KUSAM-MECO®

LIST OF PRODUCTS

* Digital Multimeter
* Digital AC & AC/DC Clampmeter
* AC Clamp Adaptor
* AC/DC Current Adaptor
* Thermo Anemometer
* Thermo Hygrometer
* Distance Meter
* Digital Lux Meter
* Network Cable Tester
* Power Factor Regulator
* Earth Resistance Tester
* Digital Panel Meters
* DC Power Supplies
* High Voltage Detectors
* Calibrators
* Gas Detectors
* Frequency Counter
* Function Generator
* Phasing Sticks
* Battery Tester
* Waterproof Pen Testers
* Solar Power Meter
* EMF Detector
* Discharge Rods(400 KV)
* Wood, Paper & Grain Moisture Meter
* Transistorised Electronic Analog & Digital Insulation Resistance Testers(upto 15 KV)
* Digital Sound Level Meter & Sound Level Calibrator
* Digital contact & Non-contact Type Tachometer
* Digital Non-contact (infrared) Thermometer/ Thermal Imaging Camera
* Maximum Demand Controller/Digital Power Meter
* Digital Hand Held Temperature Indicators

KUSAM-MECO®

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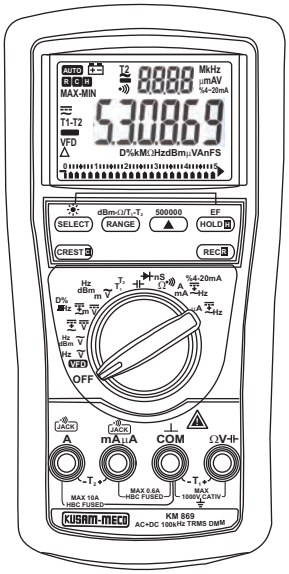
KUSAM-MECO®

KUSAM-MECO®

AN ISO 9001:2015 COMPANY

TRMS DIGITAL MULTIMETER

MODEL - KM 869



OPERATION MANUAL

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 I f 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®

TABLE OF CONTENTS

1) SAFETY

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.

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/UL/EN61010-2-030 Ed. 1.0, IEC/EN61010-2-033 Ed. 1.0, IEC/UL/EN61010-031 Ed. 1.1 & CAN/CSA-C22.2 No. 61010-1-12 Ed. 3.0 to Category IV 1000 V AC & DC .

Terminals (to COM) measurement category:

V / mAμA / A : Category IV 1000Volts 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 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.

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 60 VDC 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, & 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.

CAUTION

Disconnect the test leads from the test points before changing functions. Always set the instrument to the highest 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

SPECIAL FEATURES :

- Record MAX, MIN & AVG readings
- Crest (Instantaneous Peak hold) MAX & MIN reading
- Relative zero mode
- 500,000 counts stable DCV mode
- Paper-White Backlight display
- dBm readings
- % 4-20mA loop current readings
- Data Hold
- BeepJack™ Audible & visible input warning
- T1-T2 differential temperature readings
- VFD, V & Hz readings.

SPECIFICATIONS :

GENERAL SPECIFICATIONS :

- **Display :** 4-4/5 digits 50,000 counts fast mode. Selectable stable mode 5-4/5 digits 500,000 counts for DC Voltage, & 5 digits 99,999 counts for Hz large Dual LCD display with white Backlight.
- **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.
- **41 Segments Bar graph :** 60 per second max
- **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
- **Pollution degree :** 2
- **Storage Temperature :** -20°C to 60°C, <80% R.H. (With battery removed)
- **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.
- **Sensing :** AC, AC+DC True RMS
- **Safety :** Double insulation per IEC/UL/EN61010-1Ed.3.0, IEC/UL/EN61010-2-030 Ed. 1.0, IEC/EN61010-2-033 Ed. 1.0, IEC/UL/EN61010-031 Ed. 1.1 & CAN/CSA-C22.2 No. 61010-1-12 Ed. 3.0 to CAT IV 1000V AC & DC .

- **Terminals (to COM) Measurement Category :**
  V / A / mAμA : Category IV 1000 VAC & VDC
- **Overload Protection :**
  μA & mA : 0.44A / 1000V, IR 10kA or better, F fuse
  A : 11A / 1000V, IR 20kA or better, F fuse
  V : 1100V DC / AC rms
  mV, Ω & Others : 1000V DC / AC rms
- **Transient protection :** 12kV (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 + 1000 digits
  Performance above 3V/m is not specified.
- **Power Supply :** Single 9V Alkaline battery.
- **Power Consumption :** 6.5mA typical; 8mA for VFD ranges.
- **Low battery :** Below approx. 7V
- **APO Timing :** Idle for 17 minutes
- **APO Consumption :** 70μA typical.
- **Dimension :** 208(L) x 103(W) x 64.5(H) mm with holster
- **Weight :** 635gm with holster.
- **Accessories :** Test leads (pair), holster, battery installed, User's Manual, Bkp60 banana plug K-type Thermocouple x 1.
- **Optional Accessories :** BU-86X PC interface kit, Bkb32 banana pins to K-type socket plug adapter.

