


EMF829 ElectroSmog Instruction Manual

I. Safety Instructions

Notes

1. Before measurement, Please check if the low power symbol () is displayed. If it is displayed please replace the batteries.
2. Turn OFF the instrument and remove the battery when not in use for a long time.
3. When the electric field device is connected to the meter, please don't vibrate the meter especially in measuring.
4. The outside environment and unsuitable operation will influence the accuracy and function.

Dangers Matters

1. In some cases, working near intense radiation sources may come about life risk.
2. Note that, when there is an electronic introducer (for example, pace maker) in human body, it may be extremely dangerous in some cases.
3. The equipment operation shall comply with the local safety regulations.
4. The application of equipment that can produce conduction or consume electromagnetic energy shall comply with its operation instructions.
5. Note that, the secondary radiant matters (for example, reflectors of metal walls) may cause amplification effect of the electric field.
6. Note that, the electric-field strength near the periphery of radiation sources increases to be inversely proportional to the third power of the distance. So, when approaching to small radiant sources, you will immediately feel large electric-field strength (for example, leakage of wave guide, induction furnace).
7. The tester for electric-field strength may underestimate the pulse signal, especially the radar signal. As a result, it may have obvious measurement errors.
8. Testers for electric-field strength all have a specified limit on frequency response range. When the spectrum component of the electric field exceeds such frequency range, it may generally lead to incorrect estimate and tend to underestimate. Therefore, before using the tester for electric-field strength, it shall firstly confirm that all the measured components are within the frequency range specified by such tester.

II. Introduction

2-1 Key words

1. Electromagnetic pollution:

It is the electromagnetic pollution generated by artificial electro field (E) and magnetic field (H) . Any where with a voltage or current there be must such

electromagnetic fields. All the radio and television transmission will produce electromagnetic field. In the applications of industrial and commercial there are also electromagnetic fields. Human can't have any sense in the electromagnetic fields but it is really affect the inner of human body.

2. Electric field intensity (E)

If the charge can feel the effect of the force in a field then the field is an electric field. The electric field intense of a point in the electric field is defined as the capacity of the electric field control unit charge at this point. The electric potential gradient is measured by volt per meter (V/M) .

The electric field mode should be used in following cases:

- 1) The frequency is below 30MHz
- 2) The near field region close to radiation source
- 3) In the unaware electric field

3. Magnetic field intensity (H)

It is a force field around magnetic object or around current-carrying conductor. In this field a moving charge can feel force. The unit of magnetic field is ampere per meter (A/M) .

Only if the meter is in the far field region faraway form radiation source the magnetic field intensity mode is suitable to be used.

4. Power density (S)

It is the power per unit area on the surface perpendicular to transmitting direction of electromagnetic field. The unit of power density is always watt per square meter (W/m²) . Milliwatt per square centimeter (mW/cm²) is also be used as unit for convenient application.

5. Characteristic of electromagnetic field (S):

- 1) The electromagnetic field is transmitted by waves and the speed is the light speed (C) .

The wave length is inversely proportional to frequency.

$$\lambda \text{ (wave length)} = C \text{ (light speed)} / f \text{ (frequency)}$$

- 2) The area in 3 wave lengths to field source is regarded as near field. The area out of 3 wave lengths is regarded as far field.
- 3) In the near field the electric field (E) intense to the magnetic (H) field intense ratio is not a constant value. So in the near field these two values should be separately measured. In far field measuring one value is enough and the other value can be calculated.

2-2 Application

It is used to the cases that there are radiant electromagnetic fields in the region that the routine operation, maintaining and servicing work are always done, Such as the broad cast. When the other employees maybe expose to the electromagnetic field, in this case it is very important

that the employees don't expose to the danger level electromagnetic transmission.

For the effective protection some national and international regulations and standards are produced. The permitted power density limit defined in these regulations is the electric field and magnetic field intense in different frequency range and signal state.

1. High frequency (RF) electromagnetic wave field strength measurement.
2. Mobil phone base station antenna radiation power density measurement.
3. Wireless communication applications (CW, TDMA, GSM, DECT).
4. RF high frequency electromagnetic waves use safety.
5. RF power measurement for transmitters.
6. Wireless LAN (Wi-Fi) detection, installation.
7. Spy camera, wireless bug finder.
8. Cellular/Cordless phone radiation safety level.
9. Microwave oven leakage detection.
10. Personal living environment EMF safety.

