LIST OF PRODUCTS

* Digital Multimeter
* Digital AC & AC/DC Clampmeter
* AC Clamp Adaptor
* AC/DC Current Adaptor
* Transistorised Electronic Analog & Digital Insulation Resistance Testers(upto 10 KV)
* Digital Sound Level Meter & Sound Level Calibrator
* Digital contact & Non-contact Type Tachometer
* Digital Non-contact (infrared) Thermometer
* Thermo Hygrometer
* Thermo Anemometer
* Wood & Paper Moisture Meter
* Distance Meter
* Digital Hand Held Temperature Indicators
* Digital Lux Meter
* Network Cable Tester
* Power Factor Regulator
* Maximum Demand Controller/Digital Power Meter
* Earth Resistance Tester
* Gas Analysers
* Panel Meters
* Battery Testers
* DC Power Supply
* Vehicle Tracking System

27/02/2017

KUSAM-MECO®

AN ISO 9001:2015 COMPANY

DIGITAL MULTIMETER KM 857 / KM 859CF

OPERATION MANUAL

KUSAM-MECO

DIGITAL MULTIMETER

KM 857
KM 859CF

27/02/2017

KUSAM-MECO

TAKE MEASUREMENTS CAREFULLY AND YOU'LL SPARE YOUR METER AND YOURSELF, SOME PAIN

Nearly every electrical engineer has a hand held Multimeter. We sometimes take them for granted, until we damage them or "burn them out". If you incorrectly connect your DMM to a circuit or have the DMM on wrong setting, you damage the meter and possibly hurt yourself. You can also get into trouble if you try to measure the voltage across a charged capacitor.

DMM users frequently burn their meters by trying to measure current the same way as they measure voltage, Remember, you measure voltage across a circuit, and current through a circuit. When you use the current input, your DMM becomes a low impedance circuit element. If you accidentally connect this low impedance path across your circuit, you'll effectively short-circuit it. You can, therefore send high current through your meter and severely damage it. Unless the meter has a fused input, you can even get an explosion or fire.

Even if you correctly insert your DMM into the circuit, you can still damage your meter. Don't try to measure current in excess of your meter's capacity. Handheld DMMs usually have a maximum current rating of 10A or 20A.

If you are measuring current in industrial environment, you can easily exceed those ratings. The best way to avoid damage is to use a clamp meter or to connect a clamp attachment to your DMM.

To prevent excess current from flowing through your meter, always disconnect the test leads from the circuit under test whenever you change DMM functions, Set your meter to the correct function, say current and its highest range for the setting, say 20A. Next, connect the test leads before you apply power to the circuit. To be safe, start by setting your meter to its highest range first.

KUSAM-MECO

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KUSAM-MECO

1) SAFETY

This manual contains information and warnings that must be followed for operating the instrument safely and maintaining the instrument in a safe operating condition. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. The meter is intended only for indoor use.

The meter protection rating, against the users, is double insulation per IEC/UL/EN61010-1Ed.3.0, IEC / EN61010-2-030 Ed. 1.0, IEC / EN61010-2-033 Ed. 1.0, IEC/UL/EN61010-031 Ed. 1.1 and CAN/CSA-C22.2 No. 61010-1-12 Ed. 3.0 to CAT III 1000V AC & DC & CAT IV 600V AC & DC.

Terminals (to COM) measurement Category:

V / A / mAμA : Category III 1000V AC & DC, & Category IV 600V AC & DC.

Per IEC61010-1 2nd Ed. (2001) Measurement Category

Measurement Category IV (CAT IV) is for measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.

Measurement Category III (CAT III) is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation,

and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

Measurement Category II (CAT II) is for measurements performed on circuits directly connected to the low voltage installation. Examples are measurements on household appliances, portable tools and similar equipment.

TERMS IN THIS MANUAL

WARNING identifies conditions and actions that could result in serious injury or even death to the user.

CAUTION identifies conditions and actions that could cause damage or malfunction in the instrument.

WARNING

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. To avoid electrical shock hazard, observe the proper safety precautions when working with voltages above 60V DC or 30 VAC rms. These voltage levels pose a potential shock hazard to the user.

Do not touch test lead tips or the circuit being tested while power is applied to the circuit being measured.

Keep your fingers behind the finger guards of the test leads during measurement.

Inspect test leads, connectors, and probes for damaged insulation or exposed metal before using the instrument. If any defects are found, replace them immediately.

Do not measure any current that exceeds the current rating of the protection fuse. Do not attempt a current measurement to any circuit where the open circuit voltage is above the protection fuse voltage rating.

Suspected open circuit voltage should be checked with voltage functions.

Never attempt a voltage measurement with the test lead inserted into the μA/mA or A input jack.

Only replace the blown fuse with the proper rating as specified in this manual. Only use the test lead provided with the equipment or UL listed Probe assembly rated CAT III 1000V or better.

CAUTION

Disconnect the test leads from the test points before changing functions. Always set the instrument to the hightest range and work downward for an unknown value when using manual ranging mode.

