KUSAM-MECO®

An ISO 9001:2008 Company

3-4/5 DIGIT 5000 COUNTS DIGITAL MULTIMETER WITH ANALOG BAR GRAPH & RS-232 COMPUTER INTERFACE

Model 5040 - 13 FUNCTIONS 45 RANGES

5040-T - 14 FUNCTIONS 46 RANGES

SPECIAL FEATURES :

- Auto lead zero function
- 50ms record MAX-MIN readings at fast 20/second measurement mode
- 0.8ms Crest (instantaneous Peak-HOLD)
- Data Hold & Range- Hold
- Backlighted Display
- Autoranging
- Audible & Visible input warning.
- Optical isolated RS232 PC-interface capabilities
- MAX-MIN readings
- Relative-Zero offset mode
- Zoom 5x Analog pointer at 60/s. (Model 5040-T only)
- Auto power off

Model - 5040 / 5040-T

GENERAL SPECIFICATIONS

- ✷ **Sensing :** Average Sensing **(Model - 5040)** , True RMS **(Model-5040-T)**
- ✷ **Display :** 3-4/5 digits 5000 counts LCD display
- ✷ **Update Rate :**
  Fast data : 5 / second nominal;
  52 Segment Bar-graph : 60 per second nominal.
- ✷ **Operating Temperature :** 0°C to 45°C
- ✷ **Relative Humidity :** Maximum 80% R.H. for Temperature upto 31°C decreasing linearly to 50% R.H. at 45°C
- ✷ **Storage Temperature :** -20°C to 60°C, 80% R.H. (With battery removed)
- ✷ **Pollution degree :** 2
- ✷ **Altitude :** Operating below 2000m
- ✷ **Temperature Coefficient :** Nominal 0.15 x (specified accuracy)/°C@(0°C ~ 18°C or 28°C ~ 45°C), or otherwise specified.
- ✷ **Power Consumption :** 4.3mA typical
- ✷ **Low Battery :** Below approx. 7V
- ✷ **APO Timing :** Idle for 17 minutes.
- ✷ **APO Consumption :** 50 A typical
- ✷ **Power Supply :** Single 9V battery.
- ✷ **Dimension :** 186(L)mm x 87(W)mm x 35.5(H)mm; 198(L)mm x 97(W)mm x 55(H)mm with holster
- ✷ **Weight :** Approx.340gm, Approx. 430gm with holster.

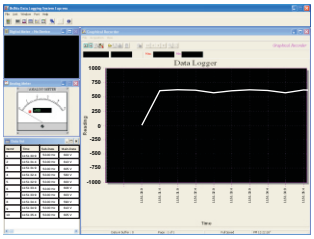
ACCESSORIES :

Test leads (pair), Holster, Battery installed, User's Manual

OPTIONAL ACCESSORIES :

PC interface Kit, (RS232 optical adapter cable+ software CD), RS232-USB Convertor, K-type socket plug adapter **(Model 5040-T),** Current Clamp CA300, Current Clamp Adaptor CA500, CA1000, CA2000, High Voltage Probe PD-28.

Software CD



Software

Software Cable

SAFETY

- **Safety :** Double insulation per IEC61010-1 2nd Ed., EN61010-1 2nd Ed., UL61010-1 2nd Ed., & CAN/CSAC22.2 No.61010.1-0.92 to CAT III 1000V AC & DC and CAT IV 600V 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 :** 8kV lightning surge (1.2/50 s)
- **Terminals (to COM) ratings :**
  V : CAT III 1000 Volts AC & DC, and CAT IV* 600 Volts AC & DC.
  A / mA A : CAT III and CAT IV 600 Volts AC and 300 Volts DC.
- **Overload Protections :**
  A & mA : 1A/600V, IR 10kA or better, F fuse;
  A : 10A/600V, IR 100kA or better, F fuse
  V : 1050 Vrms, 1450V peak
  mV, & Others : 600VDC/VAC rms

All Specifications are subject to change without prior notice

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ELECTRICAL SPECIFICATIONS : KM 5040/5040-T

Accuracy is ± (% reading digits + number of digits) or otherwise specified @ 23°C ± 5°C & less than 75% R.H.
(For Model 5040-T) ACV & ACA accuracies are specified from 5% to 100% of range or otherwise specified. Maximum Crest Factor <3:1 at full scale & < 6:1 at half scale, and with frequency spectrums, besides fundamentals, fall within the meter specified AC bandwidth for non-sinusoidal waveforms.