2-3 Features

This meter is designed as wide frequency to supervise high frequency transmission of range from 50MHz to 3.5GHz. It has the non-directional measurement feature and high sensitivity. It can be used to measure electromagnetic field intense of the transverse electromagnetic wave cell and Absorber rooms.

The unit and mode are selectable for purpose of using in limits defined in most of regulations. The measured value can be displayed in units of electric field intense, magnetic field intense and power density.

The frequency density is very important in high frequency. It provides the power absorbed by a person exposed in electromagnetic field. It is better that in high frequency the power value must be tried to maintain at a lower level. It is more important than electric field intense in low frequency.

The meter can be set to instantaneous value, maximum value and average value modes. The instantaneous value mode and maximum value mode can be used to directional measurement, such as you come in an exposed region for the first time.

1. 50 MHz to 3.5 GHz frequency range.
2. For isotropic measurements of electromagnetic fields.
3. Non-directional (isotropic) measurement with three-channel measurement probe.
4. High dynamic range due to three-channel digital results processing.
5. Configurable alarm threshold and memory function.
6. Easy to use.

III. Specifications

3-1 Common Specifications

Measurement method: Digital, triaxial measurement

Directional characteristic: Isotropic, triaxial

Measurement range selection: One continuous range

Display resolution: 0.1mV/m, 0.1 μ A/m, 0.1 μ W/m², 0.001 μ W/cm²

Setting time: Typically 1s (0 to 90% of meas. value)

Display refresh rate: Typically 400mS

Display type: LCD 4 digit

Measurement units: mV/m, V/m, μ A/m, mA/m, μ W/m², mW/m², μ W/cm²

Measurement display value: Instantaneous measured value, maximum value or average value since power-on.

Measurement alarm function: Adjustable threshold with ON/OFF

Measurement calibration factor CAL: Adjustable

Manual data memory and read storage: 99 sets (only recall by meter)

Battery: 4 batteries of 9V

Battery life: >15 hours

Automatically power off: 15 minutes

Operation temperature range: 0°C - +50°C

Operation humidity range: 25% - 75%RH

Storage temperature range: -10°C - +60°C

Storage humidity range: 0% - 80%RH

Dimension: 261cm (Length) * 73cm (Width) * 38cm (Height)

Weight (include batteries): About 220g

Accessory: 9V battery, carrying case & manual

3-2 Electrical specification

1. Unless otherwise stated, all specifications hold under the following assumptions:
 - device in far-field of a source; probe head pointing toward source;
 - Environment temperature: +23°C \pm 3°C
 - Relative air humidity: 25% to 75%
2. Sensor type: Electric field
3. Frequency range: 50MHz to 3.5 GHz
4. Measurement range:
 - Continuous (CW) signal ($f > 50$ MHz) : 20mV/m to 108.0V/m;
 - 53 μ A/m to 286.4mA/m;
 - 1 μ W/m² to 30.93W/m²;
 - 0 μ W/cm² to 3.093mW/cm²
5. Dynamic range: about 75dB
6. Absolute error(below 1V/m and 50MHz): \pm 1.0dB
7. Frequency response
 - Taking into account the sensor CAL factor: \pm 1.0dB (50MHz to 1.9 GHz) ,

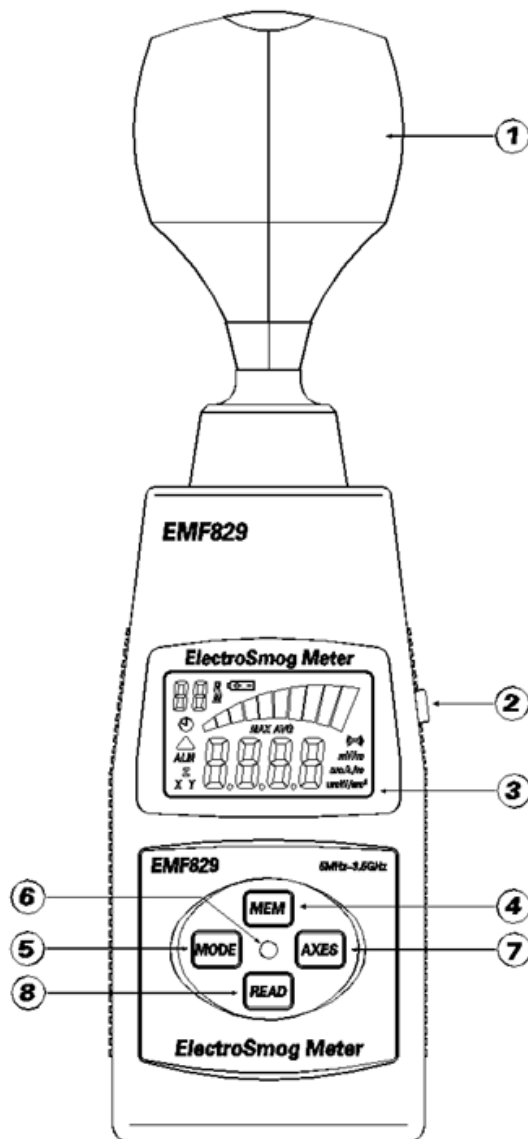
±2.4dB(1.9GHz to 35GHz)

