

## ADC400

# Digital Clamp Meter

### Preface

Thank you for purchasing the new Digital Clamp Meter. In order to use this product safely and correctly, please read this manual thoroughly, especially the *Safety Instructions* part. After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

### Limited Warranty and Liability

WIPCOOL guarantees that the product is free from any defect in material and workmanship within one year from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination or improper handling. The dealer shall not be entitled to give any other warranty on behalf of WIPCOOL. If you need warranty service within the warranty period, please contact your seller directly.

WIPCOOL will not be responsible for any special, indirect, incidental or subsequent damage or loss caused by using this device. As some countries or regions do not allow limitations on implied warranties and incidental or subsequent damages, the above limitation of liability may not apply to you.

### I. Overview

The ADC400 is Digital Clamp Meter. They are designed according to EN61010-1 and CAT II 600V/ CAT III 300V safety standards. These meters come with full-featured protection which ensures users a safe and reliable measurement experience. Aside from all the normal features of Digital Clamp Meter, these meters also include high voltage frequency measurement, fast capacitance measurement, audio visual NCV detection, and plenty of additional safety features.

### II. Features

- True RMS measurement
- Audio visual NCV detection
- Maximum measurable voltage: 600V;
- High voltage frequency range: 10Hz~10kHz
- Current (ADC400: 400A) frequency response: 50Hz~100Hz; current frequency measurement function
- Large capacitance (4mF) and temperature measurement
- Very large capacitance (60mF), low voltage frequency (10MHz)
- Large LCD and fast refresh rate (3 times/s)
- Response time for capacitance measurement: less than 3s for  $\leq 1\text{mF}$ ; about 6s for  $\leq 10\text{mF}$ ; about 8s for  $\leq 60\text{mF}$
- Full-featured false detection protection for up to 600V (30kVA) energy surge; overvoltage and overcurrent alarm functions
- The power consumption of the meter is about 1.8 mA. The circuit has an automatic power saving function. The consumption in sleep state is  $< 11\mu\text{A}$ , which effectively extends the battery life to 400 hours.

**Warning:** Before using the meter, please read the *Safety Instructions* carefully.

### III. Accessories

Open the package box and take out the meter. Please double check whether the following items are missing or damaged.

- User manual ----- 1 pc
- Test leads ----- 1 pair
- K-type temperature probe ----- 1 pc
- Cloth bag ----- 1 pc

If any of the above is missing or damaged, please contact your supplier immediately.

### IV. Safety Instructions

The meter is designed according to EN61010-1, 61010-2-032/033 and electromagnetic radiation protection EN61326-1 safety standards, and conforms to CAT II 600V, CAT III 300V, double insulation and pollution grade II.

**Note:** In case the meter is not used in accordance with the operating instructions, the protection provided by the meter may be weakened or lost.

- Before use, please check if there is any item which is damaged or behaving abnormally. If any abnormal item (such as bare test lead, damaged meter casing, broken LCD, etc.) is found, or if the meter is considered to be malfunctioning, please do not use the meter.
- Do not use the meter if the rear cover or the battery cover is not covered up, or it will pose a shock hazard!
- When using the meter, keep fingers behind the finger guards of the test leads, and do not touch exposed wires, connectors, unused inputs, or circuits being measured to prevent electric shock.
- The function switch should be placed in the correct position before measurement. It is forbidden to change the position during measurement to avoid damage to the meter!
- Do not apply voltage over 600V between any meter terminal and earth ground to prevent electric shock or damage to the meter.
- Be cautious when the measured voltage is higher than 60V (DC) or 30Vrms (AC) to avoid electric shock!
- Never input voltage or current which exceeds the specified limit. If the range of the measured value is unknown, the maximum range should be selected.
- Before measuring the resistance, diode and continuity online, switch off the power supply of the circuit, and fully discharge all capacitors to avoid inaccurate measurement.

- When the " " symbol appears on the LCD, please replace the batteries in time to ensure measurement accuracy. If the meter is not in use for a long time, please remove the batteries.
- Do not change the internal circuit of the meter to avoid damage to the meter and user!
- Do not use or store the meter in high temperature, high humidity, flammable, explosive or strong magnetic field environments.
- Clean the meter casing with a soft cloth and mild detergent. Do not use abrasives or solvents!

### V. Electrical Symbols

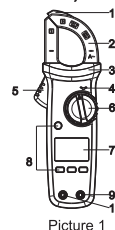
Symbol	Description
	Caution, possibility of electric shock
	Alternating current
	Direct current
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
	Earth (ground) TERMINAL
	Warning or Caution

### VI. General Specifications

- Max display: 6099
- Polarity display: Auto
- Overload display: "OL" or "-OL"
- Low battery indication: The " " symbol is displayed.
- Low battery shutdown prompt: The "Lo.Bt" interface appears on the LCD and lasts for about 10s, the buzzer beeps three times, and the meter automatically shuts down.
- Test position error: If the source under test is not placed at the center of the clamp jaws when measuring current,  $\pm 1.0\%$  additional error in reading will be produced.
- Drop protection: 1m
- The maximum size of jaw opening: 28mm in diameter
- Battery: AAA battery 1.5V $\times$ 2
- Auto power off: If there is no operation of the function switch or any button for 15 minutes, the meter will automatically power off. This function can be turned off as needed.
- Dimensions: 215mm $\times$ 63.5mm $\times$ 36mm
- Weight: About 248g (including batteries)
- Altitude: 2000m
- Operating temperature and humidity: 0 $^{\circ}$ C~30 $^{\circ}$ C ( $\leq 80\%$ RH), 30 $^{\circ}$ C~40 $^{\circ}$ C ( $\leq 75\%$ RH), 40 $^{\circ}$ C~50 $^{\circ}$ C ( $\leq 45\%$ RH)
- Storage temperature and humidity: -20 $^{\circ}$ C~60 $^{\circ}$ C ( $\leq 80\%$ RH)
- Electromagnetic compatibility: RF=1V/m, overall accuracy  $\pm$  specified accuracy + 5% of range RF>1V/m, no specified calculation

### VII. External Structure (Picture 1)

- NCV sensing end
- Clamp jaws
- Hand guard
- LED indicator
- Jaw opening trigger
- Function switch
- LCD display
- Function buttons
- Positive (+) input jack
- COM (negative -) input jack



### VIII. Button Description

#### 1.SELECT Button

In the composite function position, press this button to switch between the corresponding measurement functions; in the AC/DC/Hz position, short press this button to switch between the AC and DC functions, and long press (about 2s) this button to enter/exit the Hz measurement function.

