

UNI-T[®]

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User's Manual

UTE9811+ Smart Digital Power Meter

Preface

Thank you for purchasing this brand new UNI-T product. In order to use this product safely and correctly, please read this manual thoroughly, especially the safety notes.

After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

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If the product is proved to be defective within the warranty period, UNI-T reserves the rights to either repair the defective product without charging of parts and labor, or exchange the defected product to a working equivalent product. Replacement parts and products may be brand new, or perform at the same specifications as brand new products. All replacement parts, modules, and products become the property of UNI-T.

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Guarantee Limit

This warranty shall not apply to any defects or damages caused by accidental, machine parts' wear and tear, improper use, and improper or lack of maintenance. UNI-T under the provisions of this warranty has no obligation to provide the following services:

- a) Any repair damage caused by the installation, repair, or maintenance of the product by non UNI-T service representatives.
- b) Any repair damage caused by improper use or connection to an incompatible device.
- c) Any damage or malfunction caused by the use of a power source which does not conform to the requirements of this manual.
- d) Any maintenance on altered or integrated products (if such alteration or integration leads to an increase in time or difficulty of product maintenance).

This warranty is written by UNI-T for this product, and it is used to substitute any other express or implied warranties. UNI-T and its distributors do not offer any implied warranties for merchant ability or applicability purposes.

For violation of this guarantee, regardless of whether UNI-T and its distributors are informed that any indirect, special, incidental, or consequential damage may occur, UNI-T and its distributors shall not be responsible for any of the damages.

Safety Instructions

To avoid possible electric shock and personal safety problem, please follow the instructions below. Uni-Trend will not be responsible for the personal safety and property damage caused by the user's failure to comply with the following terms.

1. Do not use the damaged instrument. Before using, please check the outer shell whether has crack or plastic lack. Do not use the instrument in flammable and explosive gas, steam or dusty environment.
2. Only trained personnel can execute maintain procedure to avoid fire and personal injury; there must be personnel supervision in use, otherwise it should be turned off the instrument and its power supply.
3. Before connecting the instrument, observe all marks on the instrument to learn more about the rated value, warnings and Notes.
4. The power supply of the instrument is 100-240VAC, 50/60Hz.
5. The instrument is equipped with three core power cord, only use the power cord provided by the manufacturer to avoid accidental injury; do not plug and unplug the power cord when the instrument is energizing; do not put other objects on the power cable when using it, and ensure that the power cable is away from heat source.

6. Instrument grounding: To prevent the risk of electric shock, please connect the power ground wire.
7. Do not install substitutes or perform unauthorized changes; do not use the instrument when the outer shell opened or looseness.
8. During the test, do not touch terminal blocks and test line to prevent from electric shock; do not plug the communication port; do not put article on the instrument to protect the instrument, especially pay attention not to let metal chips, water, oil and other liquids into the internal the interior of the instrument, otherwise, it may cause unpredictable and serious consequences.
9. Avoid exposed circuits, do not touch exposed connectors and components after the power is turned on.
10. Use the appropriate fuse, only with the fuse type and rating indicator specified for this product.
11. Do not use the instrument that work abnormally; if you suspect that the product has malfunctioned, let qualified maintenance personnel to check the instrument.
12. Unplug the power cord from the power outlet if the instrument is not to be used for a long time. Please do not pull the power cord to unplug it; if the instrument need to move, please make sure the power line and other connecting line is pulled out and use the carrying handle on the side of the instrument, be gentle with it to prevent collision.

Environmental Condition

The instrument can only use indoors and non-condensing area, the general environmental requirements shown as below table.

Environmental Condition	
Operating Environment	5°C ~ 40°C, 20% ~ 80%RH (non-condensing)
Accuracy guaranteed temperature and humidity temperature	23°C±5°C, 30% ~ 75% R.H.
Storage temperature	-10°C ~ 50°C, non-condensing below 80% R.H.
Operating altitude	≤2000 meters

Explanation: In order to ensure the measurement accuracy, it is recommended to start the operation after half an hour to warm-up the machine.

Chapter 1 Inspection and Installment

1.1 Check Packing List

Check with packing list to confirm that accessories has no loss or abnormal. If there have any problem, please contact with UNI-T distributor or manufacture.

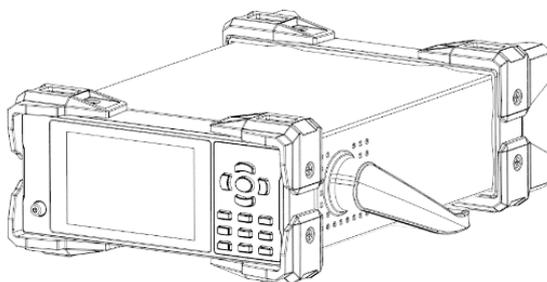
No.	Components	Quantity	Remark
1	Digital power meter	1	UTE9811+
2	Power cable	1	
3	RS-232 communication line	1	
4	User's manual	/	Please download from official website. http://www.uni-trend.com

Explanation: After confirming that the contents of the package are consistent and there are no problems, please keep the box and related contents properly, the instrument should meet the encasement requirements if it return to the factory for service.