INTERNATIONAL ELECTRICAL SYMBOLS

⚠	Caution ! Refer to the explanation in this Manual
⚠	Caution ! Risk of electric shock
⏚	Earth (Ground)
⧈	Double Insulation or Reinforced insulation
⎓	Fuse
~	AC--Alternating Current
⎓	DC--Direct Current

2) CENELEC Directives

The instruments conform to CENELEC Low-voltage directive 2006/95/EC and Electromagnetic compatibility directive 2004/108/EC

3) GENERAL SPECIFICATIONS

Display: 4-4/5 digits 50,000 counts. Selectable stable mode 5-4/5 digits 500,000 counts for DC Voltage, & 6 digits 999,999 counts for Hz

Polarity : Automatic

Update Rate:

4-4/5 digits fast mode : 5 per second nominal;

5-4/5 digits stable mode : 1.25 per second nominal;

42 Segments Bar graph : 60 per second max

Operating Temperature : 0°C to 45°C

Relative Humidity : Max. relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 45°C

Pollution degree : 2

Storage Temperature : -20°C to 60°C, < 80%R.H. (with battery removed)

Altitude : Operating below 2000m

Temperature Coefficient : nominal 0.1 x (specified accuracy)/ °C@(0°C -- 18°C or 28°C -- 40°C), or otherwise specified.

Sensing : AC, AC + DC True RMS

Safety : Double insulation per IEC/UL/EN61010-1 Ed.3.0, IEC/EN61010-2-030 Ed.1.0, IEC/EN61010-2-033 Ed. 1.0, IEC/UL/EN61010-031 Ed. 1.1 and CAN/CSA-C22.2 No. 61010-1-12 Ed. 3.0 to CAT III 1000V AC & DC & CAT IV 600V AC & DC.

Terminals (to COM) measurement category:

V/A/mAμA : Category III 1000V AC & DC, & Category IV 600V AC & DC.

Overload Protections :

μA & mA : 0.44A/1000V DC/AC rms, IR10kA, F Fuse

A : 11A/1000V DC/AC rms, IR 20kA, F Fuse

V : 1100V DC/AC rms

mV, Ω & Others :1000V DC/AC rms

Transient Protection : 8kV (1.2/50μS surge)

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.

Power Supply : Single Alkaline 9V battery.

Power Consumption : 6mA typical

Low Battery : Below approx. 7V

APO Timing : Idle for 17 minutes

APO Consumption : 55μA typical for (KM 857)

30μA typical for (KM859CF)

Dimension : 186(L) x 87(W) x 35.5(H)mm

198(L)x97(W)x55(H)mm with holster

Weight : 390gm; 500gm with holster.

Accessories : Test leads(pair), Holster, Battery installed, user Manual, Bkp60 banana plug K-type Thermocouple x 1(KM 859CF).

Optional Accessories : BRUA-85Xa PC interface Kit (BC-85Xa Rs232 optical adapter cable + BS85X software CD + BUA-2303 USB-to-serial adaptor), Bkb32 banana pins to K-type socket plug adapter.

SPECIAL FEATURES :

- Record MAX, MIN, MAX-MIN readings.
- Crest (instantaneous Peak hold)
- MAX, MIN, MAX-MIN readings.
- Relative zero mode.
- 500,000 counts high resolution stable reading mode.
- Backlighted display.
- dBm readings.
- T1-T2 differential temperature readings (KM 859CF only).
- %4-20mA loop current readings.
- High noise rejection filtered Line Level Frequency mode.
- Data Hold.
- Audible & visible input warning.

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ELECTRICAL SPECIFICATIONS

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

True RMS voltage & current accuracies are specified from 5% to 100% of range or otherwise specified. Maximum Crest Factor < 5:1 at full scale & < 10:1 at half scale, and with frequence components within the specified frequency bandwidth for non-sinusoidal waveforms.

AC & AC+DC VOLTAGE

<table>
<tr><th>Range</th><th>KM859CF</th><th>KM857</th></tr>
<tr><td></td><td colspan="2">Accuracy*</td></tr>
<tr><td colspan="3">20Hz -- 45Hz</td></tr>
<tr><td>500.00mV,
5.0000V,
50.000V</td><td>1.5% + 60d</td><td rowspan="2">Unspec'd</td></tr>
<tr><td>500.00V,
1000.0V</td><td>Unspec'd</td></tr>
<tr><td colspan="3">45Hz --300Hz</td></tr>
<tr><td>500.00mV</td><td>0.3% + 20d</td><td rowspan="3">0.8%+60d</td></tr>
<tr><td>5.0000V,
50.000V</td><td>0.8% + 20d</td></tr>
<tr><td>500.00V,
1000.0V</td><td>0.4% + 40d</td></tr>
<tr><td></td><td>300Hz--5kHz</td><td>300Hz--1kHz</td></tr>
<tr><td>500.00mV</td><td>0.3% + 10d</td><td>0.8%+40d</td></tr>
<tr><td>5.0000V,
50.000V
500.00V</td><td>0.4% + 40d</td><td>2.0%+60d</td></tr>
<tr><td>1000.0V</td><td>0.8% + 40d
(300Hz--1kHz)</td><td>1.0%+40d</td></tr>
</table>