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 < 2.1:1 at full scale & < 4.2:1 at half scale, and with frequency components within the specified frequency bandwidth for non-sinusoidal waveforms.

DC VOLTAGE

Range	Resolution	Accuracy
500.00 mV	1 µV	±(0.02%rdg + 2dgts)
5.0000 V	100 µV	±(0.02%rdg + 2dgts)
50.000 V	1 mV	±(0.03%rdg + 2dgts)
500.00 V	10 mV	±(0.04%rdg + 2dgts)
1000.0 V	100 mV	±(0.15%rdg + 2dgts)

Input Impedance : 10MΩ, 60pF nominal
(80pF nominal for 500mV range)

DC CURRENT

Range	Resolution	Accuracy	Burden Voltage
500.00 µA	10 nA	±(0.15%rdg+20dgts)	0.15 mV/µA
5000.0 µA	100 nA	±(0.1%rdg+20dgts)	0.15 mV/µA
50.000 mA	1 µA	±(0.15%rdg+20dgts)	3.3 mV/mA
500.00 mA	10 µA	±(0.15%rdg+30dgts)	3.3 mV/mA
5.0000 A	100 µA	±(0.5%rdg+20dgts)	45 mV/A
10.000 A*	1 mA	±(0.5%rdg+20dgts)	45 mV/A

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

OHMS

Range	Resolution	Accuracy
500.00 Ω	10 mΩ	±(0.07%rdg + 10dgts)
5.0000 kΩ	100 mΩ	±(0.07%rdg + 2dgts)
50.000 kΩ	1 Ω	±(0.1%rdg + 2dgts)
500.00 kΩ	10 Ω	±(0.1%rdg + 2dgts)
5.0000 MΩ	100 Ω	±(0.3%rdg + 6dgts)
50.000 MΩ	1 kΩ	±(2.0%rdg + 6dgts)
Conductance		
99.99 nS*	0.01 nS	±(2.0%rdg + 10dgts)

Open Circuit Voltage : <1.3V DC (<3V DC for 500Ω range)
*From 0% to 10% of range : Specified accuracy + 30dgts

dBm

Range & Accuracy are subjected to ACmV, ACV & reference impedance selected. Typical 600Ω reference impedance ranges:
At ACmV : -29.83dBm to -03.80dBm
At ACV : -01.09dBm to 62.22dBm
Input Impedance : 10MΩ, 60pF 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

CREST MODE (Instantaneous Peak Hold)
Resolution : 5000 counts
Accuracy : Specified accuracy ± 100 digits for changes >0.8ms in duration

AUDIBLE CONTINUITY TESTER

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

AC VOLTAGE

Range	Resolution	Accuracy *
20Hz ~ 45Hz		
500.00 mV	10 μV	±(1.2%rdg + 40dgts)
5.0000 V	100 μV	±(1.2%rdg + 40dgts)
50.000 V	1 mV	±(1.2%rdg + 40dgts)
500.00 V	10 mV	Unspec'd
1000.0 V	100 mV	Unspec'd
45Hz ~ 300Hz		
500.00 mV	10 μV	±(0.3%rdg + 20dgts)
5.0000 V	100 μV	±(0.4%rdg + 30dgts)
50.000 V	1 mV	±(0.4%rdg + 30dgts)
500.00 V	10 mV	±(0.5%rdg + 40dgts)
1000.0 V	100 mV	±(0.5%rdg + 40dgts)
300Hz ~ 5kHz		
500.00 mV	10 μV	±(0.3%rdg + 20dgts)
5.0000 V	100 μV	±(0.4%rdg + 40dgts)
50.000 V	1 mV	±(0.4%rdg + 40dgts)
500.00 V	10 mV	±(0.4%rdg + 40dgts)
1000.0 V	100 mV	±(0.8%rdg + 40dgts)**
5kHz ~ 20kHz		
500.00 mV	10 μV	±(0.5%rdg + 30dgts)
5.0000 V	100 μV	±(0.7%rdg + 40dgts)
50.000 V	1 mV	±(0.7%rdg + 40dgts)
500.00 V	10 mV	±(0.5%rdg + 40dgts)
1000.0 V	100 mV	Unspec'd

Range	Resolution	Accuracy *
20kHz ~ 100kHz		
500.00 mV	10 μV	±(2.5%rdg + 40dgts)
5.0000 V	100 μV	±(4.0%rdg + 40dgts)***
50.000 V	1 mV	±(4.0%rdg + 40dgts)***
500.00 V	10 mV	Unspec'd
1000.0 V	100 mV	Unspec'd

*** From 5% to 10% of range :** Specified accuracy + 80 dgts
** Specified bandwidth 300Hz ~ 1kHz
*** **From 5% to 10% of range :** Specified accuracy + 180 dgts
From 10% to 15% of range : Specified accuracy + 100 dgts
Input Impedance: 10MΩ, 60pF nominal
(80pF nominal for 500mV range) Residual reading less than 50 digits with test leads shorted.

