KUSAM-MECO®
An ISO 9001:2015 Company

# TRMS DIGITAL MULTIMETER WITH VFD, EF-DETECTION 3PHASE ROTATION-R & 3PHASE ROTATION-M

# Model KM 239R

THINK SAFETY
THINK KUSAM-MECO®

## SPECIAL FEATURES :

- **Display :** 3-5/6 digits 6000 counts LCD display
- DC µA function for HVAC / R flame sensor application.
- Auto V(LoZ), VFD V & Hz Function
- EF-Detection (NCV)
- Paper White Backlight Display
- Auto Power Off
- Auto-ranging MAX/MIN/AVG record
- Diode & Continuity Test
- Display Hold; Relative zero mode.
- Low Battery Indication
- Temperature Function
- BeepLit Continuity, Features Audible Beep & Visible Backlight Effects
- Beep-Jack Input warning against improper A-terminal plug in
- Auto-ranging Relative Zero Mode
- 3phase rotation-R(Regular-sensitivity mode) for supply systems(probe-contact)
- 3phase rotation-M (Hi-sensitivity mode) for Motors (probe-contact)
- Rugged Fire retarded casing.

**25 FUNCTIONS 50 RANGES**

CAT II 1000V
CAT III 600V
CAT IV 300V
UL
APPROVED

NEW

6 KV
Transient
Protection


## GENERAL SPECIFICATIONS :

- **Sensing :** TRUE RMS AC conversion
- **IP Rating :** IP40
- **Update Rate :** 5 per second nominal
- **Operating Temperature :** -10°C to 45°C
- **Relative Humidity :** Maximum relative humidity 80% for temperature upto 31°C decreasing linearly to 50% relative humidity at 45°C
- **Altitude :** Operating Below 2000m.
- **Storage Temperature:** -20°C to 60°C, <80% R.H. With battery removed from meter.
- **Pollution Degree :** 2
- **Drop :** 1 meter.
- **Temperature Coefficient :** nominal 0.15 x (specified accuracy) /°C @ (-10°C~18°C or 28°C~45°C), or otherwise specified.
- **Low battery :** Below approx. 2.5V
- **Power Consumption :** Typical 3.2mA
- **APO Consumption :** Typical 10µA
- **APO Timing :** Idle for 30 minutes
- **Power Supply :** 1.5V AAA battery x 2
- **Dimension :** 161(L) X 80(W) X 50(H) mm (with Holster)
- **Weight :** Approx. 334 gm ( with Holster)

**Magnetic Hanger**

## SAFETY :

- **Transient Protection :** 6.0kV lightning surge (1.2/50µs)
- **Safety :** Double insulation per IEC/UL/EN61010-1 Ed. 3.0, IEC/UL/EN61010-2-030 Ed. 1.0, IEC/UL/EN61010-2-033 Ed. 1.0, IEC/UL/EN61010-031 Ed. 1.1 & the corresponding CAN/CSA-C22.2 regulations to measurement CAT II 1000V, CAT III 600V and CAT IV 300V AC & DC.
- **E. M. C. :** Meets EN61326-1:2013
  In an RF field of 3V/m :
  Temperature function is not specified.
  Ohm function : Total Accuracy = Specified Accuracy + 15 digits
  Other function ranges : Total Accuracy = Specified Accuracy
  Performance above 3V/m is not specified.
- **Terminals (to COM) Measurement Category :**
  V/ mAµA / A /L3 : CAT II 1000 Volts, CAT III 600V and CAT IV 300 Volts AC & DC.
- **Overload Protections :**
  A : 11A / 1000V DC/AC rms, IR 20kA, F fuse or better
  V, Auto V & L3 : 1100V DC/AC rms
  mV, Ω & Others : 1000V DC/AC rms

**ACCESSORIES :** Test leads pair, Alligator clip set, Batteries included, User's Manual, BKP60 banana plug type-K Thermocouple & Carrying case.

**OPTIONAL ACCESSORIES :** Magnetic Hanger, BKB32 banana plug to type-K socket plug adaptor.
Current Clamp Adaptor CA500, CA1000, CA2000, High Voltage Probe PD-28.

**All Specifications are subject to change without prior notice.**

# ELECTRICAL SPECIFICATIONS - KM 239R

Accuracy is ± (% reading digits + number of digits ) or otherwise specified, at 23°C ± 5°C
ACV & ACA accuracies are specified from 5% to 100% of range or otherwise specified. Maximum Crest Factor <2:1 at full scale & <4:1 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 | ±(0.3%rdg + 2dgts) |
| 600.0 mV | 100 µV | |
| 6.000 V | 1 mV | |
| 60.00 V | 10 mV | ±(0.4%rdg + 2dgts) |
| 600.0 V | 100 mV | ±(0.2%rdg + 2dgts) |
| 1000 V | 1 V | ±(0.4%rdg + 2dgts) |

**Input Impedance :** 10MΩ, 54pF nominal

**AC CURRENT**

| Range | Resolution | Accuracy | Burden Voltage |
|---|---|---|---|
| **50Hz -- 400Hz** | | | |
| 6.000 A[2)] | 1 mA | ±(1.0%rdg + 3dgts) | 0.04 V / A |
| 10.00 A[1)] | 10 mA | | 0.04 V / A |

[1)] 10A continuous, >10A to 20A for 30 Sec. Max with 5 minutes cool down interval

[2)] <5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range & accuracy.

