

## Fluke 187/189 True-rms Digital Multimeters Extended Specifications



### Memory and PC Communication Functions

#### PC Communication (187 and 189)

Using the optional Fluke View Forms software:

- Readings and data from the meter can be downloaded to a computer.
- Signals can be logged/monitored real-time with the meter in combination with a computer.

#### Stand-alone LOGGING (189 only)

The logging interval (time between two measurements) can be selected between 1 second and 99 minutes with incremental steps of 1 second. If the signal changes more than 4% (% is user-selectable with optional Fluke View Forms Software) in the interval between two measurements, then these additional values are also stored into the internal memory. In this way up to 995 measurements can be stored into the internal memory when logging.

#### Reading SAVE (189 only)

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.

### 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 $\mu$ A to 10A (20A for 30 seconds)
Resistance	0 to 500 MOhms
Conductance	0 to 500 nS
Capacitance	0.001 nF to 50 mF
Diode Test	3.1V
Temperature	-20°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	Uses Touch Hold® feature to capture readings
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 Time Stamp	Record Maximum, Minimum, and Average values. Relative time for MAX and MIN, elapsed time for AVG. Reference to internal real time clock.
REL $\Delta$	Relative measurements to reference, displayed as absolute value or percentage
Real time clock	Displays real time of day in hours and minutes
Input Alert™	Audible warning when leads are in current input terminals but rotary switch position does not correspond
Fuse warning	Indication on display when fuse is broken
Voltage warning	Indication on display when voltage on input terminals is higher than 30V
Low battery warning	Indication on display when batteries are low
Automatic power off and backlight off	With user selectable times. Can also be switched off
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 meter

## Detailed Accuracy 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 ])

AC mV, AC V, AC μA, AC mA, and AC A specifications are ac coupled, true rms and are valid from 5 % of range to

100 % of range. AC crest factor can be up to 3.0 at full-scale, 6.0 at half-scale except the 3000 mV and 1000 V ranges where it is 1.5 at full scale, 3.0 at half-scale.

Function	Range	Resolution	Accuracy				
			45 Hz-1 kHz	20-45 Hz	1 kHz-10 kHz	10 kHz-20 kHz	20 kHz-100 kHz
AC mV <sup>1,2</sup>	50.000 mV	0.001 mV	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 <sup>1,2</sup>	5.0000 V	0.0001 V	0.4 % + 40	2 % + 80	0.4 % + 40	1.5 % + 40	8 % + 40
	50.000 V	0.001 V	0.4 % + 40	2 % + 80	0.4 % + 40	1.5 % + 40	8 % + 40
	500.00 V	0.01 V	0.4 % + 40	2 % + 80	0.4 % + 40	Not specified	Not specified
	1000.0 V	0.1 V	0.4 % + 40	2 % + 80	0.4 % + 40	Not specified	Not specified
dBV	-52 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

- For the 5,000 count mode, divide the number of least significant digits (counts) by 10.
- A residual reading of 8 to 180 digits with leads shorted, will not affect stated accuracy above 5 % of range.

Function	Range	Resolution	Accuracy			
			45-1 kHz	20-45 Hz	1-20 kHz	20 kHz-100 kHz
AC μA	500.00 μA	0.01 μA	0.75 % + 20	1 % + 20	0.75 % + 20	6 % + 40
	5,000.0 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	5.0000 A	0.0001 A	1.5 % + 20	1.5 % + 20	6 % + 40	Not specified
	10.000 A <sup>1</sup>	0.001 A	1.5 % + 5	1.5 % + 5	5 % + 10	Not specified

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

Function	Range	Resolution	Accuracy			
			DC	20 - 45 Hz	45 Hz - 1 kHz	1 kHz- 20 kHz
DC mV	50.000 mV	0.001 mV	0.1% + 20	2 % + 80	0.5 % + 40	6 % + 40
	500.00 mV	0.01 mV	0.03 % + 2			
	3000.0 mV	0.1 mV	0.025 % + 5			
DC V	5.0000 V	0.0001 V	0.025 % + 10 <sup>2</sup>	2 % + 40	Not specified	Not specified
	50.000 V	0.001 V	0.03 % + 3 <sup>2</sup>			
	500.00 V	0.01 V	0.1 % + 2 <sup>2</sup>			
	1000.0 V	0.1 V	0.1 % + 2 <sup>2</sup>			
DC μA	500.00 μA	0.01 μA	0.25 % + 20	1 % + 20	1.0 % + 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	5.0000 A	0.0001 A	0.5 % + 10	2 % + 20	2 % + 20	6 % + 40
	10.000 A <sup>1</sup>	0.001 A	0.5 % + 2	1.5 % + 10	1.5 % + 10	5 % + 10

- 10 A continuous up to 35 °C, less than 10 minutes 35 °C to 55 °C. 20 A overload for 30 seconds maximum.
- 20 counts in dual display DC or AC+DC.
- See AC conversions notes for AC mV and V.