DC ^{AC} & AC+ DC ^{AC} VOLTAGE

Range	Resolution	Accuracy *
20Hz ~ 45Hz		
500.00 mV	10 μV	±(1.5%rdg+40dgts)
5.0000 V	100 μV	±(1.5%rdg+40dgts)
50.000 V	1 mV	±(1.5%rdg+40dgts)
500.00 V	10 mV	Unspec'd
1000.0 V	100 mV	Unspec'd
DC, 45Hz ~ 300Hz		
500.00 mV	10 μV	±(0.45%rdg + 40dgts)
5.0000 V	100 μV	±(0.7%rdg + 80dgts)
50.000 V	1 mV	±(0.7%rdg + 80dgts)
500.00 V	10 mV	±(0.7%rdg + 40dgts)
1000.0 V	100 mV	±(0.7%rdg + 40dgts)

Range	Resolution	Accuracy *
300Hz ~ 5kHz		
500.00 mV	10 μV	±(0.8%rdg + 40dgts)
5.0000 V	100 μV	±(0.8%rdg + 40dgts)
50.000 V	1 mV	±(0.8%rdg + 40dgts)
500.00 V	10 mV	±(0.8%rdg + 40dgts)
1000.0 V	100 mV	±(1.0%rdg + 40dgts**)
5kHz ~ 20kHz		
500.00 mV	10 μV	±(1.0%rdg + 40dgts)
5.0000 V	100 μV	±(1.5%rdg + 40dgts)
50.000 V	1 mV	±(1.5%rdg + 40dgts)
500.00 V	10 mV	±(1.5%rdg + 40dgts)
1000.0 V	100 mV	Unspec'd
20kHz ~ 40kHz		
500.00 mV	10 μV	±(3.5%rdg + 40dgts)
5.0000 V	100 μV	±(4.0%rdg + 40dgts)***
50.000 V	1 mV	±(4.0%rdg + 40dgts)***
500.00 V	10 mV	Unspec'd
1000.0 V	100 mV	Unspec'd

*** From 5% to 10% of range :** Specified accuracy + 80 dgts
** Specified bandwidth 300Hz ~ 1kHz
*** **From 5% to 10% of range :** Specified accuracy + 180 dgts
From 10% to 15% of range : Specified accuracy + 100 dgts
Input Impedance : 10MΩ, 60pF nominal
(80pF nominal for 500mV range)
Residual reading less than 50 digits with test leads shorted.

VFD AC VOLTAGE

Range	Resolution	Accuracy *
5Hz~20Hz		
5.0000 V	100 μV	±(3%rdg + 80dgts)
50.000 V	1 mV	±(3%rdg + 80dgts)
500.00 V	10 mV	±(3%rdg + 80dgts)
1000.0 V	100 mV	±(3%rdg + 80dgts)
20Hz~200Hz		
5.0000 V	100 μV	±(2%rdg + 50dgts)
50.000 V	1 mV	±(2%rdg + 50dgts)
500.00 V	10 mV	±(2%rdg + 50dgts)
1000.0 V	100 mV	±(2%rdg + 50dgts)
200Hz~440Hz		
5.0000 V	100 μV	±(6%rdg + 80dgts)**
50.000 V	1 mV	±(6%rdg + 80dgts)**
500.00 V	10 mV	±(6%rdg + 80dgts)**
1000.0 V	100 mV	±(6%rdg + 80dgts)**

* Not specified for fundamental frequency >440Hz
**Accuracy linearly decreases from 2% + 50d
@ 200Hz to 6%+80d @ 440Hz

DIODE TESTER

Range	2.0000V
Accuracy	1% + 1dgt
Test Current (Typical)	0.4mA
Open Circuit Voltage	<3.5V DC

CAPACITANCE

Range	Resolution	Accuracy *
50.00 nF	10 pF	±(0.8%rdg + 3dgts)
500.0 nF	100 pF	±(0.8%rdg + 3dgts)
5.000 µF	1 nF	±(1.5%rdg + 3dgts)
50.00 µF	10 nF	±(2.5%rdg + 3dgts)
500.0 µF**	100 nF	±(3.5%rdg + 5dgts)
5.000 mF**	1 µF	±(5.0%rdg + 5dgts)
25.00 mF**	10 µF	±(6.5%rdg + 5dgts)

