

# Fluke 87/89 Series IV 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	15 mV to 1000V - 100 kHz bandwidth
AC Current, True-rms	25 µA to 10A (20A for 30 seconds)
Resistance	0 to 30 Mohms
Conductance	0 to 50 Nanosiemens
Capacitance	0.01 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	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 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

## 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 <sup>1,2</sup>	500.00 mV	0.01 mV	0.4% + 40	2% + 80	5% + 40	5% + 40	6% + 40
	3000.0 mV	0.1 mV	0.4% + 40	2% + 80	0.4% + 40	1.5% + 40	6% + 40
AC V <sup>1,2</sup>	5.0000V	0.0001V	0.4% + 40	2% + 80	0.4% + 40	1.5% + 40	6% + 40
	50.000V	0.001V	0.4% + 40	2% + 80	0.4% + 40	1.5% + 40	6% + 40
	500.00V	0.01V	0.4% + 40	2% + 80	0.4% + 40	Not specified	Not specified
	1000.0V	0.1V	0.4% + 40	2% + 80	0.4% + 40	Not specified	Not specified
dBV	-56 to -6	0.01 dB	0.1 dB	0.2 dB	0.5 dB	0.5 dB	0.5 dB
	-6 to +34	0.01 dB	0.1 dB	0.2 dB	0.1 dB	0.2 dB	0.5 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% + 4
	5.000 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 <sup>3</sup>	0.01 mA	0.75% + 5	1% + 5	1.5% + 10	4% + 4
AC A	5.0000A	0.0001A	1.5% + 20	1.5% + 20	6% + 40	Not specified
	10.000A <sup>4</sup>	0.001A	1.5% + 5	1.5% + 5	5% + 10	Not specified

Function	Range	Resolution	Accuracy			
			DC	20 Hz-45 Hz	45 Hz-1 kHz	1 kHz-20 kHz
DC mV	500.00 mV	0.01 mV	0.03% + 2 <sup>6</sup>	2% + 80	0.6% + 40	6% + 40 <sup>5</sup>
	3000.0 mV	0.1 mV	0.025% + 5 (89-IV) 0.025% + 10 (87-IV)	2% + 80	0.6% + 40	
DC V	5.0000V	0.0001V	0.025% + 10	2% + 80	0.5% + 40	
	50.000V	0.001V	0.03% + 3	2% + 80	0.5% + 40	
	500.00V	0.01V	0.1% + 2	2% + 80	0.5% + 40	
	1000.0V	0.1V	0.1% + 2	2% + 80	0.5% + 40	Not specified
DC µA	500.00 µA	0.01 µA	0.25% + 20 <sup>7</sup>	7% + 10	7% + 10	9% + 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% + 10	0.75% + 10	2% + 40
	400.00 mA <sup>3</sup>	0.01 mA	0.15% + 2	1.5% + 10	1.5% + 10	3% + 40
DC A	5.0000A	0.0001A	0.5% + 10	7% + 20	7% + 20	12% + 40
	10.000A <sup>4</sup>	0.001A	0.5% + 2	1.5% + 10	1.5% + 10	3% + 40

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

<sup>2</sup> A residual reading of 8 to 80 digits with leads shorted, will not affect stated accuracy above 5% of range.

<sup>3</sup> 500.00 mA for 30 seconds maximum.

<sup>4</sup> 4.20A overload for 30 seconds maximum.

<sup>5</sup> DC 5V range, -3dB typical @ 10 kHz.

<sup>6</sup> In RF field of 3V/m, add 100 counts from 100 to 120 MHz, 60 counts from 270 to 300 MHz, 40 counts from 320 to 335 MHz.

<sup>7</sup> In RF field of 3V/m, add 200 counts from 80 to 95 MHz.

<sup>8</sup> See AC conversion notes for AC mV and V.

Above specifications are subject to change without notice.

