

Fluke 187/189 True-rms Digital Multimeter Extended Specifications

Nominal Specifications

| Function | Ranges/Description |
|-----------------------|-------------------------------------|
| DC Voltage | 0 to 1000V |
| DC Current | 0 to 10A (20A for 30 seconds) |
| AC Voltage, True-rms | 2.5 mV to 1000V - 100 kHz bandwidth |
| AC Current, True-rms | 25 µA to 10A (20A for 30 seconds) |
| Resistance | 0 to 500 Mohms |
| Conductance | 0 to 500 Nanosiemens |
| Capacitance | 0.001 nF to 50 mF |
| Diode Test | 3.1V |
| Temperature | -200°C to 1350°C (-328°F to 2462°F) |
| Frequency | 0.5 Hz to 1000 kHz |
| Accuracy (Basic DC V) | 0.025% |
| (Basic AC V) | 0.4% |

Features

| Feature | Description |
|---|--|
| Dual Displays | 50,000 count primary display 5,000 count secondary display |
| Backlight with 2 brightness selections | Bright white backlight for clear readings in poorly lighted areas |
| Fast Autorange | Meter automatically selects best range - instantly |
| AC+DC True RMS, ac rms specified to 100 kHz | Choices for AC only, AC and DC dual display, or AC+DC readings |
| dBm, dBV | User selectable impedance references for dBm |
| AutoHOLD | Holds readings on display |
| Continuity/Open Test | Beeper sounds for Ohms readings below threshold or for momentary open circuit indication |
| Fast Bar Graph | 51 Segments for peaking and nulling |
| Duty Cycle/Pulse Width | Measure time a signal is on or off in % or milliseconds |
| MIN MAX/Fast MIN MAX with elapsed and Real Time Stamp | Record Maximum, Minimum, and Average values. Real Time for MAX or MIN, elapsed time for AVG. Fast MIN MAX captures peaks to 250 µsec. |
| Closed Case Calibration | No internal adjustments needed |
| Battery/Fuse Access Door | Battery or fuse replacement without voiding calibration |
| Hi-Impact Overmold Case | Integrated Protective Holster provides superior impact protection for your meter |

¹ For the 5,000 count mode, divide the number of least significant digits (counts) by 10.

² A residual reading of 8 to 180 digits with leads shorted, will not affect stated accuracy above 5% of range.

³ 20 counts in dual display DC or AC + DC

⁴ 10A continuous up to 35°C, less than 10 minutes 35° to 55°. 20A overload for 30 seconds maximum

⁵ See AC conversion notes for AC mV and V.

Above specifications are subject to change without notice.

Detailed Specifications

Accuracy is specified for a period of one year after calibration, at 18°C to 28°C (64°F to 82°F) with relative humidity to 90%. Accuracy specifications are given as ±[% of reading] + [number of least significant digits]

| Function | Range | Resolution | Accuracy | | | | |
|----------------------|------------|------------|-------------|-------------|--------------|---------------|----------------|
| | | | 45 Hz-1 kHz | 20 Hz-45 Hz | 1 kHz-10 kHz | 10 kHz-20 kHz | 20 kHz-100 kHz |
| AC mV ^{1,2} | 50.000mV | 0.001mV | 0.4% + 40 | 2% + 80 | 5% + 40 | 5.5% + 40 | 15% + 40 |
| | 500.00 mV | 0.01 mV | 0.4% + 40 | 2% + 80 | 5% + 40 | 5.5% + 40 | 8% + 40 |
| | 3000.0 mV | 0.1 mV | 0.4% + 40 | 2% + 80 | 0.4% + 40 | 1.5% + 40 | 8% + 40 |
| AC V ^{1,2} | 5.0000V | 0.0001V | 0.4% + 40 | 2% + 80 | 0.4% + 40 | 1.5% + 40 | 8% + 40 |
| | 50.000V | 0.001V | 0.4% + 40 | 2% + 80 | 0.4% + 40 | 1.5% + 40 | 8% + 40 |
| | 500.00V | 0.01V | 0.4% + 40 | 2% + 80 | 0.4% + 40 | Not specified | Not specified |
| dBV | 1000.0V | 0.1V | 0.4% + 40 | 2% + 80 | 0.4% + 40 | Not specified | Not specified |
| | -56 to -6 | 0.01 dB | 0.1 dB | 0.2 dB | 0.5 dB | 0.5 dB | 1.4 dB |
| | -6 to +34 | 0.01 dB | 0.1 dB | 0.2 dB | 0.1 dB | 0.2 dB | 0.8 dB |
| | +34 to +60 | 0.01 dB | 0.1 dB | 0.2 dB | 0.1 dB | Not specified | Not specified |

