resistance (ESR), impedance ($|Z|$), phase angle (θ), reactance (X), susceptance (B), and conductance (G), in addition to the conventional L,C,R,D and Q parameters in certain combinations with a dual 5½ digit display, and an HP-IB standard for systems integration.

This wide selection of 11 parameters provides for more accurate evaluation of electronic materials or components with high measurement speed for most needed combined parameters; for example, the C-G measurement of semiconductors, an R-X measurement in circuit design, or the C-ESR or $|Z| - \theta$ measurement of tantalum capacitors.

In addition, a deviation measurement capability ($\Delta\%$) for the L,C,R, and $|Z|$ functions displays the difference between the actual value and a stored reference, either as a difference value or in percent. Deviation applications include, for example, a temperature dependence measurement of devices in environmental tests.

Automatic Semiconductor and Component Measurements with HP-IB

Integrating the HP 4274A and the HP 4275A into an HP-IB controlled system is an excellent method for improving efficiency and cost savings both in the laboratory and on the production line. These automatic measurement systems are assembled by connecting the HP-IB cables between the instruments to be utilized for a specific task.

For example, the evaluation of semiconductors based on the frequency dependence of its C-V characteristics that requires a wide range and fast measurement speeds is easily accomplished with these instruments.

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Specifications

Refer to the HP 4274A & HP 4275A data sheet for details.

Parameters Measured

L: inductance	Q: =1/D	θ: phase angle
C: capacitance	ESR: equivalent series resistance	Δ: deviation for L, C, R, Z,
R: resistance	G: conductance	Δ%: % of deviation
Z: impedance	X: reactance	
D: dissipation factor	B: susceptance	

Measurement Range

MODEL	HP 4274A	HP 4275A
L	100.00 nH - 1000.0 H	100.00 nH - 10.00 H
C	1.0000 pF - 1.00 F	1.0000 pF - 100.00 μF
R, Z , ESR, & X	100.00 mΩ - 10.000 MΩ	1.0000 Ω - 10.000 MΩ
D	0.00001 - 9.9999	0.00001 - 9.9999
Q (1/D)	0.01 - 9900	0.01 - 9900
G & B	1.0000 μS - 100.00 S	1.0000 μS - 10.00 S
θ	0 - ±180°	0 - ±180°

Measurement Accuracy

FREQUENCY RANGE	C-D/Q	L-D/Q
	D-range: 0.00001-9.9999 Q-range: 0.01-9900 (=1/D) (C & D accuracies apply only when C: full scale and D: ≤ 0.1)	D-range: 0.00001-9.9999 Q-range: 0.01-9900 (=1/D) (L & D accuracies apply only when L: full scale and D: ≤ 0.1)

HP 4274A

100 Hz	C: 1000 pF-1000 mF, 0.1% + 3 D: 0.33% + 0.0008 + 1	L: 100 μH-10 kH, 0.1% + 3 D: 0.33% + 0.0013 + 1
120 Hz	C: 1000 pF-1000 mF, 0.1% + 2 D: 0.32% + 0.0007 + 1	L: 100 μH-10 kH, 0.1% + 3 D: 0.32% + 0.0012 + 1
200 Hz	C: 1000 pF-1000 mF, 0.14% + 1 D: 0.34% + 0.0013 + 1	L: 100 μH-10 kH, 0.1% + 3 D: 0.31% + 0.0011 + 1
400 Hz	C: 100 pF-100 mF, 0.1% + 3 D: 0.33% + 0.0008 + 1	L: 10 μH-1000 H, 0.1% + 3 D: 0.33% + 0.0013 + 1
1 kHz	C: 100 pF-100 mF, 0.1% + 2 D: 0.32% + 0.0007 + 1	L: 10 μH-1000 H, 0.1% + 3 D: 0.32% + 0.0012 + 1
2 kHz	C: 10 pF-10 mF, 0.14% + 1 D: 0.34% + 0.0013 + 1	L: 10 μH-1000 H, 0.1% + 3 D: 0.31% + 0.0011 + 1
4 kHz	C: 10 pF-10 mF, 0.1% + 3 D: 0.33% + 0.0008 + 1	L: 1 μH-100 H, 0.1% + 3 D: 0.33% + 0.0013 + 1
10 kHz	C: 10 pF-10 mF, 0.1% + 2 D: 0.32% + 0.0007 + 1	L: 1 μH-100 H, 0.1% + 3 D: 0.32% + 0.0012 + 1
20 kHz	C: 1 pF-1000 μF, 0.14% + 1 D: 0.34% + 0.0013 + 1	L: 1 μH-100 H, 0.1% + 3 D: 0.31% + 0.0011 + 1
40 kHz	C: 1 pF-1000 μF, 0.1% + 3 D: 0.33% + 0.0008 + 1	L: 100 nH-10 H, 0.1% + 3 D: 0.33% + 0.0013 + 1