	5kHz--20kHz	1kHz--20kHz
500.00mV	0.5%+20d	1dB**
5.0000V, 50.000V	0.8%+20d	2dB**
500.00V	0.5%+20d	3dB**
1000.0V	Unspec'd	Unspec'd
	20kHz--100kHz	
500.00mV	2.5%+40d	Unspec'd
5.0000V, 50.000V	4.0%+40d**	
500.00V	Unspec'd	
1000.0V		

*From 5% to 10% of range:
accuracy % of reading (or in dB) + 80d
**From 5% to 10% of range:
accuracy % of reading (or in dB) + 180d

**From 10% to 15% of range:
accuracy % of reading (or in dB) + 100d

CMRR: >80dB @ DC to 60Hz, Rs=1kΩ

Input Impedance : 10MΩ, 30pF nominal
(80pF nominal for 500mV range)

Residual reading less than 50 digits with test leads shorted.

dBm

At 600Ω, -11.76dBm to 54.25dBm,
Accuracy : ± 0.25dB + 2d @40Hz -- 20kHz)
Input Impedance : 10MΩ, 30pF nominal
Selectable reference impedance of 4,8, 16,32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500,600, 800, 900, 1000, 1200Ω.

DC VOLTAGE

Range	KM859CF	KM857
	Accuracy*	
500.00mV, 5.0000V, 50.000V	0.02%+2d	0.03%+2d
500.00V	0.04%+2d	0.05%+2d
1000.0V	0.05%+2d	0.1% +2d

NMRR : >60dB @50/60Hz
CMRR : >120dB @DC, 50/60Hz, Rs=1kΩ
Input Impedance : 10MΩ, 30pF nominal
(80pF nominal for 500mV range)

RESISTANCE

Range	KM859CF	KM857
	Accuracy*	
500.00Ω	0.07%+10d	0.1%+6d
5.0000kΩ	0.07%+2d	
50.000kΩ		
500.00kΩ		
5.0000MΩ	0.2%+6d	0.4% +6d
50.000MΩ	2.0%+6d	2.0%+6d

Open Circuit Voltage : < 1.3VDC
(<3VDC for 500Ω range)

•))) AUDIBLE CONTINUITY TESTER

Audible threshold: between 20Ω and 200Ω
Response time < 100μs

→|← DIODE TESTER

Range	Accuracy	Test Current (Typical)	Open Circuit Voltage
5.0000V	1%+1d	0.4mA	< 3.5 VDC

CAPACITANCE

Range	Accuracy*
50.00nF	0.8% + 3d
500.0nF	0.8% + 3d
5.000μF	1.5% + 3d
50.00μF	2.5% + 3d
500.0μF**	3.5% + 5d
9999μF**	5.0% + 5d

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

T1-T2 DUAL TEMPERATURE (KM859CF only)

Range	Accuracy
-50.0°C to 1000.0°C	0.3%+1°C
-58.0°F to 1832.0°F	0.3%+2°F

Thermocouple range & accuracy not included

DC CURRENT

Range	Accuracy	Burden Voltage
500.00μA	0.15% + 20d	0.15mV/μA
5000.0μA	0.1% + 20d	0.15mV/μA
50.000mA	0.15% + 20d	3.3 mV/mA
500.00mA	0.1% + 30d	3.3 mV/mA
5.0000A	0.5% + 20d	45 mV/A
10.000A*	0.5% + 20d	45 mV/A

*10A continuous, >10A to 20A for 30 second max with 5 minutes cool down interval.

AC & AC+DC CURRENT

Range	KM859CF	KM857	Burden Voltage
	Accuracy		
50Hz -- 60Hz			
500.00μA	0.5% +50d	1.0%+40d	0.15mV/μA
5000.0μA			0.15mV/μA
50.000mA			3.3mV/mA
500.00mA			3.3mV/mA
5.0000A			45mV/A
10.000A*			45mV/A
40Hz --1kHz			
500.00μA	0.7%+50d	1.0%+40d	0.15mV/μA
5000.0μA			0.15mV/μA
50.000mA			3.3mV/mA
500.00mA			3.3mV/mA
5.0000A			45mV/A
10.000A*			45mV/A
1kHz --10kHz			
500.00μA	2.0%+50d	Unspec'd	0.15mV/μA
5000.0μA			0.15mV/μA
50.000mA			3.3mV/mA
500.00mA			3.3mV/mA
5.0000A 10.000A*	Unspec'd	Unspec'd	45mV/A

*10A continuous, >10A to 20A for 30 second max with 5 minutes cool down interval.

