

# Fluke 83V and 87V Digital Multimeters Detailed Specifications

## For all detailed specifications:

Accuracy is given as  $\pm([\% \text{ of reading}] + [\text{number of least significant digits}])$  at 18 °C to 28 °C, with relative humidity up to 90 %, for a period of one year after calibration.

For Model 87 in the 4½-digit mode, multiply the number of least significant digits (counts) by 10. AC conversions are ac-coupled and valid from 3 % to 100 % of range. Model 87 is true-rms responding. AC crest factor can be up to 3 at full scale, 6 at half scale. For non-sinusoidal wave forms add  $-(2 \% \text{ Rdg} + 2 \% \text{ full scale})$  typical, for a crest factor up to 3.



### Fluke 87V ac voltage function specifications (true-rms)

Function	Range	Resolution	Accuracy					
			45 - 65 Hz	30 - 200 Hz	200 - 440 Hz	440 Hz - 1 kHz	1 - 5 kHz	5 - 20 kHz <sup>1</sup>
$\tilde{V}^{2,4}$	600.0 mV	0.1 mV	$\pm (0.7 \% + 4)$		$\pm (1.0 \% + 4)$		$\pm (2.0 \% + 4)$	$\pm (2.0 \% + 20)$
	6.000 V	0.001 V						
	60.00 V	0.01 V	$\pm (0.7 \% + 2)$				$\pm (2.0 \% + 4)^3$	unspecified
	600.0 V	0.1 V						
	1000 V	1 V					unspecified	unspecified
	Using low pass filter		$\pm (0.7 \% + 2)$	$\pm (1.0 \% + 4)$	$+ 1 \% + 4$ $-6 \% - 4^5$	unspecified	unspecified	unspecified

<sup>1</sup> Below 10 % of range, add 6 counts.

<sup>2</sup> The Fluke 87V is a true-rms responding meter. When the input leads are shorted together in the ac functions, the meter may display a residual reading between 1 and 30 counts. A 30-count residual reading will cause only a 2-digit change for readings over 3 % of range. Using REL to offset this reading may produce a much larger constant error in later measurements.

<sup>3</sup> Frequency range: 1 kHz to 2.5 kHz.

<sup>4</sup> A residual reading of up to 13 digits with leads shorted, will not affect stated accuracy above 3 % of range.

<sup>5</sup> Specification increases from -1 % at 200 Hz to -6 % at 440 Hz when filter is in use.

### Fluke 83V ac voltage function specifications (average responding rms indicating)

Function	Range	Resolution	Accuracy		
			50 Hz - 60 Hz	30 Hz - 1 kHz	1 kHz - 5 kHz
$\tilde{V}^1$	600.0 mV	0.1 mV	$\pm (0.5 \% + 4)$	$\pm (1.0 \% + 4)$	$\pm (2.0 \% + 4)$
	6.000 V	0.001 V	$\pm (0.5 \% + 2)$	$\pm (1.0 \% + 4)$	$\pm (2.0 \% + 4)$
	60.00 V	0.01 V	$\pm (0.5 \% + 2)$	$\pm (1.0 \% + 4)$	$\pm (2.0 \% + 4)$
	600.0 V	0.1 V	$\pm (0.5 \% + 2)$	$\pm (1.0 \% + 4)$	$\pm (2.0 \% + 4)^2$
	1000 V	1 V	$\pm (0.5 \% + 2)$	$\pm (1.0 \% + 4)$	unspecified

