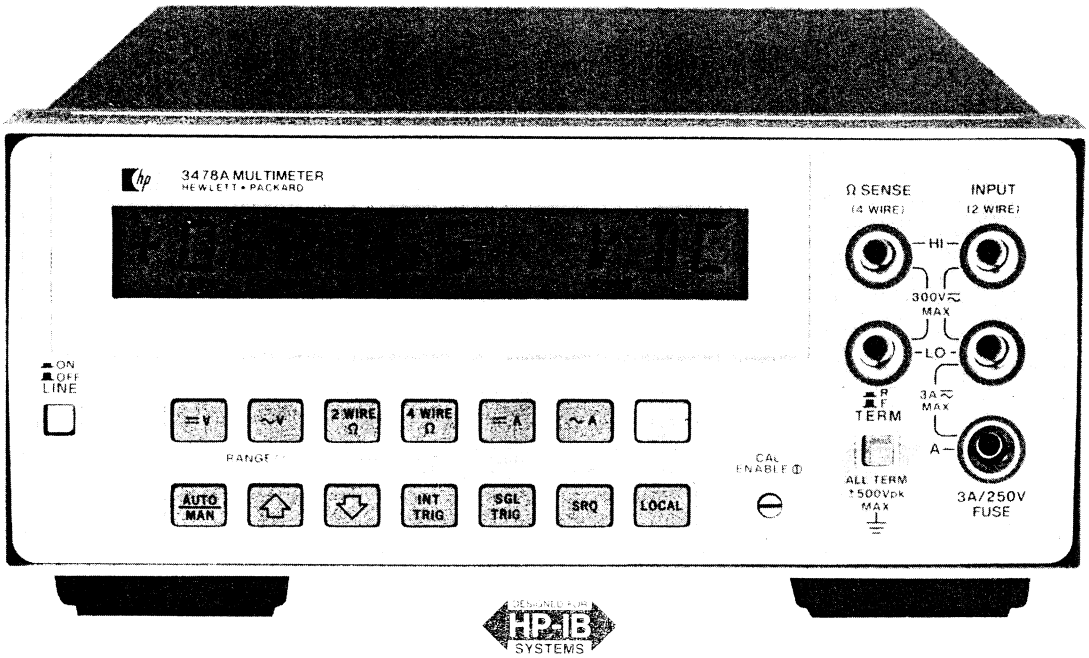
- 5 measurement functions
- Up to 71 readings/s
- Electronic calibration
- 100 nanovolt resolution



HP 3478A

Description

The HP 3478A provides a low cost, completely HP-IB programmable solution for system measurements. Selectable 3½ to 5½ digit resolution and 5 autoranging functions offer flexibility in automated testing. The HP 3478A can measure DCV, true RMS ACV, 2- and 4-wire ohms, and dc and ac current. Simple, fast electronic calibration eliminates all adjustments to provide a lower cost of ownership.

Performance

Selectable speed and resolution provide the right capability for your measurement. The HP 3478A can perform production tests or acquire experimental data at 71 readings/s with 3½ digit resolution, or take 33 readings/s with 130 dB of noise rejection using 4½ digits. The 5½ digit mode offers 100 nVdc and 100 μΩ resolution for precise measurements. True RMS with 300 kHz bandwidth and 4:1 crest factor provides reliable measurements of ac signals. Fast autoranging makes the first reading useful and accurate.

Designed for Systems

Switchable front/rear inputs permit flexible system connections. The Voltmeter Complete output and External Trigger input allow synchronization of the HP 3478A with a scanner for fast multiplexed measurements without the delay of software commands. The test program can automatically present messages or results on the alphanumeric liquid crystal display. The operator can then respond by pressing the HP 3478A's SRQ key to interrupt the controller and start the next test. Built-in self-test capability assures proper operation.

Electronic Calibration

Complete calibration of the HP 3478A is accomplished without any internal adjustment or removing the instrument's covers. The simple and fast electronic calibration procedure lowers the cost of ownership. You only need to connect standards to the HP 3478A and store calibration constants in the HP 3478A's non-volatile memory. Calibration can be done manually from the front panel or automatically using HP-IB.