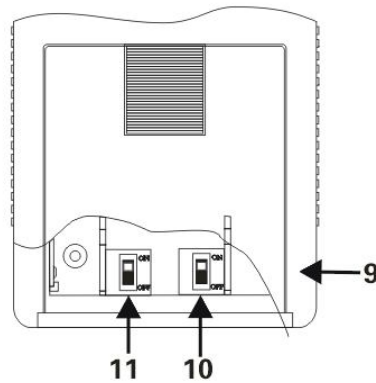
- Isotropy deviation: about ±1.0dB (f>50 MHz)
- Overload limit: 4.2W/m² (40 V/m)
- Temperature response(0 to 50 °C) : ± 1.5dB

VI. Operation Description

4-1 Front panel and back panel description

1. Electric sensor
2. Switch key
3. LCD





4. MEM key:

- 1) Press this key once a record will be saved in memory.
- 2) When the automatically turning off is enabled press this key and hold 2 seconds it will be disabled. When the automatically turning off is disabled press this key and hold 2 seconds it will be enabled.
- 3) In the setting alarm limit mode, press this key to increase the limitary value.
- 4) In the manually reading records mode, press this key to read the previous record.
- 5) In the setting CAL mode, press this key to increase the CAL value.
- 6) In the clearing memory mode, press this key to confirm clearing memory or not clearing. And press this key to quit this mode.

5. MODE key:

- 1) Press this key to circle among “instantaneous” → “maximum instantaneous value” → “average value” → “maximum average value”.
- 2) Press this key and hold for 2 seconds to turn into alarm limit setting mode.
- 3) In the CAL setting mode press this key to quit and turn into measurement mode.
- 4) In manual reading mode press this key to quit this mode.
- 5) In the alarm limit setting mode, press this key to turn the meter from unit setting to limit value setting. Press this key will also save the settings and quit this mode.

6. key:

- 1) Press this key to circle among “mV/m or V/m” → “uA/m or mA/m” → “uW/m² or mW/m²” → “uW/cm²”.

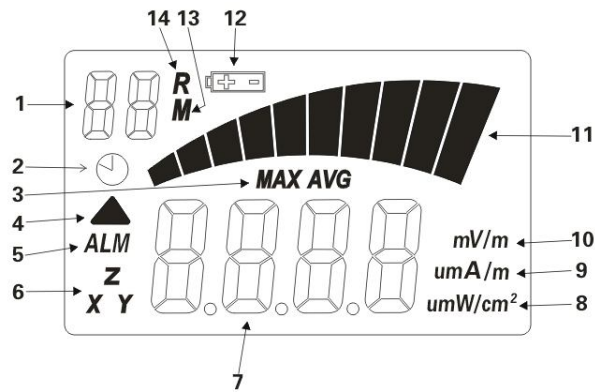
7. AXES key:

- 1) Press this key to circle among axis: “three axis” → “X axis” → “Y axis” → “Z axis”.
- 2) Press and hold for 2 seconds to turn into CAL setting mode.


READ

8. key:
- 1) Press this key to turn into manual reading mode. In this mode press this key to read the next recording.
 - 2) Press this key 2 seconds to turn into clear memory mode. In this mode press this key to circle between " YES (Clear) " → " NO (Don't clear) " .
 - 3) In alarm limit setting mode press this key to decrease limitary value.
 - 4) In CAL setting mode press this key to decrease CAL value.
9. The battery cover
10. Background light switch
11. Enable alarm switch