| Function | Range | Resolution | Accuracy | | | |
|----------|----------------------|------------|-------------|-------------|--------------|----------------|
| | | | 45 Hz-1 kHz | 20 Hz-45 Hz | 1 kHz-20 kHz | 20 kHz-100 kHz |
| AC µA | 500.00 µA | 0.01 µA | 0.75% + 20 | 1% + 20 | 0.75% + 20 | 6% + 40 |
| | 5000.0 µA | 0.1 µA | 0.75% + 5 | 1% + 5 | 0.75% + 10 | 2% + 40 |
| AC mA | 50.000 mA | 0.001 mA | 0.75% + 20 | 1% + 20 | 0.75% + 20 | 9% + 40 |
| | 400.00 mA | 0.01 mA | 0.75% + 5 | 1% + 5 | 1.5% + 10 | 4% + 40 |
| AC A | 5.0000A | 0.0001A | 1.5% + 20 | 1.5% + 20 | 6% + 40 | Not specified |
| | 10.000A ⁴ | 0.001A | 1.5% + 5 | 1.5% + 5 | 5% + 10 | Not specified |

| Function | Range | Resolution | Accuracy | | | Accuracy Dual Display AC or AC+DC ⁵ |
|----------|----------------------|------------|--------------------------|-------------|-------------|--|
| | | | DC | 20 Hz-45 Hz | 45 Hz-1 kHz | |
| DC mV | 50.000 mV | 0.001mV | 0.1% + 20 | 2% + 80 | 0.5% + 40 | 6% + 40 |
| | 500.00 mV | 0.01 mV | 0.03% + 2 | 2% + 80 | 0.5% + 40 | |
| | 3000.0 mV | 0.1 mV | 0.025% + 5 | 2% + 80 | 0.5% + 40 | |
| DC V | 5.0000V | 0.0001V | 0.025% + 10 ³ | 2% + 80 | 0.5% + 40 | 2% + 40 |
| | 50.000V | 0.001V | 0.03% + 3 ³ | 2% + 80 | 0.5% + 40 | |
| | 500.00V | 0.01V | 0.1% + 2 ³ | 2% + 80 | 0.5% + 40 | |
| DC µA | 1000.0V | 0.1V | 0.1% + 2 ³ | 2% + 80 | 0.5% + 40 | Not specified |
| | 500.00 µA | 0.01 µA | 0.25% + 20 | 1% + 20 | 1% + 20 | 2% + 40 |
| | 5.000 µA | 0.1 µA | 0.25% + 2 | 1% + 10 | 0.75% + 10 | 2% + 40 |
| DC mA | 50.000 mA | 0.001 mA | 0.15% + 10 | 1% + 20 | 0.75% + 20 | 2% + 40 |
| | 400.00 mA | 0.01 mA | 0.15% + 2 | 1% + 10 | 1% + 10 | 3% + 40 |
| DC A | 5.0000A | 0.0001A | 0.5% + 10 | 2% + 20 | 2% + 20 | 6% + 40 |
| | 10.000A ⁴ | 0.001A | 0.5% + 2 | 1.5% + 10 | 1.5% + 10 | 5% + 40 |

Detailed Specifications (continued)

Accuracy is specified for a period of one year after calibration, at 18°C to 28°C (64°F to 82°F) with relative humidity to 90%.

Accuracy specifications are given as ±[(% of reading) + (number of least significant digits)]