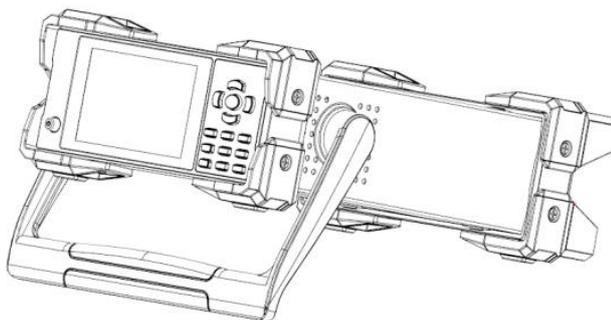
1.2 Hand Shank

The hand shank can be adjustment, hold the hand shank in both hands and then pull out two flanks to twist it, it can be adjust to four positions shown as the following figure.

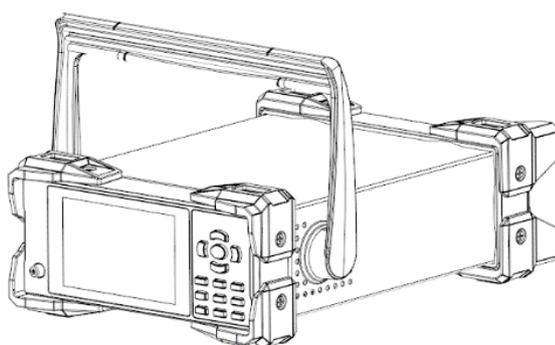
1. Original Position (Factory Setting)



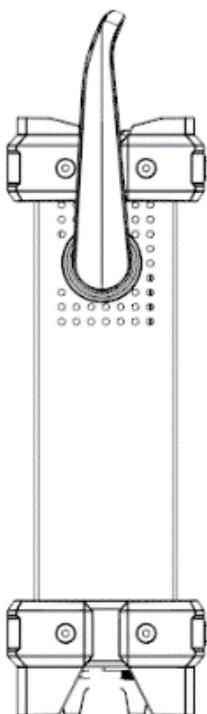
2. Testing Position



3. Remove Hand Shank



4. Lift Position



Chapter 2 Product Introduction

2.1 Product Overview

UTE9811+ smart digital power meter is an economic and portable measuring instrument. It is a multi-functional measuring instrument which integrating voltage, current, power, power factor and harmonic wave. The products is widely used in production, testing, evaluation and scientific research and multi-field.

UTE9811+ smart digital power meter adopts high speed CPU for data processing, the sampling resistance of voltage and current are all use low temperature drift resistor, therefore, the stability and accuracy of measurement data are guaranteed.

The instrument can measure voltage, current, power, power factor, frequency, voltage crest ratio and current crest ratio. It also has harmonic analysis and serial communication function.

The instrument has perfect functions, superior performance and simple operation. It meets the needs of high-speed measurement in production sites, as well as laboratory and R&D measurements. It is widely used in in the fields of lighting appliances, power tools, household appliances, electric motors and electric heating appliances of production lines, laboratories and quality inspection departments.

Characteristics

1. VA broken code screen display for intuitive reading.
2. Multi-window simultaneous display of voltage, current, power, power factor, frequency, voltage crest ratio, current crest ratio and harmonic measurement data.
3. Harmonic measurement adopts phase-locked loop (PLL) synchronization method. The maximum of harmonic analysis is 50 times.
4. Voltage and current range can switch automatically, It will help for improving the measurement accuracy.
5. Average function can make the reading more stable and it suitable for measuring the load or power with large variations.
6. Data upgrade period can be set. User can select a faster upgrade period according to the test needs, so as to improve the test efficiency.
7. Communication interface supports RS-232 and RS-485. Communication protocol supports SCPI and Modbus for communicating with computer and PLC.
8. It can freely set the upper and lower limit of current and power, the digital power meter will automatic judge whether the test value is exceed. Sound and light alarm indication, it is convenient for batch detection to improve the measurement efficiency.

2.2 Technical Index

Note: * f represent the frequency of input signal in the below table.