DC LOOP CURRENT %4--20MA

4mA = 0% (zero)

20mA = 100% (span)

Resolution : 0.01%

Accuracy : ± 25d

Crest mode (Instantaneous Peak Hold)

Accuracy : Specified accuracy ±100 digits for changes > 0.8ms in duration

~ HZ LINE LEVEL FREQUENCY

Function Range	Sensitivity (Sine RMS)	Range
500mV	100mV	10Hz ~ 200kHz
5V	1V	10Hz ~ 200kHz
50V	10V	10Hz ~ 100kHz
500V	100V	10Hz ~ 100kHz
1000V	900V	10Hz ~ 10kHz

Accuracy : 0.02% + 4d

⎍ HZ LOGIC LEVEL FREQUENCY

Range	Accuracy
5.0000Hz--2.00000MHz	0.002%+4d

Sensitivity : 2.5Vp square wave

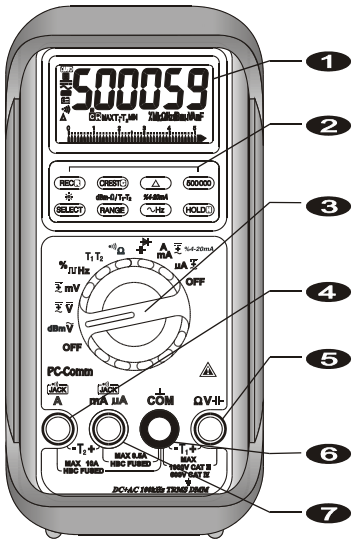
%DUTY CYCLE

Range	Accuracy
0.1% -- 99.99%	3d/kHz+2d

Input Frequency: 5Hz -- 500 kHz, 5V Logic Family

3) PRODUCT DESCRIPTION

Panel Illustration



1. 5-4/5 digits 500000 counts LCD display
2. Push-buttons for special functions & features
3. Selector to turn the Power On or Off and Select a function
4. Input jack for 10A(+) (20A for 30sec) current, and for T2(-) function
5. Input Jack (+) for all functions *EXCEPT* current (μA, mA, A) and T2 functions
6. Common (Ground reference) Input Jack(-) for all functions *EXCEPT* T2 function
7. Input Jack (+) for milli-amp, micro-amp, and T2(+) functions

Average sensing RMS calibrated

RMS (Root-Mean-Square) is the term used to describe the effective or equivalent DC value of an AC signal. Most digital multimeters use average sensing RMS calibrated technique to measure RMS values of AC signals. This technique is to obtain the average value by rectifying and filtering the AC signal. The average value is then scaled upward (calibrated) to read the RMS value of a sine wave. In measuring pure sinusoidal waveforms, this technique is fast, accurate, and cost effective. Inmeasuring non-sinusoidal waveforms, however, significant errors can be introduced because of different scaling factors relating average to RMS values.

AC True RMS

AC True RMS, normally refers as True RMS, identifies a DMM function that is AC coupled, and responds accurately only to the effective RMS AC component value regardless of the waveforms. However, DC component plays an important role in the distorted non-symmetrical waveforms, and will also be of interest sometimes. A full wave rectified sine waveform is a good example, and the AC true RMS function will only give the AC component reading which is at 43.6% of the total effective DC+AC RMS reading.

DC+AC True RMS

DC + AC True RMS calculates both of the AC and DC components given by the expression $\sqrt{DC^2+(AC\ rms)^2}$ When making measurement, and can respond accurately to the total effective RMS value regardless of the waveform. Distorted waveforms with the presence of DC components and harmonics may cause:

1) Overheated transformers, generators and motors to burn out faster than normal
2) Circuit breakers to trip prematurely.
3) Fuses to blow
4) Neutrals to overheat due to the triplen harmonics present on the neutral
5) Bus bars and electrical panels to vibrate

AC Bandwidth

AC bandwidth of a DMM is the range of frequencies over which AC measurements can be made within the specified accuracy. It is not the frequency measurement function, and is the frequency response of the AC functions. A DMM cannot accurately measure the AC value with frequency spectrums beyond the AC bandwidth of the DMM. Therefore, wide AC bandwidth plays an important role in high performance DMMs. In reality, complex waveforms, noise and distorted waveforms contain much higher frequency spectrum than its fundamental.

NMRR (Normal Mode Rejection Ratio)

NMRR is the DMM's ability to reject unwanted AC noise effect that can cause inaccurate DC measurements. NMRR is typically specified in terms of dB (decibel). This series has a NMRR specification of > 60dB at 50 and 60Hz, which is a good and definite ability to reject the effect of noise when making DC measurements.

CMRR (Commaon Mode Rejection Ratio)

Common mode voltage is voltage present on both the COM and VOLTAGE input terminals of a DMM, with respect to ground. CMRR is the DMM's ability to reject common mode voltage effect that can cause digit rolling or offset in voltage measurements. This series has a CMRR specifications of > 80dB at DC to 60Hz in ACV function; and > 120dB at DC, 50 and 60Hz in DCV function. If neither NMRR nor CMRR specification is specified, a DMM's performance will be uncertain.

Analog bar-graph

The analog bar graph provides a visual indication of measurement like a traditional analog meter needle. It is excellent in detecting faulty contacts, identifying potentiometer clicks, and indicating signal spikes during adjustments. Analog bar-graph is not available in AC+DC True RMS Voltage & Current modes.