4-2 LCD description



1. 88: Record number (1~99)
CL: Memory clear mode
2. Displayed: Automatically turning off is enabled
Don't displayed: Automatically turning off is disabled
3. MAX: Maximum value is displayed
AVG: Average value is displayed
MAX AVG: Maximum average value is displayed
4. When the alarm is enabled this symbol means the currently measured value exceed the limitary value.
5. ALM: Displayed: Alarm enabled or in the alarm limitary value setting mode
Don't displayed: Alarm is disabled
6. Axis displayed:
X: X axis measured value is displayed
Y: Y axis measured value is displayed
Z: Z axis measured value is displayed
7. The measured value
8. $\mu\text{W}/\text{m}^2$, mW/m^2 , and $\mu\text{W}/\text{cm}^2$: Power density
9. $\mu\text{A}/\text{m}$ and mA/m : Magnetic field intense

- 10. mV/m and V/m: Electric field intense
- 11. Bar code is an inductor used to observe measured value of each axis (X, Y, Z)
- 12.  : Low power indicator
- 13. M: Indicate that records are saved in memory
- 14. R: Indicate the manually records reading

4-3 Electric sensor usage description

The real triaxial sensor is in the front ball. The three voltages from sensor are input into the meter. For the far field, it is better to use field sensor, because it has a wider frequency range. The frequency range of this electric field sensor is from 50MHz to 3.5GHz.

This meter is a small and portable instrument. It is used to measure the electric field in the air around the sensor. The measurement is performed in the environment you want to measure by moving the antenna in electric field sensor.

You can measure to get a wide frequency electric field value of the place the electric field sensor pointing to. If you want to find the electric field value transmitted by a interference source, you can just point the antenna to the field and try to close the antenna to it (the electric field value is inverse proportion to the distance between sensor and radiant source) . Notice that the operator himself should not stand between inference source and measuring region, because human body will insulate the electric field.

This meter is isotropic and you do not need to do special control on it. Just point the sensor part to the target object to measure the electric field. It depends on the three axes instead of moving the sensor antenna in the three planes.

4-4 Terms to explain

4-4-1 Measurement unit

This meter is used to measure the electric component of the electric field. The default unit is electric field intense (mV/m or V/m) . The electric field intense value can be automatically changed to the other units, such as the relative magnetic intense unit (uA/m or mA/m) and power density unit (uW/m²、mW/m² or uW/cm²) . You can change units according to the far field formula in electromagnetic radiation standard.

Changing unit is invalid for near field. Because in near field there is no correct formula between electric field intense and magic field intense. So when you want to measure in near field you must set the sensor to the default unit.

4-4-2 Display mode

The bar code shows the dynamic range of each axis (X, Y, Z) for instantaneous measurement.

Digitally display instantaneous value or the result value according to one of the following four modes:

- 1) Instantaneous value: Digitally display the last instantaneous value measured by the

sensor and there is no symbol.

- 2) Maximum value: Digitally display the maximum instantaneous value measured after symbol “MAX” appeared.
- 3) Average value: Digitally display the average value measured after symbol “AVG” appeared.
- 4) Maximum average value: Digitally display the maximum average value measured after symbol “MAX AVG” appeared.

4-4-3 Correction factor (CAL)

Correction factor CAL is used to the correction of displayed value. First multiply the measured internal electric field intense value by the inputted CAL value, then display or save the result. The range of CAL is from 0.20 to 5.00.

CAL is always used to the sensitivity value of the input electric field sensor in order to improve the measurement accuracy of frequency response.

The CAL provider by electric field sensor is used for this case. In most cases the measurement accuracy is enough even if you ignore the frequency response CAL. At this time the CAL should be set to 1.00.

Typical CAL of electric field:

Frequency	CAL
100MHz	1.44
200MHz	1.56
300MHz	0.84
433MHz	1.01
500MHz	0.45
600MHz	1.12
700MHz	2.80
800MHz	1.33
900MHz	2.18
1GHz	1.07
1.2GHz	1.57
1.4GHz	1.25
1.6GHz	0.48
1.8GHz	0.72
2GHz	0.64

2.2GHz	0.75
2.45GHz	0.74

4-4-4 Alarm limitary value (ALM)