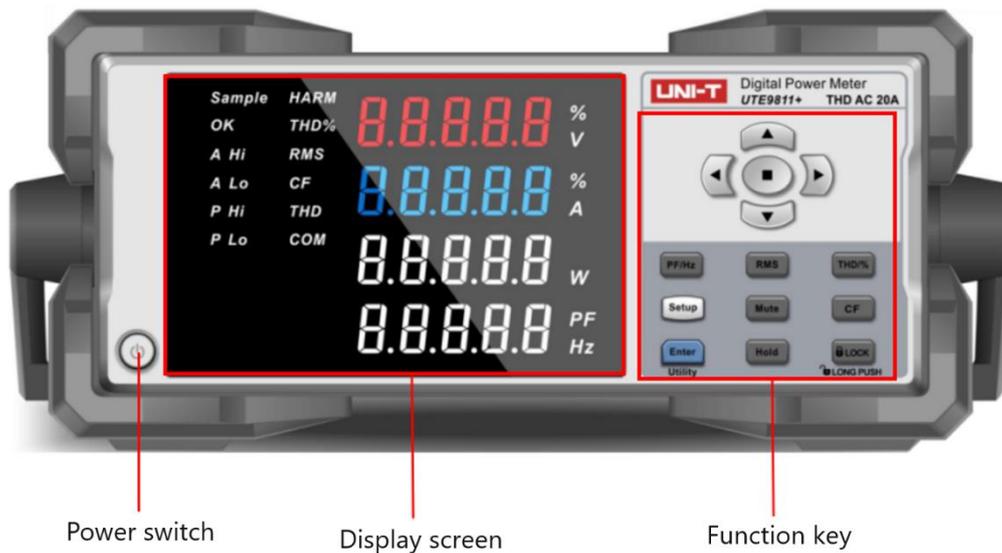
Model		UTE9811+
Display		VA broken code display, 5 digits, four windows
Display Update Rate		0.1S, 0.25S, 0.5S, 1S, 2S, 5S
Measuring Object		V,A,W,PF/HZ/THD/CF
Measuring Mode		AC
Measuring Range of Voltage		3.0V-600V
Voltage Range		75V/150V/300V/600V
Accuracy of Voltage		40Hz≤f≤70Hz: ±(0.4% reading+ 0.1 range+1 character)
Voltage Resolution		0.01V/0.1V
Measuring Range of Current		5.0mA~20.0A
Current Range		200mA/1A/4A/20A
Accuracy of Current		40Hz≤f≤70Hz: ±(0.4% reading+ 0.1 range+1 character)
Current Resolution		0.001A
Switching Range		Auto
Power Range		1W~12kW
Accuracy of Power		40Hz≤f≤70Hz: ±(0.4% reading+ 0.1 range+1 character)
Power Resolution		0.01W/0.1W/1W
Power Factor Range		-1.000~1.000
Accuracy of Power Factor		±(0.004 + 0.001* reading +1 character)
Frequency Range		40Hz~70Hz
Accuracy of Frequency		±(0.1% reading +1 character)
Auto Range	Voltage Range Increasing	Urms exceeds the measuring range about 110 %(CF < 2)
Switching	Voltage Range Decreasing	Urms is less than the lower part range about 80 %(CF < 2)

	Current Range Increasing	I _{rms} exceeds the measuring range about 110 % (CF < 2)
	Current Range Decreasing	I _{rms} is less than the lower part range about 60 % (CF < 2)
Harmonic Analysis Times		1~50
Accuracy of Harmonic		±(0.3% range +5% reading+1 character)
Pre-heating Time		>30 minutes
Current Peak		The maximum display 24A
Maximum of Allowed Input for Continuous		Voltage 700V, Current 24A
Maximum of Allowed Input for Instant		1000V, 40A(1 min)
Input Impedance		Voltage about 2 MΩ, Current is less than 0.02Ω
Upper/Lower limit	Four settings for the upper/lower limit of power and current	
	P Hi (Power high),	
	P Lo (Power low),	
	A Hi (Current high),	
	A Lo (Current low)	
Average Function		√
Interface	RS232 (DB9 ; 2 pin: TX, 3-pin: RX, 5-pin: GND)	
	RS485(DB9 ; 8-pin: A, 9-pin: B)	
Baud Rate		4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K, default 9600. It follows communication protocol of standard SCPI and Modbus-RTU.
Display Hold		√
Mute		√
Lock Key		√
Power Source		Input power: AC 100V~240V Frequency 50/60Hz

Precision Environment	18°C~28°C , 30%~75%RH (28°C < operating temperature <18°C(when in 18°C, it needs to add temperature coefficient): reading of 0.05%/°C)
Storage Temperature	-10°C~50°C , non-condensing below 80% RH
Operating Altitude	≤2000 meters
General Characteristic	
Color	Gray
Weight	3.2kg
Size	214mm×88mm×340mm
Standard Accessories	Specialized power cable x1; RS232 serial port line X1
Optional Accessories	UTE-L10A 10A three-pronged plug convert banana head plug connection cable x1
	UTE-L16C 16A connection cable with alligator clip x1
	UTE-L16A 16A three-pronged plug convert banana head plug connection cable x1
Standard Packing Quantity	2
Standard Packing Size	400mm*300m*325mm
Gross Weight of Standard Packing	9kg

2.3 Front Panel

The front panel and function of UTE9811+, as shown in the following figure.



Power switch

Display screen

Function key

2.3.1 Key function on the front panel

Key Function	Symbol	Description
Power Switch		Press one time to turn "ON", the power source is enabled, press it again to turn "OFF", the power source is disabled.
Left, Right Key		Switch sub-menu: Use left, right key to select the sub-menu that need to be edited. Number editing: Use left, right key to select the data bit that need to be edited. For description, use "←", "→" to indicate the two keys in the manual.
Up, Down Key		Menu editing: Use up, down key to select function item. Number editing: Use up, down key to increase or decrease the numerical value. For description, use "↑", "↓" to indicate the two keys in the manual.
Decimal Point Key		Number editing: To move decimal point
Display Hold		Data hold key, when the key is activated, it will keep display the current data.
PF/Hz		To select the fourth line to display power factor or frequency.
TRMS/ Total RMS of Harmonic		Press this key to enter TRMS display interface, press it again to enter total RMS of harmonic display interface.
Measurement value of Harmonic/ Harmonic Distortion Factor		Press this key to enter harmonic distortion factor display interface, press it again to enter measurement value of harmonic display interface.