## 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 <sup>1</sup>	500.00Ω	0.01Ω	0.05% + 10 <sup>5</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>
Conductance	50.00 nS	0.01 nS	1% + 10
Capacitance <sup>3</sup>	1.100 nF	0.001 nF	1% + 5
	11.00 nF	0.01 nF	
	110.0 nF	0.1 nF	
	1.100 μF	0.001 μF	
	11.00 μF	0.01 μF	
	110.0 μF	0.1 μF	
	1,100 μF	1 μF	
	11.0 mF	0.01 mF	
	50.00 mF	0.01 mF	
Diode Test <sup>1</sup>	3.1000V	0.0001V	2% + 2
Frequency	500.00 Hz	0.01 Hz <sup>4</sup>	± (0.005% + 1)
	5.0000 kHz	0.0001 kHz	
	50.000 kHz	0.001 kHz	
	999.99 kHz	0.01 kHz	
Duty Cycle <sup>5</sup>	10 to 90%	0.1%	±(0.12 x Voltage Range/ Input Voltage x 100%)
Pulse Width <sup>5</sup>	5.0000 ms	0.0001 ms	±(0.0001 ms + 1)
	50.000 ms	0.001 ms	
Temperature	-200 to +1350°C	0.1°C	±(1% of reading + 1°C) <sup>6,7</sup>
	-328 to +2462°F	0.1°F	±(1% of reading + 1.8°F) <sup>6,7</sup>
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		Specified accuracy ± 100 counts for changes >250 μs in duration <sup>8</sup>

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

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

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

<sup>4</sup> Reading will be 0.00 for signals below 0.5 Hz.

<sup>5</sup> Duty Cycle and Pulse Width operate on repetitive waveforms at 14.5 Hz or greater.

<sup>6</sup> Accuracy specification is relative to the user-adjustable temperature offset, and assumes ambient temperature stable to ± 1°C.

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

<sup>8</sup> For repetitive peaks, 2.5 ms for single events.

Above specifications are subject to change without notice.

## Memory and PC Communication Functions (Fluke 89 Series IV Only)

The Fluke 89 Series IV 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	Minimum Sensitivity (RMS Sine Wave) <sup>1</sup>			Approximate Trigger Levels (DC Voltage Function)
	40 Hz to 20 kHz <sup>2</sup>	15 Hz to 40 Hz <sup>3</sup>	20 kHz to 500 kHz <sup>3</sup>	
50 mV (dB only)	10 mV	15 mV	15 mV	± 25 mV
500 mV	100 mV	50 mV	30 mV	35 mV ± 6 mV
5000 mV	1000 mV	2000 mV	2000 mV	170 mV ± 6 mV
5V	1V	2V	2.2V	1.7V ± 0.25V
50V	10V	15V	5V	3.5V ± 2.5V
500V	100V	50V	50V	35V ± 25V
1000V	200V	250V	50V	35V ± 25V

<sup>1</sup> Maximum input for specified accuracy = 10 x Range or 1000V, ac-coupled only.

Accuracy: add 1 count.

<sup>2</sup> Sensitivity improves linearly from 40 Hz to 20 kHz.

<sup>3</sup> Useable at reduced sensitivity to 0.5 Hz and 1000 kHz.

## Input Impedance

Function	Input Impedance (Nominal)				
Volts, mV	10 MΩ, < 100 pF				
	<b>Common Mode Rejection Ratio (1 kΩ Unbalanced)</b>		<b>Normal Mode Rejection</b>		
DC Volts, mV	>100 dB -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>Open Circuit Test Voltage</b>		<b>Full-Scale Voltage</b>		
			To 5 MΩ	30 MΩ + nS	
Ohms	< 5V	500 mV		3.1V	
Diode Test	< 5V		3.1000V		
	<b>Typical Short-Circuit Current</b>				
	<b>500Ω</b>	<b>5 kΩ</b>	<b>50 kΩ</b>	<b>500 kΩ</b>	<b>5 MΩ</b>
Ohms	100 μA	100 μA	10 μA	1 μA	0.1 μA
Diode Test	0.8 mA typical				

## 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	5.0000A	0.04 V/A
	10.000A	0.04 V/A

## 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. Certification agencies (approvals/listings pending): UL per standard UL 3111 (pending) CSA per standard CSA/CAN C22.2 No. 1010.1-92 TÜV 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, VDE, TÜV, CE (UL, VDE and TÜV pending)

## General Specifications

Function	Description
Display	Digital: 50000/5000 counts primary, 5000s 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 28°C) 0% to 70% (28°C to 55°C)
Altitude	Operating: 2000 meters Storage: 10000 meters
Battery Type	4 AA Alkaline, NEDA 15C/15F or IEC R6S
Battery Life	72 Hours typical (with backlight off)
Shock Vibration	Per MIL-T-PRF 28800 for Class II instruments
EMC	Susceptibility: Commercial Limits per EN50082-1 Emissions: Commercial Limits per EN50081-1
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

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