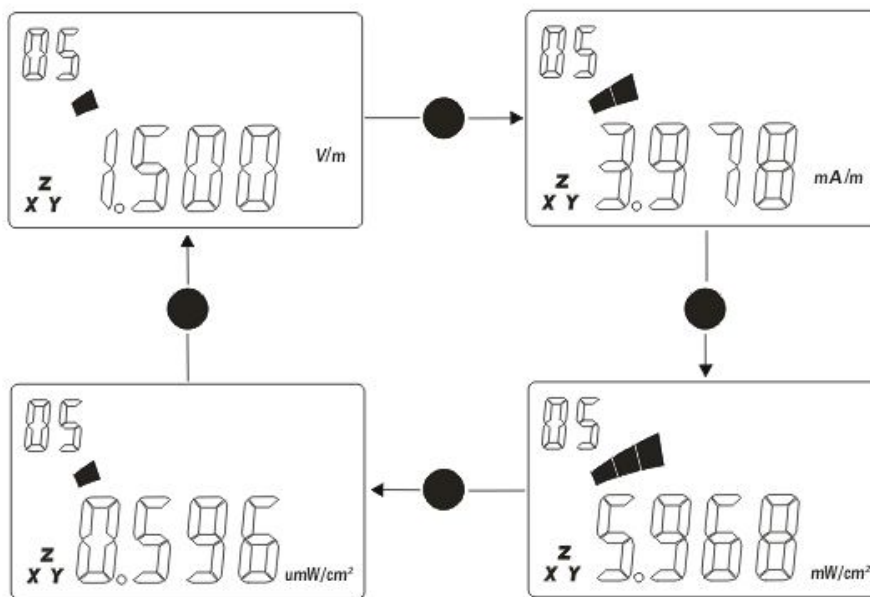
Alarm limitary value is used to automatically supervise the displayed value. It can be input in V/m unit. The minimum value can be set is 0.05V/m.

*Alarm limitary value is only suitable to compare with the total value of three axis.

4-5 Settings

4-5-1 Set unit

Set the unit with  key as the figure show.

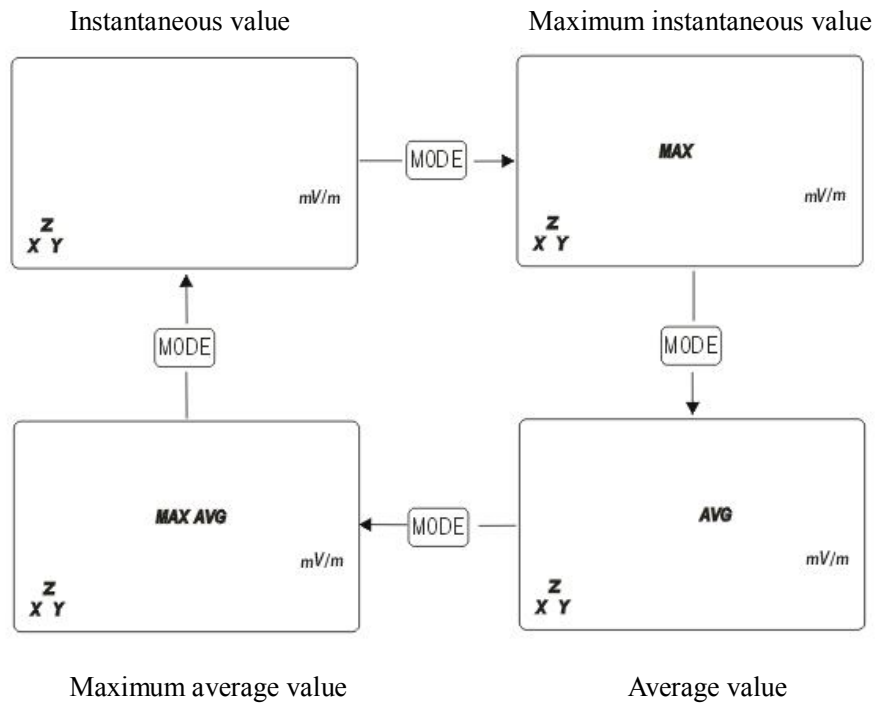


- 1) Electric field intensity (V/m)
- 2) Magnetic field intensity (mA/m)
- 3) Power density (mW/m²)
- 4) Power density (uW/cm²)