Setup Key		Enter Setup menu, this menu is to editing the configuration data of measurement, alarm and communication.
Mute Key		The beeper can be mute when over the limit (mute alarm). Press the key to activate mute key and the indicator will be illuminated; press it again to relieve the mute and the indicator will be extinguished.
Crest Factor		To enter crest factor display interface.
Enter or Utility Key		Enter Key: Short press is to activate confirm key to save the currently edited data. Utility Key: Long press is to activate Utility key to enter Utility menu.
Lock Key		Press this key and the indicator will be illuminated. Long press to unlock the key and the indicator will be extinguished.

2.3.2 Display and Symbol

Display and Symbol	Description
	Four display windows; Display measurement data: The display screen can display V (voltage), A (current), W (power), PF (power factor)/Hz (frequency) and measurement value of harmonic at the same time. Menu editing: Display menu
Sample	An upgrade symbol of measurement data.
OK , A Hi , A Lo , P Hi , P Lo	Alarm Symbol OK: Measurement value of the current and power within the upper/lower limit. A Hi: Measurement value of current is higher than the upper limit. A Lo: Measurement value of current is lower than the upper limit. P Hi: Measurement value of power is higher than the upper limit. P Lo: Measurement value of power is lower than the upper limit.
RMS	The current display data is RMS.
HARM	The current display data is the measurement data of harmonic.
CF	The current display data is crest factor.
THD	The current display data is the measurement value of harmonic.
THD%	The current display data is the harmonic distortion factor.
COM	It's a symbol of communication, it represents the upper computer communicating with power meter.

2.4 Digital and Character Display

The data display format of data display window is nixie tube. Due to the limitation of the format, special symbols are needed to represent each character, as shown in the following figure.

A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	1	2	3	4
5	6	7	8	9	0				

2.5 Rear Panel

The rear panel and function of UTE9811+, as shown in the following figure and table.



No.	Picture of parts	Description
1		Under test load/LOAD terminal, it usually used to connect to the input port of the product to be test.

2		Under test input terminal /SOURCE terminal, it usually used to connect to the output port of AC power.
3		Three-wire power socket and fuse
4		Ground terminal
5		RS232/RS485 communication interface

Chapter 3 Operating Preparation and Measurement Display

3.1 Operating Preparation

3.1.1 Connecting Power Cable

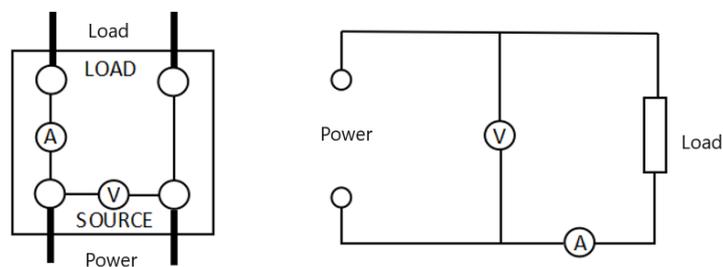
The operating voltage of the instrument is 100V~240V(50/60Hz), please make sure the power supply is within the rated voltage of this instrument, and make sure the instrument is well grounded.

Warning: Please make sure that the power supply voltage matches the supply voltage before turning on the power supply, otherwise the instrument will be burned out.

Notes: The instrument should be used under the recommended working conditions. Never use the instrument in a place where have flammable or explosive materials, it may cause safety injuries.

3.1.2 Connecting Test Circuit

Please follow the following figure to connect the power and load, and make sure voltage and current is within the measurement range of the instrument.



Warning:

1. The load current flows along the thick wire in the above diagram, so these wires should have a large enough safe load capacity.
2. The power supply of the load and the power supply of the instrument should be turned off when wiring

at the load end.

Notes:

- 1) When measuring large current/voltage or the current includes high frequency, it should pay attention to possible mutual interference and noise problems when wiring.
- 2) The lead wire should as short as possible.
- 3) Use heavy gauge wire as can as possible when measuring current.
- 4) To reduce the distributed capacitance to ground, the wire and grounding wire should be as far away from the instrument housing as possible.

3.1.3 Turn ON/OFF Power Supply

Turn on: Start self-check program when the instrument is enabled, the instrument will enter the measuring state if the check result is correct.

Turn off: The upper/lower limit of current and power will be saved when the power has been turned off.

Notes: After turn off the power, wait for 5 seconds to turn on again, otherwise the instrument may abnormally display.

3.1.4 Power-on Measurement

Firstly, plug in the power socket on the rear panel, and use the specified voltage, the power socket should be with a ground wire. After checking the wiring is connect rightly, turn on the instrument switch located at the front panel, and the instrument will enter the measurement state. Apply power to the load and read out the required measurement value from the display on the front panel of the instrument after the load has been working stably.

Notes: The instrument should be preheated for 30 minutes before entering the stable state. After cutting off the instrument power, it should wait for more than 5 seconds before powering it on again. It is strictly forbidden to switch the power on and off repeatedly within a short period of time, which will cause the instrument life to shorten and may cause instrument failure. When the measurement is finished, turn off the instrument power and unplug it to prevent possible damage to the instrument caused by lightning strikes.