<sup>1</sup> Below a reading of 200 counts, add 10 counts

<sup>2</sup> Frequency range: 1 kHz to 2.5 kHz

# Fluke 83V and 87V Detailed Specifications cont.

## DC voltage, resistance, and conductance function specifications

Function	Range	Resolution	Accuracy	
			Fluke 83V	Fluke 87V
$\overline{\text{V}}$	6.000 V	0.001 V	$\pm (0.1 \% + 1)$	$\pm (0.05 \% + 1)$
	60.00 V	0.01 V	$\pm (0.1 \% + 1)$	$\pm (0.05 \% + 1)$
	600.0 V	0.1 V	$\pm (0.1 \% + 1)$	$\pm (0.05 \% + 1)$
	1000 V	1 V	$\pm (0.1 \% + 1)$	$\pm (0.05 \% + 1)$
$\overline{\text{mV}}$	600.0 mV	0.1 mV	$\pm (0.3 \% + 1)$	$\pm (0.1 \% + 1)$
$\Omega$	600.0 $\Omega$	0.1 $\Omega$	$\pm (0.4 \% + 2)^1$	$\pm (0.2 \% + 2)^1$
	6.000 k $\Omega$	0.001 k $\Omega$	$\pm (0.4 \% + 1)$	$\pm (0.2 \% + 1)$
	60.00 k $\Omega$	0.01 k $\Omega$	$\pm (0.4 \% + 1)$	$\pm (0.2 \% + 1)$
	600.0 k $\Omega$	0.1 k $\Omega$	$\pm (0.7 \% + 1)$	$\pm (0.6 \% + 1)$
	6.000 M $\Omega$	0.001 M $\Omega$	$\pm (0.7 \% + 1)$	$\pm (0.6 \% + 1)$
nS	50.00 M $\Omega$	0.01 M $\Omega$	$\pm (1.0 \% + 3)^2$	$\pm (1.0 \% + 3)^2$
	60.00 nS	0.01 nS	$\pm (1.0 \% + 10)^1$	$\pm (1.0 \% + 10)^1$

<sup>1</sup> When using the REL  $\Delta$  function to compensate for offsets

<sup>2</sup> Add 0.5 % of reading when measuring above 30 M $\Omega$  in the 50 M $\Omega$  range and 20 counts below 33 nS in the 60 nS range

## Temperature specifications (87V only)

Temperature	Resolution	Accuracy <sup>1, 2</sup>
-200 °C to +1090 °C	0.1 °C	1 % + 10
-328 °F to +1994 °F	0.1 °F	1 % + 18

<sup>1</sup> Does not include error of the thermocouple probe.

<sup>2</sup> Accuracy specification assumes ambient temperature stable to  $\pm 1$  °C. For ambient temperature changes of  $\pm 5$  °C, rated accuracy applies after 1 hour.

## Current function specifications

Function	Range	Resolution	Accuracy		Burden Voltage (typical)
			Model 83 <sup>1</sup>	Model 87 <sup>2, 3</sup>	
$\text{mA}$ $\text{A} \sim$ (45 Hz to 2 kHz)	60.00 mA	0.01 mA	$\pm (1.2 \% + 2)^5$	$\pm (1.0 \% + 2)$	1.8 mV/mA
	400.0 mA <sup>6</sup>	0.1 mA	$\pm (1.2 \% + 2)^5$	$\pm (1.0 \% + 2)$	1.8 mV/mA
	6.000 A	0.001 A	$\pm (1.2 \% + 2)^5$	$\pm (1.0 \% + 2)$	0.03 V/A
	10.00 A <sup>4</sup>	0.01 A	$\pm (1.2 \% + 2)^5$	$\pm (1.0 \% + 2)$	0.03 V/A
$\text{mA}$ $\text{A} \overline{\text{---}}$	60.00 mA	0.01 mA	$\pm (0.4 \% + 4)$	$\pm (0.2 \% + 4)$	1.8 mV/mA
	400.0 mA <sup>6</sup>	0.1 mA	$\pm (0.4 \% + 2)$	$\pm (0.2 \% + 2)$	1.8 mV/mA
	6.000 A	0.001 A	$\pm (0.4 \% + 4)$	$\pm (0.2 \% + 4)$	0.03 V/A
	10.00 A <sup>4</sup>	0.01 A	$\pm (0.4 \% + 2)$	$\pm (0.2 \% + 2)$	0.03 V/A
$\mu\text{A} \sim$ (45 Hz to 2 kHz)	600.0 $\mu\text{A}$	0.1 $\mu\text{A}$	$\pm (1.2 \% + 2)^5$	$\pm (1.0 \% + 2)$	100 $\mu\text{V}/\mu\text{A}$
	6000 $\mu\text{A}$	1 $\mu\text{A}$	$\pm (1.2 \% + 2)^5$	$\pm (1.0 \% + 2)$	100 $\mu\text{V}/\mu\text{A}$
$\mu\text{A} \overline{\text{---}}$	600.0 $\mu\text{A}$	0.1 $\mu\text{A}$	$\pm (0.4 \% + 4)$	$\pm (0.2 \% + 4)$	100 $\mu\text{V}/\mu\text{A}$
	6000 $\mu\text{A}$	1 $\mu\text{A}$	$\pm (0.4 \% + 2)$	$\pm (0.2 \% + 2)$	100 $\mu\text{V}/\mu\text{A}$

