KUSAM-MECO®
An ISO 9001:2008 Company

AC+DC TRUE RMS DIGITAL CLAMPMETER WITH VFD, EF-DETECTION, AMPTIP FUNCTION FOR LOW CURRENT MEASUREMENT

MODEL KM 078

NEW

SPECIAL FEATURES :

- AmpTip™ low-current range calibrated at Jaw-tip for slim-conditions for accurate readings
- MAX/MIN/AVG Recording mode (Auto ranging)
- VFD-V & Hz for fundamental V/Hz of most Variable-Frequency-Drives.
- Display Hold & Non-Contact EF-Detection (NCV)
- Back-lighted easy-to-read LCD display
- Fast 80ms Peak-RMS mode to capture in-rush currents
- Auto-ranging Relative mode with DC-Zero mode on DCA, DC+ACA ranges

GENERAL SPECIFICATIONS :

✷ **Sensing :** AC+DC; True RMS
✷ **Jaws Opening size :** 35mm Max.
✷ **Display :** 3-5/6 digits 6000 counts
✷ **Update Rate :** 5 per second nominal
✷ **Polarity :** Automatic
✷ **Operating Temperature :** 0ºC to 40ºC
✷ **Relative Humidity :** Maximum relative humidity 80% for temperature up to 31ºC decreasing linearly to 50% relative humidity at 40ºC
✷ **Altitude :** Operating below 2000m
✷ **Storage Temperature :** -20°C ~ 60°C, \ <80% R.H. (with battery removed)
✷ **Temperature Coefficient :** Nominal 0.15 x (specified accuracy) / °C @ (0°C — 18°C or 28°C — 40°C), or otherwise specified
✷ **Power Supply :** Standard 1.5V AAA Size Battery X 2
✷ **Power Consumption :** typical 13mA
✷ **Low Battery :** Below approx. 2.85V for Capacitance & Hz
Below approx. 2.5V for other functions
✷ **APO timing :** Idle for 32 minutes
✷ **APO Consumption :** typical 5µA
✷ **Dimension :** 223(L) x 76(W) x 37(H)mm
✷ **Weight :** approx 234 gms.

SAFETY :

- **Safety :** Double insulation per UL/IEC/EN61010-1 Ed. 3, IEC/EN61010-2-033 Ed.1,CAN/CSA C22.2 No.61010-1 Ed. 3, IEC/EN61010-2-032 Ed. 3 & IEC/EN61010-031 Ed. 1.1
- **Measurement Category :** CAT III 600V AND CAT IV 300V AC & DC
- **Overload Protection :**
  Current & Hz functions via jaws : 600ADC/AC rms at <400Hz.
  Voltage : 660VDC rms
  Other functions via terminals : 600VDC/ VAC rms
- **Pollution Degree :** 2
- **E.M.C. :** Meets EN61326-1 : 2006 (EN55022, EN61000-3-2, EN61000-3-3, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11) :
  DCA and DC+ACA Functions, in an RF field of 1V/m :
  Total Accuracy = Specified Accuracy + 20 digits at around 405M
  Ohm Functions, in an RF field of 1V/m :
  Total Accuracy = Specified Accuracy + 25 digits
  Other Functions, in an RF field of 3V/m :
  Total Accuracy = Specified Accuracy + 20 digits
- **Transient Protection :** 6.0kV (1.2/50µs surge)
- **Rugged Fire retarded casing.**
- **LVD EN61010-2-032/EN61010-2-032/EN61010-2-033 to CAT III 600V & CAT IV 300V**

Preliminary Data

ACCESSORIES : Test leads set, Users Manual, Carrying case.

ELECTRICAL SPECIFICATIONS : KM 078

Accuracy is ± (% of reading digits + number of digits) or otherwise specified, at 23°C ± 5°C
Maximum Crest Factor <2.5:1 at full scale & <5:1 at half scale or otherwise specified, and with frequency spectrum not exceeding the specified frequency bandwidth for non-sinusoidal waveforms.

