Specifications

(refer to data sheet for complete specifications)
Measurement Parameters: C-D•Q•ESR•G
Display: Dot-matrix LCD. Displays measurement values with 4, 5, or 6 digit resolution, control settings, comparator limits, the comparator's decision, self test messages and annunciations.
Measurement Circuit Modes: Parallel and Series
Test Signals:
Frequency: 1kHz and 1 MHz, ±0.02%
Signal Level: 0.1 to 1 Vrms, ±10% (C≤20μF), in 0.1Vrms steps
Measurement Time Modes: SHORT, MEDIUM, and LONG
Measurement Times:

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

* Measurement time includes Settling, Integration (analog measurements), Calculation, and Comparison times.

No additional measurement time is required for measurements performed in an overload (shorted capacitor) condition.
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
Q	0.1 to 99999.9	0.1 to 99999.9 20 to 99999.9
G	0.00001 μS to 9.99999S	0.00001 μS to 9.99999 mS 0.00001 μS to 9.99999 mS
ESR	0.00001Ω to 9.99999 MΩ	0.001Ω to 999.999 KΩ 0.001Ω to 999.999 KΩ

1. 1kHz Normal Mode: 7 decade ranges 100pF to 100μF full scale. 100% overranging on all ranges, (max. 200000 counts) when D ≦ 0.5.
2. 1MHz Normal Mode: 11 binary ranges, 1pF to 1024pF full scale. 25% overranging on all ranges, when D ≦ 1.
3. 1MHz High Accuracy Mode: Measurement range is ±30% of the user defined nominal value, maximum 2048pF. When D ≦ 0.05.

Measurement Accuracy

It is specified at the UNKNOWN terminals and at the end of standard 1 or 2 meter test leads under the following conditions. Refer to data sheet for details.
1. Warm Up Time: ≧ 10 minutes.
2. Ambient Temperature is 23 ± 5°C and variance is less than 0.2°C/minute.
3. Test signal level is set to 1 Vrms.
4. Test cable length is 0, 1, or 2 meters (HP 16048A/B/D).
5. Zero OPEN/SHORT compensation has been performed.
6. D ≦0.05 for 1MHz High Accuracy Mode.
   D ≦0.1 for 1kHz and 1MHz Normal Modes.
7. Accuracies are only valid when the measured value is equal to full scall of each range.
8. Accuracy stated in the tables is given for MEDIUM (upper) and LONG (lower) integration times.
9. Accuracy equations are read as follows:
   C: ± (% of reading + % of full scale)
   D: ± (% of reading + absolute D value)
   (C: ± (% of reading + absolute C value) for Table 3)

Table 1 1kHz Measurement Accuracy

C range	C	D
100μF	0.13% + 0.3% 0.07% + 0.025%	0.13% + 0.003 0.065% + 0.0025
100pF - 10μF	0.1% + 0.05% 0.05% + 0.025%	0.1% + 0.001 0.05% + 0.0005

Table 2 1MHz Normal Mode Measurement Accuracy

C range	C	D
256 - 1024pF	0.2% + 0.02% 0.1% + 0.02%	0.2% + 0.002 0.1% + 0.0005
4 - 128pF	0.2% + 0.02% 0.05% + 0.02%	
2pF	0.2% + 0.03% 0.05% + 0.03%	
1pF	0.2% + 0.06% 0.05% + 0.06%	0.2% + 0.004 0.1% + 0.001

Table 3 1MHz High Accuracy Mode Measurement Accuracy

Nominal C + Open Circuit C	C	D
1024 - 2048pF	0.11% 0.11%	0.0007 0.0004
256 - 1024pF	0.11% 0.07%	0.0007 0.0003
4 - 256pF	0.11% 0.05%	0.0007 0.0002
2 - 4pF	0.1% + 0.0004pF 0.06% + 0.0004pF	0.0008 0.0003
0 - 2pF	0.1% + 0.0004pF 0.08% + 0.0004pF	0.0016 0.0006

Trigger Modes: Internal, External, or Manual
Measurement Terminals: Four-terminal pair, guarded
Cable Length Compensation: 0, 1, or 2m
Compensation Function
Zero OPEN/SHORT: Compensation range:R≦20Ω, G≦20μS, and unlimited C and L.
Standard: Improves measurement accuracy by using a standard capacitor as a reference.
Offset: Arithmetic correction of measurement data.
Comparator: Ten-bin sorting for capacitance, and go/no-go testing for D, Q, ESR, and G.
Sorting Modes: Sequential sorting into un-nested bands with absolute limits, and tolerance sorting into nested bands with absolute or percent limits.
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°C, 95% RH @ 40°C
Power: 100, 120, 220VAC ± 10%, 240VAC +5 −10%, 48–66Hz, 200VA max.
Dimensions (in mm): Approximately 426(W) by 177(H) by 498(D)
Weight: Approximately 10kg (22lb., standard)

Reference Data

Stability: LONG integration and constant operating temperature.
C ≦ 0.01%/day
D ≦ 0.0001/day
Temperature Coefficient: LONG integration and 12±5°C.
C ≦ 0.01%/°C; 1kHz and 1MHz.
D ≦ 0.0001/°C; 1kHz and 1MHz Normal Mode.
D ≦ 0.00004/°C; 1MHz High Accuracy Mode.
HP-IB Data Output Speed: Maximum 100 bytes/ms, typically 3ms for handshake, depending on the system controller.

Accessories Available

HP 16270A: Memory Card Set $275
HP 16334A: Tweezer-type Test Fixture for Chip Components $430
HP 16047A: Direct-coupled Test Fixture $265 ☎
HP 16047C: Test Fixture $305 ☎
HP 16048A: Test Leads, BNC (1m) $325 ☎
HP 16048B: Test Leads, SMC (1m) $325 ☎
HP 16048D: Test Leads, BNC (2m) $420
HP 16380A: Standard Capacitor Set $2955
HP 16380C: Standard Capacitor Set $4075
Refer to page 297.

Ordering Information

HP 4278A 1kHz/1MHz Capacitance Meter $7130
Opt 001: 1kHz test frequency only −$750
Opt 002: 1MHz test frequency only −$330
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 101: HP-IB compatibility $224
Opt 201: Handler Interface $255

☎ Fast-ship product, see page 758.