<sup>1</sup> AC conversion for Model 83 is ac coupled and calibrated to the rms value of a sine wave input.

<sup>2</sup> AC conversions for Model 87 are ac coupled, true rms responding, and valid from 3 % to 100 % of range.

<sup>3</sup> Model 87 is a true rms responding meter. When the input leads are shorted together in the ac functions, the Meter may display a residual reading between 1 and 30 counts. A 30 count residual reading will cause only a 2 digit change for readings over 3 % of range. Using REL to offset this reading may produce a much larger constant error in later measurements.

<sup>4</sup>  $\Delta$  10 A continuous up to 35 °C; < 20 minutes on, 5 minutes off at 35 °C to 55 °C. 20 A for 30 seconds maximum; > 10 A unspecified.

<sup>5</sup> Below a reading of 200 counts, add 10 counts.

<sup>6</sup> 400 mA continuous; 600 mA for 18 hours maximum.

## Capacitance and diode function specifications

Function	Range	Resolution	Accuracy
$\overline{\text{C}}$	10.00 nF	0.01 nF	$\pm (1 \% + 2)^1$
	100.0 nF	0.1 nF	$\pm (1 \% + 2)^1$
	1.000 $\mu\text{F}$	0.001 $\mu\text{F}$	$\pm (1 \% + 2)$
	10.00 $\mu\text{F}$	0.01 $\mu\text{F}$	$\pm (1 \% + 2)$
	100.0 $\mu\text{F}$	0.1 $\mu\text{F}$	$\pm (1 \% + 2)$
	9999 $\mu\text{F}$	1 $\mu\text{F}$	$\pm (1 \% + 2)$
$\overrightarrow{\text{D}}$	3.000 V	0.001 V	$\pm (2 \% + 1)$

<sup>1</sup> With a film capacitor or better, using Relative mode to zero residual.

### Frequency counter specifications

Function	Range	Resolution	Accuracy
Frequency (0.5 Hz to 200 kHz, pulse width > 2 µs)	199.99	0.01 Hz	± (0.005 % + 1)
	1999.9	0.1 Hz	± (0.005 % + 1)
	19.999 kHz	0.001 kHz	± (0.005 % + 1)
	199.99 kHz	0.01 kHz	± (0.005 % + 1)
	> 200 kHz	0.1 kHz	unspecified

### Frequency counter sensitivity and trigger levels

Input Range <sup>1</sup>	Minimum Sensitivity (RMS Sine wave)		Approximate Trigger Level (DC Voltage Function)
	5 Hz - 20 kHz	0.5 Hz - 200 kHz	
600 mV dc	70 mV (to 400 Hz)	70 mV (to 400 Hz)	40 mV
600 mV ac	150 mV	150 mV	–
6 V	0.3 V	0.7 V	1.7 V
60 V	3 V	7 V (≤ 140 kHz)	4 V
600 V	30 V	70 V (≤ 14.0 kHz)	40 V
1000 V	100 V	700 V (≤ 1.4 kHz)	100 V
Duty Cycle Range	Accuracy		
0.0 to 99.9 %	Within ± (0.2 % per kHz + 0.1 %) for risetimes < 1 µs		

<sup>1</sup> Maximum input for specified accuracy = 10X Range or 1000 V.

