

Specifications

Maximum Voltage between any Terminal and Earth Ground: 1000 V rms

⚠ Fuse Protection for mA or μ A inputs: 44/100 A, 1000 V FAST Fuse

⚠ Fuse Protection for A input: 11 A, 1000 V FAST Fuse

Display: Digital: 4000 counts updates 4/sec; (Model 87 also has 19,999 counts in 4½-digit mode, updates 1/sec.). Analog: updates 40/sec. Frequency: 19,999 counts, updates 3/sec at >10 Hz. Model 87: 4 x 32 segments (equivalent to 128); Models 83, 85: 43 segments.

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 except: Models 85,87: Total Accuracy = Specified Accuracy + 0.4% of range above 800 MHz (μ ADC only). (mVAC and μ AAC unspecified). Model 83: Total Accuracy = Specified Accuracy + 5% of range above 300 MHz (μ ADC only). (VDC unspecified).

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 hrs typical with alkaline (with backlight off)

Shock Vibration: Per MIL-T-28800 for a Class 2 instrument

Size (HxWxL): 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 S82.01-1994, CSA 22.2 No. 1010.1:1992 to 1000 V Overvoltage Category III. UL listed to UL3111-1. Licensed by TÜV to EN61010-1.

Table 11. Models 85 and 87 AC Voltage Function Specifications

Function	Range	Resolution	Accuracy ¹			
			50 Hz - 60 Hz	45 Hz - 1 kHz	1 kHz - 5 kHz	5 kHz - 20 kHz ²
\tilde{V} ₃	400.0 mV	0.1 mV	$\pm(0.7\% + 4)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)$	$\pm(2.0\% + 20)$
	4.000 V	0.001 V	$\pm(0.7\% + 2)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)$	$\pm(2.0\% + 20)$
	40.00 V	0.01 V	$\pm(0.7\% + 2)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)$	$\pm(2.0\% + 20)$
	400.0 V	0.1 V	$\pm(0.7\% + 2)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)^4$	unspecified
	1000 V	1 V	$\pm(0.7\% + 2)$	$\pm(1.0\% + 4)^5$	unspecified	unspecified
<p>1. 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 4 ½-digit mode, multiply the number of least significant digits (counts) by 10. AC conversions are ac-coupled and valid from 5% to 100% of range. Models 85 and 87 are 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.</p> <p>2. Below 10% of range, add 6 counts.</p> <p>3. Models 85 and 87 are true rms responding meters. When the input leads are shorted together in the ac functions, the meters display a reading (typically <25 counts) that is caused by internal amplifier noise. The accuracy on Models 85 and 87 is not significantly affected by this internal offset when measuring inputs that are within 5% to 100% of the selected range. When the rms value of the two values (5% of range and internal offset) is calculated, the effect is minimal as shown in the following example where 20.0 = 5% of 400 mV range, and 2.5 is the internal offset: $\text{RMS} = \text{SQRT}[(20.0)^2 + (2.5)^2] = 20.16$. If you use the REL function to zero the display when using the ac functions, a constant error that is equal to the internal offset will result.</p> <p>4. Frequency range: 1 kHz to 2.5 kHz.</p> <p>5. Below 10% of range, add 16 counts.</p>						

Table 12. Model 83 AC Voltage Function Specifications

Function	Range	Resolution	Accuracy ¹		
			50 Hz - 60 Hz	45 Hz - 1 kHz	1 kHz - 5 kHz
\tilde{V}^2	400.0 mV	0.1 mV	$\pm(0.5\% + 4)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)$
	4.000 V	0.001 V	$\pm(0.5\% + 2)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)$
	40.00 V	0.01 V	$\pm(0.5\% + 2)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)$
	400.0 V	0.1 V	$\pm(0.5\% + 2)$	$\pm(1.0\% + 4)$	$\pm(2.0\% + 4)^3$
	1000 V	1 V	$\pm(0.5\% + 2)$	$\pm(1.0\% + 4)$	unspecified
<ol style="list-style-type: none"> 1. See the first sentence in Table 11 for a complete explanation of accuracy. 2. Below a reading of 200 counts, add 10 counts. 3. Frequency range: 1 kHz to 2.5 kHz. 					