AC VOLTAGE

Range	Resolution	Accuracy
50Hz -- 60Hz		
50.00 mV	10 V	±(0.5%rdg + 3dgts)
500.0 mV	100 V	
5.000 V	1 mV	
50.00 V	10 mV	
500.0 V	100 mV	
1000 V	1 V	
40Hz -- 500Hz		
50.00 mV	10 V	±(0.8%rdg + 3dgts)
500.0 mV	100 V	
5.000 V	1 mV	±(1.0%rdg + 4dgts)
50.00 V	10 mV	
500.0 V	100 mV	
1000 V	1 V	±(1.2%rdg + 4dgts)
Upto 20 KHz		
50.00 mV	10 V	0.5dB*
500.0 mV	100 V	
5.000 V	1 mV	3dB*
50.00 V	10 mV	
500.0 V	100 mV	
1000 V	1 V	Unspec'd

*Specified from 30% to 100% of range
CMRR : > 60dB @ DC to 60Hz, Rs = 1K
Input Impedance : 10M , 16pF nominal
(44pF nominal for 50mV & 500mV ranges)

DC VOLTAGE

Range	Resolution	Accuracy
50.00 mV	10 V	±(0.12%rdg + 2dgts)
500.0 mV	100 V	±(0.06%rdg + 2dgts)
5.000 V	1 mV	±(0.08%rdg + 2dgts)
50.00 V	10 mV	
500.0 V	100 mV	
1000 V	1 V	

NMRR : > 60dB @ 50 / 60Hz
CMRR : > 120dB @ DC, 50 / 60Hz, Rs=1K
Input Impedance : 10M , 16pF nominal
(44pF nominal for 50mV & 500mV ranges)

RESISTANCE

Range	Resolution	Accuracy
50.00	0.01	±(0.3%rdg + 6dgts)
500.0	0.1	±(0.1%rdg + 3dgts)
5.000 K	1	±(0.1%rdg + 2dgts)
50.00 K	10	
500.0 K	100	
5.000 M	1 K	±(0.4%rdg + 3dgts)
50.00 M	10 K	±(1.5%rdg + 5dgts)

Open Circuit Voltage : < 1.3V DC
(< 3V DC for 50 & 500 ranges)

AUDIBLE CONTINUITY TESTER

Audible Threshold	Between 20 & 200
Fast Response Time	< 100 s

AC CURRENT

Range	Resolution	Accuracy	Burden Voltage
50Hz -- 60Hz			
500.0 A	0.1 A	±(0.6%rdg + 3dgts)	0.15mV/ A
5000 A	1 A		0.15mV/ A
50.00 mA	0.01 mA		3.3mV/mA
500.0 mA	0.1 mA	±(1.0%rdg + 3dgts)	3.3mV/mA
5.000 A	0.001 A	±(0.6%rdg + 3dgts)	45mV/A
10.00 A*	0.01 A*		45mV/A
40Hz -- 1kHz			
500.0 A	0.1 A	±(0.8%rdg + 4dgts)	0.15mV/ A
5000 A	1 A		0.15mV/ A
50.00 mA	0.01 mA		3.3mV/mA
500.0 mA	0.1 mA	±(1.0%rdg + 4dgts)	3.3mV/mA
5.000 A	0.001 A	±(0.8%rdg + 4dgts)	45mV/A
10.00 A*	0.01 A*		45mV/A

*** 10A continuous, >10A to 15A for 30 seconds max with 5 minutes cool down interval**
Burden Voltage : 0.15mV / A for 500 A, 5000 A.
3.3mV / mA for 50mA,
500mA & 45mV / A for 5A, 10A.

DC CURRENT

Range	Resolution	Accuracy	Burden Voltage
500.0 A	0.1 A	±(0.2%rdg + 4dgts)	0.15mV/ A
5000 A	1 A		0.15mV/ A
50.00 mA	0.01 mA		3.3mV/mA
500.0 mA	0.1 mA		3.3mV/mA
5.000 A	0.001 A		45mV/A
10.00 A*	0.01 A*		45mV/A

*** 10A continuous, >10A to 15A for 30 seconds max with 5 minutes cool down interval**
Burden Voltage : 0.15mV / A for 500 A, 5000 A.
3.3mV / mA for 50mA,
500mA & 45mV / A for 5A, 10A.

CAPACITANCE

Range	Resolution	Accuracy*
50.00 nF	10 pF	±(0.8%rdg + 3dgts)
500.0 nF	100 pF	
5.000 F	1 nF	±(1.5%rdg + 3dgts)
50.00 F	10 nF	±(2.5%rdg + 3dgts)
500.0 F**	100 nF	±(3.5%rdg + 5dgts)
9999 F	1 F	±(5.0%rdg + 5dgts)

* Accuracies with film capacitor or better.
** In manual-ranging mode, measurements not specified below 45.0 F and 450 F for 500.0 F & 9999 F ranges respectively.

FREQUENCY

Function	Sensitivity (sine Rms)	Range
mV	300 mV	10Hz - 125kHz
5 V	2 V	10Hz - 125kHz
50 V	20 V	10Hz - 20kHz
500 V	80 V	10Hz - 1kHz
1000 V	300 V	10Hz - 1kHz
, Cx, Diode	300 mV	10Hz - 125kHz
A, mA, A	10% F.S.	10Hz - 125kHz

Accuracy : 0.01% rdg + 2 dgts

DIODE TEST

Range	Resolution	Accuracy	Test Current	Open Circuit Volt
2.000 V	0.001 V	±(1.0%rdg +1dgt)	0.4 mA	<3.5V DC

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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.