CLAMP METER

Model : CM-6146

Your purchase of this smart DCA/ACA CLAMP METER marks a step forward for you into the field of precision measurement. Although this CLAMP METER is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

Caution Symbol

Caution :

* Risk of electric shock !

Caution :

* Do not apply the overload voltage, current to the input terminal !
* Remove test leads before open the battery cover !
* Cleaning - Only use the dry cloth to clean the plastic case !

* **Double insulation**

Environment Conditions

* *Installation Categories III-1000V.*
* *Pollution Degree 2.*
* *Altitude up to 2000 meters.*
* *Indoor use.*
* *Relative humidity 80% max.*

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1. FEATURES

* Meet IEC 1010 CAT III 1000 V safety requirement.
* 6000 counts A/D, high resolution.
* ACV, ACA, DCV, DCA, ohms, continuity, Hz, Capacitance, Diode.
* Smart function, Auto range or manual range with hold.
* Smart operation, Build in 4 intelligent function : " V ", " Ω "," 600A ", " 1000A ".
* " V " function can select ACV, DCV automatically with auto range.
* " Ω " function can select the Resistance , Diode, Continuity beeper, Capacitance automatically with auto range.
* " 600A " & " 1000A " function can select ACA, DCA automatically.
* Data hold .
* Auto shut off is available to save battery life.
* 10 M ohm impedance for voltage circuit.
* Built-in overload protection for most ranges.
* LSI circuit provides high reliability and durability.
* Uses durable, long-lasting components, enclosed in strong, light weight ABS-plastic housing.
* Full line optional adapters : Clamp adapter, Tachometer adapter, Pressure adapter, Humidity Adapter, Sound level adapter, Anemometer adapter, Light adapter, EMF adapter.

2. SPECIFICATIONS

2-1 General Specifications

Display	39.5 mm x29.8 mm large LCD display
Measurement	DCV, ACV, DCA, ACA, Resistance, Capacitance, Frequency, Diode, Continuity beeper.
A/D counts no.	6000 counts.
Smart function	" V " function can select ACV, DCV automatically with auto range.
	" Ω " function can select the Resistance,Diode, Continuity beeper,Capacitance automatically with auto range.
	" 600A " " 1000A " function can measure ACA, DCA .
Data hold	To freeze the display reading on the LCD display
Power On/Off management	Auto power of or manual power off. *@ Details please refer page 7*
Hz button	When execute the voltage or current fumction also can measure the frequency of signal.
Selection	Smart function or auto function .
Range	manual range selecting.
Polarity	Automatic Switching, " - " indicates negative polarity.
Sampling time	Approx. 0.5 to 1 second.
Operating Temp. & humidity	0 ℃ to 50 ℃ (32 ℉ to 122 ℉) Max. 80% RH.
Power supply	DC 9 V battery 006P,MN1604
Power consumption	Approx. DC 9.1 mA.
Max. Conductor Size	32 mm (1.3inch) Dia.

Dimension	241 x94 x 46 mm (9.5 x 3.7 x 1.8 inch).
Weight	373 g/0.82 LB (w.o battery).
Accessories Included	Red and Black Test Leads..... 1 Set Instruction Manual..... 1 PC
Optional accessories	Full line adapters : ACA/DCA current adapter, Tachometer adapter, Humidity adapter, Pressure adapter, Light adapter, EMF adapter, Sound level adapter, High voltage probe.

2-2 Electrical Specifications (23±5 ℃)

DC Voltage		
Range	600 mV /6 V/60 V/600 V /1000 V	
Resolution	0.1 mV /0.001V /0.01V /0.1V/1 V	
Accuracy	± (0.8% + 2d)	600 mV
	± (0.8% + 1d)	6 V, 60 V, 600 V, 1000 V
Input impedance	10 M ohm.	
Over load protection	600 mV range	± 500 DCV, 350 ACV
	other ranges	±1000 DCV, 1000 ACV

AC Voltage		
Range	6 V/60 V/600 V/1000 V	
Resolution	0.001V /0.01V /0.1V/1 V	
Accuracy	± (1% + 2d) ** Spec. are tested under 50/60 Hz.*	
Input impedance	10 M ohm.	
Over load protection	600 mV range	± 500 DCV, 350 ACV
	other ranges	±1000 DCV, 1000 ACV