Function	Range	Resolution	Accuracy
Resistance <sup>1</sup>	500.00 Ω	0.01 Ω	0.05 % + 10 <sup>3</sup>
	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 <sup>2</sup>
	30.000 MΩ	0.001 MΩ	1 % + 4 <sup>2</sup>
	100.0 MΩ	0.1 MΩ	3 % + 2 <sup>4</sup>
	500.0 MΩ	0.1 MΩ	10 % + 2 <sup>4</sup>
Conductance	50.00 nS	0.01 nS	1 % + 10
Capacitance <sup>5</sup>	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	
	50.00 mF	0.01 mF <sup>6</sup>	3 % + 10
Diode Test <sup>1</sup>	3.1000 V	0.0001 V	2 % + 20
Frequency	500.00 Hz	0.01 Hz <sup>7</sup>	± (0.0050 % + 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 %	0.01 %	± (voltage range/input voltage) X 300 counts) <sup>11,12</sup>
Pulse Width	499.99 ms	0.01 ms	± (3 % X (voltage range/input voltage) + 1 count) <sup>11,12</sup>
	999.9 ms	0.1 ms	
Temperature	-200 to +1350 °C -328 to +2462 °F	0.1 °C 0.1 °F	± ( 1 % of reading + 1 °C) <sup>8,9</sup> ± ( 1 % of reading + 1.8 °F) <sup>8,9</sup>
MIN MAX AVG	Response: 100 μs to 80 %		Specified accuracy ± 12 counts for changes > 200 ms in duration. (± 40 counts in AC for changes > 350 ms and inputs > 25 % of range)
FAST MN MX	250 μs <sup>10</sup>		Specified accuracy ±100 counts up to 5,000 count (full range) reading. For higher peak readings (to 20,000 counts), specified accuracy ± 2% of reading.

- For the 5,000 count mode, divide the number of least significant digits (counts) by 10.
- For relative humidity greater than 70 %, resistance accuracy is 0.5 % over 1 MΩ and 2.5 % over 10 MΩ.
- Using relative mode (**REL Δ**) to zero residual reading.
- To ensure stated accuracy, switch to conductance mode and verify that the open circuit reading is less than 0.10 nS.
- For film capacitor or better, using Relative mode (**REL Δ**) to zero Residual on 1.000 nF and 10.00 nF ranges.
- Least significant digit not active above 10 mF.
- Reading will be 0.00 for signals below 0.5 Hz.
- Accuracy specification is relative to the user-adjustable temperature offset, and assumes ambient temperature stable to ± 1 °C.
- For ambient temperature changes of ± 5 °C, rated accuracy applies after 1 hour.
- For repetitive peaks; 2.5 ms for single events. Use DC function settings below 20 Hz. 50 mV range not specified.
- Frequency greater than 5 Hz, except for VDC, 500 mVDC and 3000 mVDC functions; 0.5 Hz to 1 kHz. Signals centered around trigger levels.
- Range/input ratios also apply to current functions. 500 counts or 5 % for 10 A ranges.

## Input Characteristics

Function	Input Impedance (Nominal)					
Volts, mV	10 MΩ, < 100 pF					
	<b>Common Mode Rejection Ratio</b>	<b>Normal Mode Rejection</b>				
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					
	<b>Full-Scale Voltage</b>					
	<b>Open Circuit Test Voltage</b>		<b>To 5 MΩ</b>	<b>30 MΩ + nS</b>		
Ohms	< 5 V	500 mV		3.1 V		
Diode Test	< 5 V	3.1000 V				
	<b>Typical Short-Circuit Current</b>					
	<b>500 Ω</b>	<b>5 kΩ</b>	<b>50 kΩ</b>	<b>500 kΩ</b>	<b>5 MΩ</b>	<b>30 MΩ</b>
Ohms	1 mA	100 μA	10 μA	1 μA	0.1 μA	0.1 μA
Diode Test	1 mA typical					