**DC CURRENT**

| Range | Resolution | Accuracy | Burden Voltage |
|---|---|---|---|
| 6.000 A | 1 mA | ±(0.7%rdg + 3dgts) | 0.04 V / A |
| 10.00 A[1)] | 10 mA | | 0.04 V / A |

[1)] 10A continuous, >10A to 20A for 30 Sec. Max with 5 minutes cool down interval
Overload Protection type : HBC fuse

**ACµA**

| Range | Resolution | Accuracy | Burden Voltage[1)] |
|---|---|---|---|
| **50Hz -- 400Hz** | | | |
| 200.0 µA | 100 nA | ±(1.0%rdg + 3dgts) | 2.5 mV/µA |
| 2000 µA | 1 µA | | 2.5 mV/µA |

[1)] Combination PTC protective impedance is being used.

**DCµA**

| Range | Resolution | Accuracy | Burden Voltage[1)] |
|---|---|---|---|
| 200.0 µA | 100 nA | ±(0.7%rdg + 3dgts) | 2.5 mV/µA |
| 2000 µA | 1 µA | | 2.5 mV/µA |

[1)] Combination PTC protective impedance is being used.
DC µA function is useful for HVAC / R flame sensor application.

**ACmV**

| Range | Resolution | Accuracy |
|---|---|---|
| **10Hz -- 500Hz** | | |
| 60.00mV[1)2)] | 10 µV | ±(1.0%rdg + 3dgts) |
| 600.0mV[3)] | 100 µV | |
| **500Hz -- 800Hz** | | |
| 60.00mV[1)2)] | 10 µV | ±(2.0%rdg + 3dgts) |
| 600.0mV[3)] | 100 µV | |

**Input Impedance :** 10MΩ, 54pF nominal

[1)] <5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range & accuracy.

[2)] Signal peak absolute values, including DC bias, less than $130mV_{peak}$

[3)] Signal peak absolute values, including DC bias, less than $1300mV_{peak}$

**AC VOLTAGE**

| Range | Resolution | Accuracy |
|---|---|---|
| **50Hz -- 60Hz** | | |
| 6.000 V[1)] | 1 mV | ±(0.7%rdg + 3dgts) |
| 60.00 V | 10 mV | |
| 600.0 V | 100 mV | |
| 1000 V | 1 V | |
| **45Hz -- 440Hz** | | |
| 6.000 V[1)] | 1 mV | ±(2.0%rdg + 3dgts) |
| 60.00 V | 10 mV | |
| 600.0 V | 100 mV | |
| 1000 V | 1 V | |

**Input Impedance :** 10MΩ, 54pF nominal

[1)] <5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range & accuracy.

**VFD AC VOLTAGE (with Low Pass Filter)**

| Range | Resolution | Accuracy[1)] |
|---|---|---|
| **10Hz -- 100Hz (fundamental)** | | |
| 600.0 V | 100 mV | ±(1.0%rdg + 3dgts) |
| 1000 V | 1 V | |
| **100Hz -- 400Hz (fundamental)** | | |
| 600.0 V | 100 mV | ±(10%rdg + 3dgts)[2)] |
| 1000 V | 1 V | |

[1)] Not specified for fundamental frequency >400Hz

[2)] Accuracy linearly decreases from 1% + 3d @ 100Hz to 10% + 3d @ 400Hz

**AUTOV_ AC VOLTAGE (LoZ)**

| Range | Resolution | Accuracy[1)] |
|---|---|---|
| **45Hz -- 440Hz** | | |
| 600.0 V | 100 mV | ±(2.0%rdg + 3dgts) |
| 1000 V | 1 V | |

[1)] Not specified at <1VAC
Threshold : >1VAC nominal
**Input Impedance :** Initially approx. 2.1kΩ, 164pF 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:
12kΩ @100V
100kΩ @300V
240kΩ @600V
580kΩ @1000V

**AUTOV_ DC VOLTAGE (LoZ)**

| Range | Resolution | Accuracy[1)] |
|---|---|---|
| 600.0 V | 100 mV | ±(2.0%rdg + 3dgts) |
| 1000 V | 1 V | |

[1)] Not specified at <1VDC
Threshold : > + 1.0VDC or < -1.0VDC nominal
**Input Impedance :** Initially approx. 2.1kΩ, 164pF 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:
12kΩ @100V
100kΩ @300V
240kΩ @600V
580kΩ @1000V

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# ELECTRICAL SPECIFICATIONS - KM 239R

