DCA/ACSmart CLAMP METER Model : CM-6158



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 ", " 2000A ".
- * " 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 " & " 2000A " 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

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 " " 2000A " function can measure ACA, DCA .
MAX./MIN.	Records Maximum & Minimum readings with recall.
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	0 ℃ to 50 ℃ (32 °F to 122 °F)
Temp. & humidity	Max. 80% RH.
Power supply	DC 9 V battery 006P,MN1604
Power	Approx. DC 9.1 mA.
consumption	
Max. Conductor Size	50 mm (1.97inch) Dia.

Dimension	253 x99 x 46 mm (9.96 x 3.9 x 1.8 inch).
Weight	440 g/0.97 LB (w.o battery).
Accessories	Red and Black Test Leads 1 Set
Included	Instruction Manual 1 PC
	Soft carrying case 1PC
Optional	Full line adapters :
accessories	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 $\,^{\circ}C$)

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	600 mV range	± 500 DCV, 350 ACV		
protection	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	600 mV range	± 500 DCV, 350 ACV		
protection	other ranges	±1000 DCV, 1000 ACV		

DC Current, AC Cu	urrent			
Range	600A/2000A			
Resolution	0.1A /1A			
Accuracy	600 A Range	±(2%+5d)		
	2000 A Range	±(2%+8d)		
Over load	AC/DC 2000A			
protection				
Remark	* ACA specification sine wave 50/60 H	* ACA specification be tested on sine wave 50/60 Hz		
	* Measurement ran	* Measurement range : 0.1A to 2000A		

Diode				
Short/nc	on conduc	ctance, good	d/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





- 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
- 3-14 MAX/MIN buttern

4. PRECAUTIONS & PREPARATIONS FOR MEASUREMENT

- 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.
- 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.
- 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.
- 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	S	vmbol	s &	units	of	disi	nla	v
0-1	<u> </u>	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		umo	U	<i>u13</i>	uiu i	

Symbols	Descriptions		
Units			
SMART	Appears when selecting " Smart " mode.		
	The meter default mode is " Smart "		
AUTO	Appears when selecting "Automatic range " mode.		
	Appears when selecting DC mode.		
DC	(DC voltage or DC current)		
\sim	Appears when selecting AC mode.		
	(AC voltage or AC current)		
	Appears when the " Data hold " function is		
	operated.		
	Power voltage is already under the low condition.		
Ζ	Appears when the " DCA Zero " is operated.		
Max/Min	Appears when the " Max/Min " is operated.		
•))	Appears when the " Continuity beeper " is operated.		
mV, V	Units for voltage measurements.		
А	Units for " Current " measurement.		
Ω,ΚΩ,ΜΩ	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).
- 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

- Select the "Function rotary switch " (3-3, Fig. 1) to the "600A" or "2000A " position, Display will show "SMART "marker. meter is under" Smart " mode for Current ACA, DCA auto scanning.
- 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.
- 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 "(3-7, Fig. 1) once, until the LCD show the "kHz " marker and the display will show the frequency value of the measurement 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)
- Select the "Function rotary switch " (3-3, Fig. 1) to the " •⁽¹⁾) "position.
- 4) The LCD display will show the "SMART ",the meter is under "Smart " moder for auto scanning Continuity measurement.
- 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.)
- 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.





5-7 Capacitance Measurement

- 1) Select the "Function rotary switch " (3-3, Fig. 1) to the " **+**
- 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.
- The LCD display will show the "SMART ", the meter is under "Smart " mode for auto scanning Capacitance measurement.
- 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 : <u>Voltage (ACV/DCV) measurement (Chapter 5-2)</u> <u>Current (ACA/DCA) measurement (Chapter5-4)</u>

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 Max and Min. value record

- 1) Application : To record the maximum and the minimum reading value during the measurement.
- 2) Used the "SELECT button " (3-5, Fig. 1) to select the desired manual range.
 - * For the 600 A (AC/DC) range, it is only one range, do not necessary to use the " Range button " to select the range.
- 3) Push the "MAX/MIN button " (3-14, Fig. 1) once 3 times, the display will show the "Min Max " two markers together with flash, now the meter is ready for recording the "Max." and "Min." value.
- 4) Push the "MAX/MIN button " (3-14, Fig. 1) once again the display will show the "Max " maker along with the maximum measured value.
 Push the "MAX/MIN button " (3-14, Fig. 1) once again the display will show the "Min " maker along with the minimum measured value.
- If intend to cancel the "Max/Min Record function" just push the "MAX/MIN button" (3-14, Fig. 1) > 2 seconds continuously.

5-12 Data Hold Operation

- 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 !

- 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