4-5-2 Set display mode

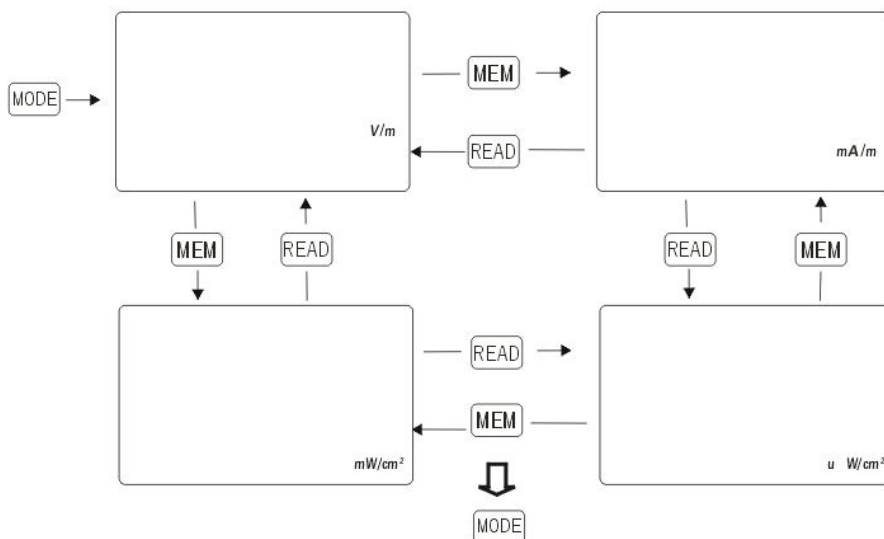
After powered on the meter is in instantaneous value mode.

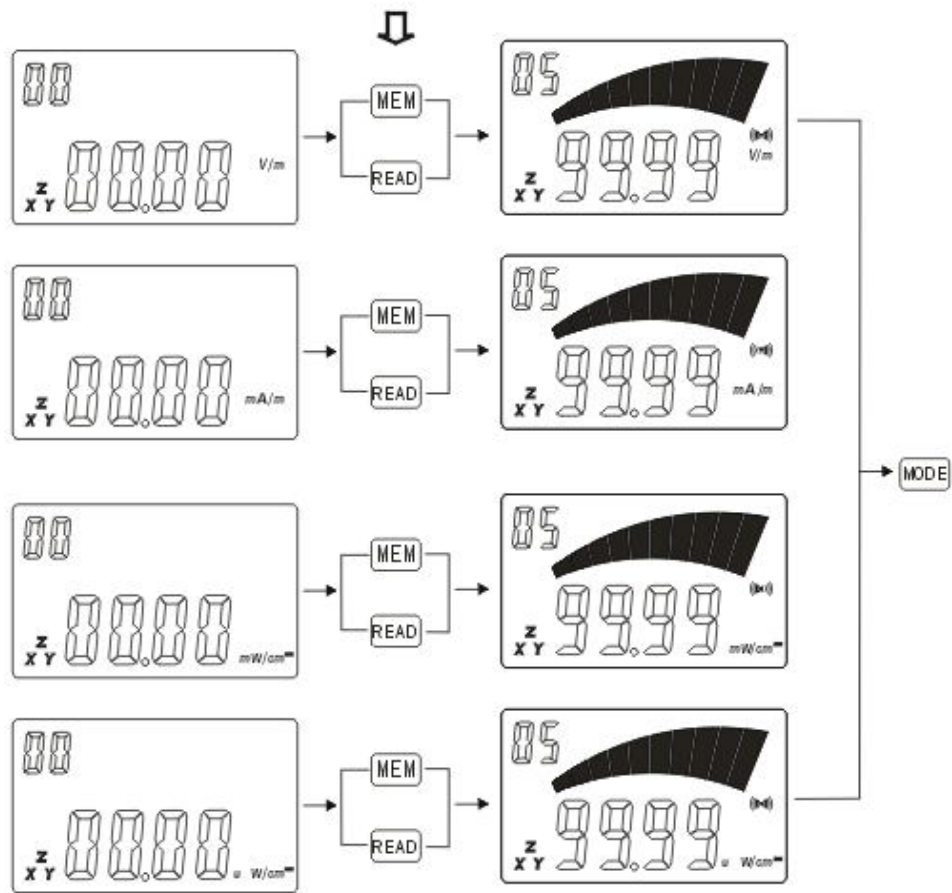
As the figure show press  key to set display mode:



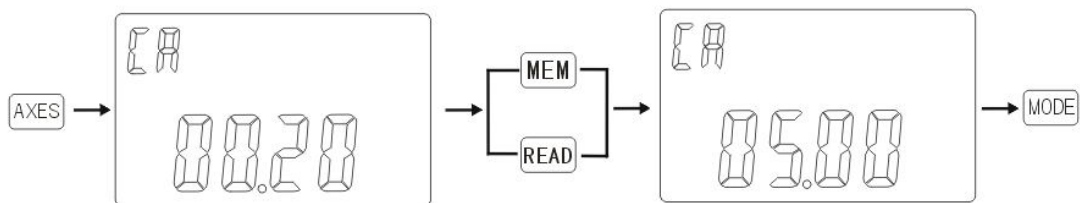
4-5-3 Set alarm limitary value (ALM)

- 1) Long press **MODE** key to get in limitary value setting mode, the units and digits on the screen will flash to change the setting values.
- 2) Press **MEM** or **READ** key to increase or decrease the value to what you want.
- 3) Press **MODE** key to save the value and quit this mode.