4) OPERATION

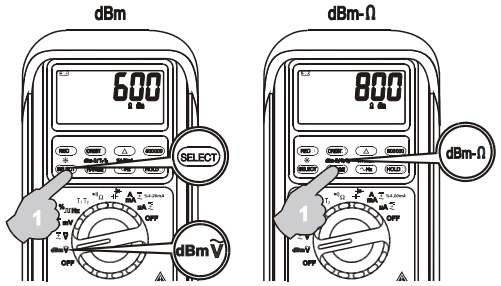
CAUTION

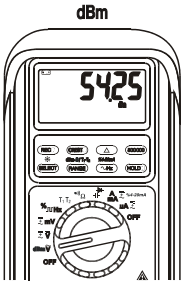
Before and after hazardous voltage measurements, test the voltage function on a known source such as line voltage to determine proper meter functioning.

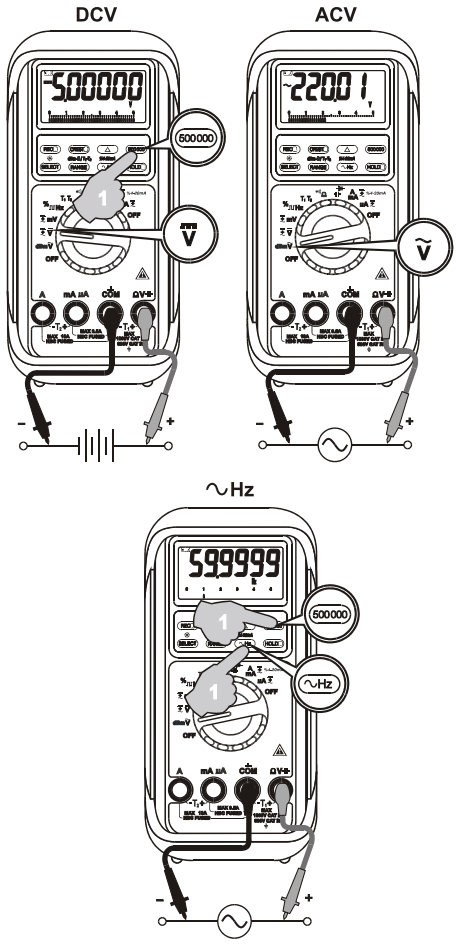
AC Voltage, DC Voltage, DC+AC Voltage, & ~Hz Line Level Frequency

In AC Voltage, press **SELECT** button momentarily to toggle between AC and dBm. In DC Voltage, press **SELECT** button momentarily to toggle between DC, and DC+AC. In mV Voltage, press **SELECT** button momentarily to select DC, AC, or DC+AC.The new settings will be saved automatically to the non-volatile memory as power up default. In DCV and DCmV, press **500000** button momentarily to toggle between 4-4/5 digits and 5-4/5 digits readings. In voltage or current functions, press the **~Hz** push button momentarily to activate or to exit Line Level Frequency measuring function. Line Level Frequency measuring function is designed especially for noisy electrical high voltage signals.

Note : In dBm function, power up default reference impedance will be displayed for 1 second before displaying the dBm readings. Press **dBm-Ω (RANGE)** button momentary to select different reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, up to 1200Ω. The new impedance value will be saved automatically to the non-volatile memory as power up default.



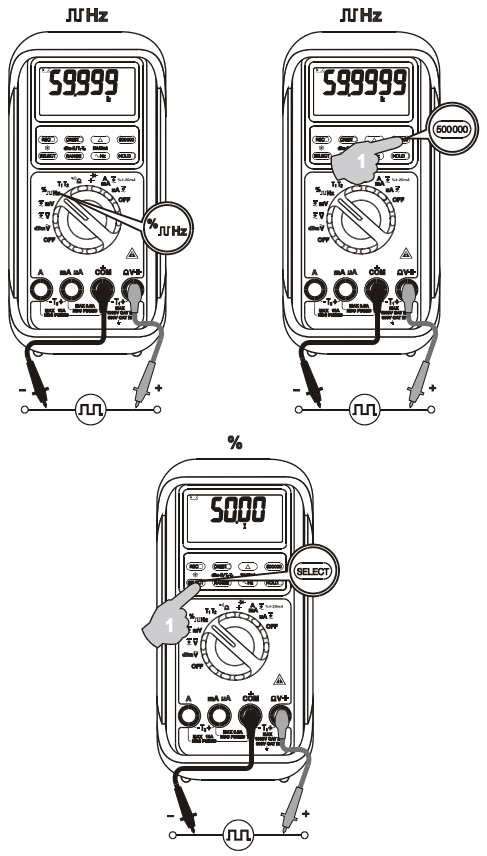




Note : Line Level Frequency measuring function input sensitivity varies automatically with voltage (or current) function range selected. The lower the measuring range the higher the sensitivity. That is, mV function has the highest and the 1000V range has the lowest as in voltage function ranges. It is recommended to first measure the signal voltage (or current) level then activate the Hz function in that voltage (or current) range to automatically get the most approprite trigger level. When activated from voltage function, you can also press the **RANGE** button momentarily to select another trigger level range manually. The analog bargraph pointer will point at the selected trigger level range scale 1, 2, 3, or 4. If the Hz reading is unstable, select lower sensitivity to avoid electrical noise. If the reading shows zero, select higher sensitivity.