REGULAR CLAMP-ON AC CURRENT

Range	Resolution	Accuracy[1) 2)]
50Hz ~ 100Hz		
60.00 A[3)]	0.01 A	±(1.8%rdg + 5dgts)
600.0 A	0.1 A	
100Hz ~ 400Hz		
60.00 A[3)]	0.01 A	±(2.0%rdg + 5dgts)
600.0 A	0.1 A	

[1)] **Induced error from adjacent current-carrying conductor :** < 0.01A/A
[2)] Maximum Crest Factor <2:1 at full scale & <4:1 at half scale.
[3)] Add 10d to the specified accuracy @ < 9A.

REGULAR CLAMP-ON DC CURRENT

Range	Resolution	Accuracy[1) 2)]
60.00 A[3)]	0.01 A	±(2.0%rdg + 5dgts)
600.0 A	0.1 A	

[1)] **Induced error from adjacent current-carrying conductor :** < 0.01A/A
[2)] Specified with DC-Zero mode applied to offset the non-zero residual readings, if any
[3)] Add 10d to the specified accuracy @ < 9A

All Specifications are subject to change without prior notice

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REGULAR CLAMP-ON DC+AC CURRENT

Range	Resolution	Accuracy[1) 2)]
DC, 50Hz ~ 100Hz		
60.00 A[3)]	0.01 A	±(2.2%rdg + 7dgts)
600.0 A	0.1 A	
100Hz ~ 400Hz		
60.00 A[3)]	0.01 A	±(2.7%rdg + 7dgts)
600.0 A	0.1 A	

1) **Induced error from adjacent current-carrying conductor :** < 0.01A/A
2) Specified with DC-Zero mode applied to offset the non-zero residual readings, if any
3) Add 10d to the specified accuracy @ < 9A

DC VOLTAGE

Range	Resolution	Accuracy
600.0 V	0.1 V	±(1.0%rdg + 5dgts)

Input Impedance : 10MΩ, 100pF nominal

AC VOLTAGE (with Digital Low-Pass Filter)

Range	Resolution	Accuracy
50Hz ~ 60Hz		
600.0 V	0.1 V	±(1.0%rdg + 5dgts)

Input Impedance : 10MΩ, 100pF nominal

DC+AC VOLTAGE (with Digital Low-Pass Filter)

Range	Resolution	Accuracy
DC, 50Hz ~ 60Hz		
600.0 V	0.1 V	±(1.2%rdg + 7dgts)

Input Impedance : 10MΩ, 100pF nominal

HZ LINE LEVEL FREQUENCY

Function	Sensitivity[1)] (Sine RMS)	Range
600 V	50 V	5.00Hz~999.9Hz
60 A (AmpTip™)	40 A	50.00Hz~400.0Hz
60 A	40 A	50.00Hz~400.0Hz
600 A		

Accuracy : ±(1%rdg + 5dgts)
1) DC-bias, if any, not more than 50% of Sine RMS

CAPACITANCE

Range	Resolution	Accuracy[1)]
200.0 μF	0.1 μF	±(2.0%rdg + 4dgts)
2500 μF	1 μF	

1) Accuracies with film capacitor or better

DIODE TESTER

Range	Resolution	Accuracy[1)]
2.000 V	1 mV	±(1.5%rdg + 5dgts)

Test Current : 0.3mA typically
Open Circuit Voltage : < 3.5VDC typically

AMPTIP™ CLAMP-ON AC CURRENT

Range	Resolution	Accuracy[1) 2) 3)]
50Hz ~ 60Hz		
60.00 A	0.01 A	±(1.5%rdg + 5dgts)

1) **Induced error from adjacent current-carrying conductor :** < 0.01A/A
2) Specified with DC-Zero mode applied to offset the non-zero residual readings, if any
3) Add 10d to the specified accuracy @ < 4A

AMPTIP™ CLAMP-ON DC CURRENT

Range	Resolution	Accuracy[1) 2) 3)]
60.00 A	0.01 A	±(2.0%rdg + 5dgts)

1) **Induced error from adjacent current-carrying conductor :** < 0.01A/A
2) Specified with DC-Zero mode applied to offset the non-zero residual readings, if any
3) Add 10d to the specified accuracy @ < 4A

AMPTIP™ CLAMP-ON DC+ACA CURRENT

Range	Resolution	Accuracy[1) 2) 3)]
DC, 50Hz ~ 60Hz		
60.00 A	0.01 A	±(2.0%rdg + 7dgts)