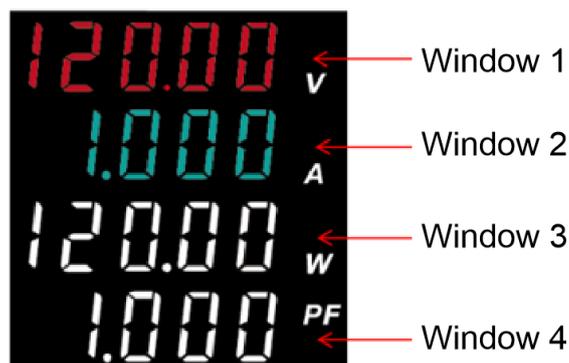
3.2 Measurement Display

3.2.1 Window Display

UTE9811+ has four display windows, it can display different measurement value at the same time, as shown in the following table.

No.	Window Display	Name	Measurement Range
1	V	Voltage (volt)	U: 3.0V ~ 600V
2	A	Current (Ampere/milliamperere)	I: 0.0005A ~ 20A
3	W	Active power (Watt)	P: 0.001W ~ 12kW
4	PF	Power factor	PF: -1.000~1.000
	Hz	Frequency (Hertz)	Hz: 40Hz ~ 70Hz

The four window display as shown in the following figure.



3.2.2 Alarm for Over Range

These situations will be regarded as over range.

1. The measured value of voltage and current exceeds 120% of the rated range;
2. The peak value of voltage and current exceeds 170% of the rated range;

"--OL--" will be appear when the range is exceeded.

3.2.3 Alarm for the Lower Measured Value

The alarm will be appear if the measured value of voltage is less than 3V or the measured value of current is less than rated value 0.1%.

1. Voltage, current, power displays "0".
2. Power factor displays "-----".

3.2.3 Alarm for Break Off

When switch measurement range and function, "-----" will be appear for a while.

3.2.4 Alarm for Auto Range Switching

UTE9811+ supports auto range, it can adjust the range according to the size of input signal. The adjustment interface as shown in the following figure.



Window 2: the current voltage range, "600V", "300V", "150V", "75V".

Window 4: the currently current range, "20A", "4A", "1A", "0.2A".

When the instrument is only adjust the voltage range, window 3, 4 will display "----".

When the instrument is only adjust the current range, window 1, 2 will display "----".

3.2.5 Hold (Data-Hold)

Press Hold key and the indicator will be illuminated, the measurement value will keep display and the data will not refresh. Press it again, the indicator will be extinguished and the data will be update.

3.2.6 Lock (Lock Key)

To prevent from error operating during measurement, lock key function can set other key be invalid (Lock state). Press Lock key and the indicator light will be illuminated. This key will be no response. It need to long press Lock key for 1s and the indicator light will be extinguished. After that, the key will turn to enable state.

3.3 Display Measurement Value

UTE9811+ supports multiple parameter measurement. Press different keys to enter different parameter measurement interface.

3.3.1 TRMS

After the instrument is boot-up, the instrument will automatic enter TRMS display interface. In other interface, press **【RMS】** key to enter TRMS display interface.

Notes: If press **【RMS】** key multiple times, the system switches between the TRMS display interface and the

total RMS of harmonic display interface, please select the appropriate interface. The following figure is TRMS display interface.



Window 1: the measured value of voltage, the unit is V.

Window 2: the measured value of current, the unit is A.

Window 3: the measured value of power, the unit is W.

Window 4: the measured value of power factor (PF) or frequency (Hz) , it can be switch by press **【PF/HZ】** key.

3.3.2 Crest Factor

Press **【CF】** key to enter crest factor display interface, as shown in the following figure.



Window 1: the measured value of voltage crest factor, no unit. The measured value of voltage crest factor= Voltage crest value/ TRMS Voltage. When no voltage signal is input, it displays "-----".

Window 2: the measured value of current crest factor, no unit. The measured value of current crest factor= Current crest value/ TRMS Current. When no current signal is input, it displays "-----".

Window 3: the measured value of power, the unit is W.

Window 4: the measured value of power factor (PF) or frequency (Hz) , it can be switch by press **【PF/HZ】** key.

3.3.3 Total RMS of Harmonic

Press **【RMS】** key to enter the total RMS of harmonic display interface.

Notes: If press **【RMS】** key multiple times, the system switches between the TRMS display interface and the total RMS of harmonic display interface, please select the appropriate interface. The following figure is the total RMS of harmonic display interface.



Window 1: the total RMS voltage (operation value) of 1~50 times, the unit is V.

Window 2: the total RMS current (operation value) of 1~50 times, the unit is A.

Window 3: the total RMS active power (operation value) of 1~50 times, the unit is W.

Window 4 is fixed to display "RMS".

- When no voltage signal is input or voltage frequency is over the range, Window 1, 2, 3 displays "-----".

3.3.4 Measured Value of Harmonic

Press **【THD/%】** key to enter the measured value of harmonic display interface.

Notes: If press **【THD/%】** key multiple times, the system switches between the measured value of harmonic display interface and the harmonic distortion display interface, please select the appropriate interface. The following figure is the measured value of harmonic display interface.



Window 4 displays "tHD" or "or01"~"or50". "tHD" represents the total harmonic distortion; "or01"~"or50" represents the currently selected harmonic times. The display item of window 4 can switch by **【↑】** or **【↓】**.

【 ↑ 】 or 【 ↓ 】 key supports continuous press function, long press the two keys to quickly switch the display item.