### CAPACITANCE

| Range | Resolution | Accuracy |
|---|---|---|
| 2000 nF | 1 nF | ±(1.5%rdg + 2dgts) |
| 20.00 µF | 10 nF | |
| 200.0 µF | 100 nF | |
| 2000 µF | 1 µF | |
| 10.00 mF | 10 µF | ±(4.5%rdg + 10dgts) |

Accuracies with film apacitor or better

### TEMPERATURE

| Range | Resolution | Accuracy[1)2)] |
|---|---|---|
| -40.0°C ~ 99.9°C | 0.1°C | ±(1%rdg + 1°C) |
| 100°C ~ 400°C | 0.1°C | |
| -40.0°F ~ 99.9°F | 0.1°F | ±(1%rdg + 2°F) |
| 100°F ~ 752°F | 0.1°F | |

[1)] Accuracies assume meter interior & the ambient have reached the same temperature (isothermal stage) for a correct junction voltage compensation. Allow enough settling time for a significant change of ambient temperature. It can take up to an hour for changes > 5°C.
[2)] Type-K thermocouple range & accuracy not included.

### LINE FREQUENCY

| Function | Sensitivity (Sine RMS) | Range |
|---|---|---|
| 60 mV | 50 mV | 10Hz - 50kHz |
| 600 mV | 50 mV | 10Hz - 50kHz |
| 6 V | 5 V | 10Hz - 50kHz |
| 60 V | 10 V | 10Hz - 50kHz |
| 600 V | 50 V | 10Hz - 1kHz |
| 1000 V | 500 V | 10Hz - 1kHz |
| VFD 600 V | 50 V | 10Hz - 1kHz |
| VFD 1000V | 500 V | 10Hz - 1kHz |
| 200 µA | 50 µA | 10Hz - 5kHz |
| 2000 µA | 500 µA | 10Hz - 5kHz |
| 6 A | 4 A | 50Hz - 1kHz |
| 10 A | 8 A | 50Hz - 1kHz |

**Accuracy :** 0.03%+2d

### BEEPLIT CONTINUITY TESTER

| | |
|---|---|
| **Continuity Threshold :** | Between 30Ω and 480Ω |
| **Continuity on Response time :** | <15ms |
| **Audible Indication:** | Beep sound |
| **Visible Indication:** | LCD Backlight |

### DIODE TESTER

| Range | Resolution | Accuracy |
|---|---|---|
| 3.000 V | 100mV | ±(0.9%rdg + 2dgts) |

**Test Current :** 0.3mA typical.
**Open Circuit Voltage :** <3.2VDC typical.

### OHMS

| Range[1)] | Resolution | Accuracy |
|---|---|---|
| 600.0 Ω | 100 mΩ | ±(0.3%rdg + 3dgts) |
| 6.000 kΩ | 1 Ω | |
| 60.00 kΩ | 10 Ω | ±(0.5%rdg + 3dgts) |
| 600.0 kΩ | 100 Ω | |
| 6.000 MΩ[2)] | 1 kΩ | ±(0.9%rdg + 3dgts)[4)] |
| 60.00 MΩ[3)] | 10 kΩ | |

[1)] **Open Circuit Voltage :** 1.6VDC typical.
[2)] **Constant Test Current :** 0.2µA Typical
[3)] **Constant Test Current :** 0.02µA Typical
[4)] 5% + 20d @ > 30MΩ.

### NON-CONTACT EF-DETECTION

| Bar-Graph Indication | EF-H (Hi Sensitivity) | EF-L (Lo Sensitivity) |
|---|---|---|
| | Typical Voltage (Tolerance) | |
| - | 10V (3V ~ 19V) | 40V (16V ~ 71V) |
| - - | 20V (10V ~ 38V) | 80V (32V ~ 142V) |
| - - - | 40V (21V ~ 79V) | 160V (63V ~ 285V) |
| - - - - | 80V (40V ~ 156V) | 300V (105V ~ 608V) |
| - - - - - | 160V (>80V) | 500V (>300V) |

**Indication :** Bar-graph segments & audible beep tones proportional to the field strength
**Detection Frequency :** 50/60Hz
**Detection Antenna :** Top left end of the meter
**Probe-Contact EF-Detection :** For more precise indication of live wires, such as distinguishing between live and ground connections, use direct contact testing with one single test-probe via an input terminal COM or V. The COM terminal (Black) has the best sensitivity.

### Ⓜ 3-PHASE MOTOR ROTATION FUNCTION

| **Hi-sensitivity mode Ⓜ (It detects low signal)** | |
|---|---|
| **Voltage Range** | 0.4V ~ 1000V |
| **Frequency Range** | 3Hz ~ 400Hz |

Out put generated from motor rotation for checking phase connection of motors.

### Ⓡ 3-PHASE ROTATION FUNCTION

| **Normal sensitivity mode Ⓡ** | |
|---|---|
| **Voltage Range** | 65V ~ 1000V |
| **Frequency Range** | 35Hz ~ 400Hz |

For identifying phase sequence of Electricity supply.

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