In the NCV, short press this button to switch between the EFHl and EFLo ranges, and long press (about 2s) this button to enter.

#### 2.HOLD/BACKLIGHT Button

Short press this button to enter/exit the data hold mode, and long press (about 2s) this button to turn on/off the backlight (the backlight will automatically turn off after 60s).

#### 3.MAX/MIN Button

Short press this button to enter the maximum/minimum measurement mode and long press this button to exit (only valid for AC/DC voltage, AC current, resistance and temperature measurement).

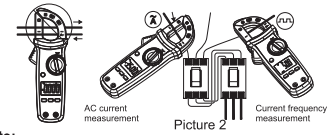
#### 4.REL Button

In the capacitance and voltage positions, press this button to store the current reading as a reference for future readings. When the LCD display value is reset to zero, the stored reading will be subtracted from the future readings. Press this button again to exit the relative value mode.

### IX. Operating Instructions

#### 1.AC Current/Current Frequency Measurement (Picture 2)

- Select the AC current range (4A/6A, 40A/60A or 400A/600A)
- Press the trigger to open the clamp jaws, and fully enclose one conductor.
- Only one conductor can be measured at a time, otherwise the measurement reading will be wrong.

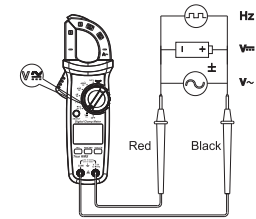


#### Note:

- The current measurement must be taken within 0 $^{\circ}$ C~40 $^{\circ}$ C. Do not suddenly release the trigger, as the impact will change the reading for a short time.
- To ensure measurement accuracy, center the conductor in the jaws. Otherwise,  $\pm 1.0\%$  additional error in reading will be produced.
- When the measured current is  $\geq 400\text{A}$ , the meter will automatically sound an alarm and the high voltage alarm prompt " " will automatically flash.
- If the LCD displays "OL", it indicates that the current is over range and there is a danger of damage to the meter.

#### 2.AC/DC Voltage and Voltage Frequency Measurement (Picture 3)

- Insert the red test lead into the "V  $\overline{\text{C}}$   $\overline{\text{H}}$   $\overline{\text{Z}}$  " jack, black into the "COM" jack.
- Turn the function switch to the AC/DC voltage position, and connect the test leads with the measured load or power supply in parallel.



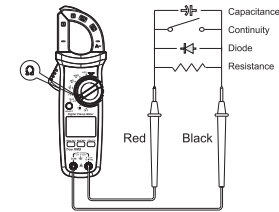
Picture 3

#### Note:

- Do not input voltage above 600V. Although it is possible to measure higher voltage, it may damage the meter.
- Be cautious to avoid electric shock when measuring high voltage.
- When the measured voltage is  $\geq 30\text{V}$  (AC) or  $\geq 60\text{V}$  (DC), the LCD will display the high voltage alarm prompt " "

#### 3.Resistance Measurement (Picture 4)

- Insert the red test lead into the "V  $\overline{\text{C}}$   $\overline{\text{H}}$   $\overline{\text{Z}}$  " jack, black into the "COM" jack.
- Turn the function switch to the " " position, press the SELECT button to select resistance measurement, and connect the test leads with both ends of the measured resistance in parallel.



Picture 4

#### Note:

- If the measured resistor is open or the resistance exceeds the maximum range, the LCD will display "OL".
- Before measuring the resistance online, switch off the power supply of the circuit, and fully discharge all capacitors to avoid inaccurate measurement.
- If the resistance is not less than 0.5 $\Omega$  when the test leads are short-circuited, please check the test leads for looseness or other abnormalities.
- Do not input voltage higher than 30V to avoid personal injury.

#### 4.Continuity Test (Picture 4)

- Insert the red test lead into the "V  $\overline{\text{C}}$   $\overline{\text{H}}$   $\overline{\text{Z}}$  " jack, black into the " " jack.
- Turn the function switch to the " " position, press the SELECT button to select continuity measurement, and connect the test leads with both ends of the measured load in parallel.
- Measured resistance  $< 10\Omega$ : The circuit is in good conduction status; the buzzer beeps continuously. Measured resistance  $> 31\Omega$ : The buzzer makes no sound.

#### Note:

- Before measuring the continuity online, switch off the power supply of the circuit, and fully discharge all capacitors.
- Do not input voltage higher than 30V to avoid personal injury.

#### 5.Diode Test (Picture 4)

- Insert the red test lead into the "V  $\overline{\text{C}}$   $\overline{\text{H}}$   $\overline{\text{Z}}$  " jack, black into the "COM" jack. The polarity of the red test lead is "+" and that of the black test lead is "-".
- Turn the function switch to the " " position, press the SELECT button to select diode measurement, and connect the test leads with the positive and negative poles of the measured diode.
- 0.08V  $\leq$  reading  $< 1.2\text{V}$ : The buzzer makes one beep indicating the normality of the diode. Reading  $< 0.08\text{V}$ : The buzzer beeps continuously indicating the damage of the diode. For the silicon PN junction, the normal value is generally about 500~800 mV.