⎍ Hz Logic Level Frequency and % Duty Cycle functions:-

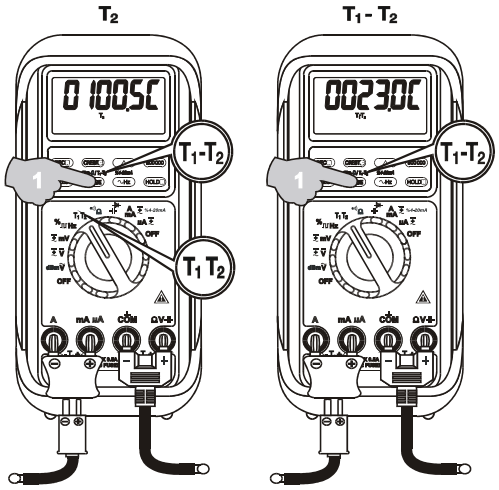
Press **SELECT** button momentarily to toggle between Hz and % (duty cycle) readings. The new setting will be saved automatically to the non-volatile memory as power up default. Press **500000** button momentarily to toggle between 5 full digits and 6 full digits Hz readings.

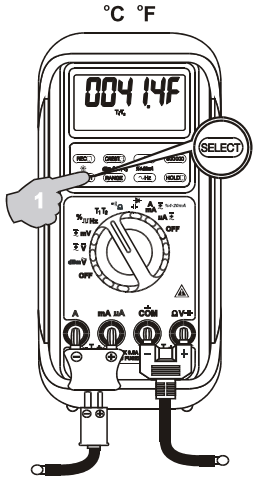


Note: Unlike the Line Level Frequency measuring function as previously stated, this Logic Level Frequency function is set only at the highest input sensitivity to measure digital type electronic signals.

T1-T2 Dual Channels Temperature function (KM859CF only)

Press **SELECT** button momentarily to toggle between ℃ and ℉ readings, and the new setting will be saved automatically in the non-volatile memory as power up default. Press T1-T2(RANGE) button momentarily to select T1,T2, or T1-T2 readings.

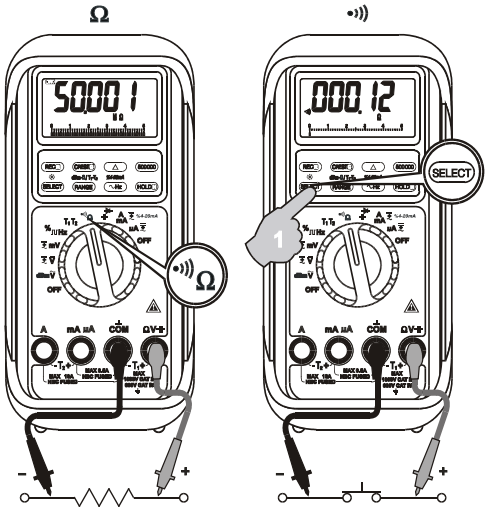




Note : insert the banana plug K-type temperature bead probe (stadard accessory x 1) with correct **+ -** polarities. Dual channels T1-T2 readings require 2 probes. You can also use a plug adapter (Optional purchase) with banana pins to K-type socket to adapt other standard K type mini plug temperature probes.

Ω RESISTANCE, •))) CONTINUITY FUNCTIONS

Press **SELECT** button momentarily to toggle between Ω and •))) Continuity function. The new setting will be saved automatically to the non-volatile memory as power up default. Continuity function is convenient for checking wiring connections and operation of switched. A continuous beep tone indicates a complete wire.



CAUTION

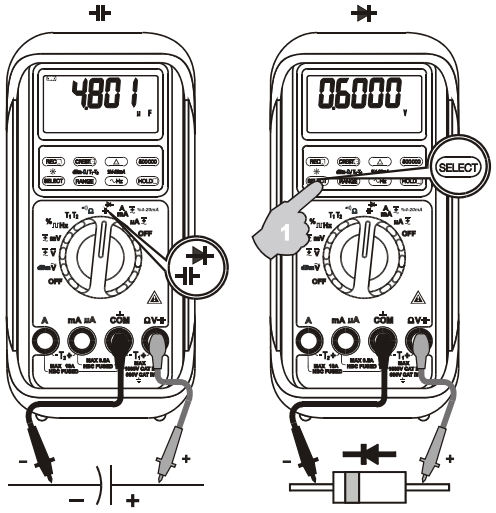
Using resistance or continuity function in a live circuit will produce false results and may damage the meter. In many cases the suspected component must be disconnected from the circuit to obtain an accurate reading.

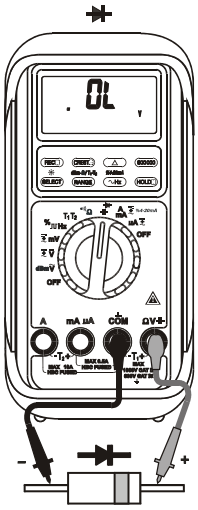
⊣⊢ CAPACITANCE, →⊢ DIODE TEST FUNCTION

Press **SELECT** button momentarily to toggle between ⊣⊢ Capacitance and →⊢ Diode test function. The new setting will be saved automatically to the non-volatile memory as power up default.

