

- Measurement speed: 6.5 ms/10 ms/21 ms
- Measurement parameters: C-D-Q-ESR-G
- C-D measurement accuracy:
 - 0.07%, 0.0005(1 kHz, 21 ms)
 - 0.05%, 0.0002(1 MHz, 21 ms)
- High resolution: 6 digit, D:0.00001
- Intelligent built-in comparator: 10-bin sorting



HP 4278A



HP 4278A Capacitance Meter

The HP 4278A 1 kHz/1 MHz Capacitance Meter is a high-speed, highly reliable, precision test instrument aimed at incoming/outgoing capacitor inspection applications on the production line and in quality control. The HP 4278A will improve test efficiency by performing comparative measurements of low to medium value capacitors (up to 200 μF —a range that covers most ceramic and film capacitors).

The HP 4278A's standard measurement frequencies and oscillator output levels are 1 kHz/1 MHz and from 0.1 V to 1 V in 0.1 V steps, respectively.

The built-in comparator function of the HP 4278A gives you the ability to sort parts into ten bins. A high-speed HP-IB interface and an optional handler interface are available for combining the HP 4278A with an automatic handler and an external computer, to build a total solution for automatic testing and data acquisition and analysis.

Specifications (Refer to data sheet for complete specifications.)

Measurement Parameters: C-D-Q-ESR-G

Display: Dot-matrix LCD, 4, 5, 6 digits, selectable

Measurement Circuit Modes: Parallel and series

Test signals

Frequency: 1 kHz and 1 MHz, $\pm 0.02\%$

Signal level: 0.1 to 1 V rms, $\pm 10\%$ ($C \leq 20 \mu\text{F}$), in 0.1 V rms steps

Measurement Time Modes: SHORT, MEDIUM, and LONG

Measurement Times

Mode	SHORT	MEDIUM	LONG
Time*	6.5 ms	10 ms	21 ms

* Measurement time includes settling, integration (analog measurements), calculation, and comparison times.

Measurement Range

Measurement Parameter	1 KHz	1 MHz normal mode
		1 MHz high accuracy
C	0.001 pF to 200.000 μF	0.00001 pF to 1280.00 pF 0.00001 pF to 2663.00 pF
DF	0.00001 to 9.99999	0.00001 to 9.99999 .000001 to .999999

- 1 kHz normal mode: 7 decade ranges 100 pF to 100 μF full scale. 100% overranging on all ranges, (max. 200000 counts) when $D \leq 0.5$.
- 1 MHz normal mode: 11 binary ranges, 1 pF to 1024 pF full scale. 25% overranging on all ranges, when $D \leq 1$.
- 1 MHz high accuracy mode: Measurement range is $\pm 30\%$ of the user defined nominal value, maximum 2048 pF, when $D \leq 0.05$.

Measurement Accuracy

It is specified at the UNKNOWN terminals and at the end of standard 1- or 2-m test leads under the following conditions.

1. Warmup time: ≥ 10 minutes
2. Ambient temperature is $23 \pm 5^\circ\text{C}$ and variance is less than 0.2°C/minute
3. Test signal level is set to 1 V rms
4. Zero OPEN/SHORT compensation has been performed
5. $D \leq 0.05$ for 1 MHz High Accuracy Mode, $D \leq 0.1$ for 1 kHz and 1 MHz Normal Modes
6. Accuracies are only valid when the measured value is equal to the full scale of each range
7. Accuracy stated in the tables is given for LONG integration time
8. Accuracy equations are read as follows:
 - C: \pm (% of reading + % of full scale)
 - D: \pm (% of reading + absolute D value)
 - (C: \pm (% of reading + absolute C value) for Table 3)

Table 1: 1 kHz Measurement Accuracy

C range	C	D
100 μF	0.07% + 0.025%	0.065% + 0.0025
100 pF to 10 μF	0.05% + 0.025%	0.05% + 0.0005

Table 2: 1 MHz Normal Mode Measurement Accuracy

C range	C	D
256 to 1024 pF	0.1% + 0.02%	0.1% + 0.0005
4 to 128 pF	0.05% + 0.02%	0.1% + 0.0005
2 pF	0.05% + 0.03%	0.1% + 0.0005
1 pF	0.05% + 0.06%	0.1% + 0.001

Table 3: 1 MHz High Accuracy Mode Measurement Accuracy

Nominal C + Open Circuit C	C	D
1024 to 2048 pF	0.11%	0.0004
256 to 1024 pF	0.07%	0.0003
4 to 256 pF	0.05%	0.0002
2 to 4 pF	0.06% + 0.0004 pF	0.0003
0 to 2 pF	0.08% + 0.0004 pF	0.0006

Trigger Modes: Internal, external, or manual

Measurement Terminals: Four-terminal pair, guarded

Cable Length Compensation: 0, 1, or 2 m

Compensation Function: Zero OPEN/SHORT, standard, offset

Comparator: Ten-bin sorting for capacitance, and go/no-go testing for D, Q, ESR, and G

Self Test: Checks the HP 4278A's basic operation

Memory Card: External memory for storing and recalling control settings and comparator limits

General Specifications

Operating Temperature and Humidity: 0–55 $^\circ\text{C}$, 95% RH @ 40 $^\circ\text{C}$

Power: 100, 120, 220 Vac $\pm 10\%$, 240VAC +5 –10%, 48 to 66 Hz, 200 VA max

Size: Approximately 426 mm W \times 177 mm H \times 498 mm D (16.77 in \times 6.97 in \times 19.61 in)

Weight: Approximately 10 kg (22 lb, standard)

Accessories Available

Accessories Available	Price
HP 16270A Memory Card Set	\$315
HP 16334A Tweezer-Type Test Fixture for Chip Components	\$540
HP 16047A Direct-Coupled Test Fixture	\$300
HP 16047C Test Fixture	\$345
HP 16048A Test Leads, BNC (1 m)	\$345
HP 16048B Test Leads, SMC (1 m)	\$330
HP 16048D Test Leads, BNC (2 m)	\$440

Ordering Information

HP 4278A 1 kHz/1 MHz Capacitance Meter	\$9,650
Opt W30 Extended Repair Service (see page 624)	+\$180
Opt 001 1 kHz Test Frequency Only	–\$865
Opt 002 1 MHz Test Frequency Only	–\$370
Opt 003 1% Frequency Shift: Prevents possible test signal interference when component test contacts are located close to those of other test units	\$0
Opt 009 Delete Manual	–\$28
Opt 101 HP-IB Compatibility	+\$248
Opt 201 Handler Interface	+\$280
Opt 202 Handler Interface	+\$310
Opt 301 Scanner Interface	+\$600

☎ For off-the-shelf shipment, call 800-452-4844.