#### Note:

- If the diode is open or its polarity is reversed, the LCD will display "OL".
- Before measuring the diode online, switch off the power supply of the circuit, and fully discharge all capacitors.
- Do not input voltage higher than 30V to avoid personal injury.

## 6. Capacitance Measurement (Picture 4)

- 1) Insert the red test lead into the "V C-Ω Hz" jack, black into the "COM" jack.
- 2) Turn the function switch to the "F" position, and connect the test leads with the measured capacitance in parallel. For capacitance  $\leq 100\text{nF}$ , it is recommended to use "REL" measurement mode.

### ⚠ Note:

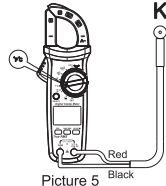
- If the measured capacitor is short-circuited or the capacitance exceeds the maximum range, the LCD will display "OL".
- When measuring capacitance  $>400\mu\text{F}$ , it may take some time to steady the readings.
- Before measuring, fully discharge all capacitors (especially for capacitors with high voltage) to avoid damage to the meter and user.

## 7. Temperature Measurement (Picture 5)

- 1) Insert the positive pole of the temperature probe into the "V C-Ω Hz" jack and negative pole into the "COM" jack.
- 2) Turn the function switch to the "C/F" position and the LCD will display room temperature.
- 3) Fix the temperature probe on the object to be tested, and read the temperature value of the tested object directly from the display after a few seconds.
- 4) Press the SELECT button to switch between °C and °F.

### ⚠ Note:

- The ambient temperature of the meter should be in the range of 18~28°C, otherwise it will cause measurement error.
- The positive and negative poles of the temperature probe should be properly connected. Do not measure non-insulated live objects to avoid incorrect readings.
- Do not input voltage higher than 30V to avoid personal injury.

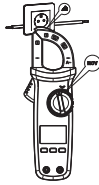


Picture 5

## 8. Non-contact AC Electric Field Sensing (NCV, Picture 6)

The electric field sensing sensitivity is divided into two levels ("EFHI" and "EFLo"). The meter defaults to "EFHI". Select different sensitivity levels for measurement according to the intensity of the measured electric field. When the electric field is around 220V (AC) 50Hz/60Hz, select "EFHI"; when the electric field is around 110V (AC) 50Hz/60Hz, select "EFLo".

- 1) Turn the function switch to the NCV position.
- 2) Bring the NCV sensing end of the clamp jaws close to a charged electric field (socket, insulated wire, etc.). The LCD will display the segment "—", the buzzer will beep, and the red LED will flash. As the intensity of the measured electric field increases, the more the segments (—) are displayed, and the higher the frequency at which the buzzer beeps and the red LED flashes.



Picture 6

### ⚠ Note:

- Use the NCV sensing end of the clamp jaws to approach the measured electric field, otherwise the measurement sensitivity will be affected.
- When the measured electric field voltage is  $\geq 100\text{V}$  (AC), observe whether the conductor of the measured electric field is insulated to avoid personal injury.

## 9. Others

- 1) Auto power off: During measurement, if there is no operation of the function switch or any button for 15 minutes, the meter will automatically shut down to save power. You can wake it up by pressing any button or restart it after turning the function switch to the OFF position. To disable the auto power off function, press and hold the SELECT button in the off state, and then turn on the meter. To resume the auto power off function, restart the meter after shutdown.
- 2) Buzzer: When any button is pressed or the function switch is turned, if it is valid, the buzzer will make one beep (about 0.25s). When measuring voltage or current, the buzzer will beep intermittently to indicate the over range.
- 3) Low battery detection: The battery voltage will be automatically detected as long as the meter is on. If it is lower than 2.5V, the LCD will display the "Lo" symbol.
- 4) Low battery shutdown function: When the battery voltage is lower than 2.4V, the LCD displays the "Lo" symbol, the "Lo.b" interface appears and lasts for about 10s, the buzzer makes consecutive beeps three times, and then the meter automatically shuts down (no interface is displayed).

## X. Technical Specifications

Accuracy:  $\pm$  (a% of reading + b digits), 1 year calibration period  
Ambient temperature and humidity: 23°C $\pm$ 5°C;  $\leq$ 80%RH  
Temperature coefficient: To ensure measurement accuracy, operating

### 1. AC Current

Range	Resolution	Accuracy	Overload Protection
4.000A	6.000A	0.001A	420A
40.00A	60.00A	0.01A	
400.0A	600.0A	0.1A	
Current frequency monitoring: 50Hz~100Hz	0.1Hz	$\pm$ (1.0%+5)	

- Frequency response: 50Hz~100Hz
- For 4A range, open circuit allows least significant digit  $<3$ .
- Accuracy guarantee range: 1%~100% of range
- The input current amplitude of the current frequency should be  $>2\text{A}$ .

## 2. AC Voltage

Range	Resolution	Accuracy	Overload Protection
4.000V	0.001V	$\pm$ (1.0%+5)	600Vrms
40.00V	0.01V	$\pm$ (0.8%+5)	
400.0V	0.1V		
600V	1V	$\pm$ (1.0%+5)	
Voltage frequency monitoring: 10Hz~10kHz	0.01Hz~0.01kHz		

- Input impedance: About 10M $\Omega$
- Frequency response: 45Hz~400Hz, true RMS display
- Accuracy guarantee range: 1%~100% of range; the input voltage amplitude of the voltage frequency should be  $>5\text{V}$ .
- The AC crest factor of a non-sinusoidal wave can reach 3.0 at 4000 counts while can only reach 1.8 at 6000 counts. The additional error should be added for the corresponding crest factor as follows:
  - a) Add 3% when crest factor is 1~2
  - b) Add 5% when crest factor is 2~2.5
  - c) Add 7% when crest factor is 2.5~3