DC Current, AC Current		
Range	600A/1000A	
Resolution	0.1A /1A	
Accuracy	600 A Range	± (1.5% +15d)
	1000 A Range	± (2% +8d)
Over load protection	AC/DC 1000A	
Remark	* ACA specification be tested on sine wave 50/60 Hz. * Measurement range：0.1A to 1000A	

Diode
Short/non conductance, good/defect test

Capacitance	
Range	6 nF/60 nF/600 nF/6 uF/60 uF/600 uF
Resolution	0.001nF/0.01nF/0.1 nF/0.001uF/0.01uF/0.1uF
Accuracy	± (3 % + 5d)
Over load protection	±30 DCV, 30 ACV.
Remark	Discharge capacitor before testing.

Frequency	
Range	40Hz to 1KHz
Resolution	0.001KHz
Accuracy	± (0.5% + 2d)
Over load protection	±1000 DCV, 1000 ACV.

OHMS	* auto range
Range	600/6 K/60 K/600 K/6 M/60M
Resolution	0.1Ω/0.001K/0.01K/0.1K/0.001M/0.01M
Accuracy	600 ohm : ±(1 % + 2d) 6K/60K/600K/6M/60M : ±(1.5 % + 2d)
Over load protection	±350 DCV, 350 ACV.

Continuity Beeper
Beeper will sound if measured resistance less than 20 ohm.

Max. & Min. Measurement
During the operation can memorize the maximum and the minimum measurement value.

Remark :

* *Spec. tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.*

3. FRONT PANEL DESCRIPTION

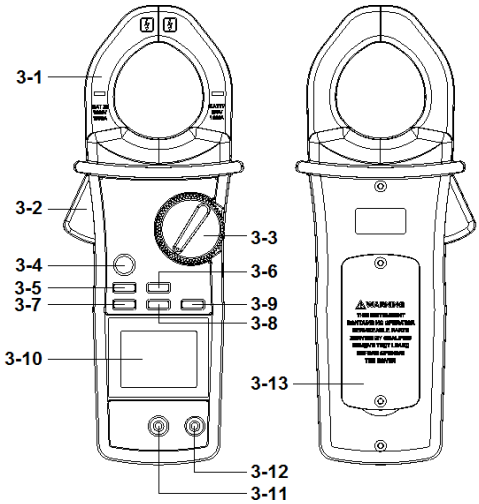

Fig. 1

3-1 Current Sense Jaws
3-2 Trigger
3-3 Function rotary switch
3-4 HOLD button
3-5 SELECT button
3-6 DCA Zero buttern
3-7 Hz button
3-8 RANGE select button
3-9 LCD backlight button
3-10 Display
3-11 COM input terminal
3-12 V/ohm/Diode/Continuity/Cap. input terminal
3-13 Battery compatment/Cover

4. PRECAUTIONS & PREPARATIONS FOR MEASUREMENT

1) Ensure that the DC 9V batteries are connected with the right polarity and placed in the battery compartment correctly.
2) Place the Red & Black Test Leads into the proper input terminal before making measurement.
3) Remove either of the test leads from the circuit when changing the measurement range.
4) Except operate the " Data Hold " function, it should cancel the " Data Hold " function, otherwise the display reading will freeze permanently.
5) Do not exceed the maximum rated voltage and current to the input terminal.
6) Always switching the " Function Rotary Switch " to the " Off " position when the instrument is not operation.
7) Remove the battery if the instrument is not to be used in a long period of time.
8) For safety consideration, when change the new test leads, it should use the replace test leads that already approval of " CATIII-1000 V " at least.
9) Power On/Off management :
   a. When not use the meter, should rotate the " Function rotary switch " (3-3, Fig. 1) to the " OFF " position.
   b. During the measurement, after 10 minutes the meter will auto power off. If intend to power on again, it should rotate the " Function switch " to " OFF " position then set to the new desiring function position.
   c. Disabling auto power off (not auto power off) Press the " backlight button " (3-9, Fig. 1) while turning the " Function switch " from the " OFF " position to the desiring function position.