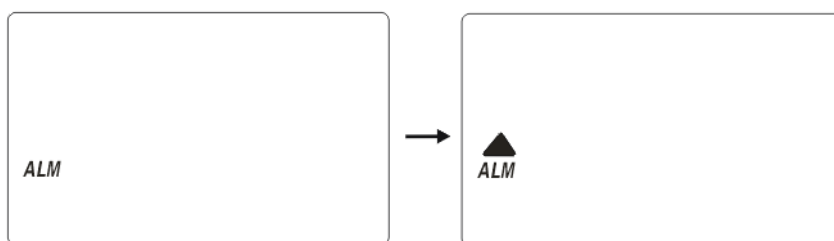


4-5-4 Set CAL



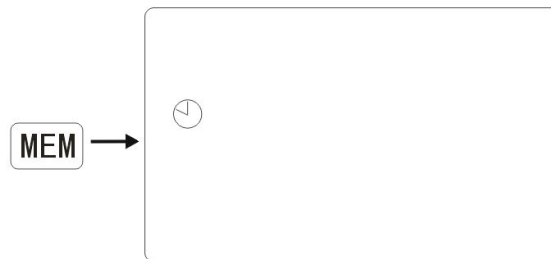
- 1) Long press **AXES** key till the symbol "CA" appeared to get in CAL setting mode, the 4 digits is flashing and can be changed.
- 2) Press **MEM** or **READ** key to increase or decrease to the needed value.
- 3) Press **MODE** key to save the set value and quit the setting mode.

4-5-5 Enable or disable alarm



- 1) Open the battery case cover and take out batteries. Turn the left switch to the downside place to disable alarm. Turn the left switch to the upside place to enable alarm. Symbol “ALM” means alarm is enabled.
- 2) If the measured instantaneous value is exceed the limitary value and if the alarm is enabled the symbol “▲” will appear.

4-5-6 Disable automatically turning off function



1. Long press MEM key to disable or enable the automatically turning off function. When you enable the function the symbol “⌚” will appear. When you disable the function the symbol “⌚” will disappear.

4-5-7 Switch on/off background light

Open battery-case cover and take out batteries. Turn the right switch to the downside place to switch off the background light. Turn the right switch to the upside place to switch on the background light.

4-6 Measurement

Important illustrate:

The following influence should be noticed for all the electric field intense meters:

If you quickly move the sensor the measured value will be bigger than the real electric field intense. This is the influence of static discharging.

Advise: Please hold the meter stably during measurement.

4-6-1 Short time measurement

Application:

When you get in an exposed region of an electromagnetic field, in order to know the feature and direction of an unknown field please use the instantaneous value mode or maximum instantaneous value mode.

Procedure:

1. Hold the meter with one hand.

2. Measure several values at different points in your working place or around the region you want to measure. This is very important if you know nothing about this field.
3. Pay more attention to measuring the possible radiant source nearby. Except active radiant source, the components connected to radiant source will also radio electromagnetic field. For example the power line used by current heating medical equipment maybe also radio electromagnetic energy. So the maximum electric field intense in working place is at the region nearby the knees. Notice that metal objects in the field maybe concentrate or enlarge the field coming from a radiant source at a distance.

4-6-2 Long time exposed measurement

Place:

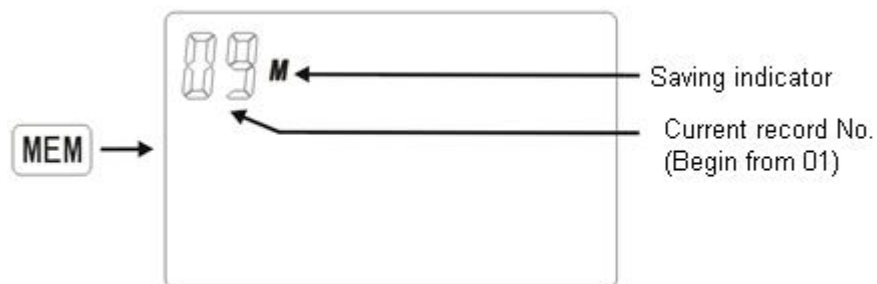
Place the meter between your work position and the possible radiant source. Do the measurement at the part of your body most close to the radiant source.