• When window 4 displays "tHD",

Window 1: the measured value of the voltage total harmonic distortion, the unit is V.

Window 2: the measured value of the current total harmonic distortion, the unit is A.

Window 3: the total RMS power (operation value) of 1~50 times, the unit is W.

• When window 4 displays "or01"~"or50",

Window 1: the voltage measured value of the current harmonic times, the unit is V.

Window 2: the current measured value of the current harmonic times, the unit is A.

Window 3: the total RMS power (operation value) of 1~50 times, the unit is W.

• When no voltage signal is input or voltage frequency is over the range,

Window 1, 2, 3 displays "-----".

• When no current signal is input,

Window 2 displays "-----".

3.3.5 Harmonic Distortion Factor

Press 【 THD/% 】 key to enter harmonic distortion factor display interface.

Notes: If press 【 THD/% 】 key multiple times, the system switches between the measured value of harmonic display interface and the harmonic distortion display interface, please select the appropriate interface. The following figure is harmonic distortion factor display interface.



Window 4 displays "tHD" or "or01"~"or50". "tHD" represents the total harmonic distortion; "or01"~"or50"

represents the currently selected harmonic times. The display item of window 4 can switch by **【 ↑ 】** or **【 ↓ 】**.

【 ↑ 】 or **【 ↓ 】** key supports continuous press function, long press the two keys to quickly switch the display item.

•When window 4 displays“tHD”,

Window 1: voltage total harmonic distortion factor, the unit is %.

Window 2: current total harmonic distortion factor, the unit is %.

Window 3: the total RMS power (operation value) of 1~50 times, the unit is W.

•When window 4 displays“or01”~“or50”,

Window 1: voltage distortion factor of the current harmonic times, the unit is %.

Window 2: current distortion factor of the current harmonic times, the unit is %.

Window 3: the total RMS power (operation value) of 1~50 times, the unit is W.

•When no voltage signal is input or voltage frequency is over the range,

Window 1, 2, 3 displays“-----”.

•When no current signal is input,

Window 2 displays“-----”.

Chapter 4 Measurement

4.1 Average Setting

·Step

1. Press **【SETUP】** key to enter SETUP menu, press **【←】** or **【→】** key to select submenu "AVG" as shown in the following figure;
2. Press **【ENTER】** key to enter the next option, and the press **【↑】** or **【↓】** key to select OFF, 8, 16, 32 or 64;
3. Press **【ENTER】** key to select the current selected option and save it;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit SETUP menu.



·Explanation

OFF represents the average function is disabled. 8, 16, 32, 64 represents the average function is enabled and the number of average.

Average

The average method is moving average, it is for power supply or load with great variation or the numerical value display is unstable, reading is difficult when the frequency of input signal is low.

Executing average measurement function as follows,

- (1) U, I, P, S, Q and λ (power factor) is calculated by the average value of Urms, Irms, P, S, Q.;
- (2) Each measured value of sub-harmonic and distortion factor and total RMS is calculated by the average value of the measured value of harmonic.

***Notes: S (apparent power), Q (reactive power) is only for the operation, it will not show on the display interface.**

Moving Average

According to the following formula, use the specified average number to calculating the moving average.

$$D_n = \frac{M_{n-(m-1)} + \dots + M_{n-2} + M_{n-1} + M_n}{m}$$

D_n : Display the numerical value after linear average of m item data from the n-(m-1) to the nth order

$M_{n-(m-1)}$: The numerical value data of n-(m-1) order

M_{n-2} : The numerical value data of n-2 order

M_{n-1} : The numerical value data of n-1 order

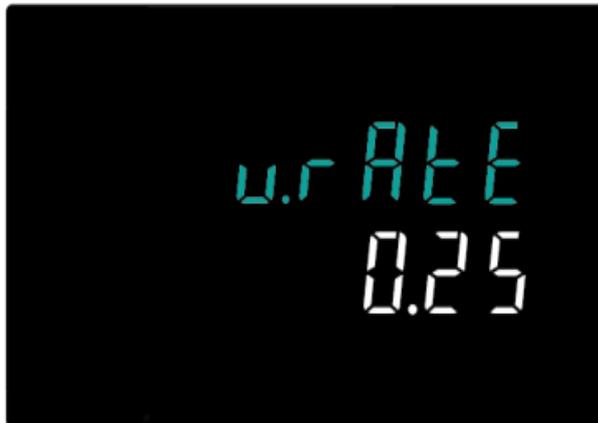
M_n : The numerical value data of n order

m : The number of average

4.5 Data Update Cycle

•Step

1. Press **【SETUP】** key to enter SETUP menu, press **【←】** or **【→】** key to select submenu "u.rate" as shown in the following figure;
2. Press **【ENTER】** key to enter the next option, and the press **【↑】** or **【↓】** key to select 0.1, 0.25, 0.5, 1, 2 or 5;
3. Press **【ENTER】** key to select the current selected option and save it;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit SETUP menu.



•Explanation

The data update cycle is the update interval of the sampled data of the measurement function. The data update cycle can set to 0.1s, 0.25s, 0.5s, 1s, 2s or 5s. The default is 0.25s.

4.3 Measurement Range

4.3.1 Manual Range

If the measurement range is set to manual range, the selected range will not be change even if the size of input signal changes.