5. MEASURING PROCEDURE

5-1 Symbols & units of display

Symbols Units	Descriptions
SMART	Appears when selecting " Smart " mode. The meter default mode is " Smart "
AUTO	Appears when selecting " Automatic range " mode.
DC	Appears when selecting DC mode. (DC voltage or DC current)
AC	Appears when selecting AC mode. (AC voltage or AC current)
H	Appears when the " Data hold " function is operated.
	Power voltage is already under the low condition.
Z	Appears when the " DCA Zero " is operated.
	Appears when the " Continuity beeper " is operated.
mV, V	Units for voltage measurements.
A	Units for " Current " measurement.
Ω,KΩ,MΩ	Units for resistance measurements.
nF,uF	Units for " Capacitance " measurement.
KHz	Units for " Frequency " measurement.
	Appears when the " Diode " function is operated.
—	Appears when measuring a DCV or DCA value is negative.
OL	Over range indicator for voltage and current, ohm function.

5-2 DC Voltage, AC voltage Measurement

1) Connect BLACK test lead into " COM " terminal (3-11,Fig. 1)
2) Connect RED test lead into " V " terminal (3-12, Fig. 1).
3) Select the " Function rotary switch " (3-3, Fig. 1) to the " V " position, Display will show " SMART "marker.meter is under " Smart " mode for voltage AC/DC auto scanning.
4) The meter can measure the ACV, DCV value automatically and with auto range selection.
5) Push the " SELECT button " (3-5, Fig. 1) to select the " ACV " or " DCV " measurement.
6) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
7) Under the operation of " auto range " mode, push the " Range button " (3-8 Fig. 1) once will execute the " Manual Range " mode and hold the range.
   Under the manual range operation, push the " SELECT button " will return to SMART mode.

Remark :

During the measurement, if push the " Hz button " (3-7 Fig. 1) once, until the LCD show the " kHz " marker and the display will show the frequency value of the measuement signal.

5-3 Resistance Measurement

1) Connect BLACK test lead into " COM " terminal (3-11, Fig. 1).
2) Connect RED test lead into " Ω " terminal (3-12, Fig. 1).
3) Select the " Function rotary switch " (3-3, Fig. 1) to the " Ω " position.
4) When LCD show the " SMART " marker, the meter is under the " SMART " mode. Meter will select the suitable measurement range automatically.

5) Under the operation of " SMART " mode, push the
" SELECT button " (3-5 Fig. 1) will execute the "AUTO Range"
mode and hold the range, the LCD will show the " AUTO "marker.
Under the auto range operation, push the " SELECT button "
will return to SMART mord.

5-4 DC Current, AC Current Measurement

1) Select the " Function rotary switch " (3-3, Fig. 1) to
the " 600A" or "1000A " position, Display will show " SMART "marker.
meter is under" Smart " mode for Current ACA ,DCA auto scanning.
2) Press the " Tigger " (3-2,Fig. 1) to open the " Current Sensor Jaws "
(3-1, Fig. 1) and clamp on the measured conductor, the display will
show the measurement ACA or DCA current value automatically.
3) The meter can measure the ACA, DCA value automatically
4) Push the " SELECT button " (3-5, Fig. 1) to select the
" ACA " or " DCA " measurement.
5) Under the operation of "SMART " mode, push the
" Select button " (3-5 Fig. 1) once will execute the
" ACA or DCA " mode and hold the range.
Under the DCA, ACA operation, push the " SELECT button "
will return to SMART mode.
6) Push the " DCA Zero button " (3-6, Fig. 1) until the display show " 0.0 "
the LCD will indicate "Z "symbol.

Consideration:

As the jaw core may remain some magnetic force after using for a while.
if the display can not read " 0 " when push " DCA ZERO button "
please take following process to correct it :

A. To change the direction of the measured DC current.

or B. Open the JAWS several times.

Remark :

*During the measurement, if push the " Hz button " (3-7Fig. 1) once,
until the LCD show the " kHz " marker and the display will show the
frequency value of the measuement signal.*

5-5 Continuity Check

1) Connect BLACK test lead into " COM " terminal (3-11,Fig 1.)
2) Connect RED test lead into " •)) " treminal (3-12,Fig 1)
3) Select the " Function rotary switch " (3-3, Fig. 1) to the " •)) "position.
4) The LCD display will show the " SMART ",the meter is under " Smart " moder for auto scanning Continuity measurement.
5) when the resistance value is less than 20 ohm, the beeper sound will be generated. The display will show " •)) **" indicator.**

5-6 Diode Test

1) Connect BLACK test lead into " COM " terminal (3-11,Fig 1.)
2) Connect RED test lead into " Ω " terminal (3-12, Fig 1.)
3) Select the " Function rotary switch " (3-3, Fig. 1) to the " ⊣⊢ " position.
4) The LCD display will show the " SMART " , the meter is under " Smart " mode for auto scanning Diode measurement.
5) a. When connected with polarity as shown in Fig. 2, a forward current flow is established and the approx. Diode Forward Voltage (VF) value in volt will appears on the display reading. If the diode under test is defective, " 0.000 " or near " 0.000 " value (short circuit) " OL " (open circuit) will be displayed.