CAUTION

Discharge capacitors before making any measurement. Large value capacitors should be discharged through an appropriate resistance load.

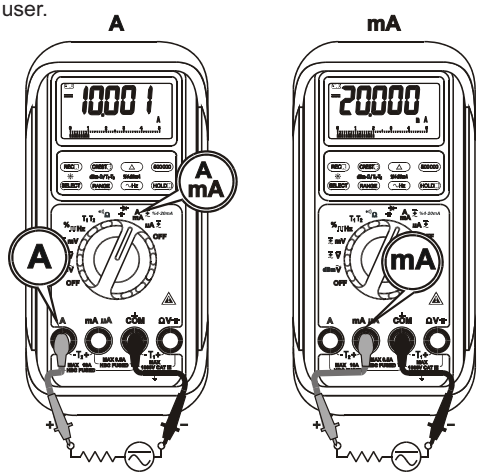


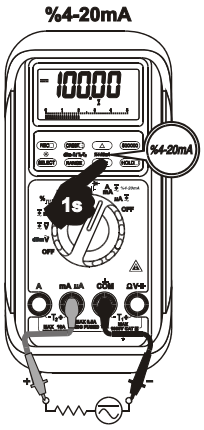


Note: Normal forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An OL indicates an open diode (defective). Reverse the test leads connections (reverse baised) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

μA, mA, A, and %4-20mA Current functions

Insert the red test lead into the correct μA/mA or A input jack. Press **SELECT** button momentarily to select DC, AC, or DC+AC. The new settings will be saved automatically to the non-volatile memory as power up default. In DC mA function, neither in AC nor in DC+AC, *press and hold the %**4-20mA*** (**~Hz**) button for 1 second or more to display the current digital data in terms of loop current percentage (%) value. It is set at 4mA=0%(zero) and 20mA= 100%(span) with 0.01% high resolution, which virtually extends the meters' capability to test and regulate the externally powered loop current in the industrial process control applications. The analog bar-graph remains showing the mA current value to alert the user.





Warning: When measuring a 3-phase system, special attention should be taken to the phase to phase voltage which is significantly higher than the phase to earth voltage. To avoid exceeding the voltage rating of the protection fuse(s) accidentally, always consider the phase to phase voltage as the working voltage for the protection fuse(s).

PC-COMM Computer interface capabilities

The instrument equips with an optical isolated interface port at the meter back for data communication. Optional purchase PC interface kit BRUA-85Xa (BC-85Xa RS232C optical adapter cable + BS85X software CD + BUA-2303 USB-to-Serial adaptor) is required to connect the meter to the PC computer. The BS85x Data Recording System software equips with a digital meter, an analog meter, a comparator meter, and a Data Graphical recorder display. Refer to the README file in the interface kit for further details.

MAX/MIN RECORDING mode

Press **REC** button momentarily to activate MAX/MIN recording mode. The LCD annunciators "R" and "MAX/MIN turn on. The meter beeps when new maximum or minimum reading is updated. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), and Maximum minus Minimum (MAX-MIN) readings. Press the button for 1 second or more to exit MAX/MIN recording mode. Auto Power Off feature will be disabled automatically in this mode.

CREST capture (Instantaneous Peak Hold)mode

Press CREST button momentarily to activate CREST mode to capture voltage or current signal duration as short as 0.8ms. This mode is available in DC, AC, DC+AC modes of voltage and current functions. The LCD annunciators "C" & "MAX" turn on. The meter beeps when new maximum or minimum reading is updated. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), and Maximum minus Minimum (MAX-MIN) readings. Press the button for 1 second or more to exit CREST capture mode. Auto Power Off feature will be disabled automatically in this mode.

Δ Relative Zero mode

Relative Zero allows the user to offset the meter consecutive measurements with the displaying reading as the reference value. Practically MAX/MIN recording feature readings can also be set as relative reference value. Press the Δ button momentarily to activate and to exit Relative Zero mode.

500000 high resolution stable mode

In DC voltage and frequency functions, press the **500000** button momentarily to toggle between the 4-4/5 digits fast mode and the 5-4/5 digits high resolution stable mode.

Backlighted display

Press the **SELECT** button for 1 second or more to turn on or off the display backlight function. The backlight will also be turned off automatically after 30 seconds to extend battery life.

Manual or Auto-ranging

Press the **RANGE** button momentarily to select manual-ranging mode, and the meter will remain in the range it was in, the LCD annunciator **AUTO** turns off. Press the button momentarily again to step through the ranges. Press and hold the button for 1 second or more to resume auto-ranging mode. Note: Manual ranging mode feature is not available in Hz function.

Hold

The hold function freezes the display for later view. Press the HOLD button momentarily to activate or to exit the hold function

Set Beeper Off

Press the **~Hz** button while turning the meter on to disable the push button operating beeper feature. However, the continuity and Jack Beep input warning features remain.

Beep-Jack™ Input Warning

The meter beeps as well as displays **"InErr"** to warn the user against possible damage to the meter due to improper connections to the μA, mA, or A input jacks when other function (like voltage function) is selected.

