KUSAM-MECO®

An ISO 9001:2008 Company

3-5/6 DIGIT 6000 COUNTS DIGITAL MULTIMETER WITH EF-DETECTION & PC INTERFACE

20 FUNCTIONS 50 RANGES
Model KM 255/ KM 257

CAT III 600V
CAT IV 300V
UL
APPROVED

SPECIAL FEATURES :

- Autocheck V & Ω
- EF-Detection (NCV)
- 24 Segments Analog Bar-graph
- Crest Mode (Peak Hold), Data Hold function

FEATURES :

- Backlight LCD Display
- Auto Power Off
- Diode & Continuity Test
- Autoranging Relative Zero Mode
- Low Battery Indication
- Wrong Input (test lead) warning detection (w. r. t. switch position)
- Auto-ranging MAX/MIN record
- PC interface (optional)

GENERAL SPECIFICATIONS :

- ✶ **Sensing :** Average Sensing **(Model KM 255)**
  TRUE RMS **(Model KM 257)**
- ✶ **Display :** 3-5/6 digits 6000 counts LCD display
- ✶ **Update Rate :** Fast Data : 5 per second nominal
  24 Segments Analog Bar-graph : 40/second
- ✶ **Operating Temperature :** 0°C to 40°C,at <70% R.H.
- ✶ **Relative Humidity :** Maximum relative humidity 80% for temperature upto 31°C decreasing linearly to 50% relative humidity at 40°C
- ✶ **Storage Temperature:** -20°C to 60°C, <80% R.H.
  With battery removed from meter.
- ✶ **Altitude :** 2000m
- ✶ **Pollution Degree :** 2
- ✶ **Temperature Coefficient :** nominal 0.15 x (specified accuracy)/°C @ (0°C~18°C or 28°C~40°C), or otherwise specified.
- ✶ **Low battery :** Below approx. 2.3V
- ✶ **Power Consumption :** 3.5mA
- ✶ **APO Consumption :** 10µA typical
- ✶ **APO Timing :** Idle for 34 minutes
- ✶ **Power Supply :** 1.5V AAA battery x 2
- ✶ **Dimension :** 161(L) X 80(W) X 50(H) mm
- ✶ **Weight :** Approx. 340 gm (with Holster)

SAFETY :

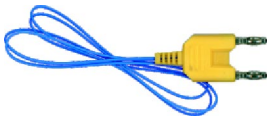
- **Safety :** Double insulation per IEC61010-1 2nd Ed., EN61010-1 2nd Ed., UL61010-1 2nd Ed. & CAN/CSA C22.2 No. 61010.1-0.92 to Category II 1000V, CAT III 600V and CAT IV 300V AC & DC.
- **E. M. C. :** Meets EN61326-1:2006 (EN55022, EN61000-3-2, EN61000-3-3, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11)
  In an RF field of 3V/m :
  Capacitance function is not specified.
  Other function ranges : Total Accuracy =
  Specified Accuracy + 100 digits
  Performance above 3V/m is not specified.
- **Transient Protection :** 6.5kV lightning surge (1.2/50µs)
- **Terminals (to COM) Measurement Category :**
  V : CAT II 1000 Volts and CAT III 600V and CAT IV 300 Volts AC & DC.
  mAµA : CAT III 500 Volts AC and 300 Volts DC.
  A : CAT III 600 Volts AC and 300 Volts DC.
- **Overload Protections :**
  µA & mA : 0.63A / 500VAC, IR 150kA, @500V AC
  A : 10A / 600VAC, IR 100kA, @600VAC
  V : 1050 Vrms, 1450V peak
  AutoCheck, mV, Ω & Others : 600Vrms

Software CD

Software

Fuse

Software Cable



Thermocouple

Magnetic Hanger

ACCESSORIES :

Test leads pair, Carrying Case, Batteries installed, User's Manual & Banana plug K-Type Thermocouple

OPTIONAL ACCESSORIES :

PC interface kit, Magnetic Hanger, Banana plug to K-Type socket plug adaptor.
Current Clamp CA300, Current Clamp Adaptor CA500, CA1000, CA2000, High Voltage Probe PD-28.

All Specifications are subject to change without prior notice

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G-17, Bharat Industrial Estate, T. J. Road, Sewree (W), Mumbai - 400 015. INDIA.
Sales Direct.: 022 -2 4156638, **Tel. :** 022-241224540, 24181649, **Fax :** 022 - 24149659
Email : kusam_meco@vsnl.net, **Website :** www.kusamelectrical.com,

ELECTRICAL SPECIFICATIONS - KM 255 / KM 257

Accuracy is ± (% reading digits + number of digits) or otherwise specified, at 23°C ± 5°C & less than 75% R.H.
True RMS KM 257 ACV & ACA accuracies are specified from 5% to 100% of range or otherwise specified. Maximum Crest Factor <3:1 at full scale & <6: half scale, and with frequency components fall within the meter specified frequency bandwidth for non-sinusoidal waveforms.