## 3. DC Voltage

Range	Resolution	Accuracy	Overload Protection
400.0mV	0.1mV	$\pm$ (0.7%+3)	600Vrms
4.000V	0.001V	$\pm$ (0.5%+2)	
40.00V	0.01V	$\pm$ (0.7%+3)	
400.0V	0.1V		
600V	1V		

- Input impedance: About 10M $\Omega$
- For mV range, short circuit allows least significant digit  $\leq 5$ .
- Accuracy guarantee range: 1%~100% of range

## 4. Resistance

Range	Resolution	Accuracy	Overload Protection
400.0 $\Omega$	0.1 $\Omega$	$\pm$ (1.0%+2)	600Vrms
4.000k $\Omega$	0.001k $\Omega$	$\pm$ (0.8%+2)	
40.00k $\Omega$	0.01k $\Omega$		
400.0k $\Omega$	0.1k $\Omega$	$\pm$ (2.0%+5)	
4.000M $\Omega$	0.001M $\Omega$		
40.00M $\Omega$	0.01M $\Omega$		

## 5. Continuity

Range	Resolution	Accuracy	Overload Protection
400.0 $\Omega$	0.1 $\Omega$	<10 $\Omega$ : Consecutive beeps >31 $\Omega$ : No beep Open circuit voltage: About 2.0V	600Vrms

## 6. Diode

Range	Resolution	Accuracy	Overload Protection
4.000V	0.001V	Open circuit voltage: About 2.2V Measurable PN junction: Forward voltage drop $\leq 2\text{V}$ . For the silicon PN junction, the normal value is generally about 0.5~0.8V.	600Vrms

temperature should be within 18°C~28°C and the fluctuation range should be within  $\pm 1^\circ\text{C}$ . When the temperature is  $<18^\circ\text{C}$  or  $>28^\circ\text{C}$ , add temperature coefficient error 0.1 x (specified accuracy)/ $^\circ\text{C}$ .

## 7. Capacitance

Range	Resolution	Accuracy	Overload Protection
4.000nF	0.001nF	$\pm$ (4.0%+10)	600Vrms
40.00nF	0.01nF		
400.0nF	0.1nF		
4.000uF	0.001uF	$\pm$ (4.0%+5)	
40.00uF	0.01uF		
4.000mF	0.001mF	$\pm$ 10%	

- Measured value = displayed value - open circuit value of the test leads (For capacitance  $\leq 100\text{nF}$ , it is recommended to use "REL" measurement mode.)
- For capacitance range, open circuit allows least significant digit  $\leq 20$ .

## 8. Temperature

Range	Resolution	Accuracy	Overload Protection
-40°C~40°C	1°C	$\pm 4^\circ\text{C}$	600Vrms
40°C~500°C		$\pm$ (1.5%+5)	
500°C~1000°C	$\pm$ (2.0%+5)		
-40°F~104°F	1°F	$\pm 6^\circ\text{F}$	
104°F~932°F		$\pm$ (2.0%+6)	
932°F~1832°F	$\pm$ (2.5%+4)		

## 9. NCV

Range	Electric field sensing sensitivity level	Accuracy
NCV	EFLo	To sense the wire above 24 $\pm$ 6V and identify whether the mains socket is charged
	EFHI	To sense the wire above 74V $\pm$ 12V, to identify whether the mains socket is charged, or to judge the live/neutral wire of the socket according to the intensity of the sensing

- Test results may be affected by different socket designs or wire insulation thickness.

## XI. Maintenance

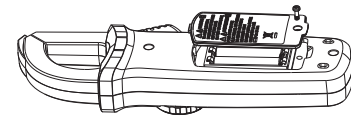
⚠ Warning: Before opening the rear cover of the meter, remove the test leads to avoid electric shock.

### 1. General Maintenance

- 1) When the meter is not in use, place the function switch in the OFF position to avoid continuous consumption of battery energy.
- 2) Clean the meter casing with a soft cloth and mild detergent. Do not use abrasives or solvents!
- 3) The maintenance and service must be implemented by qualified professionals or designated departments.

### 2. Battery Replacement (Picture 7)

- 1) Turn off the meter and remove the test leads from the input terminals.
- 2) Unscrew the screw of the battery compartment, remove the battery cover, and replace the 2 standard AAA batteries according to the polarity indication.
- 3) Secure the battery cover and tighten the screw.



Picture 7

## ADC400

## 数字钳形表使用说明书

## 一. 概述

ADC400为手持式自动量程具有有效值交流钳形表安全标准EN61010-2010 CAT II 600V/CAT III 300V等级设计具有全档智能保护, 可满足高可靠性和高安全性操作要求; 产品包含电气测量的基本功能, 电流档具备高精度测量, 并扩展了电流频率、高压频率功能。

## 二. 特点

- 1) 真有效值测量
- 2) NCV电场检测具备声光报警提示
- 3) 电压测量600V, 并具有交流高压频率测量功能10Hz~10kHz
- 4) 电流(400A)频响达50Hz~100Hz, 并具有交流电流频率测量功能
- 5) 配备电容(4mF)、温度测量功能
- 6) 大屏LCD读数显示, 快速ADC/模数转换器(3次/秒), 尤其是电容档比较同类产品, 在测量 $\leq 1\text{mF}$ 响应时间小于3秒,  $\leq 10\text{mF}$ 响应时间约6秒,  $\leq 60\text{mF}$ 响应时间约8秒。  
全功能误测保护, 最大可承受600V (30kVA)的能量冲击, 并设置过压、过流报警提示。
- 7) 在不背光情况下, 整机功耗约1.8mA, 电路设置自动省电功能, 睡眠状态下消耗 $< 11\mu\text{A}$ , 有效延长电池的使用寿命达400小时。