Table 13. DC Voltage, Resistance, and Conductance Function Specifications

Function	Range	Resolution	Accuracy ¹		
			Model 83	Model 85	Model 87
$\overline{\text{V}}$	4.000 V	0.001 V	$\pm(0.1\% + 1)$	$\pm(0.08\% + 1)$	$\pm(0.05\% + 1)$
	40.00 V	0.01 V	$\pm(0.1\% + 1)$	$\pm(0.08\% + 1)$	$\pm(0.05\% + 1)$
	400.0 V	0.1 V	$\pm(0.1\% + 1)$	$\pm(0.08\% + 1)$	$\pm(0.05\% + 1)$
	1000 V	1 V	$\pm(0.1\% + 1)$	$\pm(0.08\% + 1)$	$\pm(0.05\% + 1)$
$\overline{\text{mV}}$	400.0 mV	0.1 mV	$\pm(0.3\% + 1)$	$\pm(0.1\% + 1)$	$\pm(0.1\% + 1)$
Ω nS	400.0 Ω	0.1 Ω	$\pm(0.4\% + 2)^2$	$\pm(0.2\% + 2)^2$	$\pm(0.2\% + 2)^2$
	4.000 k Ω	0.001 k Ω	$\pm(0.4\% + 1)$	$\pm(0.2\% + 1)$	$\pm(0.2\% + 1)$
	40.00 k Ω	0.01 k Ω	$\pm(0.4\% + 1)$	$\pm(0.2\% + 1)$	$\pm(0.2\% + 1)$
	400.0 k Ω	0.1 k Ω	$\pm(0.7\% + 1)$	$\pm(0.6\% + 1)$	$\pm(0.6\% + 1)$
	4.000 M Ω	0.001 M Ω	$\pm(0.7\% + 1)$	$\pm(0.6\% + 1)$	$\pm(0.6\% + 1)$
	40.00 M Ω	0.01 M Ω	$\pm(1.0\% + 3)$	$\pm(1.0\% + 3)$	$\pm(1.0\% + 3)$
	40.00 nS	0.01 nS	$\pm(1.0\% + 10)$	$\pm(1.0\% + 10)$	$\pm(1.0\% + 10)$
	<ol style="list-style-type: none"> See the first sentence in Table 11 for a complete explanation of accuracy. When using the REL Δ function to compensate for offsets. 				

Table 14. Current Function Specifications

Function	Range	Resolution	Accuracy ¹			Burden Voltage (typical)
			Model 83 ²	Model 85 ^{3, 4}	Model 87 ^{3, 4}	
mA A~ (45 Hz to 2 kHz) mA A[≡]	40.00 mA	0.01 mA	$\pm(1.2\% + 2)^6$	$\pm(1.0\% + 2)^6$	$\pm(1.0\% + 2)$	1.8 mV/mA
	400.0 mA	0.1 mA	$\pm(1.2\% + 2)^6$	$\pm(1.0\% + 2)^6$	$\pm(1.0\% + 2)$	1.8 mV/mA
	4000 mA	1 mA	$\pm(1.2\% + 2)^6$	$\pm(1.0\% + 2)^6$	$\pm(1.0\% + 2)$	0.03 V/A
	10.00 A ⁵	0.01 A	$\pm(1.2\% + 2)^6$	$\pm(1.0\% + 2)^6$	$\pm(1.0\% + 2)$	0.03 V/A
	40.00 mA	0.01 mA	$\pm(0.4\% + 4)$	$\pm(0.2\% + 4)$	$\pm(0.2\% + 4)$	1.8 mV/mA
	400.0 mA	0.1 mA	$\pm(0.4\% + 2)$	$\pm(0.2\% + 2)$	$\pm(0.2\% + 2)$	1.8 mV/mA
	4000 mA	1 mA	$\pm(0.4\% + 4)$	$\pm(0.2\% + 4)$	$\pm(0.2\% + 4)$	0.03 V/A
	10.00 A ⁵	0.01 A	$\pm(0.4\% + 2)$	$\pm(0.2\% + 2)$	$\pm(0.2\% + 2)$	0.03 V/A
1. See the first sentence in Table 11 for a complete explanation of accuracy. 2. AC conversion for Model 83 is ac coupled and calibrated to the rms value of a sinewave input. 3. AC conversions for Models 85 and 87 are ac coupled, true rms responding, and valid from 5% to 100% of range. 4. See note 3 in Table 11. 5. Δ 10 A continuous; 20 A for 30 seconds maximum; >10 A: unspecified. 6. Below a reading of 200 counts, add 10 counts.						

Table 14. Current Function Specifications (continued)

Function	Range	Resolution	Accuracy ¹			Burden Voltage (typical)
			Model 83 ²	Model 85 ^{3, 4}	Model 87 ^{3, 4}	
$\mu\text{A} \sim$ (45 Hz to 2 kHz) $\mu\text{A} \overline{\sim}$	400.0 μA	0.1 μA	$\pm(1.2\% + 2)^5$	$\pm(1.0\% + 2)^5$	$\pm(1.0\% + 2)$	100 $\mu\text{V}/\mu\text{A}$
	4000 μA	1 μA	$\pm(1.2\% + 2)^5$	$\pm(1.0\% + 2)^5$	$\pm(1.0\% + 2)$	100 $\mu\text{V}/\mu\text{A}$
	400.0 μA	0.1 μA	$\pm(0.4\% + 4)$	$\pm(0.2\% + 4)$	$\pm(0.2\% + 4)$	100 $\mu\text{V}/\mu\text{A}$
	4000 μA	1 μA	$\pm(0.4\% + 2)$	$\pm(0.2\% + 2)$	$\pm(0.2\% + 2)$	100 $\mu\text{V}/\mu\text{A}$
<ol style="list-style-type: none"> See the first sentence in Table 11 for a complete explanation of accuracy. AC conversion for Model 83 is ac coupled and calibrated to the rms value of a sinewave input. AC conversions for Models 85 and 87 are ac coupled, true rms responding, and valid from 5% to 100% of range. See note 3 in Table 11. Below a reading of 200 counts, add 10 counts. 						

