# DIGITAL MULTIMETERS

## High Performance 5 1/2 to 3 1/2 Digit Bench DMM

**HP Models 3468A/B**

- Five functions
- Electronic calibration
- 51/2to31/2digits

**HP 3468A/B**

### Description

The HP Models 3468A/B are autoranging 5 1/2 to 3 1/2 digit DMMs, with the five functions of dc volts, true RMS ac volts, 2- and 4-wire ohms, dc current and true RMS ac current. They are low-cost, highly reliable DMMs which can be completely calibrated electronically, either manually from the front panel or remotely in an automatic calibration system. Remote calibration is made possible by the built-in HP-IL (Hewlett-Packard Interface Loop) interface which provides complete programmability of functions, ranges and modifiers.

The HP 3468A comes in a streamlined portable package with a handle for convenient carrying, whereas the HP 3468B comes in a plastic system case for easy rack mounting. Both are available with a rechargeable battery and battery charging circuitry for portable measurements.

### High Performance

The HP 3468A/B have 5 functions with selectable 5 1/2 4 1/2 or 3 1/2 digit resolution. DC and true RMS ac voltage measurements are provided from 0.3 volt full scale range with 1 *uV* sensitivity up to 300 volts. The bandwidth of the true RMS ac converter is from 20 Hz to 100 kHz on all ranges and up to 300 kHz on the 30 V range. Either 2 or 4-wire ohms measurements can be selected with a maximum range of 30 M . Both dc and true RMS ac current capability is provided up to 3 A. All functions on the HP 3468A/B incorporate fast autoranging. The HP 3468A/B use an integrating analog to digital conversion technique for high noise rejection. The selectable 3 1/2, *4 1/2* or 5 1/2 digits of resolution allows flexibility for choosing speed or noise rejection.

### Electronic Calibration

Complete calibration of the HP 3468A/B is done electronically, either manually from the front panel or remotely in an automatic calibration system. There are no internal adjustments necessary. Complete calibration of all functions is done without removal of the instrument's covers, thus saving valuable time and reducing cost. The calibration procedure for the HP 3468A/B involves connecting a calibration standard to the input, then pressing three keystrokes to store one calibration constant in CMOS RAM for each range and function. When the HP 3468A/B make a measurement, each reading is corrected according to the calibration constants that have been stored. The internal CMOS RAM used in the HP 3468A/B is powered by a lithium battery to create a non-volatile memory capable of holding the calibration constants for more than ten years.

### Battery

The optional battery pack includes a rechargeable battery and the battery charger circuitry for up to five hours of continuous measurements.

### DC Voltage

#### Input Characteristics

| Range | Maximum Reading (5½ digit) | Resolution | | |
|---|---|---|---|---|
| | | 5½ digit | 4½ digit | 3½ digit |
| 0.3 V | ±0.301000 V | 1 μV | 10 μV | 100 μV |
| 3 V | ± 3.01000 V | 10 μV | 100 μV | 1 mV |
| 30 V | ± 30.1000 V | 100 μV | 1 mV | 10 mV |
| 300 V | ± 301.000 V | 1 mV | 10 mV | 100 mV |

**Input resistance:** 0.3 V, 3 V ranges: $> 10^{10}$
30 V, 300 V ranges: 10 M ±1%

**Maximum Input Voltage** (non-destructive)
Hi to Lo: 301 Vrms or 450 V peak
Hi or Lo to Earth Ground: ±500 V peak

**Measurement accuracy:** ±(% of reading + number of counts). Auto zero ON. 5 1/2 digits.

| Range | $T_{Cal}$*±1°C 24 Hour | $T_{Cal}$*±5°C | |
|---|---|---|---|
| | | 90 Day | 1 Year |
| 0.3 V | 0.005 + 4 | 0.009 + 5 | 0.02 + 5 |
| 3 V | 0.0035 + 2 | 0.0072 + 2 | 0.0181 + 2 |
| 30 V | 0.005 + 3 | 0.009 + 3 | 0.02 + 3 |
| 300 V | 0.0055 + 2 | 0.009 + 2 | 0.02 + 2 |

*$T_{Cal}$ is the temperature of the environment where the 3468A/B was calibrated. Calibration should be performed with the temperature of the environment between 20°C and 30°C.

**Temperature coefficient:** 0°C to 55°C, 5 1/2 digits, auto zero ON. ± (% of reading + number of counts)/°C.

| Range | Temperature Coefficient |
|---|---|
| 0.3 V, 30 V | 0.0008 + 0.5 |
| 3 V, 300 V | 0.0007 + .05 |

**Noise rejection:** in dB, with 1 k 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 rate With HP-41CV:** 2 readings/second.