*Accuracies with film capaitor or better
**In manual-ranging mode, measurements not specified below 45.0µF / 0.450mF / 4.50mF (450 counts) for 500.0µF / 5.000mF / 25.00mF ranges respectively

DC LOOP CURRENT %4~20mA

4mA : 0% (zero) **20mA :** 100% (span)
Resolution : 0.01% **Accuracy :** ±25d

Hz LOGIC LEVEL FREQUENCY

Range	Accuracy
5.000Hz ~ 1.0000MHz	0.002% + 4d

Sensitivity : 2.5Vp square wave

T1-T2 DUAL TYPE-K TEMPERATURE

Range	Accuracy*
-50.0°C to 1000.0°C	0.3% + 1.5°C
-58.0°F to 1832.0°F	0.3% + 3.0°F

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

AC, DC ^{AC} & AC+DC ^{AC} CURRENT

Range	Resolution	Accuracy	Burden Voltage
DC, 50Hz ~ 60Hz			
500.00 µA	10 nA	±(0.5%+50d)	0.15 mV/µA
5000.0 µA	100 nA	±(0.5%+50d)	0.15 mV/µA
50.000 mA	1 µA	±(0.5%+50d)	3.3 mV/mA
500.00 mA	10 µA	±(0.5%+50d)	3.3 mV/mA
5.0000 A	100 µA	±(0.5%+50d)	45 mV/A
10.000 A*	1 mA	±(0.5%+50d)	45 mV/A
40Hz ~ 1kHz			
500.00 µA	10 nA	±(0.7%+50d	0.15 mV/µA
5000.0 µA	100 nA	±(0.7%+50d)	0.15 mV/µA
50.000 mA	1 µA	±(0.7%+50d)	3.3 mV/mA
500.00 mA	10 µA	±(0.7%+50d)	3.3 mV/mA
5.0000 A	100 µA	±(0.7%+50d)	45 mV/A
10.000 A*	1 mA	±(0.7%+50d)	45 mV/A
1kHz ~ 20kHz			
500.00 µA	10 nA	±(2.0%+50d)	0.15 mV/µA
5000.0 µA	100 nA	±(2.0%+50d)	0.15 mV/µA
50.000 mA	1 µA	±(2.0%+50d)	3.3 mV/mA
500.00 mA	10 µA	±(2.0%+50d)	3.3 mV/mA
5.0000 A	100 µA	Unspec'd	45 mV/A
10.000 A*	1 mA	Unspec'd	45 mV/A
20kHz ~ 100kHz			
500.00 µA	10 nA	±(5.0%+50d)	0.15 mV/µA
5000.0 µA	100 nA	±(5.0%+50d)	0.15 mV/µA
50.000 mA	1 µA	±(5.0%+50d)	3.3 mV/mA
500.00 mA	10 µA	±(5.0%+50d)	3.3 mV/mA
5.0000 A	100 µA	Unspec'd	45 mV/A
10.000 A*	1 mA	Unspec'd	45 mV/A

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

~Hz LINE LEVEL FREQUENCY

AC Function Range	Sensitivity (Sine RMS)	Range
500 mV	100 mV	10Hz ~ 200kHz
5 V	0.5 V	10Hz ~ 200kHz
50 V	5 V	10Hz ~ 100kHz
500 V	50 V	10Hz ~ 100kHz
1000 V	500 V	10Hz ~ 10kHz
VFD 5 V	0.5V ~ 2 V*	10Hz ~ 440Hz
VFD 50 V	5V ~ 20 V*	10Hz ~ 440Hz
VFD 500 V	50V ~ 200V*	10Hz ~ 440Hz
500 μA	50 μA	10Hz ~ 10kHz
5000 μA	500 μA	10Hz ~ 10kHz
50 mA	5 mA	10Hz ~ 10kHz
500 mA	50 mA	10Hz ~ 10kHz
5 A	1 A	10Hz ~ 3kHz
10 A	10 A	10Hz ~ 3kHz

Accuracy : 0.02% + 4d

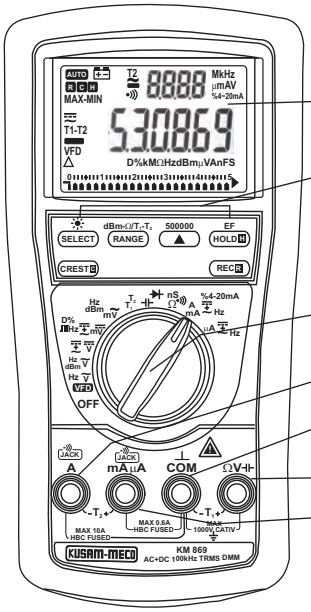
*VFD sensitivity linearly decreases from 10% F.S. @ 200Hz to 40% F.S. 440Hz

%DUTY CYCLE

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

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

4) PRODUCT DESCRIPTION



1) 5-4/5 digits 500000 counts dual displays

1 2) Push-buttons for special functions & features

2 3) Selector to turn the Power On or Off and Select a function

4) Input Jack for 10A (20A for 30sec) current & for T2(-)function

3 5) Common (Ground ref.) Input Jack for all functions *EXCEPT T2* function

4 6) Input Jack for all functions EXCEPT current (μA, mA, A) & T2 functions

5 7) Input Jack for milli-amp, micro-amp & T2(+) functions

6

7

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.