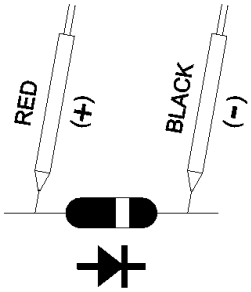

Fig. 2

b. When connected as shown in Fig. 3, a reverse check on the diode is made. If the diode under test is good, " OL " will be displayed. If the diode under test is defective, " 0.000 " or other numbers will be displayed. Proper diode testing should include both steps a. and b. above.

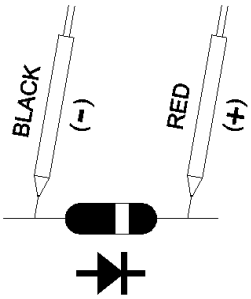

Fig. 3

5-7 Capacitance Measurement

1) Select the " Function rotary switch " (3-3, Fig. 1) to the " ⊣⊢ " position.
2) Connect the tested capacitor to " Input terminals " directly.

   * ***If the measured capacity existing the polarity, then should connect the " + " polarity of the measured capacitor to the " V " terminal (3-12, Fig. 1), connect the " - " polarity of the measured capacitor to the " COM " terminal (3-11, Fig. 1),***
   * ***Full discharge the measured capacitor before the make the measurement.***

3) The LCD display will show the " SMART " , the meter is under " Smart " mode for auto scanning Capacitance measurement.
4) The meter can measure the capacitance value automatically and with auto range selection.

5-8 Smart/Auto function selection

When the Display show the " SMART ", the meter is ready for the Smart mode. Under the " Smart " mode if press the " SELECT button " (3-5, Fig. 1) once (or once in sequence) then can select the individual function, for example ACV, DCV , Diode, Capacitance, Continuity...testing. In the same time the Display will show the " AUTO " indicator (auto range)
Under the SELECT operation, push the "SELECT button " (3-5 Fig. 1) > 2 seconds, the meter will enter power off.

5-9 Range selection

Under the " Auto range " mode (Display show the " AUTO " indicator), if press the " Range button " (3-8, Fig. 1) once (or once in sequence) then can select the desired range (manual range) and also hold the measurement range.

5-10 Hz measurement

During the measurement :
Voltage (ACV/DCV) measurement (Chapter 5-2)
Current (ACA/DCA) measurement (Chapter5-4)

if press the " Hz button " (3-7, Fig. 1) once, the Display will show " AUTO " and " kHz " indicator, now the meter is ready for frequency measurement of the measurement signal with auto range indication.

5-11 Data Hold Operation

1) During the measurement, pushing the " Hold button " (3-4, Fig. 1) once a while will freeze the measured value & the LCD will indicate " H "symbol.
2) Push the " Hold Button " again to cancel the data hold function.

6. MAINTENANCE

6-1 Battery replacement

Caution : *Remove test leads before opening the battery cover !*

1) When the LCD display showing the mark of " ⌧ "it is necessary to replace the battery, However in-spec. measurement may still be made for several hours after " Low battery indicator " appears before the instrument become inaccurate.
2) Open the screw of " Battery Cover " (3-13, Fig. 1) by loosing the screws, then move the battery.
3) Replace with 9 V (006P, MIN1604) and reinstate the cover.

6-2 Cleaning

Caution : *Cleaning - Only use the dry cloth to clean the plastic case !*

7. OPTIONAL ACCESSORIES & ADAPTERS

Item	*Model*
Carrying Case	*CA-05A*
Light Adapter	*LX-02*
EMF Adapter	*EMF-824*
Pressure Adapter	*PS-403*
Anemometer Adapter	*AM-402*
Tachometer Adapter	*TA-601*
Sound Adapter	*SL-406*
High Voltage Probe	*HV-40*

8. THE ADDRESS OF AFTER SERVICE CENTER