Intelligent Auto Power Off(APO)

The Intelligent Auto Power Off (APO) mode turns the meter off automatically to extend battery life after approximately 17 minutes of no activities. Activities are specified as: 1) Rotary switch or push button operations, and 2) Significant measuring readings of above 10% of range or non-OL Ω readings. In other words, the meter will intelligently avoid entering the APO mode when it is under normal measurements. To wake up the meter from APO, press the **RECORD** button momentarily or turn the rotary switch to the OFF position and then turn back on again. Always turn the rotary switch to the OFF position when the meter is not in use.

Disabling Auto Power Off

Press the **RANGE** button while turning the meter on to disable the Auto Power Off (APO) feature.

5) MAINTENANCE

WARNING

To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case. Do not operate with open case. Install only the same type of fuse or equivalent.

Calibration

Periodic calibration at intervals of one year is recommended to maintain meter accuracy. Acuracy is specified for a period of one year after calibration.

If self-diagnostic message “rE-O” is being displayed while powering on, the meter is re-organizing internal parameters. Do not switch off the meter then, and it will be back to normal measurement shortly. However, if self-diagnostic message “C_Er” is being displayed while powering on, some meter ranges might be largely out of specifications. To avoid mis-leading measurements, stop using the meter and send it for re-calibration. Refer to the LIMITED WARRANTY section for obtaining warranty or repairing service.

Trouble Shooting

If the instrument fails to operate, check battery, fuses, leads, etc., and replace as necessary. Double check operating procedure as described in this user's manual. If the instrument voltage-resistance input terminal has subjected to high voltage transient (caused by lighting or switching surge to the system) by accident or abnormal conditions of operation, the series fusible resistors will be blown off (become high impedance) like fuses to protect the user and the instrument. Most

measuring functions through this terminal will then be open circuit. The series fusible resistors and the spark gaps should then be replaced by qualified technician. Refer to the LIMITED WARRANTY section for obtaining warranty or repairing service.

Cleaning and Storage

Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for periods of longer than 60 days, remove the battery and store it separately.

Battery and Fuse replacement

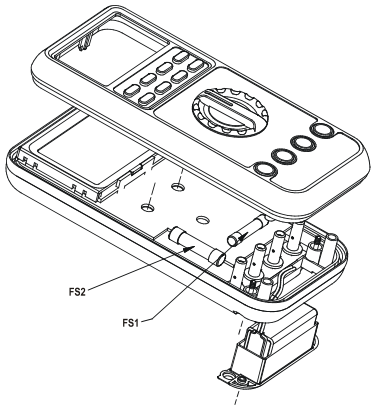
Battery use: 9V alkaline battery

Fuse (FS1) for μAmA current input:
0.44A/1000V, IR 10kA, or better,
F fuse; Dimension : 10 x 38mm

Fuse (FS2) for A current input:
11A/1000V, IR 20kA or better,
F fuse; Dimension : 10 x 38mm

Battery replacement for models with battery access door:

Loosen the 2 screws from the battery access door of the case bottom. Lift the battery access door and thus the battery compartment up. Replace the battery. Re-fasten the screws.



Fuse replacement (and also Battery replacement for splash proof version without battery access door):

Loosen the 4 screws from the case bottom. Lift the end of the case bottom nearest the input jacks until it unsnaps from the case top. Replace the blown fuse(s) and /or the battery. Replace the case bottom, and ensure that all the gaskets are properly seated and the two snaps on the case top (near the LCD side) are engaged. Re-fasten the screws.

KUSAM-MECO

MUMBAI

TEST CERTIFICATE

DIGITAL MULTIMETER

This Test Certificate warrantees that the product has been inspected and tested in accordance with the published specifications.

The instrument has been calibrated by using equipment which has already been calibrated to standards traceable to national standards.

MODEL NO. **KM 857 / KM 859CF**

SERIAL NO. _____

DATE: _____

ISO 9001:2015
REGISTERED

QC
KUSAM-MECO
PASS

KUSAM-MECO

LIMITED WARRANTY

Each “KUSAM-MECO” product is warranted to be free from defects in material and workmanship under normal use & service. The warranty period is one year (12 months) and begins from the date of despatch of goods. In case any defect occurs in functioning of the instrument, under proper use, within the guarantee period, the same will be rectified by us free of charges, provided the to and fro freight charges are borne by you.

This warranty extends only to the original buyer or end-user customer of a “KUSAM-MECO” authorized dealer.

This warranty does not apply for damaged Ic’s, fuses, disposable batteries, carrying case, test leads, or to any product which in “KUSAM-MECO’s” opinion, has been misused, altered, neglected, contaminated or damaged by accident or abnormal conditions of operation or handling.

“KUSAM-MECO” authorized dealer shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of “KUSAM-MECO”.

“KUSAM-MECO’s” warranty obligation is limited, at option, free of charge repair, or replacement of a defective product which is returned to a “KUSAM-MECO” authorized service center within the warranty period.

KUSAM-MECO

THIS WARRANTY IS BUYER’S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. “KUSAM-MECO” SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE WHATSOEVER.

All transaction are subject to Mumbai Jurisdiction.

KUSAM-MECO®

AN ISO 9001:2015 COMPANY

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