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 waveform, this technique is fast, accurate and cost effective. In measuring 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 wave forms. However, DC component plays an important role in the distorted non-symmetrical waveforms, and will also be of interest sometimes.

DC + AC True RMS

DC + AC True RMS calculates both of the AC & DC components given by the expression $\sqrt{DC^2 + (AC\ rms)^2}$ when making measurements, and can respond accurately to the total effective RMS value regardless of the waveform. Distorted wave forms 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, but is the frequency response of the AC functions. A DMM cannot accurately measure the AC value with frequency spectrums fall 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 wave forms contain much higher frequency spectrum than its fundamental.

Crest Factor

Crest Factor is the ratio of the Crest (instantaneous peak) value to the True RMS value, and is commonly used to define the dynamic range of a True RMS DMM. A pure sinusoidal waveform has a Crest Factor of 1.4. A badly distorted sinusoidal waveform normally has a much higher Crest Factor.

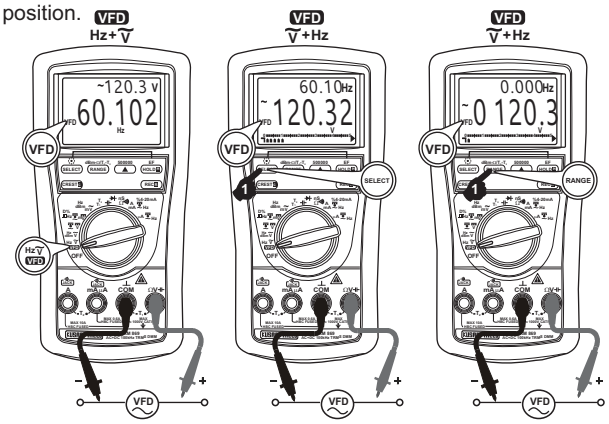
5) OPERATION

CAUTION

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

VFD ACV $^{+Hz}$, VFD Hz $^{+ACV}$ functions

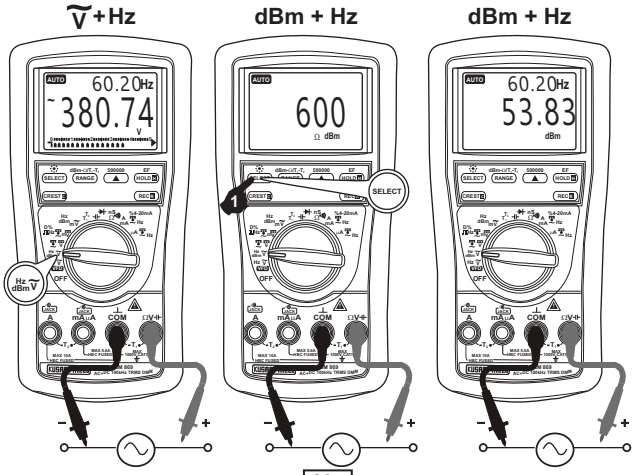
Press the **SELECT** button momentarily to toggle between the subject functions. Last selection will be saved as power up default for repeat measurement convenience. By default, voltage is always set at manual-range 500V to best cope with most Variable Frequency Drives (VFD) measurements. Press the RANGE button momentarily to select other ranges only when needed. High noise-rejection frequency measurement algorithm and Low-pass filter circuit are permanently bundled with all the voltage and frequency function-ranges within this rotary-switch position.



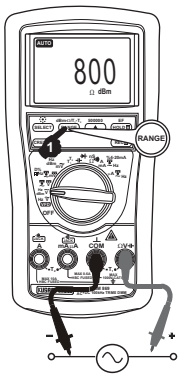
Note : Hz Input sensitivity varies automatically with voltage (Current function alike) range selected. 5V range has the highest & the 1000V range has the lowest. This VFD function defaults at the most appropriate trigger level for Variable Frequency Drive measurements. You can also press the **RANGE** button momentarily to select another trigger level (voltage range) manually. If the Hz reading becomes unstable, select higher voltage range to avoid electrical noise. If the reading shows zero, select lower voltage range for better sensitivity.