| Function | Range | Resolution | Accuracy |
|--------------------------|-------------------------|----------------------|--|
| Resistance ¹ | 500.00Ω | 0.01Ω | 0.05% + 10 ⁵ |
| | 5.0000 kΩ | 0.0001 kΩ | 0.05% + 2 |
| | 50.000 kΩ | 0.001 kΩ | 0.05% + 2 |
| | 500.00 kΩ | 0.01 kΩ | 0.05% + 2 |
| | 5.0000 MΩ | 0.0001 MΩ | 0.15% + 4 ² |
| | 30.000 MΩ | 0.001 MΩ | 1% + 4 ² |
| | 100.0 MΩ | 0.1 MΩ | 3% + 2 ¹¹ |
| | 500.0 MΩ | 0.1 MΩ | 10% + 2 ¹¹ |
| Conductance | 50.00 nS | 0.01 nS | 1% + 10 |
| Capacitance ³ | 1.000 nF | 0.001 nF | 2% + 5 |
| | 10.00 nF | 0.01 nF | 1% + 5 |
| | 100.0 nF | 0.1 nF | |
| | 1.000 μF | 0.001 μF | |
| | 10.00 μF | 0.01 μF | |
| | 100.0 μF | 0.1 μF | |
| | 1.000 μF | 1 μF | |
| 10.0 mF | 0.01 mF | 3% + 10 | |
| 50.00 mF | 0.01 mF ⁵ | 3% + 10 | |
| Diode Test ¹ | 3.1000V | 0.0001V | 2% + 20 |
| Frequency | 500.00 Hz | 0.01 Hz ⁴ | ±(0.005% + 1) |
| | 5.0000 kHz | 0.0001 kHz | |
| | 50.000 kHz | 0.001 kHz | |
| | 999.99 kHz | 0.01 kHz | |
| Duty Cycle | 10.00 to 90.00% | 0.1% | ±(Voltage Range/ Input Voltage) x 300 counts ^{9,10} |
| Pulse Width ⁵ | 499.99 ms | 0.01 ms | ±(3% x(Voltage range/ input voltage) + 1 count) ^{9,10} |
| | 999.9 ms | 0.1 ms | |
| Temperature | -200 to +1350°C | 0.1°C | ±(1% of reading + 1°C) ^{7,12} |
| | -328 to +2462°F | 0.1°F | ±(1% of reading + 1.8°F) ^{7,12} |
| Min-Max-Avg | Response: 100 ms to 80% | | Specified accuracy ± 12 counts for changes >200 ms in duration. (± 40 digits in AC for changes >350 ms and inputs >25% of range) |
| Fast Min-Max | 250 μs ⁸ | | Specified accuracy ± 100 counts for changes >250 μs in duration ⁸ |

¹ For the 5,000 count mode, divide the number of least significant digits (counts) by 10.

² For relative humidity greater than 70%, resistance accuracy is 0.5% over 1 MΩ and 2.5% over 10 MΩ.

³ For film capacitor or better, using Relative mode (REL Δ) to zero residual on 1.1 nF range.

⁴ Reading will be 0.00 for signals below 0.5 Hz.

⁵ Least significant digit not active above 10 mF.

⁶ Using relative mode (REL Δ) to zero residual reading.

⁷ For ambient temperature changes of ± 5°C, rated accuracy applies after 1 hour.

⁸ For repetitive peaks, 2.5 ms for single events.

⁹ Frequency greater than 5 Hz, except for VDC, 500 mV dc and 3000 mV dc functions; 0.5 Hz to 1.0 + 0.

¹⁰ Range/input ratios also apply to current functions.

¹¹ To ensure stated accuracy, switch to conductance mode and verify that the open circuit reading is less than 0.10 nS.

¹² Accuracy specification is relative to the user - adjustable temperature offset, and assumes ambient temperature stable to ± 1°C

Above specifications are subject to change without notice.

Memory and PC Communication Functions (Fluke 189 Only)

The Fluke 189 adds the following capabilities:

Interval LOGGING At least 288 intervals (specified by user in Setup) may be recorded to internal memory. These values may be viewed using the VIEW MEM function on the meter. Up to 700 unstable event values (similar to AutoHold) are automatically added to LOGGING memory for viewing only through the optional FlukeView® Forms PC software. Additional intervals will be logged if the signal is stable.

Reading SAVE Up to 100 readings may be saved by the user in a memory separate from LOGGING memory. These readings may be viewed using VIEW MEM.

Frequency Counter Sensitivity

| Input Range | Approximate VAC Sensitivity (RMS Sine Wave) ¹ | | | | |
|-------------|--|---------------------|----------------------------|---|----------------------------|
| | 15 Hz to 100 kHz ² | 500 Hz ² | VAC Bandwidth ³ | Approximate VCD Trigger Levels ¹ | VDC Bandwidth ³ |
| 50 mV | 5 mV | 10 mV | 1 MHz | -5 mV & 5 mV | 1 MHz |
| 500 mV | 20 mV | 20 mV | 1 MHz | 5 mV & 65 mV | 1 MHz |
| 3000 mV | 500 mV | 2000 mV | 800 kHz | 140 mV & 200 mV | 90 kHz |
| 5V | 0.5V | 2.0V | 950 kHz | 1.4 V & 2.0 V | 14 kHz |
| 50V | 5V | 5.0V | 1 MHz | 0.5 V & 6.5 V | > 400 kHz |
| 500V | 20V | 20V | 1 MHz | 5 V & 65 V | > 400 kHz |
| 1000V | 100V | 100V | > 400 kHz | 5 V & 65 V | > 400 kHz |

¹ Maximum input = 10 x Range (1000 V max). Noise at low frequencies and amplitudes may affect accuracy.