## Frequency Counter Sensitivity

Input Range	Approximate VAC Sensitivity (RMS Sine Wave) <sup>1</sup>		VAC Bandwidth <sup>3</sup>	Approximate VDC Trigger Levels <sup>1</sup>	VDC Bandwidth <sup>3</sup>
	15 Hz to 100 kHz <sup>2</sup>	500 kHz <sup>2</sup>			
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
5 V	0.5 V	2.0 V	950 kHz	1.4 V & 2.0 V	14 kHz
50 V	5 V	5.0 V	1 MHz	0.5 V & 6.5 V	> 400 kHz
500 V	20 V	20 V	1 MHz	5 V & 65 V	> 400 kHz
1000 V	100 V	100 V	> 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. Useable at reduced sensitivity to 0.5 Hz and 1000 kHz.
3. Typical frequency bandwidth with full scale (or maximum 2 X 10<sup>7</sup> V-Hz product) RMS sine wave.

## Burden Voltage (A, mA, μA)

Function	Range	Burden Voltage (typical)
mA - μA	500.00 μA	102 μV / mA
	5,000 μA	102 μV / mA
	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

## Safety Information

<b>Maximum voltage between any terminal and earth ground.</b>	1000 V dc or rms ac
<b>Compliances</b>	Complies with ANSI/ISA-S82.01-94, CSA C22.2 No 1010.1-92 to 1000 V Overvoltage Category III, 600 V Overvoltage Category IV, Pollution Degree 2 *
<b>Certifications (listed and pending)</b>	CSA per standard CSA/CAN C22.2 No. 1010.1-92 UL per standard UL 3111 TÜV per standard EN 61010 Part 1-1993
<b>Surge Protection</b>	8 kV peak per IEC 1010.1-92
<b>⚠ Fuse Protection for mA or μA inputs</b>	0.44 A (44/100 A, 440 mA), 1000 V FAST Fuse
<b>⚠ Fuse Protection for A input</b>	11 A, 1000 V FAST Fuse
<b>Markings</b>	CE, UL, and TÜV
* CAT III/CAT IV: OVERVOLTAGE (Installation) Category III/IV, Pollution Degree 2 per IEC1010-1 refers to the level of Impulse Withstand Voltage protection provided. Equipment of OVERVOLTAGE CATEGORY III is equipment in fixed installations. Examples include electricity meter and primary over-current protection equipment. Equipment of OVERVOLTAGE CATEGORY IV is equipment in the overhead or underground utility service to a fixed installation.	

## General Specifications

<b>Display (LCD)</b>	Digital: 50000/5000 counts primary display, 5000 counts secondary display; updates 4/second. Analog: 51 segments, updates 40/second.
<b>Operating Temperature</b>	- 20 °C to + 55 °C
<b>Storage Temperature</b>	- 40 °C to + 60 °C
<b>Temperature Coefficient</b>	0.05 x (specified accuracy) / °C (<18 °C or >28 °C)
<b>Relative Humidity</b>	0 % to 90 % (0 °C to 35 °C) 0 % to 70 % (35 °C to 55 °C)
<b>Altitude</b>	Operating: 0-2000 meters per EN61010 CAT III, 1000 V; CAT IV, 600 V 0-3000 meters per EN61010 CAT II, 1000 V; EN61010 CAT III, 600 V; CAT IV, 300 V Storage: 0000 meters
<b>Battery Type</b>	4 AA Alkaline, NEDA 15A or LR6
<b>Battery Life</b>	72 Hours typical (with backlight off)
<b>Shock Vibration</b>	Per MIL-T-PRF 28800 for Class II instruments
<b>Electromagnetic Compatibility (EMC)</b>	Susceptibility and Emissions: Commercial Limits per EN61326-1
<b>Size</b>	10.0 cm x 20.3 cm x 5.0 cm (3.94 in x 8.00 in x 1.97 in) (Not Including Accessory Mount)
<b>Weight</b>	545 grams (1.2 lbs.)
<b>Case Sealing</b>	IP-42 per IEC 529, Section 3
<b>Warranty</b>	Lifetime
<b>Calibration Interval</b>	1 year

**Fluke.** *Keeping your world up and running.*

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