dBm $^{+Hz}$, Hz $^{+ACV}$, ACV $^{+Hz}$ function

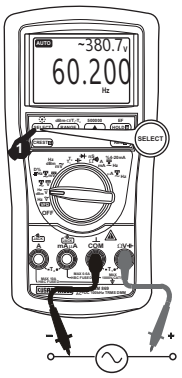
Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



dBm + Hz



Hz + $\widetilde{V}$



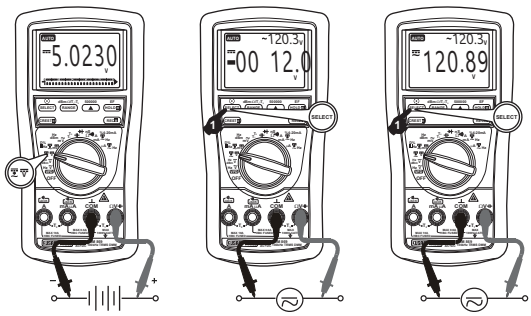
Note : Hz Input sensitivity varies automatically with voltage (current function alike) range selected. 5V range has the highest and the 1000V range has the lowest. Auto-ranging measurements normally set the most appropriate trigger level. You can also press the **RANGE** button momentarily to select another trigger level (voltage range) manually. If the Hz reading becomes unstable, select higher voltage range to avoid electrical noise. If the reading shows zero, select lower voltage range for better sensitivity.

Note : In **dBm** $^{+Hz}$ 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. Last selection will be saved as power up default for repeat measurement convenience. Manual trigger level selection on Hz reading is not available in this function.

DCV, DCV $^{+ACV}$, DC+ACV $^{+ACV}$ functions

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.

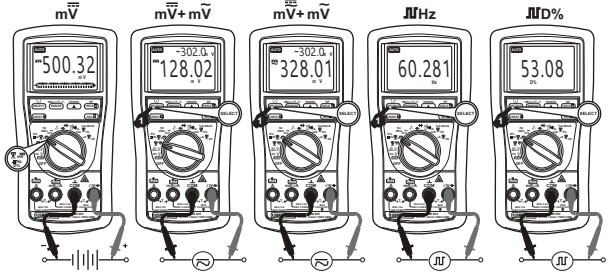
$\overline{\widetilde{V}}$ $\overline{\widetilde{V}}+\widetilde{V}$ $\overline{\widetilde{V}}+\widetilde{V}$



DCmV, DCmV $^{+ACmV}$, DC+ACmV $^{+ACmV}$, Logic-Level ⎍ Hz, Duty% function

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.

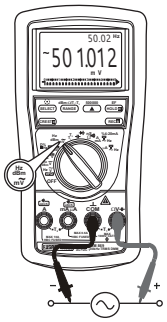
$m\overline{\widetilde{V}}$ $m\overline{\widetilde{V}}+m\widetilde{V}$ $m\overline{\widetilde{V}}+m\widetilde{V}$ ⎍Hz ⎍D%



ACmV $^{+Hz}$, dBm $^{+Hz}$, Hz $^{+ACmV}$ functions

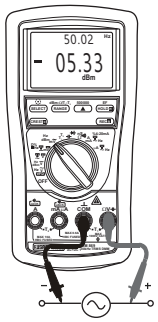
Press the SELECT button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.

mV~+Hz

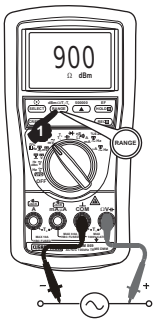


dBm+Hz

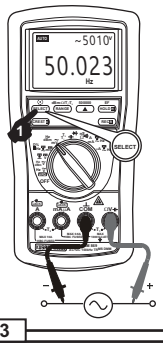
dBm+Hz



dBm+Hz



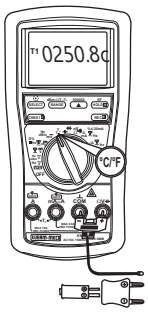
Hz + mV~



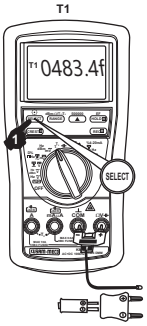
Temperature Functions

Press **SELECT** button momentarily to toggle between °C & °F readings. Press **T1-T2 (RANGE)** button momentarily to select **T1, T2, T1** $^{+T2}$ or **T1-T2** $^{+T2}$ readings. Last selection will be saved as power up default for repeat measurement convenience.