请仔细阅读本说明书中包括的有关“安全”和“警告提示”的相关内容, 并严格遵守所有警告的注意事项。

## 警告:

在使用仪表之前, 请仔细阅读有关“安全操作准则”。

## 三. 开箱检查

打开包装盒, 取出仪表, 请仔细检查下列项目是否缺少或损坏:

1. 使用说明书 一本;
2. 表笔 一副;
3. K型温度探头 一条;
4. 布包 一个;
5. 保用证 一张;

如果发现任何一个项目缺少或损坏, 请立即与您所购买的供应商进行联系。

## 四. 安全操作准则

请注意“警告标识及警告字句”。警告表示对使用者构成危险, 对仪表或被测设备可能造成损坏的情况或行动。

本仪表依据IEC/EN61010-1, 61010-2-032, 电磁辐射EN61326-1安全标准设计, 符合双重绝缘、过电压CAT II 600V、CAT III 300V和污染等级2的安全标准。如果未能按照有关的操作说明使用, 则可能会削弱或失去仪表的保护能力。

1. 使用前应检查钳表和表笔, 谨防任何损坏或不正常的现象。如发现表笔、壳体绝缘有明显损坏以及液晶显示器无显示等, 或者您认为仪表已无法正常工作, 请勿再使用。
2. 后盖及电池盖没有盖好前严禁使用仪表, 否则有电击危险。
3. 在进行测量时, 切记手指不要超过表笔挡手部位, 不要接触裸露的电线、连接器、没有使用的输入端或正在测量的电路, 防止触电。
4. 测量前, 功能开关必须置于正确位置, 严禁在测量中进行转换档位, 以防损坏仪表。
5. 不要在仪表终端及接地之间施加 $> 600\text{V}$ 以上的交直流电压, 以防电击和损坏仪表。
6. 当被测直流电压高于 $60\text{V}$ 或交流电压高于 $30\text{Vrms}$ 的场合, 应小心谨慎, 防止触电。
7. 不要测量高于允许输入值的电压或电流, 在不能确定被测值的范围时, 须将功能量程开关置于最大量程位置。进行在线电阻、二极管或电路通断测量之前, 必须先将电路中所有电源切断, 并将所有电容器放电, 否则会导致测量结果不准确。
8. 当液晶显示器显示“ $\square$ ”标志时, 应及时更换电池, 以确保测量精度。仪表长期不用时, 应取出电池。
9. 请勿随意改变仪表内部接线, 以免损坏仪表和危及安全。
10. 不要在高温、高湿、易燃、易爆和强电磁环境中存放及使用本仪表。
11. 维护保养请使用软布及中性清洁剂清洁仪表外壳, 切勿使用研磨剂及溶剂, 以防外壳被腐蚀, 以免损坏仪表、危及安全。

## 五. 电气符号

符号	含义说明	符号	含义说明
	高压危险		双重绝缘
	AC(交流)		接地
	DC(直流)		警告提示

## 六. 综合特性

LCD显示: 最大显示至4099;

极性显示: 自动正负极性显示;

过载显示: 以“OL”或“OL”显示;

电池低电压显示: “ $\square$ ”符号显示, 表示电池电压低于工作电压, 需要更换新电池;

电池欠压关机提示: LCD画面出现“Lo. bat”界面, 界面持续约10秒钟, 蜂鸣器发声三次, 仪表自动关机;

测试位置误差: 测量电流时因为未将待测源置于钳头中心位置会产生 $\pm 1.0\%$ 读数附加误差;

耐冲击强度: 可承受1m高度落地撞击;

钳头开口最大尺寸: 直径28 mm;

电源供给: 2节AAA 1.5V电池;

自动关机功能: 在约15分钟内无转盘开关拨动或按键按下时仪表自动关机, 也可根据需要关闭该功能;

尺寸: 215mm $\times$ 63.5mm $\times$ 36mm;

重量: 约248g(包括电池);

海拔高度: 2000米;

操作温湿度:  $0^{\circ}\text{C}\sim 30^{\circ}\text{C}$ (不大于80%RH),  $30^{\circ}\text{C}\sim 40^{\circ}\text{C}$ (不大于75%RH),  $40^{\circ}\text{C}\sim 50^{\circ}\text{C}$ (不大于45%RH);

储存温湿度:  $-20^{\circ}\text{C}\sim +60^{\circ}\text{C}$ (不大于80%RH);

电磁兼容性: 在1V/m的射频场下, 总精度=指定精度+量程的5%, 超过1V/m以上的射频场没有指定指标。

## 七. 外表结构 (见图1)

1. NCV感测端点。
2. 钳头, 测量交流电流的传感装置。
3. 钳身, 为保护使用者手部碰到危险区的一种安全设计。
4. 发光LED指示灯。
5. 钳头扳动手柄, 按压扳机使钳头张开; 松开扳机则钳头自动闭合。
6. 转盘开关, 测量功能档位的选择。
7. LCD显示区, 测量数据及功能符号显示。
8. 功能按键, 用于选择和切换测量功能和测量模式。
9. 测量信号输入端口, 接红表笔和温度探头的正极端。
10. 测量输入公共端(COM), 接黑表笔和温度探头的负极端。

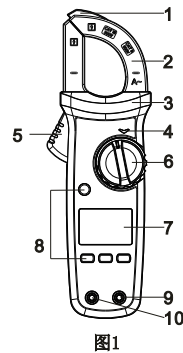


图1

## 八. 按键功能说明

## 1. SELECT键

在复合功能档位上, 按下SELECT键可以在相应功能之间切换; 在复合AC/DC/Hz档; 短按SELECT键在AC/DC功能之间切换, 长按SELECT(约2S)键进入Hz功能测量, 再长按SELECT键退出Hz功能测量。

在复合NCV, 短按SELECT键在切换EPH/EFL功能, 长按SELECT键(约2S)进入LIVE功能测量, 再长按SELECT键退出LIVE功能测量, 恢复NCV测量。