### Electrical characteristics of the terminals

Function	Overload Protection <sup>1</sup>	Input Impedance (nominal)	Common Mode Rejection Ratio (1 kΩ unbalance)	Normal Mode Rejection						
$\overline{\overline{V}}$	1000 V rms	10 MΩ < 100 pF	> 120 dB at dc, 50 Hz or 60 Hz	> 60 dB at 50 Hz or 60 Hz						
$\overline{mV}$	1000 V rms	10 MΩ < 100 pF	> 120 dB at dc, 50 Hz or 60 Hz	> 60 dB at 50 Hz or 60 Hz						
$\tilde{V}$	1000 V rms	10 MΩ < 100 pF (ac-coupled)	> 60 dB, dc to 60 Hz	Full Scale Voltage			Typical Short Circuit Current			
				Open Circuit Test Voltage	To 6.0 MΩ	50 MΩ or 60 nS	600 Ω	6 k	60 k	600 k
Ω	1000 V rms	< 7.3 V dc	< 4.1 V dc	< 4.5 V dc	1 mA	100 µA	10 µA	1 µA	1 µA	0.5 µA
$\rightarrow +$	1000 V rms	< 3.9 V dc	3.000 V dc			0.6 mA typical				

<sup>1</sup> 10<sup>6</sup> V Hz maximum

### MIN MAX recording specifications

Model	Nominal Response	Accuracy
83V	100 ms to 80 %	Specified accuracy ± 12 counts for changes > 200 ms in duration (± 40 counts in ac with beeper on)
87V	100 ms to 80 % (dc functions)	Specified accuracy ± 12 counts for changes > 200 ms in duration > 25 % of range
	120 ms to 80 % (ac functions)	Specified accuracy ± 40 counts for changes > 350 ms and inputs
	250 µs (peak) (Model 87 only) <sup>1</sup>	Specified accuracy ± 100 counts for changes > 250 µs in duration (add ± 100 counts for readings over 6000 counts) (add ± 100 counts for readings in Low Pass mode)

<sup>1</sup> For repetitive peaks: 1 ms for single events.

## Fluke 83V and 87V General Specifications

**Maximum voltage between any terminal and earth ground:** 1000 V rms

**Fuse protection for mA or  $\mu$ A inputs:** 44/100 A, 1000 V FAST Fuse

**Fuse protection for A input:** 11 A, 1000 V FAST Fuse

**Display:**

Digital: 6000 counts updates 4/sec; (Model 87V also has 19,999 counts in high-resolution mode)

Analog: 33 segments, updates 40/sec.

Frequency: 19,999 counts, updates 3/sec at > 10 Hz

**Temperature:** Operating: -20 °C to +55 °C; Storage: -40 °C to +60 °C

**Altitude:**

Operating: 2000 m

Storage: 10,000 m

**Temperature coefficient:** 0.05 x (specified accuracy)/ °C (< 18 °C or > 28 °C)

**Electromagnetic compatibility:** In an RF field of 3 V/m total accuracy = specified accuracy

**Relative humidity:** 0 % to 90 % (0 °C to 35 °C); 0 % to 70 % (35 °C to 55 °C)

**Battery type:** 9 V zinc, NEDA 1604 or 6F22 or 006P

**Battery life:** 400 hours typical with alkaline (with backlight off)

**Vibration:** Per MIL-PRF-28800 for a Class 2 instrument

**Shock:** 1 Meter drop per IEC 61010-1:2001

**Size (HxWxD):** 1.25 in x 3.41 in x 7.35 in (3.1 cm x 8.6 cm x 18.6 cm)

**Size with holster and flex-stand:** 2.06 in x 3.86 in x 7.93 in (5.2 cm x 9.8 cm x 20.1 cm)

**Weight:** 12.5 oz (355 g)

**Weight with holster and flex-stand:** 22.0 oz (624 g)

**Safety:** Complies with ANSI/ISA S82.01-2004, CSA 22.2 No. 1010.1:2004 to 1000 V Overvoltage Category III, IEC 664 to 600 V Overvoltage Category IV. UL listed to UL3111-1. Licensed by TÜV to EN61010-1.

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