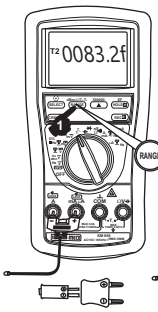
T1



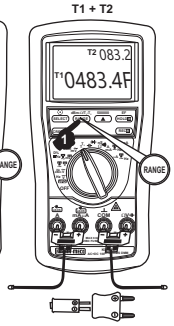
T1



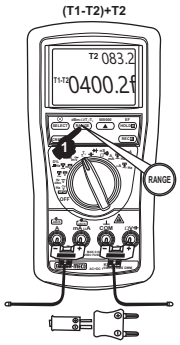
T2



T1 + T2



(T1-T2)+T2



Note : Be sure to insert the banana plug type-K temperature bead probe Bk60 with correct + - polarities. You can also use a plug adapter Bkb32 (Optional Purchase) with banana pins to type-K socket to adapt other standard type-K mini plug temperature probes.

⊣⊢ Capacitance, ⊣▶⊢ Diode Test Functions

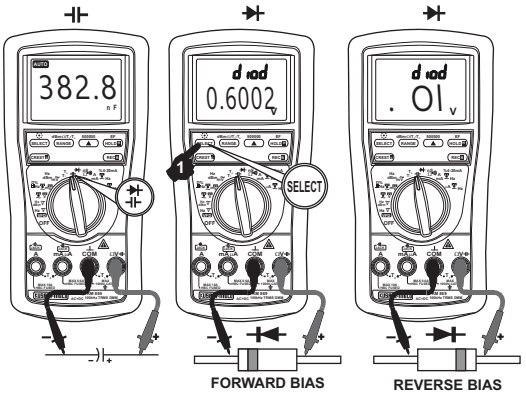
Press the **SELECT** button momentarily to toggle between the subject functions. Last selection will be saved as power up default for repeat measurement convenience.

CAUTION

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

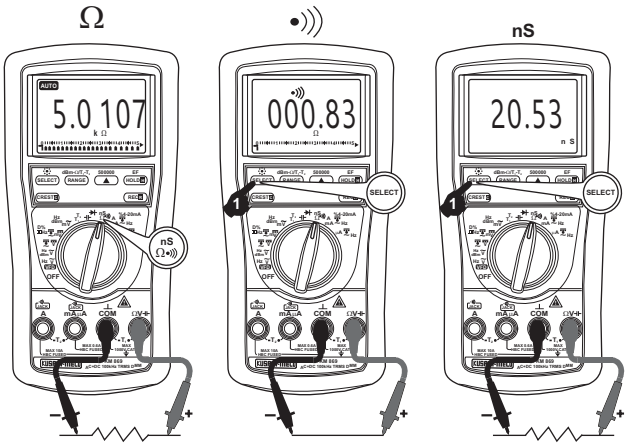
Normal forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective).

An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).



Ω Resistance, •))) Continuity, nS Conductance functions

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



Note :

Conductance is the inverse of Resistance, that is S=1/Ω or nS=1/GΩ. It virtually extends the Resistance measurements to the order of Giga-Ohms for leakage measurements.

•))) Continuity function is convenient for checking wiring connection and operation of switches. A continuous beep tone indicates a complete wire.

CAUTION

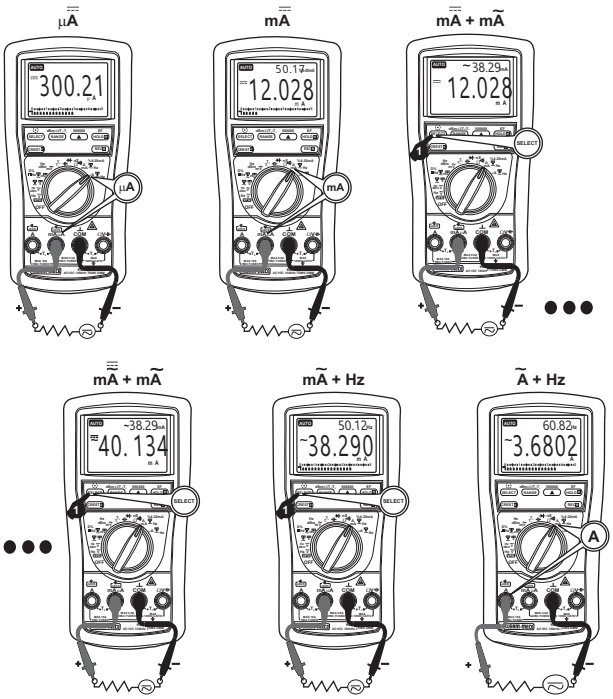
Using resistance and continuity function in a live circuit will produce false results and may damage the instrument. In many cases the suspected component must be disconnected from the circuit to obtain an accurate reading.

μA, mA (DCmA with %4-20mA) and A Current Functions

Press the **SELECT** button momentarily to select **DC, DC** $^{+AC}$**, DC+AC** $^{+AC}$ & **AC** $^{+Hz}$. Last selection will be saved as power up default for repeat measurement convenience.