The manual range can select from the following options.

Voltage range: 600V, 300V, 150V, 75V.

Current range: 20A, 4A, 1A, 0.2A.

***Notes:** UTE9811+ is only supports auto range in normal mode, not support manual range. If need to set manual range in some condition, please refer to UTE9811+ Auxiliary Function.

4.3.2 Auto Range

If the measurement range is set to auto range, the instrument will synchronous switch range according to the size of input signal. UTE9811+ is only supports auto range in normal mode.

Voltage Range Increasing

The voltage range will increasing when any one of the following condition is met.

Urms exceeds measurement range about 110%.

Upk exceeds measurement range about 170%.

Voltage Range Decreasing

The voltage range will decreasing when any one of the following condition is met.

Urms is less than the lower part range about 80%.

Upk is less than the lower part range about 170%.

Current Range Increasing

The current range will increasing when any one of the following condition is met.

Irms exceeds measurement range about 110%.

Ipk exceeds measurement range about 170%.

Current Range Decreasing

The current range will decreasing when any one of the following condition is met.

Irms is less than the lower part range about 60%.

Ipk is less than the lower part range about 170%.

Chapter 5 Alarm

5.1 Upper/Lower Limit of Current and Power

·Step

1. Press **【SETUP】** key to enter SETUP menu, press **【←】** or **【→】** key to select one of submenu "A-Hi", "A-Lo", "P-Hi" or "P-Lo" as shown in the following figure;
2. Press **【ENTER】** key to enter numerical value editing state, press **【↑】** **【↓】** **【→】** **【←】** **【】** key to edit the numerical value;
3. Press **【ENTER】** key save the setting;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit SETUP menu.



·Explanation

"A-Hi" represents the upper limit of current. "A-Lo" represents the lower limit of current.

"P-Hi" represents the upper limit of power. "P-Lo" represents the lower limit of power.

*Notes: when editing the numerical value, the lower limit cannot be greater than the upper limit. Otherwise it will prompt "--oF--" and the setting cannot be saved when press **【Enter】** key.

5.2 Alarm Delay

·Step

1. Press **【SETUP】** key to enter SETUP menu, press **【←】** or **【→】** key to select submenu "tiME" as shown in the following figure;
2. Press **【ENTER】** key to enter numerical value editing state, press **【↑】** **【↓】** **【→】** **【←】** key to edit the numerical value;
3. Press **【ENTER】** key save the setting;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit SETUP menu.



Explanation

The unit of alarm delay is S, the range can set to 0~99.9.

5.3 Alarm Function

·Turn on/off Alarm Function

When the upper/lower limit is different but as "0", it represents the alarm function is enabled.

When the upper/lower limit is "0" at the same time, it represents the alarm function is forbidden.

·Alarm Function

After the alarm function is enabled, the system waits to connect the load. When the system detects the voltage and current are both greater than "0", it will recognize the load is connected and start to count the time.

After the alarm delay, the system will compare the measured value with the upper/lower limit, if the measured value is within the upper/lower limit, the interface displays "OK"; if the measured value is higher than the upper limit, the interface displays "Hi", and the beeper will alarm; if the measured value is lower than the lower limit, the interface displays "Lo", and the beeper will alarm. When the load is removed, the system waits for load access again, the alarm sign is eliminated, and the beeper is turned off.

Chapter 6 Communication

6.1 Communication Command

·Step

1. Press **【SETUP】** key to enter SETUP menu, press **【←】** or **【→】** key to select submenu "CoMAd" as shown in the following figure;
2. Press **【ENTER】** key to enter the next option, and the press **【↑】** or **【↓】** key to select "SCPI" or "Modbus";
3. Press **【ENTER】** key to select the current selected option and save the setting;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit SETUP menu.



·Explanation

UTE9811+ supports SCPI and Modbus communication command.

"Modbus" represents "Modbus" communication command. Modbus is only support RTU mode. The detailed command can refer to *UTE9811+ Smart Digital Power Meter -SCPI Programming Manual* and *UTE9811+ Smart Digital Power Meter -Modbus Programming Manual*

6.2 Baud Rate

·Step

1. Press **【SETUP】** key to enter SETUP menu, press **【←】** or **【→】** key to select submenu "bAud" as shown in the following figure;
2. Press **【ENTER】** key to enter the next option, and the press **【↑】** or **【↓】** key to select 4800, 9600, 19200, 38400、57600 or 115200;
3. Press **【ENTER】** key to select the current selected option and save the setting;

4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit SETUP menu.



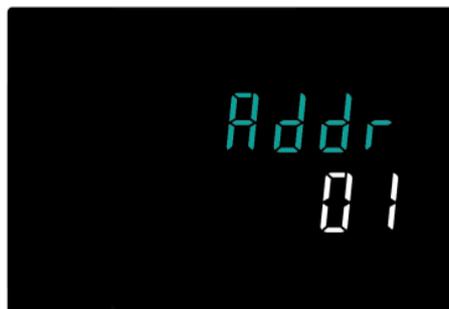
·Explanation

UTE9811+ supports RS232 and RS485 interface, both interfaces have the same baud rate, so it can be set by the method in this section.