* **Note:** Only when the instantaneous value changes greatly the “average value” and “maximum average value” modes will be used. You can fix the meter on a board.

4-7 Storage a single value

A single record can be saved in the non volatile memory. Totally you can save 99 records in the meter.

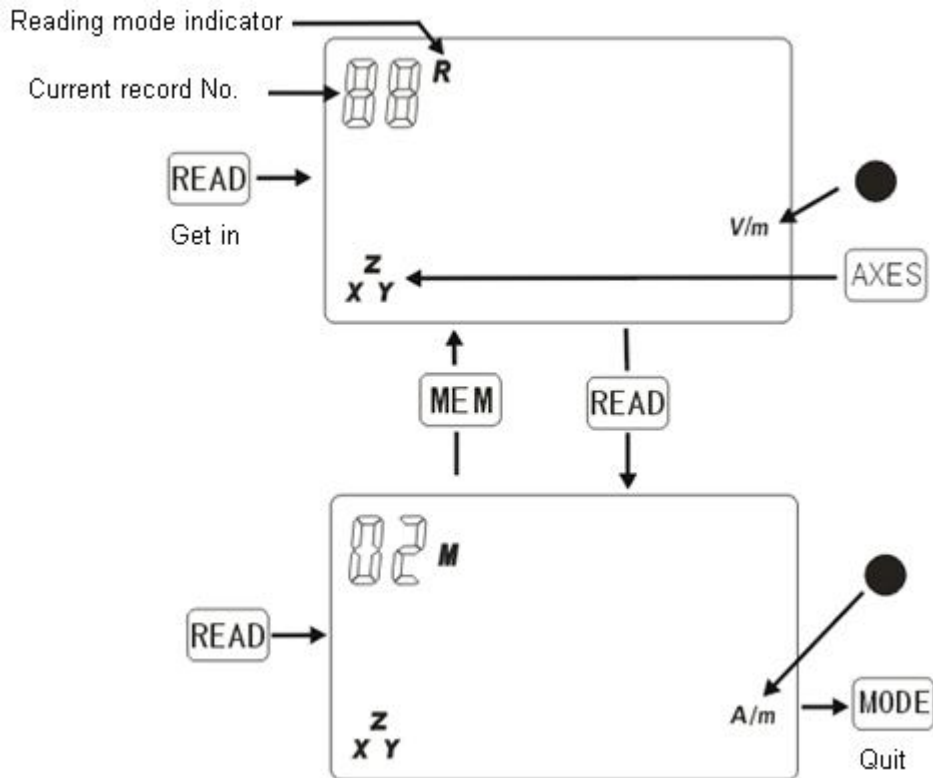
4-7-1 Storage a single value




Now the record number is at the top left of the screen.

Press **MEM** once a record will be saved and the number will add one. Once appear of the symbol “M” indicates one record saving. If the number is “99” it means the memory is full and you must clear all the memory before you save a new record.

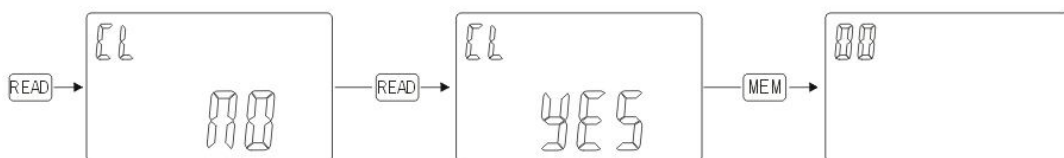
4-7-2 Read a single record




1. Press **READ** key to get in reading mode, the symbol “R” will be displayed.
2. Press **READ** or **MEM** key to select the record number.
3. Press  key to select the unit.
4. Press **AXES** key to select the axis.
5. Press **MODE** key to quit this mode.

4-7-3 Clear memory

You can clear the memory as the figure show:



1. Long press **READ** key, the symbol “CL” and “no” will appear and the meter is turned into clear mode.
2. Press **READ** key to select “YES”.


3、 Press  key to clear the whole memory.

V. Operation Preparation

5-1 Mount batteries

Open the battery case cover and put in the new batteries.

5-2 Change batteries

When the voltage is lower than necessary voltage the symbol “” will appear and it is time to change batteries.