² Usable at reduced sensitivity to 0.5 Hz and 1000 kHz.

³ Typical frequency bandwidth with full scale (or maximum 2 x 10⁷ V-Hz product) RMS sine wave.

Burden Voltage (A, mA, μA)

| Function | Range | Burden Voltage (typical) |
|----------|-----------|--------------------------|
| mA- μA | 500.00 μA | 102 μV / μA |
| | 5,000 μA | 102 μV / μA |
| | 50.000 mA | 1.8 mV / mA |
| | 400.00 mA | 1.8 mV / mA |
| A | 5.0000 A | 0.04 V / A |
| | 10.000 A | 0.04 V / A |

Input Impedance

| Function | Input Impedance (Nominal) | | | | | |
|--------------|--------------------------------------|-------------|--------------|--------------------------------|-------------------|--------------|
| Volts, mV | 10 MΩ, < 100 pF | | | | | |
| | Common Mode Rejection Ratio | | | Normal Mode Rejection | | |
| DC Volts, mV | >100 dB at dc, 50 Hz or 60 Hz ±0.1% | | | >90 dB at 50 Hz or 60 Hz ±0.1% | | |
| AC Volts, mV | > 90 dB dc to 60 Hz | | | | | |
| | Open Circuit Test Voltage | | | Full-Scale Voltage | | |
| | | | | To 5 MΩ | 30 to 500 MΩ + nS | |
| Ohms | < 5V | | | 500 mV | 3.1V | |
| Diode Test | < 5V | | | 3.1000V | | |
| | Typical Short-Circuit Current | | | | | |
| | 500Ω | 5 kΩ | 50 kΩ | 500 kΩ | 5 MΩ | 30 MΩ |
| Ohms | 1 μA | 100 μA | 10 μA | 1 μA | 0.1 μA | 0.1 μA |
| Diode Test | 1.0 mA typical | | | | | |

Safety Information

| Function | Description |
|------------------|---|
| Safety | 1000 V, AC/DC, maximum voltage between any terminal and earth ground. Complies with ANSI/ISA-S82.01-94, CSA C22.2 No 1010.1-92 to 1000 V Overvoltage Category III and to 600V Overvoltage Category IV. Certification agencies (approvals/listings pending): UL per standard UL 3111 (pending) CSA per standard CSA/CAN C22.2 No. 1010.1-92 TUV per standard EN 61010 Part 1-1993 (pending) |
| Surge Protection | 8 kV peak per IEC 1010.1-92 |
| Fuse Protection | 440 mA, 1000 V FAST Fuse, 11A, 1000V FAST Fuse |
| Markings | UL, CSA, TUV, CE (VDE pending) |

General Specifications

| Function | Description |
|-------------------------|---|
| Display | Digital: 50000/5000 counts primary, 5000 counts secondary, updates 4/second. Analog: 51 segments, updates 40/second. |
| Operating Temperature | -20°C to +55°C |
| Storage Temperature | -40°C to +60°C |
| Temperature Coefficient | 0.05 x (specified accuracy)/°C (<18°C or >28°C) |
| Relative Humidity | 0% to 90% (0°C to 55°C) 0% to 70% (35°C to 55°C) |
| Altitude | Operating: 2000 meters Storage: 10000 meters |
| Battery Type | 4 AA Alkaline, NEDA 15A or LR6 |
| Battery Life | 72 Hours typical (with backlight off) |
| Shock Vibration | Per MIL-T-PRF 28800 for Class II instruments |
| EMC | Susceptibility and Emissions: Commercial Limits per EN61326-1 |
| Size | 10.0 cm X 20.3 cm X 5.0 cm (3.94" X 8.00" X 1.97") (Not Including Accessory Mount) |
| Weight | 545 grams (1.2 lbs.) |
| Case Sealing | IP-42 per IEC 529, Section 3 |
| Warranty | Lifetime |
| Calibration Interval | 1 year |

Above specifications are subject to change without notice.

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