KUSAM-MECO®

An ISO 9001:2008 Company

400A DC/AC AUTORANGING TRUE RMS CLAMP-ON METER WITH FULL MULTIMETER RANGES

Model KM 061 - AVERAGE SENSING - 18 FUNCTION 37 RANGES

KM 062 - TRUE RMS SENSING - 20 FUNCTION 37 RANGES

SPECIAL FEATURES :

- Measure line-level ACV frequency via test leads
- Relative Zero feature
- 4000 Counts high resolution, Fast measurements
- Versatile & Handy
- Backlight display **(KM 062)**
- Fully Autoranging on all functions for ease of use
- AC True RMS Voltage & Current Functions **(KM 062)**
- 30ms Max HOLD to capture in-rush currents
- DCA / ACA 0.1A to 400A non-invasive current measurements.
- Display Hold, PEAK-rms MAX HOLD & Data Hold
- Fast Audible Continuity
- Diode Test

CAT III 600V CE Approved

GENERAL SPECIFICATIONS :

- ✶ **Sensing :** Average Sensing (**(KM 061) ;** True RMS sensing **(KM 062)**
- ✶ **Jaw opening & Conductor diameter :** 30mm max
- ✶ **Display :** 3-3/4 digits 4000 counts LCD display
- ✶ **Update Rate :** 3 per second nominal
- ✶ **Polarity :** Automatic
- ✶ **Low Battery :** Below approx 2.4V
- ✶ **Operating Temperature :** 0°C to 40°C
- ✶ **Relative Humidity :** Maximum relative humidity 80% for temperature upto 31°C decreasing linearly to 50% Relative Humidity at 40°C
- ✶ **Altitude :** Operating below 2000m
- ✶ **Storage Temperature :** -20°C to 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 Battery x 2.
- ✶ **Power Consumption :** DCA & ACA : 11mA typical
  Other function : 2.9mA typical
- ✶ **APO Timing :** Idle for 30 minutes
- ✶ **APO Consumption :** 190 A typical
- ✶ **Dimension :** 188(L) x 63(W) x 40(H) mm
- ✶ **Weight :** Approx. 218 gms

SAFETY :

- Meets IEC61010-1 2nd Ed., EN61010-1 2nd Ed., UL61010-1 2nd Ed., IEC61010-2-032, EN61010-2-032, UL61010B-2-032.
- **Measurement Category :** CAT III 600 Volts AC & DC
- **Transient Protection :** 6.5kV (1.2/50 S surge)
- **Pollution degree :** 2
- **E. M. C. :** Meets EN61326-1:2006 (EN55022, EN61000-3-2, EN61000-3-3, EN61000-4-2 / 3 / 4 / 5 / 6 / 8 / 11.
  In an RF field of 3V/m :
  Capacitance function is not specified.
  Other function ranges :
  Total Accuracy = Specified Accuracy + 50 digits
  Performance above 3V/m is not specified
- **Overload Protections :**
  Clamp-on jaws : DC / AC 400A rms continuous
  + & COM terminals (all functions) : 600 V DC / V AC rms
- **600V AC / DC input protection on all functions**
- **Battery cover with Probe Holders**
- **Rugged Fire retarded casing; Soft carrying pouch**
- **LVD EN61010-1 & EN61010-2-032 CAT III 600V**

Backside Photo

ACCESSORIES :

Test leads (pair), Battery installed, User's Manual & Carrying Case.

All Specifications are subject to change without prior notice

ELECTRICAL SPECIFICATIONS : KM 061/ KM 062

Accuracy is ± (% reading digits + number of digits) or otherwise specified, at 23°C ± 5°C & less than 75% R.H.

True RMS ACV & ACA clamp-on accuracies are specified from 5% to 100% of range or otherwise specified. Maximum Crest Factor are as specified below, and with frequency spectrums, besides fundamentals, fall within the meter specified AC bandwidth for non-sinusoidal waveforms. Fundamentals are specified at 50Hz and 60Hz.