Specifications

DC Voltage

Input Characteristics

Range	Maximum Reading (5½ digit)	Resolution 5½ digit	4½ digit	3½ digit
30 mV	±30.3099 mV	100 nV	1 μV	10 μV
300 mV	±303.099 mV	1 μV	10 μV	100 μV
3 V	±3.03099 V	10 μV	100 μV	1 mV
30 V	±30.3099 V	100 μV	1 mV	10 mV
300 V	±303.099 V	1 mV	10 mV	100 mV

Input resistance: 30 mV, 300 mV, 3 V ranges: $>10^{10}$ Ω
30 V, 300 V ranges: 10 MΩ ±1%

Maximum input voltage (non-destructive): Hi to Lo: 303 Vrms or 450 V peak; Hi or Lo to Earth Ground: ±500 V peak

Measurement accuracy: ±(% of reading + number of counts). Auto zero ON.

5½ Digit Mode

Range	T_{Cal}* ±1°C 24 Hour	T_{Cal}* ±5 °C 90 Day	1 Year
30 mV	0.027 + 35	0.03 + 41	0.04 + 41
300 mV	0.005 + 4	0.0074 + 5	0.02 + 5
3 V	0.0034 + 2	0.0059 + 2	0.019 + 2
30 V	0.005 + 3	0.0074 + 3	0.02 + 3
300 V	0.0055 + 2	0.0076 + 2	0.02 + 2

*T_{Cal} is the temperature of the environment where the HP 3478A was calibrated. Calibration should be performed with the temperature of the environment between 20°C and 30°C.

4½ and 3½ digit mode: accuracy is the same as 5½ digit mode for % of reading; use 1 count for number of counts on all ranges except 30 mV, use 4 counts.

Temperature coefficient: 0° to 55°C, 5½ digits, auto zero ON. ±(% of reading + number of counts)/°C

Range	Temperature Coefficient
30 mV	0.0028 + 5.0
300 mV	0.0005 + 0.5
3 V	0.0004 + 0.05
30 V	0.0006 + 0.5
300 V	0.0004 + 0.05

Noise rejection: in dB with 1 kΩ imbalance in Lo lead. AC rejection for 50, 60 Hz ± 0.1%. Auto zero ON.

Display	AC NMR	AC ECMR	DC CMR
5½ digits	80	150	140
4½ digits	59	130	140
3½ digits	0	70	140

Maximum Reading Rates (readings/s.)

Line Frequency	Auto Zero	Resolution		
		3½ digits	4½ digits	5½ digits
60 Hz	Off	71	33	4.4
	On	53	20	2.3
50 Hz	Off	67	30	3.7
	On	50	17	1.9

AC Voltage (true rms)
Input Characteristics

Range	Maximum Reading (5½ Digit)	Resolution		
		5½ Digit	4½ Digit	3½ Digit
300 mV	303.099 mV	1 µV	10 µV	100 µV
3 V	3.03099 V	10 µV	100 µV	1 mV
30 V	30.3099 V	100 µV	1 mV	10 mV
300 V	303.009 V	1 mV	10 mV	100 mV

Input impedance: 1 MΩ ± 1% shunted by <60 pF
Maximum Input Voltage (non-destructive):
Hi to Low: 303 Vrms or 450 V peak
Hi or Lo to Earth Ground: ±500 V peak
Measurement accuracy: ±(% of reading + number of counts). Auto zero ON. 5½ digit display. Accuracy is specified for sinewave inputs only, >10% full scale.

1 Year, T_{Cal}* ±5°C

Frequency	Ranges		
	300 mV	3 V, 30 V	300 V
20-50 Hz	1.14 + 163	1.14 + 102	1.18 + 102
50-100 Hz	0.46 + 163	0.46 + 103	0.5 + 102
100 Hz-20 kHz	0.29 + 163	0.26 + 102	0.33 + 102
20-50 kHz	0.56 + 247	0.41 + 180	0.55 + 180
50-100 kHz	1.74 + 882	1.05 + 825	1.26 + 825
100-300 kHz	10.1 + 3720 (30 V range only)		

Crest factor: >4:1 at full scale
Common mode rejection: with 1 kΩ imbalance in Lo lead, >70 dB, at 60 Hz
Maximum reading rates: 3½ or 4½ digits, 1.4 readings/s; 5½ digits, 1.0 readings/s. First reading is correct within 70 counts of final value when triggered coincident with step input. Add 0.6 second for each range change.