## 2. HOLD/BACK LIGHT键

a). 短按此键一次, 进入读数保持测量模式, 再按一次, 退出读数保持测量模式。

b). 长按此键(约2秒), 打开或关闭背光, 背光开启约60秒后会自动关闭。

## 3. MAX/MIN键

按一次LCD会显示“MAX”符号, 进入最大值测量模式, 接着按一次, LCD显示“MIN”符号, 进入最小值测量模式, 如此循环。长按此键退出最大值/最小值测量。

## 4. REL键

在电容档功能下, 按下REL键, 将当前读数作为以后读数的参考值, LCD显示值被归零, 所储存的读数将从以后读取的读数减去, 再按REL可退出相对值模式。

## 九. 测量操作说明

## 1. 交流电流与电流频率测量 (见图2)

- 1) 选定交流电流量程(4A/6A~、40A/60A~、400A~/600A~)
- 2) 打开钳头, 钩上电线(单线), 注意应确保钩部应完全闭合, 两钩之间不可有间隙。
- 3) 仪表一次只能测量一个电流导体, 若同时测量两个或以上的电流导体, 测量读数是错误的。

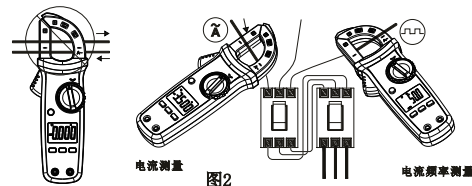


图2

## 注意:

- 电流测量功能必须在 $0^{\circ}\text{C}\sim 40^{\circ}\text{C}$ 之间操作, 按住扳机不要突然松开, 仪表测量对机械应力均有不同程度的敏感, 撞击会短时间引起读数变化。
- 为保证测量数据准确, 须将被测导体位于钳头的中央, 未置于钳头中心位置会产生 $\pm 1.0\%$ 读数附加误差。
- 当测量电流大于 $\geq \text{AC } 400\text{A}$ 时仪表会自动发出报警声且高压报警提示符“ $\Delta$ ”会自动闪烁, 以作报警提示。
- 对于测量大于仪表最大电流420A的情况下, 仪表已经显示“OL”时, 应避免继续测试下去, 如长时间测试下去有损坏仪表的危险, 此时应更换更大量程的仪表来测量。

## 2. 交/直流电压及电压频率测量 (图3)

- 1) 将红表笔插入“V C  $\leftarrow$   $\Omega$   $\rightarrow$  Hz”插孔, 黑表笔插入“COM”插孔。
- 2) 将功能量程开关置于交/直流电压测量档, 并将表笔并连到待测电源或负载上。

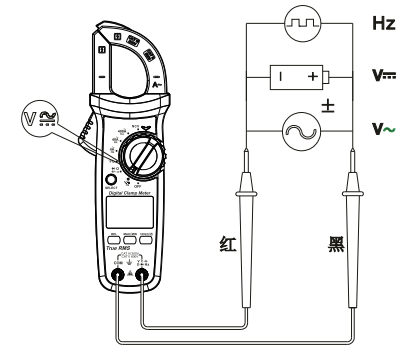


图3

## 注意:

- 不要输入高于600V的电压。测量更高的电压是有可能的, 但有损坏仪表的危险。
- 在测量高压时, 要特别注意避免触电。
- 被测电压 $\geq 30\text{V AC}$ 或 $60\text{V DC}$ 安全电压时, 本仪表LCD显示高压警告提示符“ $\Delta$ ”, 当测量电压 $\geq 600\text{V}$ 时仪表会自动发出报警声且高压报警提示符“ $\Delta$ ”会自动闪烁。

## 3. 电阻测量 (图4)

- 1) 将红表笔插入“V C  $\leftarrow$   $\Omega$   $\rightarrow$  Hz”插孔, 黑表笔插入“COM”孔。
- 2) 将功能开关置于“ $\Omega$ ”测量档, 按SELECT键选择电阻测量, 并将表笔并连到被测电阻两端上。

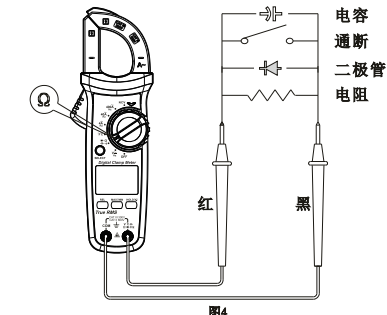


图4

## 注意:

- 如果被测电阻开路或阻值超过仪表最大量程时, 显示器将显示“OL”。
- 当测量在线电阻时, 在测量前必须先将被测电路内所有电源切断, 并将所有电容器放尽残余电荷。才能保证测量正确。
- 如果表笔短路时的电阻值不小于 $0.5\Omega$ 时, 应检查表笔是否有松脱现象或其它原因。
- 不要输入高于直流或交流30V以上的电压, 避免伤及人身安全。

## 4. 导通检测 (图4)

- 1) 将红表笔插入“V C  $\leftarrow$   $\Omega$   $\rightarrow$  Hz”插孔, 黑表笔插入“COM”插孔。
- 2) 将功能开关置于“ $\rightarrow$ ”测量档, 按SELECT键选择电路通断测量“ $\rightarrow$ ”, 并将表笔并连到被测电路负载的两端。如果被测二端之间电阻 $< 10\Omega$ , 认为电路导通, 蜂鸣器连续声响, 电阻 $> 31\Omega$ , 蜂鸣器不发声。

## 注意:

- 当检查在线电路通断时, 在测量前必须先将被测电路内所有电源切断, 并将所有电容器放尽残余电荷。
- 不要输入高于直流或交流30V以上的电压, 避免伤及人身安全。