AC CURRENT (Clamp-On)

Range	Accuracy [1]
400.0A	
40Hz ~ 60Hz @ 0~50A	±(1.0%rdg + 6dgts)
60Hz ~ 400Hz @ 0~50A	±(1.5%rdg + 5dgts)
40Hz ~ 60Hz @50A~200A	±(1.5%rdg + 5dgts)
60Hz ~ 200Hz @ 50A~200A	±(2.0%rdg + 5dgts)
40Hz ~ 60Hz @ 200A~300A	±(2.0%rdg + 5dgts)
40Hz ~ 60Hz @ 300A~400A	±(2.5%rdg + 5dgts)

[1] Induced error from adjacent current-carrying conductor : <0.01A/A
Crest Factor : < 1 : 8 at full scale & < 3.6 : 1 at half scale

DC CURRENT (Clamp-On)

Range	Accuracy [1] [2]
400.0A	
0 ~ 50.0A	±(1.0%rdg + 4dgts)
50.0A ~ 200.0A	±(1.5%rdg + 5dgts)
200.0A ~ 300.0A	±(2.0%rdg + 5dgts)
300.0A ~ 400.0A	±(2.5%rdg + 5dgts)

[1] Induced error from adjacent current-carrying conductor : <0.01A/A
[2] Relative Zero △ mode is applied to offset the non-zero residual readings, if any

RESISTANCE

Range	Resolution	Accuracy
400.0	100 m	±(0.8%rdg + 6dgts)
4.000 k	1	±(0.6%rdg + 4dgts)
40.00 k	10	±(0.6%rdg + 4dgts)
400.0 k	100	±(0.6%rdg + 4dgts)
4.000 M	1 k	±(1.0%rdg + 4dgts)
40.00 M	10 k	±(2.0%rdg + 4dgts)

Open Circuit Voltage : 0.4V DC typical

CAPACITANCE

Range [1]	Resolution	Accuracy [2][3]
500.0 nF	100 pF	±(3.5%rdg + 6dgts)
5.000 F	1 nF	±(3.5%rdg + 6dgts)
50.00 F	10 nF	±(3.5%rdg + 6dgts)
500.0 F	100 nF	±(3.5%rdg + 6dgts)
3000 F	1 F	±(3.5%rdg + 6dgts)

[1] Additional 50.00nF range accuracy is not specified
[2] Accuracies with film capacitor or better
[3] Specified with battery voltage above 2.8V (approximately half full battery).
Accuracy decreases gradually to 12% at low battery warning voltage of approximately 2.4V

DC VOLTAGE

Range	Resolution	Accuracy
400.0 mV	100 V	±(0.3%rdg + 3dgts)
4.000 V	1 mV	±(0.5%rdg + 3dgts)
40.00 V	10 mV	±(0.5%rdg + 3dgts)
400.0 V	100 mV	±(0.5%rdg + 3dgts)
600.0 V	100 mV	±(1.0%rdg + 4dgts)

NMRR : > 50dB @ 50 / 60Hz
CMRR : > 120dB @ DC, 50 / 60Hz, Rs=1k
Input Impedance: 10M , 30pF nominal (1000M for 400mV range)

AC VOLTAGE

Range	Resolution	Accuracy
50Hz / 60Hz		
4.000 V	1 mV	±(1.0%rdg + 4dgts)
40.00 V	10 mV	±(1.0%rdg + 4dgts)
400.0 V	100 mV	±(1.0%rdg + 4dgts)
60Hz ~ 500Hz		
4.000 V	1 mV	±(1.5%rdg + 4dgts)
40.00 V	10 mV	±(1.5%rdg + 4dgts)
400.0 V	100 mV	±(1.5%rdg + 4dgts)
50Hz ~ 500Hz		
600.0 V	100 mV	±(2.0%rdg + 4dgts)

CMRR : > 60dB @ DC to 60Hz, Rs=1k
Input Impedance : 2M , 30pF nominal
Crest Factor : < 2 : 1 at full scale & < 4 : 1 at half scale

HZ FREQUENCY

Function	Sensitivity (Sine Wave)	Range
400.0mV	350 mV	10Hz ~ 1kHz
4.000V	3.2 V	5Hz ~ 20kHz
40.00V	25 V	5Hz ~ 100kHz
400.0V	100 V	5Hz ~ 100kHz
600 V	410 V	5Hz ~ 5kHz
DCA/ACA	Unspecified	

Display counts : 5000
Maximum resolution : 0.001Hz
Accuracy : 0.5% + 4d

DIODE TESTER

Test Current	0.4 mA typical
Open Circuit Voltage	< 1.6V DC typical

AUDIBLE CONTINUITY TESTER

Audible Threshold	between 10 and 120
Range	400.0
Accuracy	1.5%rdg + 8dgts
Open Circuit Voltage	0.4V DC typical

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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.