DC VOLTAGE

Range	Resolution	Accuracy
60.00 mV	10 µV	±(0.2%rdg + 3dgts)
600.0 mV	100 µV	
6.000 V	1 mV	
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

NMRR : >60dB @ 50Hz / 60Hz
CMRR : >100dB @ DC 50Hz / 60Hz; Rs=1KΩ
Input Impedance : 10MΩ, 50pF nominal

AUTOCHECK DCV

Range	Resolution	Accuracy
1.000V to 1000V	1mV ~ 1V	±(1.3%rdg + 3dgts)

AutoCheck Lo-Z DCV Threshold :
>+ 1.0VDC & <-1.0VDC nominal.
AutoCheck Lo-Z DCV Input Impedance :
Initially approx. 2.5kΩ, 120pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V(typical). Ended up impedances vs display voltages typically are :

15kΩ @ 100V
100kΩ @ 300V
250kΩ @ 600V
375kΩ @ 1000V

AC CURRENT

Range	Resolution	Accuracy	Burden Voltage
50Hz -- 400Hz			
600.0 µA	100 nA	±(1.0%rdg + 3dgts)	0.10 mV / µA
6000 µA	1 µA		0.10 mV / µA
60.00 mA	10 µA		1.7 mV / mA
600.0 mA	100 µA		1.7 mV / mA
6.000 A	1 mA		0.03 V / A
10.00 A[1)]	10 mA		0.03 V / A

[1)] 10A continuous, >10A to 15A for 30 Sec. Max with 5 minutes cool down interval

DC CURRENT

Range	Resolution	Accuracy	Burden Voltage
600.0 µA	100 nA	±(0.5%rdg + 3dgts)	0.10 mV/µA
6000 µA	1 µA		0.10 mV/µA
60.00 mA	10 µA		1.7 mV/mA
600.0 mA	100 µA		1.7 mV/mA
6.000 A	1 mA		0.03 V/A
10.00 A[1)]	10 mA		0.03 V/A

[1)] 10A continuous, >10A to 15A for 30 Sec. Max with 5 minutes cool down interval

AUTOCHECK ACV

Range	Resolution	Accuracy
50Hz / 60Hz		
1.000V to 1000V	1mV ~ 1V	±(1.4%rdg + 5dgts)

AutoCheck Lo-Z ACV Threshold : >1V nominal.
AutoCheck Lo-Z ACV Input Impedance :
Initially approx. 2.5kΩ, 120pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V(typical). Ended up impedances vs display voltages typically are :

15kΩ @ 100V
100kΩ @ 300V
250kΩ @ 600V
375kΩ @ 1000V

AC VOLTAGE

Range	Resolution	Accuracy
50Hz -- 400Hz		
60.00 mV	10 µV	±(1.0%rdg + 5dgts)
600.0 mV	100 µV	
6.000 V	1 mV	
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

CMRR : >60dB @ DC to 60Hz, Rs=1KΩ
Input Impedance : 10MΩ, 50pF nominal

HZ(LINE) @ ACV, DCV, CURRENT & AUTOCHECK

Range	Resolution	Accuracy
6 V	0.4 V	10Hz - 100kHz
60 V	4 V	10Hz - 100kHz
600 V	40 V	10Hz - 100kHz
1000 V	400 V	45Hz - 1kHz
600 µA	40 µA	10Hz - 100kHz
6000 µA	400 µA	10Hz - 100kHz
60 mA	4 mA	10Hz - 100kHz
600 mA	40 mA	10Hz - 100kHz
6 A	1 A	10Hz - 1kHz
10 A	6 A	10Hz - 1kHz

Accuracy : 0.03%+3d

CREST MODE

Accuracy	Specified accuracy plus 150 digits for changes > 5ms in duration.

RECORD MODE

Accuracy	Specified accuracy plus 100 digits for change >100ms in duration.

OHMS

Range	Resolution	Accuracy
600.0 Ω	100 mΩ	±(0.5%rdg + 4dgts)
6.000 kΩ	1 Ω	
60.00 kΩ	10 Ω	
600.0 kΩ	100 Ω	
6.000 MΩ	1 kΩ	±(0.7%rdg + 4dgts)
60.00 MΩ	10 kΩ	±(1.2%rdg + 4dgts)

Open Circuit Voltage : 0.45VDC typical.

CAPACITANCE

Range	Resolution	Accuracy
60.00 nF	10 pF	±(2.0%rdg + 5dgts)
600.0 nF	100 pF	
6.000 µF	1 nF	±(1.5%rdg + 5dgts)
60.00 µF	10 nF	
600.0 µF	100 nF	
3000 µF	1 µF	±(2.0%rdg + 5dgts)

Accuracies with film apacitor or better

LOGIC LEVEL Hz (mV FUNCTION)

Range	Sensitivity (square wave)	Accuracy
5.00 Hz to 500.0 kHz	3 Vpeak	±(0.03%rdg + 2dgts)
5.00 Hz to 1.000 MHz	5 Vpeak	±(0.03%rdg + 2dgts)

DIODE TESTER

Range	Resolution	Accuracy
1.000 V	100mV	±(1.0%rdg + 3dgts)

Test Current : 0.56mA typical.
Open Circuit Voltage : <1.8VDC typically.

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 : Top-right end of the meter
Probe-Contact EF-Detection : For more precise indication of live wires, such as distinguishing between live & ground connections, use the Red(+) test probe for direct contact measurements.

AUTOCHECK OHM

Range[1)]	Resolution	Accuracy
00.00Ω to 60.00MΩ	10mΩ to 10kΩ	±(1.2%rdg + 10dgts)

Open Circuit Voltage : 0.45VDC typical.
[1)] AutoCheck Ohm Threshold : < 10.00MΩ nominal

TEMPERATURE (K-Type Thermocouple)

Range	Accuracy
-50°C ~ 1000°C	0.3% + 3d
-58°F ~ 1832°F	0.3% + 6d

K type thermocouple range & accuracy not included. Supplied Thermocouple suitable for measurement upto 250°C.

AUDIBLE CONTINUITY TESTER

Audible Threshold :	Between 10Ω and 80Ω
Response time :	32ms

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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.