In DC mA function, neither in AC nor DC+AC selection, loop-Current percentage (%4-20mA) reading is displayed simultaneously. It is set at 4mA = 0% (zero) and 20mA=100% (span) with 0.01% high resolution for testing and monitoring externally powered loop current in industrial process control applications.

* **Note :** 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 USB interface kit **BU-86X** is required to connect the meter to PC computers.

MAX / MIN / AVG recording mode

Press **REC** button momentarily to activate MAX / MIN / AVG recording mode. The LCD "R" & "MAX MIN AVG" turn on. The meter beeps when new MAX (maximum) or MIN (minimum) reading is updated. AVG (Average) reading is calculated over time. Press the button momentarily to read the MAX, MIN and AVG readings in sequence. Press the button for 1 second or more to exit MAX / MIN / AVG recording mode.

*** Note :**
When activated, nominal measurement speed and manual / auto-ranging selection remains, and Auto-Power-Off is disabled automatically. Main display readings are used for MAX/MIN Comparison and AVG calculation. Secondary display is the accompanied significant readings where available. In 500,000 count mode, lower resolution 50,000 count mode will be used instead.

1ms CREST capture mode

Press **CREST** button momentarily to activate CREST (Instantaneous Peak-Hold) mode to capture voltage or current signal duration as short as 1ms. It is available to main display 5000μA, 500mA, 10A and voltage function ranges. The LCD "C" & "MAX" turn on. The meter beeps when new MAX (maximum) or MIN (minium) reading is updated. Press the button momentarily to read the MAX, and MIN readings in sequence. Press the button for 1 second or more to exit CREST mode. Voltage manual / auto-ranging (up range) remains, and Auto-Power-Off is disabled automatically in this mode.

Backlighted display

Press **SELECT** button for 1 second or more to toggle the LCD backlight. The backlight will also be turned off automatically after 32 seconds to extend battery life.

500000 Count Mode

Press the 500000 (△) button for 1 second or more to toggle the 50000 / 500000 count mode. It is available to single display DC voltage function ranges. Measuring speed is reduced to 1.25 times per second.

Beep-Jack™ Input Warning

The meter beeps as well as displays **"InEr"** 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.

Hold

The hold feature freezes the display for later view. Press the HOLD button momentarily to toggle the hold feature.

△ Relative Zero mode

Press the △ Button momentarily to toggle relative zero mode. Relative zero allows the user to offset the meter consecutive measurements with the displaying reading as the reference value in the main display. Practically all displaying readings in the main display can be set as relative reference value including MAX / MIN / AVG readings.

Manual or Auto-ranging

Press the **RANGE** button momentarily to select manual-ranging, and the meter will remain in the range it was in, the LCD **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.

Note : Manual ranging feature is not available in Hz function.

Set Beeper Off

Press the **RANGE** button while turning the meter on to temporarily disable the Beeper feature. Turn the rotary switch OFF and then back on to resume.

Auto-Power off (APO)

The 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 512 counts 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 **SELECT, RANGE, RELATIVE or HOLD** button momentarily or turn the rotary switch OFF and then back on. Always turn the rotary switch to the OFF position when the meter is not in use.

Disabling Auto-Power off

Press the **SELECT** button while turning the meter on to temporarily disable the Auto-Power-Off feature. Turn the rotary switch OFF and then back on to resume.

5) MAINTENANCE

WARNING

To avoide 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

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

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, 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 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.

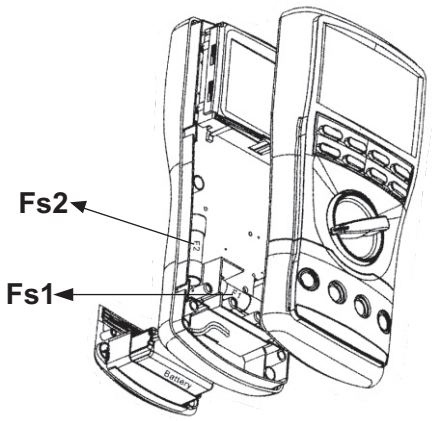
Trouble Shooting

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 lightning 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 (or varistors) should then be replaced by qualified technician. Refer to the WARRANTY section for obtaining warranty or repairing service.

Battery and Fuse replacement

Battery use : Single 9V Alkaline battery.



Fuse use :

Fuse (Fs1) for μAmA current input :
0.44A/1000VAC & VDC,
IR 10kA or better, F fuse;

Fuse (Fs2) for A current input :
11A/1000 VAC & VDC,
IR 20kA or better, F fuse

Battery replacement :

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 :

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). 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

TRMS 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 869**

SERIAL NO. _____

DATE: _____

ISO 9001:2015
REGISTERED

QC
KUSAM-MECO
PASS

KUSAM-MECO®

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 warranty 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, burnt PCB's, 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.

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.