## 5. 二极管测量 (图4)

- 1) 将红表笔插入“V C  $\leftarrow$   $\Omega$   $\rightarrow$  Hz”插孔, 黑表笔插入“COM”插孔。红表笔极性为“+”, 黑表笔极性为“-”。
- 2) 将功能开关置于“ $\rightarrow$ ”测量档, 按SELECT键选择二极管测量“ $\rightarrow$ ”, 从显示器上直接读取被测二极管的近似正向PN结电压。当正向压降在 $\geq 0.08\text{V}\sim < 1.2\text{V}$ 蜂鸣一声, 表示器件正常; 当正向压降 $< 0.08\text{V}$ , 蜂鸣器长鸣, 表示器件损坏; 对硅PN结而言, 一般约为 $500\sim 800\text{mV}$ 确认为正常值。

## 注意:

- 如果被测二极管开路或极性反接时, 显示“OL”。
- 当测量在线二极管时, 在测量前必须先将被测电路内所有电源切断, 并将所有电容器放尽残余电荷。
- 不要输入高于直流或交流30V以上的电压, 避免伤及人身安全。

## 6. 电容测量 (图4)

- 1) 将红表笔插入“V C  $\leftarrow$   $\Omega$   $\rightarrow$  Hz”插孔, 黑表笔插入“COM”插孔。
- 2) 将量程开关置于“ $\leftarrow$ ”档位, 并将表笔并连到被测电容两端上, 对于 $\leq 100\text{nF}$ 被测电容建议采用“REL”模式测量。
- 3) 建议用短表笔线进行电容测量, 可以减小分布电容的影响。

## 注意:

- 如果被测电容短路或容值超过仪表的最大量程时, 显示器将显示“OL”。
- 对于大于 $400\mu\text{F}$ 电容的测量, 需要一定的读数稳定时间, 便于正确读数。
- 为了确保测量精度, 建议电容在测试前将电容全部放尽残余电荷后再输入仪表进行测量, 对带有高压的电容更为重要, 避免损坏仪表和伤及人身安全。

## 7. 温度测量(图5)

- 1) 将温度探头正极插入“V C-Hz Hz”插孔, 负极插入“COM”插孔。
- 2) 将量程开关置于“C/F”档位, 将温度探头紧贴被测物表面, 数秒后从LCD显示器上直接读取被测物表面温度值。
- 3) 按SELECT键可以选择华氏温度值与摄氏温度值之间切换。

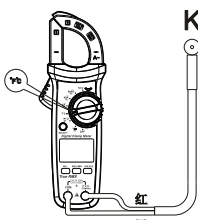


图5

### 注意:

- 仪表所处环境温度不得超出18~28°C范围之外, 否则会造成测量误差。
- 温度探头的正负极应正确连接, 不要测量非绝缘带物体, 避免仪表测出错误读数。
- 不要输入高于30V以上的交直流电压, 以避免伤及人身安全。

## 8. 非接触交流电压感测NCV(见图6a)

电场感测灵敏度分2级(EFHI和EFL0), 产品开机默认EFHI模式, 测量时, 可以根据被测电场的强弱来选择不同的灵敏度档位进行测量, 当电场在220V AC 50Hz/60Hz左右时, 选择NCV的“EFHI”进行测量, 钳头部位的NCV感测端靠近插座或者绝缘导线等带电电场时, LCD显示“-”横段, 蜂鸣器发出滴滴声, 同时红色LED也闪烁; 随着测量电场强度的增大, LCD显示横段“—”越多; 蜂鸣器发声频率和红色LED发光闪烁频率越高。当电场在110V AC 50Hz/60Hz左右时, 选择NCV的“EFL0”进行测量。

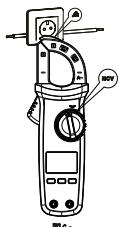


图6a

### 注意:

- 应采用钳头部位的NCV感测端点接近被测电场, 否则影响测量灵敏度。
- 当被测电场 $\geq 100V$  AC以上电压时, 应注意观察所测电场的导体是否绝缘, 以避免伤及人身安全

## 9. 其它功能

自动关机: 在约15分钟内无转盘开关拨动或按键按下时, 仪表会“自动关机”以节能。在自动关机状态下点击任何按键, 仪表会“自动唤醒”或将旋钮开关旋至OFF后重新开机。

关机状态按下SELECT键后再开机, 自动关机功能被取消。关机后重新则恢复自动关机功能。

蜂鸣器: 按任何按键或转动功能开关时, 如果该功能按键有效, 蜂鸣器会发“Beep”一声(约0.25秒)。在测量电压或电流时, 蜂鸣器也会间断性发出“Beep”声, 以示超量程警告。

低电压检测: 供电时检测电池电压, 当低于2.5V时, LCD显示“ $\nabla$ ”欠压符号。

欠压关机功能: 当电池电压小于约2.4V, LCD显示“ $\nabla$ ”欠压符号同时出现“Lo. bt”界面, 界面持续约10秒钟后, 蜂鸣器连续发出“滴滴”声, 发出三次后, 仪表自动关机(不显示任何界面)。

## 十. 技术指标

准确度:  $\pm$ (%读数+字数), 校准期为一年。

环境温度湿度: 23°C $\pm$ 5°C;  $\leq 80\%RH$ 。

温度系数: 准确度温度条件18°C至28°C, 环境温度波动范围稳定在 $\pm 1^\circ C$ 内。当温度 $< 18^\circ C$ 或 $> 28^\circ C$ 时, 附加温度系数误差 $0.1 \times$ (指定准确度)/°C。

### (1) 交流电流

量程	分辨率	准确度	过载保护
4.000A	0.001A	$\pm$ (4%+10)	420A
40.00A	0.01A	$\pm$ (2%+10)	
400.0A	0.1A	$\pm$ (1.0%+5)	
电流频率监测: 50Hz~100Hz	0.1Hz	$\pm$ (1.0%+5)	