1) **Induced error from adjacent current-carrying conductor :** < 0.01A/A
2) Specified with DC-Zero mode applied to offset the non-zero residual readings, if any
3) Add 10d to the specified accuracy @ < 4A

RESISTANCE

Range	Resolution	Accuracy
600.0 Ω	0.1 Ω	±(1.0%rdg + 5dgts)
6.000KΩ	1 Ω	
60.00KΩ	10 Ω	

Open Circuit Voltage : 1.0VDC typical

Non-Contact EF-Detection

Typical Voltage	Bar-Graph Indication
20V (tolerance : 10V~36V)	-
55V (tolerance : 23V~83V)	- -
110V (tolerance : 59V~165V)	- - -
220V (tolerance : 124V~330V)	- - - -
440V (tolerance : 250V~1000V)	- - - - -

Indication : Bar-graph segments & audible beep tones proportional to the field strength
Detection Frequency : 50/60Hz
Detection Antenna : Inside the top side of the stationary jaw
Probe-Contact EF-Detection : For more precise indication of live wires, such as distinguishing between live and ground connections, use one single probe to test via terminal COM for direct contact EF-Detection with best sensitivity.

PEAK-RMS (ACV & ACA)

Response	80ms to > 90%

AUDIBLE CONTINUITY TESTER

Audible Threshold	Between 10Ω and 250Ω
Response Time	32ms approx.

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USE TRUE RMS WHEN MEASURING AC WAVEFORMS

The waveforms on today's AC power lines are anything but clean. Electronic equipment such as office computers, with their switching power supplies, produce harmonics that distort power-line waveforms. These distortions make measuring AC voltage inaccurate when you use an averaging DMM.

Average voltage measurements work fine when the signal you're measuring is a pure sine wave, but errors mount as the waveform distorts. By using true RMS measurements, however, you can measure the equivalent heating effect that a voltage produces, including the heating effects of harmonics. Table 1 shows the difference between measurements taken on averaging DMMs & those taken on true RMS DMMs. In each case, the measured signal's peak-to-peak value is 2V. Therefore, the peak value is 1V.

For a 1-V peak sine wave, the average & RMS values are both 0.707V. But when the input signal is no longer a sine wave, differences between the RMS values & the average readig values occur. Those errors are most prominent when you are measuring square waves & pulse waveforms, which are rich in harmonics.

Table 1. Average versus true RMS comparison of typical waveforms.

Waveform	Actual Pk-Pk	True RMS Reading	Average Reading	Reading Error
Sine Wave	2.000	0.707	0.707	0%
Triangle Wave	2.000	0.577	0.555	-3.8%
Square Wave	2.000	1.000	1.111	+11.1%
Pulse (25% duty Cycle)	2.000	0.433	0.416	-3.8%
Pulse (12.5% duty Cycle)	2.000	0.331	0.243	-26.5%
Pulse (6.25% duty Cycle)	2.000	0.242	0.130	-46.2%

One limitation to making true RMS measurements is crest factor, and you should consider crest factor when making AC measurements. Crest factor is the ratio of a waveform's peak ("crest") voltage to its RMS voltage. Table 2 shows the crest factors for ideal waveforms.

Table 2. Crest factors of typical waveforms.

Waveform	Crest Factor
DC	1.000
Square Wave	1.000
Sine Wave	1.414
Triangle Wave	1.732
Pulse (25% duty Cycle)	1.732
Pulse (12.5% duty Cycle)	2.646
Pulse (6.25% duty Cycle)	3.873

A DMM's specifications should tell you the maximum crest factor that the meter can handle while maintaining its measurement accuracy. True RMS meters can handle higher crest factors when a waveform's RMS voltage is in the middle of the meter's range setting. Typically, a DMM may tolerate a crest factor of 3 near the top of its scale but it might handle a crest factor of 5 that's in the middle of the range. Therefore, if you're measuring waveforms with high crest factors (greater than 3), you should adjust the DMM so the measured voltage is closest to the center of the measurement range.

Another limitation of true RMS is speed. If you're measuring relatively clean sine waves, then you can save time & money by using as averaging DMM. True RMS meters cost more than averaging meters and can take longer to produce measurements, especially when measuring millivolt-level AC signals. At those low levels, true RMS meters can take several seconds to stabilize a reading. Averaging meters won't leave you waiting.