



AX-TI220

OPERATION MANUAL



Chapter 1

Meter Safety Standards

This style of digital multimeter is designed and manufactured according to the safety requirements set out by the IEC61010-1 standards for electronic test instruments and the hand-held digital multimeters. Its design and manufacture is strictly based on the provisions in the 1000V CATIII of IEC6060-1 and the Stipulation of 2-Pollution Grade.

The meter conforms to the European Union's following requirements:89/336/EEC (EMC Electromagnetic Compatibility),73/23/EEC(LVD Low Voltage Protection)and 93/68/EEC (CE Mark).



Warning

- Before use of the meter firstly check up if there is any crack on the outer shell or if it lacks any plastic part, and check up whether the testing line is damaged or has any exposed metal. The meter can be used only if no any insulating problem be found.
- Carefully read the operating methods and safety prompts in this manual. Using it not based on the methods specified in this manual may cause the meter damaged.
- Non-normal meter must not be used. It should be sent for repairing.
- The meter must not be used in an environment with combustible gases, steam or dust pollution.
- It should be careful to work when measuring votage higher than 30Vac(effective value)or 50Vdc for such voltage having the risk of shock. Avoid the body directly touching ground or any metal substance in which there may be ground
- potential during measuring. The body should be kept insulated from ground with dry insulating shoes, insulating pads or insulating clothes.
- When performing measurement with a test probe your fingers should be put behind a finger-protector.
- Must not try to measure a voltage higher than 1000VAC or 1000VDC,the meter may be damaged and the operator's safety may be threatened if the limit for voltage measurement be exceeded.
- When the symbol for electric insufficiency appearing on the display screen it is necessary to replace the batteries for avoiding the possible shock or injury resulted in by erroneous reading.
- In case of replacing batteries, it is necessary firstly to pull out the testing line. AA batteries should be used and they should be put into the meter with the proper polarity.
- Must not make any voltage measurement when the testing line being inserting into the current hole.
- Repair and calibration of the meter must be carried out by experienced professionals, unprofessionals should not repair and calibrate the meter by themselves.

Limited Guarantee and the Liability Scope

- This company will undertake repairs freely for any quality problem of the meter which if should be found within 18 months from the date at which it was bought, but which not including replacement of fuse and batteries as well as any damage caused by negligence, wrong use, pollution, change of circuit and non-normal use.
- For maintenance beyond the 18-month guarantee period, the company will charge a certain repair fee and materials cost.



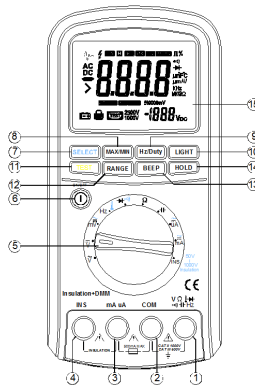
Chapter 2 Characteristics

- 500 counts measurement
- ACV and DCV measurements reach up to 1000V
- DC measurement accuracy reaches up to 0,1%
- 0,1 Ω resistance resolution and 10 μ V voltage resolution
- Linear frequency measurement logic frequency/duty ratio measurement
- Capacitance measurement from 0.1 nf to 1000 μ F
- AC/DC true RMS measurement
- Maximum value/minimum value measurement
- Insulation resistance measurement range: 50K Ω to 2G Ω
- Automatic shutdown/continuous working mode selection
- Back light control
- Overload protection
- Secondary plasticizing meter shell, with insulating performance reaching 1000V CAT III

Explanation on Front Panel

The front panel is shown as in Figure 2-1, explanation being as follows:

Figure 2-1



V Ω \rightarrow \rightarrow

(1) \rightarrow \rightarrow end

It is the input end for all measurement functions except for current measurement and insulation resistance measurement, connected with a red meter probe. Hereinafter referred to as V end.

(2) COM end

It is the negative input end for all measurements except for insulation resistance measurement, connected with a black meter probe.

(3) mA/ μ A end

It is the positive end for measurement of mA or μ A current, connected with a red meter probe. It is an end for measurement of the insulation resistance, connected with a black meter probe.

(4) INS end

It is the input end for insulation resistance measurement, connected with a red meter probe.



(5) Rotary switch

Used for selecting measurement functions such AC voltage, DC voltage, millivolt, frequency/temperature, diode/continuity/resistance and capacitance, microampere current, milliampere current, insulation resistance.