## Resistance (2-wire , 4-wire )

### Input Characteristics

| Range | Maximum Reading (5½ digit) | Resolution | | |
|---|---|---|---|---|
| | | 5½ digit | 4½ digit | 3½ digit |
| 300 Ω | 301.000 Ω | 1 mΩ | 10 mΩ | 100 mΩ |
| 3 kΩ | 3.01000 kΩ | 10 mΩ | 100 mΩ | 1 Ω |
| 30 kΩ | 30.1000 kΩ | 100 mΩ | 1 Ω | 10 Ω |
| 300 kΩ | 301.000 kΩ | 1 Ω | 10 Ω | 100 Ω |
| 3 MΩ | 3.01000 MΩ | 10 Ω | 100 Ω | 1 kΩ |
| 30 MΩ | 30.1000 MΩ | 100 Ω | 1 kΩ | 10 kΩ |

**Input protection** (non-destructive): ± 350 V peak.
**Measurement accuracy:** ±(% of reading + number of counts). Auto zero ON. 5 1/2 digit display. 4-wire ohms.

| Range | TCal* ±1°C 24 Hour | TCal* ±5°C | |
|---|---|---|---|
| | | 90 Day | 1 Year |
| 300 Ω | .0045 + 4 | .012 + 4 | .017 + 5 |
| 3 kΩ–300 kΩ | .0035 + 2 | .011 + 2 | .016 + 2 |
| 3 MΩ | .0052 + 2 | .011 + 2 | .016 + 2 |
| 30 MΩ | .036 + 2 | .066 + 2 | .078 + 2 |

### Current Through Unknown

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

**Maximum open circuit voltage: 6.5 V**

## AC Voltage (true RMS responding)

### Input Characteristics

| Range | Maximum Reading (5½ digit) | Resolution | | |
|---|---|---|---|---|
| | | 5½ digit | 4½ digit | 3½ digit |
| 0.3 V | 0.301000 V | 1 µV | 10 µV | 100 µV |
| 3 V | 3.01000 V | 10 µV | 100 µV | 1 mV |
| 30 V | 30.1000 V | 100 µV | 1 mV | 10 mV |
| 300 V | 301.000 V | 1 mV | 10 mV | 100 mV |

**Input impedance:** 1 M ±1% shunted by <60 pF.
**Maximum input voltage** (non-destructive): 301 Vrms or 450 V peak.
**Measurement accuracy:** ±(% of reading + number of counts) Auto zero ON. 5 1/2 digit display. Accuracy is specified for sinewave inputs only, > 10% of full scale.

### 1 Year, TCal ±5°C

| Frequency | Ranges | | |
|---|---|---|---|
| | 0.3V | 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 k-300 kHz | 10.1 + 3720 (30 V range only) | | |

**Crest factor:** >4:1 at full scale.

## DC Current

### Input Characteristics

| Range | Maximum Reading (5½ digit) | Resolution | | |
|---|---|---|---|---|
| | | 5½ digit | 4½ digit | 3½ digit |
| 3 A | ± 3.01000 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. *5 1/2* digit display.

| Range | TCal ±5°C | |
|---|---|---|
| | 90 Days | 1 Year |
| 3 A, <1 A input | 0.14 + 6 | 0.17 + 6 |
| 3 A, >1 A input | 1.0 + 30 | 1.0 + 30 |

## AC Current (true RMS responding)

### Input Characteristics

| Range | Maximum Reading (5½ digit) | Resolution | | |
|---|---|---|---|---|
| | | 5½ digit | 4½ digit | 3½ digit |
| .3 A | 0.301000 A | 1 µA | 10 µA | 100 µA |
| 3 A | 3.01000 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. *5 1/2* digit display. Accuracy specified for sinewave inputs only, > 10% of full scale.

### 1 Year, TCal±5°C

| Frequency | Ranges | |
|---|---|---|
| | 0.3 A | 3 A |
| 20-50 Hz | 1.77 + 163 | 2.5 + 163 |
| 50-1 kHz | 1.1 + 163 | 1.8 + 163 |
| 1 k-10 kHz | 1.0 + 163 | 1.7 + 163 |
| 10 k-20 kHz | 1.14 + 163 | 1.84 + 163 |

## General Information

**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, (see configuration)
**Battery:** (Opt 001) Rechargeable lead-acid; minimum continuous operation for 5 hours at 25°C; recharge time is 16 hours with HP 3468A/B off and 36 hours with HP 3468A/B on.
**Size:** HP 3468A: 98.4 mm H x 238.1 mm W x 276.2 mm D (3.88 in. H x 9.38 in. W x 10.88 in. D). 3468B: 89 mm H x 213 mm W x 275 mm D (without feet), 3.5 in. H x 8.38 in. W x 10.83 in. D.
**Weight:** HP 3468A/B—2.1 kg (4.63 lb); HP 3468A/B with Opt 001—3.1 kg (6.83 lb).

**Configuration:** order one power and frequency option at no charge from below.
**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

| Ordering Information | Price |
|---|---|
| **HP 3468A DMM** in Streamlined Portable Case with HP-IL and test probes. | $765 ☎ |
| **HP 3468B DMM** in Rack and Stack Case with HP-IL and test probes. | $765 ☎ |

### Options and Accessories

| | |
|---|---|
| **HP 3468A/B Option W30,** add 3 year Extended Hardware Support | $25 |
| **HP 3468A/B Option 001,** add Rechargeable Battery Pack | $155 |
| **HP 3468B Option 401,** add Side Handle Kit (HP P/N 5061-1171) | $40 |
| **HP 3468B Option 907,** add Front Handle Kit (HP P/N 5061-1170) | $52 |
| **HP 3468B Option 908,** add Rack Mount Kit for a Single Instrument (HP P/N 5060-0173) | $55 |
| **HP P/N 5060-0174 Rack Mount Kit** for rack mounting two instruments side-by-side | $87.50 |

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