\* 频率响应: 50Hz~100Hz;

\* 4A量程开路允许有<3个字剩余额数;

\* 准确度保证范围: 1%~100%量程;

\* 电流频率输入电流幅度应 $> 2A$ ;

### (2) 交流电压

量程	分辨率	准确度	过载保护
4.000V	0.001V	$\pm$ (1.0%+5)	600Vrms
40.00V	0.01V	$\pm$ (0.8%+5)	
400.0V	0.1V	$\pm$ (0.8%+5)	
600V	1V	$\pm$ (1.0%+5)	
电压频率监测:10Hz~10kHz	0.01Hz~0.01kHz	$\pm$ (1.0%+5)	

### 注意:

● 电压输入阻抗均约10M $\Omega$ ;

● 电压频率: 45Hz~400Hz, 显示真有效值;

● 电压量程准确度保证范围: 1~100%量程; 电压频率输入电压幅度应 $> 5V$ ;

● 交流波形因素, 在4000counts满度值时可达3.0。在6000满度值测量非正弦波时只能达1.8, 相应的波形因素按如下增加误差:

A. Add 3%在波形因素为1~2

B. Add 5%在波形因素为2~2.5

C. Add 7%在波形因素为2.5~3

### (3) 直流电压

量程	分辨率	准确度	过载保护
400.0mV	0.1mV	$\pm$ (0.7%+3)	600Vrms
4.000V	0.001V	$\pm$ (0.5%+2)	
40.00V	0.01V	$\pm$ (0.7%+3)	
400.0V	0.1V	$\pm$ (0.7%+3)	
600V	1V	$\pm$ (0.7%+3)	

输入阻抗 $\geq 10M\Omega$ ;

mV量程短路允许有 $\leq 5$ 个字数, 其它量程短路归零;

准确度保证范围: 1%~100%量程;

### (4) 电阻

量程	分辨率	准确度	过载保护
400.0 $\Omega$	0.1 $\Omega$	$\pm$ (1.0%+2)	600Vrms
4.000k $\Omega$	0.001k $\Omega$	$\pm$ (0.8%+2)	
40.00k $\Omega$	0.01k $\Omega$	$\pm$ (0.8%+2)	
400.0k $\Omega$	0.1k $\Omega$	$\pm$ (0.8%+2)	
4.000M $\Omega$	0.001M $\Omega$	$\pm$ (2.0%+5)	
40.00M $\Omega$	0.01M $\Omega$	$\pm$ (2.0%+5)	

### (6) 导通测试

量程	分辨率	准确度	过载保护
400.0 $\Omega$	0.1 $\Omega$	$< 10\Omega$ 蜂鸣器发声, $> 31\Omega$ 蜂鸣器不发声 开路电压约2.0V	600Vrms

### (6) 二极管测试

量程	分辨率	准确度	过载保护
4.000V	0.001V	开路电压约2.2V (UT202A+约3.9V), 可测量PN结约 $\leq 2V$ 正向压降值。硅PN 结正常电压值约为 0.5~0.8V。	600Vrms

### (7) 电容

量程	分辨率	准确度	过载保护
4.000nF	0.001nF	$\pm$ (4.0%+10)	600Vrms
40.00nF	0.01nF		
400.0nF	0.1nF		
4.000uF	0.001uF	$\pm$ (4.0%+5)	
40.00uF	0.01uF		
400.0uF	0.1uF		
4.000mF	0.001mF	$\pm$ (10%)	

被测值=测量显示值-表笔开路值

( $\leq 100nF$ 被测电容建议采用REL模式测量);

电容档开路状态下可能有残余读数(最大20字)

### (8) 温度

量程	分辨率	准确度	过载保护
-40°C~40°C	1°C	$\pm 4^\circ C$	600Vrms
40°C~500°C		$\pm$ (1.5%+5)	
500°C~1000°C		$\pm$ (2.0%+5)	
-40°F~104°F	1°F	$\pm 6^\circ F$	
104°F~932°F		$\pm$ (2.0%+6)	
932°F~1832°F		$\pm$ (2.5%+4)	

## (9) NCV

量程	电场感测条件	准确度
NCV	EFL0	电场感测灵敏度分2级(EFHI和EFL0), 产品开机默认EFHI模式 1) 紧贴导线可感测24V $\pm$ 6V以上的交流电压, 在工频电压的110V条件下建议设置HFL0模式。 2) 在网电220V的条件下下设为EFHI模式, 紧贴导线可感测74V $\pm$ 12V以上的交流电压, 可感测市电插座是否带电, 或根据感应的强弱判断插座的零、火线。 注: 不同类型的插座设计或不同的电线绝缘厚度可能会影响到产品的测试结果。
	EFHI	

## 十一. 保养和维护(见图7)

**警告:** 在打开底盖前为避免电击, 请移开测试表笔。

1. 当仪表不使用时, 应尽量将开关置于OFF档位, 避免电池能量持续消耗。

2. 一般维护

a. 本仪表的维修与服务必须由有资格的专业维修人员或指定的维修部门完成。

b. 定期性使用干布去清洁外壳, 但不得使用含有研磨剂或溶剂成份的清洁剂。

3. 电池安装或更换

本产品的电源为2节AAA 1.5V电池, 请按下列顺序安装或更换电池:

a. 本产品关机, 请移开位于输入端之测试表笔。

b. 将本产品面板朝下, 并旋开电池盒螺丝, 拔下电池盖, 取出电池, 按照极性指示安装新电池。

c. 安装新的电池后, 装上电池盖, 并锁上螺丝即可。

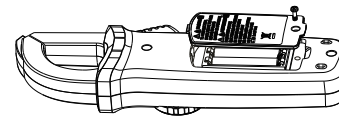


图7