Table 15. Capacitance and Diode Function Specifications



Function	Range	Resolution	Accuracy ¹
	5.00 nF 0.0500 μ F 0.500 μ F 5.00 μ F	0.01 nF 0.0001 μ F 0.001 μ F 0.01 μ F	$\pm(1\% + 3)$ $\pm(1\% + 3)$ $\pm(1\% + 3)$ $\pm(1.9\% + 3)$
	3.000 V	0.001 V	$\pm(2\% + 1)$
1. With a film capacitor or better, using Relative mode to zero residual. See the first sentence in Table 11 for a complete explanation of accuracy.			

Table 16. Frequency Counter Specifications

Function	Range	Resolution	Accuracy ¹
Frequency (0.5 Hz to 200 kHz, pulse width >2 μ s)	199.99 1999.9 19.999 kHz 199.99 kHz >200 kHz	0.01 Hz 0.1 Hz 0.001 kHz 0.01 kHz 0.1 kHz	$\pm(0.005\% + 1)$ $\pm(0.005\% + 1)$ $\pm(0.005\% + 1)$ $\pm(0.005\% + 1)$ unspecified
1. See the first sentence in Table 11 for a complete explanation of accuracy.			

Table 17. Frequency Counter Sensitivity and Trigger Levels

Input Range ¹	Minimum Sensitivity (RMS Sinewave)		Approximate Trigger Level (DC Voltage Function)
	5 Hz - 20 kHz	0.5 Hz - 200 kHz	
400 mV dc	70 mV (to 400 Hz)	70 mV (to 400 Hz)	40 mV
400 mV dc	150 mV	150 mV	—
4 V	0.3 V	0.7 V	1.7 V
40 V	3 V	7 V (≤140 kHz)	4 V
400 V	30 V	70 V (≤14.0 kHz)	40 V
1000 V	300 V	700 V (≤1.4 kHz)	400 V
Duty Cycle Range	Accuracy		
0.0 to 99.9%	Within ±(0.05% per kHz + 0.1%) of full scale for a 5 V logic family input on the 4 V dc range. Within ±((0.06 x Voltage Range/Input Voltage) x 100%) of full scale for sine wave inputs on ac voltage ranges.		
1. Maximum input for specified accuracy = 10X Range or 1000 V.			

Table 18. Electrical Characteristics of the Terminals

Function	Overload Protection ¹	Input Impedance (nominal)	Common Mode Rejection Ratio (1 kΩ unbalance)		Normal Mode Rejection					
$\bar{\bar{V}}$	1000 V rms	10 MΩ<100 pF	>120 dB at dc, 50 Hz or 60 Hz		>60 dB at 50 Hz or 60 Hz					
\bar{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							
			Open Circuit Test Voltage	Full Scale Voltage		Typical Short Circuit Current				
				To 4.0 MΩ	40 MΩ or nS	400 Ω	4 k	40 k	400 k	4 M
Ω	1000 V rms	<1.3 V dc	<450 mV dc	<1.3 V dc	200 μA	80 μA	12 μA	1.4 μA	0.2 μA	0.2 μA
\rightarrow	1000 V rms	<3.9 V dc	3.000 V dc		0.6 mA typical					
1. 10 ⁶ V Hz max										

Table 19. MIN MAX Recording Specifications

Model	Nominal Response	Accuracy
83	100 ms to 80% 1 s	Specified accuracy ± 12 counts for changes >200 ms in duration (± 40 counts in ac with beeper on) Same as specified accuracy for changes >2 seconds in duration (± 40 counts in ac with beeper on)
85, 87	100 ms to 80% (DC functions) 120 ms to 80% (AC functions) 1 s 250 μ s (Model 87 only)	Specified accuracy ± 12 counts for changes >200 ms in duration Specified accuracy ± 40 counts for changes >350 ms and inputs >25% of range Same as specified accuracy for changes >2 seconds in duration Specified accuracy ± 100 counts for changes >250 μ s in duration (± 250 digits typical for mV, 400 μ A dc, 40 mA dc, 4000 mA dc)