(6) POWER switch

Used for putting on or off the operating power for the meter.

(7) SELECT key

- When setting the rotary switch to the position mV, uA, mA, press the SELECT key to select the DC or AC mode.
- When setting the rotary switch to the position Hz %°C, press the SELECT key to select plus frequency, duty ratio or temperature mode.
- When setting the rotary switch to the position Diode/Continuity, press the SELECT key to select diode or continuity mode.
- Pressing this key will be void during the other measurement.
- If press down the SELECT key at the same time when turning on the power switch, the automatic sleep mode will be canceled.

(8) MAX/MIN key

Press MAX/MIN key to enter the record state for the maximum and minimum value. By pressing this key again it will display the minimum value, the maximum value, the average value and the current value in cycles. When releasing the key after pressing it for two seconds, the maximum and minimum record state will be exited.

(9) Hz/Duty key

- During the Frequency/Duty measurements state, by pressing HZ/DUTY key the meter will shift the frequency or duty measurement state.
- During the AC voltage or AC current measurements, by pressing Hz/DUTY key the meter will enter the linear frequency measurement state. At this time what being measured is the frequency of voltage or current. By pressing this key again to exit the linear frequency measurement state.

(10) LIGHT key

By pressing this key for a time, the backlight of the LCD screen will be opened and after ten seconds the meter will automatically turn off the backlight. It is also possible to turn off the backlight by pressing the LIGHT key before the ten seconds.

(11) TEST key

During the insulation resistance measurement state, press the TEST key to start measuring, and then press the TEST key again to stop measuring.

(12) RANGE key

- During the temperature measurement state, press the RANGE key to select Celsius or Fahrenheit.
- For various kinds of measurements it is used manually to select range. Under the automatic range state (AUTO RANGE displaying), it will enter manual range state (MANUAL RANGE displaying) with a press on RANGE, after that the range will be changed with a press on RANGE while the small digits on the left lower corner indicating the actual range. When the RANGE key being released after pressing for two seconds the meter will return back to the automatic state. When performing logic frequency measurement and diode measurement pressing RANGE will be void. During the insulation resistance measurement, the voltage range need to be selected by manual.

(13) BEEP key

When the short circuit is measured, press the BEEP key to select whether the buzzer sound.

(14) HOLD key

Used to maintain the measurement data unchanging, by pressing the key again it will resume the measurement

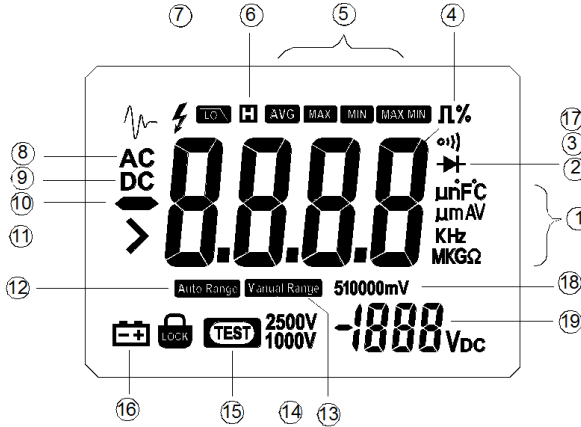


(15) LCD screen

Used for displaying the measuring results and various symbols.

Understanding Display Screen :







Figure 2-2



LCD screen is shown as in Figure 2-2, with its every symbol's meaning shown as in the Table 1:

Number of Order	Symbol	Functions
1	$\mu n^{\circ}F^{\circ}C$	Indicating the measurement unit being $^{\circ}C$ or $^{\circ}F$ of temperature or μF or nF of Capacitance
	μmAV	Indicating the measurement unit being μA , mA of current or μV and mV of voltage
	KHz	Indicating the measurement unit being KHz and Hz of frequency
	MKGΩ	Indicating the measurement unit being $M\Omega$, $K\Omega$, $G\Omega$ and Ω of resistance
2		Indicating it is now now performing the diode measurement
3		Indicating it is now now performing the continuity measurement
4	$\Pi\%$	Indicating it is now now performing the duty measurement