HP 4275A

10 kHz	C: 10 pF-100 μF, 0.1% + 3 D: 0.33% + 0.0008 + 1	L: 10 μH-100H, 0.1% + 3 D: 0.33% + 0.0013 + 1
20 kHz	C: 10 pF-100 μF, 0.1% + 2 D: 0.32% + 0.0007 + 1	L: 10 μH-100 H, 0.1% + 3 D: 0.32% + 0.0012 + 1
40 kHz	C: 1 pF-10 μF, 0.14% + 1 D: 0.34% + 0.0009 + 1	L: 10 μH - 100 H, 0.1% + 3 D: 0.31% + 0.0011 + 1
100 kHz	C: 1 pF-10 μF, 0.1% + 3 D: 0.33% + 0.0008 + 1	L: 1 μH - 10 H, 0.1% + 3 D: 0.33% + 0.0013 + 1
200 kHz	C: 10 pF-10 μF, 0.1% + 2 D: 0.32% + 0.0007 + 1	L: 1 μH - 1000 mH, 0.2% + 3 D: 0.53% + 0.0023 + 1
400 kHz	C: 1 pF-1000 nF, 0.14% + 1 D: 0.34% + 0.0009 + 1	L: 1 μH - 1000 mH, 0.2% + 3 D: 0.51% + 0.0021 + 1
1 MHz	C: 1 pF-1000 nF, 0.1% + 3 D: 0.33% + 0.0008 + 1	L: 100 nH - 100 mH, 0.2% + 3 D: 0.55% + 0.0025 + 1
2 MHz	C: 10 pF-100 nF, 0.3% + 3 D: 0.55% + 0.0025 + 1	L: 1 μH - 10 mH, 0.5% + 5 D: 1.0% + 0.0033 + 1
4 MHz	C: 1 pF-10 nF, 1% + 20 + 0.002 pF D: 3.3% + 0.01 + 1	L: 1 μH - 10 mH, 1% + 5 D: 2.0% + 0.0063 + 1
10 MHz	C: 1 pF-10 nF, 2% + 20 + 0.002 pF D: 4% + 0.01 + 1	L: 100 nH - 1 mH, 2% + 7 D: 3.1% + 0.002 + 1

Range: full scale range, accuracy: % of reading + counts (D accuracy: % of reading + absolute D value + count).

(Conditions: Warm-up time ≥ 30 minutes, environment temperature: 23°C ±5°C).

Refer to technical data sheet for accuracy details.

Measurement Frequencies

HP 4274A: 100 Hz-100 kHz, 11 spots (100 Hz, 120 Hz, 200 Hz, 400 Hz, 1 kHz, 2 kHz, 4 kHz, 10 kHz, 20 kHz, 40 kHz, 100 kHz; ±0.01%)

HP 4275A: 10 kHz-10 MHz, 10 spots (10 kHz, 20 kHz, 40 kHz, 100 kHz, 200 kHz, 400 kHz, 1 MHz, 2 MHz, 4 MHz, 10 MHz; ±0.01%)

Test Signal Level:

HP 4274A: 4-ranges (1 mVrms-5 Vrms) continuously variable

HP 4275A: 3-ranges (1 mVrms-1 Vrms) continuously variable

Test Signal Level Monitor: standard.

Displays: dual 5½-digit and single 3-digit; maximum display 199999 (full scale and overrange in high resolution mode), and 4½-digit: maximum display 19999 in normal mode. (Number of digits depends on measurement frequency, test level, and range).

Circuit modes: series equivalent circuit and parallel equivalent circuit. Automatic selection available in AUTO mode.

Deviation measurement: difference between recallable stored reference and displayed is deviation value (count or percent).

Ranging: AUTO or MANUAL (UP/DOWN).

Trigger: internal, external or manual.

Measurement terminals: four-terminal pair with guard.

Auto zero adjustment: automatic normalization of the readout offset due to residuals of the test fixture by pushbutton operation.

Normalization range: C < 20 pF, L < 2000 nH, R < 0.5Ω, G < 5μS.

Self test: automatic operational verification check indicates pass or fail condition.

Reference Data

Measurement time: (typical) 140-180 ms (>1 kHz); 140-210 ms ≤ 1 kHz (measurement time depends on range, sample value and offset adjustment value).

Z - θ measurement time: 170-210 ms > 1 kHz; 170-240 ms ≤ 1 kHz.

High resolution mode: approximately 8 times the normal measurement time.

Auto ranging time: 100 ms - 300 ms per range change.

General Information

Operating Temperature and Humidity: 0°C - 55°C, ≤95% RH at 40°C

Power: 100, 120, 220V ±10%, 240V + 5% - 10%, 48 - 66Hz, 135VA max. (HP 4274A); 165VA max. (HP 4275A)

Size: 177H x 425W x 574Dmm (7" x 16.75" x 22.6")

Weight: 18kg (39.6lbs)

Accessory Furnished

HP 16047A: Direct coupled test fixture.

Accessory Available

HP 16023B: dc Bias Controller, for control of dc bias \$350
 Opt 001 or 002 Internal Bias Supply.

Special Options

One or two arbitrary test frequencies for each instrument are available. For more details, please contact nearest HP sales office.

Selectable Frequency Range

HP 4274A: 100 Hz to 100 kHz to ±0.1%. If two frequencies are added, at least one frequency must satisfy the following equation: f = 1200/N kHz where N is an integer from 12 to 12000.

HP 4275A: 10 kHz to 10.7 MHz ±0.1%.

Ordering Information

	Price
HP 4274A Multi-Frequency LCR Meter	\$10,700
Opt W30: 3-year hardware support	\$270
HP 4275A Multi Frequency LCR Meter	\$12,850
Opt W30: 3-year hardware support	\$320
Opt 001: 0 to ±35 internal dc bias, max resolution; 1 mV steps	\$965
Opt 002: 0 to ±99.9 V internal dc bias, resolution: 100 mV steps.	\$915
Opt 004: Frequency steps in 1-3-5 sequence	N/C
Fast-Ship product—see page 734.	