Resistance (2-wire Ω, 4-wire Ω)
Input Characteristics

Range	Maximum Reading (5½ Digit)	Resolution		
		5½ Digit	4½ Digit	3½ Digit
30 Ω	30.3099 Ω	100 µΩ	1 mΩ	10 mΩ
300 Ω	303.099 Ω	1 mΩ	10 mΩ	100 mΩ
3 kΩ	3.03099 kΩ	10 mΩ	100 mΩ	1 Ω
30 kΩ	30.3099 kΩ	100 mΩ	1 Ω	10 Ω
300 kΩ	303.099 kΩ	1 Ω	10 Ω	100 Ω
3 MΩ	3.03099 MΩ	10 Ω	100 Ω	1 kΩ
30 MΩ	30.3099 MΩ	100 Ω	1 kΩ	10 kΩ

Input protection (non destructive): Hi to Lo: ±350 V peak; Hi or Lo to Earth Ground: ±500 V peak.

Measurement accuracy: ±(% of reading + number of counts). Auto zero ON. 5½ digit display. 4-wire ohms.

Range	T_{Cal}* ± 1°C	T_{Cal}* ± 5°C	
	24 Hour	90 Day	1 Year
30 Ω	0.023 +35	0.027 + 41	0.034 + 41
300 Ω	0.0045 + 4	0.012 + 5	0.017 + 5
3 k-300 kΩ	0.0035 + 2	0.011 + 2	0.016 + 2
3 MΩ	0.0052 + 2	0.011 + 2	0.016 + 2
30 MΩ	0.036 + 2	0.066 + 2	0.078 + 2

Current Through Unknown

Range	30 Ω	300 Ω	3 kΩ	30 kΩ	300 kΩ	3 MΩ	30 MΩ
Current	1 mA	1 mA	1 mA	100 µA	10 µA	1 µA	100 nA

DC Current
Input Characteristics

Range	Maximum Reading (5½ Digit)	Resolution		
		5½ Digit	4½ Digit	3½ Digit
300 mA	± 303.099 mA	1 µA	10 µA	100 µA
3 A	± 3.03099 A	10 µA	100 µA	1 mA

Maximum input (non-destructive): 3 A from <250 V source: fuse protected.
Measurement accuracy: ±(% of reading + number of counts). Auto zero ON. 5½ digit display.

Range	T_{Cal}* ± 5°C	
	90 Days	1 Year
300 mA	0.11 + 40	0.15 + 40
3 A (<1 A)	0.14 + 6	0.17 + 6
3 A (>1 A)	1.0 + 30	1.0 + 30

Maximum burden at full scale: 1 V (3 A range), 0.1 V (0.3 A range)

AC Current (true rms responding)
Input Characteristics

Range	Maximum Reading (5½ Digit)	Resolution		
		5½ Digit	4½ Digit	3½ Digit
300 mA	303.099 mA	1 µA	10 µA	100 µA
3 A	3.03099 A	10 µA	100 µA	1 mA

Maximum input: (non-destructive): 3 A from <250 V source; fuse protected.
Measurement accuracy: ±(% of reading + number of counts). Auto zero ON. 5½ digit display. Accuracy is specified for sinewave inputs only, >10% of full scale.

1 Year, T_{Cal}* ±5°C

Frequency	Ranges	
	300 mA	3 A
20-50 Hz	1.54 + 163	2.24 + 163
50-1 kHz	0.81 + 163	1.50 + 163
1 k-10 kHz	0.72 + 163	1.42 + 163
10 k-20 kHz	0.86 + 163	1.56 + 163

Maximum burden at full scale: 1 V (3A range)

General
Operating temperature: 0 to 55°C
Humidity range: 95% R.H., 0 to 40°C
Power: ac line 48 to 440 Hz; 86 to 250 V, 25 VA max.
Size: 102 mm H x 215 mm W x 356 mm D (4″ x 8″ x 14″); 3½ in. H without feet.
Weight: 3 kg (6.5 lb)
HP-IB Interface Functions: SH1, AH1, T5, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0

Ordering Information
Choose one N/C power option:
Opt 315: 100 V, 50 Hz; **Opt 335:** 220 V, 50 Hz
Opt 316: 100 V, 60 Hz; **Opt 336:** 220 V, 60 Hz
Opt 325: 120 V, 50 Hz; **Opt 345:** 240 V, 50 Hz
Opt 326: 120 V, 60 Hz; **Opt 346:** 240 V, 60 Hz
Opt 907: Front Handle Kit (HP P/N 5061-0088)
Opt 908: Rack Mount Kit (HP P/N 5061-0072)
Opt 910: Extra Manuals

HP 3478A Multimeter