5	AVG MAX MIN MAX MIN	Indicating the display value being the current value(MAX MIN), the maximum value(MAX), the minimum value(MIN) and the average value(AVG)
6		Indicating it is now in the data-holding state
7		Warning symbol that the input signal is the high-voltage
8	AC	Indicating it is now in the AC measurement state
9	DC	Indicating it is now in the DC measurement state
10		Indicating the measurement value being negative
11		Indicating the overload in the insulation resistance measurement
12	AUTO RANGE	Indicating the measurement being automatic range
13	MANUAL RANGE	Indicating the measurement being manual range
14	2500V 1000V	Indicating the range of excitation voltage when performing the insulation resistance measurement
15	TEST	Indicating it is now in the insulation resistance measurement state
16		Indication to low voltage of the batteries, showing the energy of batteries will be exhausted soon
17		The display zone for the meter's measurement value, showing all the measurement values
18	51000	Indicator of range, indicating the full range value of this range in manual range such as 5, 50, 500 and 1000,5000, etc.
19	-1888VDC	Real-time display of the excitation voltage value when performing the insulation resistance measurement


Function Descriptions

Along with the conventional measurement functions this meter also possesses some special functions which being described as follows:

- True effective value (TRUE RMS) measurement: all the measurement values of this meter on the



AC voltage and AC current are true effective values, which distinguishing this meter from the meters which only can measure the AC average value.

- Automatic and manual ranges: When turning on the meter's power switch the meter defaults the automatic range state (AUTO displaying), and simultaneously it will automatically select the proper range according to the measured electric parameters. If OL being displayed under automatic range, it indicates the measured value exceeding the meter's maximum range. Pressing the RANGE key under the automatic range the meter will enter the manual range(MANUAL displaying), then pressing the RANGE key again it will be possible to select the required range. The indicator for range will display the maximum value of this range. If OL displaying under the manual range, it indicates the measured value exceeding the selected range. Press the RANGE key under the manual range for two seconds and then release it, the meter will go back to the automatic range state.
- Linear frequency measurement: Pressing the Hz/Duty key when the meter performing measurements on AC voltage or current, it will be capable to measure the frequency of the AC component. However it has a certain requirements on the amplitude of the AC component.
- Logic impulse duty ratio measurement: logic impulse duty ratio refers to: $(\text{high level width}/\text{impulse cycle}) \times 100\%$
- Diode measurement: during diode measurement the meter is indicating to the forward voltage drop of the diode
- Insulation resistance measurement: during insulation resistance measurement state, press the TEST key to start measuring, and then press the TEST key again to stop measuring. The measurement range of the insulation resistance is 50K---2G.
- Maximum/minimum value measurement: by pressing MAX/MIN keys the meter can enter the maximum/minimum value record state, and it will continuously update the maximum/minimum values based on the new measurement results. Pressing the MAX/MIN key can display the maximum value, the minimum value, the average value and the current value in cycles. After exiting the MAX/MIN measurement state the recorded maximum value/minimum values will disappear.
- Automatic shutdown and the continuous operating mode: after the meter being turned on, in case of stopping to pressing any key or stopping to turning the rotary switch for more than fifteen minutes, the meter will automatically shutdown. (The meter will not automatically shutdown during the insulation resistance measurement.) As the meter will still consume a little energy after its automatic shutdown, so it is better to turn off the POWER switch if the meter remains idle for a long time. If you want the meter to operate continuously without automatically turning off, it can be done only just by pressing down the SELECT key at the same time when turning on the POWER switch.
- Low voltage detection: when the meter detecting the total voltage of the batteries lower than 6.8V, the  symbol on the LCD screen will be lighted to prompt the batteries should be replaced.

Chapter 4 Technological Specifications

General Features

- Voltage between the measurement end and ground is of 1000V AC/DC. 1000V CAT \square , 2th pollution grade.
- 5000 counts, automatic/manual range, basic sampling rate 2.5 t/s and 51 segment analog bar.



5V	1mV	$\pm(0.1\% +2)$
50V	10mV	$\pm(0.1\% +2)$
500V	0.1V	$\pm(0.1\% +2)$
1000V	1V	$\pm(0.1\% +2)$

Notes: above accuracies can be guaranteed within the full range

• AC Current

Range	Resolution	Accuracy	Voltage Drop
		40Hz-400Hz	
500 μ A	0.1 μ A	$\pm(0.8\% +4)$	102 μ V/ μ A
5000 μ A	1 μ A	$\pm(0.8\% +4)$	
50mA	10 μ A	$\pm(0.8\% +4)$	1.5mV/mA
500mA	0.1mA	$\pm(0.8\% +4)$	

Notes: above accuracies can be guaranteed within 10%-100% of the full range

• DC Current

Range	Resolution	Accuracy	Voltage Drop
500 μ A	0.1 μ A	$\pm(0.2\% +2)$	102 μ V/ μ A
5000 μ A	1 μ A	$\pm(0.2\% +2)$	
50mA	10 μ A	$\pm(0.2\% +2)$	1.5mV/mA
500mA	0.1mA	$\pm(0.2\% +2)$	

Notes: above accuracies can be guaranteed within the full range

• Resistance

Range	Resolution	Accuracy
500 Ω	0.1 Ω	$\pm(0.3\% +5)$



5K Ω	1 Ω	$\pm(0.3\% +5)$
50K Ω	10 Ω	$\pm(0.3\% +5)$
500K Ω	100 Ω	$\pm(0.3\% +5)$
5M Ω	1K Ω	$\pm(0.3\% +5)$
50M Ω	10K Ω	$\pm(0.8\% +5)$

Notes: above accuracies can be guaranteed within the full range

• **Capacitance**

Range	Resolution	Accuracy
50nF	0.01nF	$\pm(2.5\% +10)$
500nF	0.1nF	$\pm(2.5\% +10)$
5 μ F	1nF	$\pm(2\% +10)$
50 μ F	10nF	$\pm(2\% +10)$
500 μ F	0.1 μ F	$\pm(2\% +10)$
1000 μ F	1 μ F	$\pm(3\% +10)$

Notes: above accuracies for film capacitor or better can be guaranteed within the full range.

• **Diode**

Range	Resolution	Accuracy
2.5V	1mV	$\pm(1\%+5)$

Notes: the test current is about 0.7mA

• **Logic Frequency**

Frequency Range	Sensitivity	Resolution	Accuracy
5Hz-2MHz	Vp 2-5V square wave	0.001Hz	± 4 counts

• **Temperature**

Frequency Range	Resolution	Accuracy
-40°C ~ 537°C	0.1°C	$\pm(1\% +1.5^\circ\text{C})$



• **Linear Frequency**

Frequency Range	Voltage/Current Range	Sensitivity	Resolution	Accuracy
5Hz=200KHz (sine wave)	500mV	200mV	0.001Hz	±4counts
	5V	0.5V		
	50V	4V		
	500V	40V		
	1000V	400V		
	5000μA	1mA		
	500mA	100mA		

Notes: Low voltage or low frequency would lower the accuracy.

• **Duty Ratio**

Frequency Range	Duty Ratio Range	Resolution	Accuracy
5Hz~500KHz	5% ~ 95%	0.01%	±0.02%

• **Insulation Resistance**


Excitation voltage	Resistance Range	Resolution	Accuracy
50V	50K-10M	0.01MΩ	±(3% +5)
	10M-50M	0.1 MΩ	
100V	100K-10M	0.01MΩ	±(3% +5)
	10M-100M	0.1 MΩ	
250V	250K-100M	0.1MΩ	±(1.5% +5)



	100M-250M	1M Ω	
500V	500K-100M	0.1M Ω	$\pm(1.5\% +5)$
	100M-500M	1M Ω	
1000V	1M-100M	0.1M Ω	$\pm(1.5\% +5)$
	100M-2G	1 M Ω	

Chapter 5 Maintenance

Replacement of Batteries

If symbol  appears on the LCD screen during measurement, it indicates the total voltage of batteries being lower than 6.8V. For ensuring measurement accuracy, it is necessary to replace the batteries. Before the replacement, must take off the red and black testing lines from the measured circuit and turn off the power of the meter. Loose the fixing screws of the cover by a standard screwdriver, then remove the cover to take out all the old batteries, replacing them with the 7# batteries. Take care to put in the batteries as the polarity specified on the shell of the meter. Put the cover as its origin. The meter must not be used until the cover of batteries being put properly and locked in.

Replacement of Fuse

It must take off the red and black testing lines from the measured circuit and turn off the power of the meter before replacement of fuse. It should only use fuse of the same model and the same electric specifications. And the meter must not be used until the cover of fuses being put properly and locked in.

Notes: generally, fuses will not be blown under the normal use of the meter. In case of blowing it is necessary first to find out the reasons for the blowing and then take an account on the use of the meter. Generally, blowing may attribute to:

- Perform voltage measurement under the current measurement state.
- Current exceeds range.