6.3 Modbus Communication Address

·Step

1. Press **【SETUP】** key to enter SETUP menu, press **【←】** or **【→】** key to select submenu "Addr" as shown in the following figure;
2. Press **【ENTER】** key to enter numerical value editing state, press **【↑】** **【↓】** **【→】** **【←】** key to editing numerical value;
3. Press **【ENTER】** key to save the setting;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit SETUP menu.



·Explanation

Only when the communication command sets to Modbus, submenu "Addr" can display. The setting method of communication command can refer to section 6.1

The communication address range of Modbus is 1-99.

Chapter 7 System Function

7.1 Initialization

·Step

1. Long press **【ENTER】** (Utility) key to enter Utility menu, and the submenu is "init" as shown in the following figure;
2. Press **【ENTER】** key to enter the next option, and the press **【↑】** or **【↓】** key to select NO or YES;
3. Press **【ENTER】** key to select the current option;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit Utility menu.



·Explanation

The setting parameter can be initialize and restore it to the factory setting. This function is very useful for cancelling all the setting or restarting execute measurement function. The factory setting can see as the following table.

Item	Default Setting
Display Window 4	Display function: PF
Date Update Cycle	0.25s
Average Function	OFF
Upper/lower limit of current and power	"0"
Alarm Delay	"0"
Data Hold	OFF
Mute	OFF

*Notes: The item cannot be restore to the factory setting: the relevant setting of communication (communication command, baud rate, Modbus communication address) and user's grade.

7.2 View Software Information

·Step

1. Long press **【ENTER】**(Utility) key to enter Utility menu, press **【←】** or **【→】** key to select submenu "Ver" as shown in the following figure;
2. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit Utility menu.



·Explanation

"**F-1.03**" represents firmware version; "**H-1.01**" represents hardware version.

7.3 User's Grade

·Step

1. Long press **【ENTER】** (Utility) key to enter Utility menu, press **【←】** or **【→】** key to select submenu "LEVEL" as shown in the following figure;
2. Press **【ENTER】** key to enter secret code editing, press **【↑】** **【↓】** **【→】** **【←】** key to edit secret code;
3. Press **【ENTER】** key to confirm the setting, if the secret code is correct, then it can enter next step;
4. Press **【↑】** or **【↓】** key to switch "High" or "norm";
5. Press **【ENTER】** key to select the current option and save it;
6. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit Utility menu.



·Explanation

“norm” represents that the instrument only supports normal function. “High” represents that the instrument supports other auxiliary functions except only normal function. The default is “norm”. The auxiliary function can refer to *UTE9811+ Auxiliary Function*. After the user's grade is complete, reboot the instrument for the setting to take effect.

7.4 Firmware Update

·Step

1. Long press **【ENTER】** (Utility) key to enter Utility menu, press **【←】** or **【→】** key to select submenu “boot” as shown in the following figure;
2. Press **【ENTER】** key to enter secret code editing, press **【↑】** **【↓】** **【→】** **【←】** key to edit secret code;
3. Press **【ENTER】** key to confirm the setting, if the secret code is correct, then it can enter firmware update interface;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit Utility menu.



7.5 Calibration

·Step

1. Long press **【ENTER】** (Utility) key to enter Utility menu, press **【←】** or **【→】** key to select submenu "CALib" as shown in the following figure;
2. Press **【ENTER】** key to enter secret code editing, press **【↑】** **【↓】** **【→】** **【←】** key to edit secret code;
3. Press **【ENTER】** key to confirm the setting, if the secret code is correct, then it can enter calibration interface;
4. Press **【←】** or **【→】** key to select other submenu, or press **【SETUP】** key to exit Utility menu.



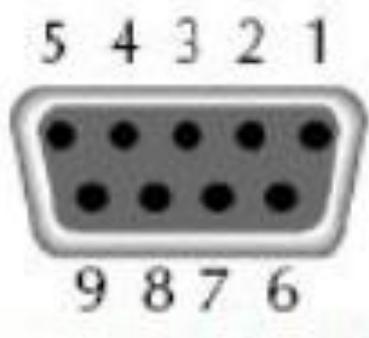
Chapter 8 Communication Interface

8.1 RS232 and RS485 Interface

UTE9811+ has standard RS232 and RS485 communication interface, PC or PLC can remote control UTE9811+ via SCPI or Modbus command.

•The Definition of Pin

UTE9811+ communication interface is DB9 female head, the definition of pin as shown in the following figure.



1	NC
2	TXD (RS232)
3	RXD (RS232)
4	NC
5	GND (RS232)
6	NC
7	NC
8	A(RS485)
9	B(RS485)

Communication Setting

Before operating communication, UTE9811+ should match with the following parameters of the control host.

(1) Baud Rate:

4800, 9600, 19200, 38400, 57600, 115200.

The setting method of baud rate for UTE9811+ can refer to section 6.2.

(2) Check bit: NONE (fixed value)

(3) Data bit: 8 (fixed value)

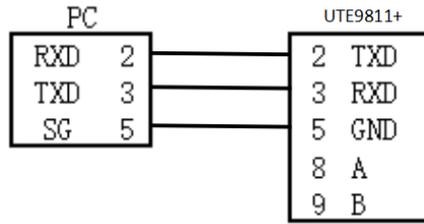
(4) Stop bit: 1 (fixed value)

8.2 Connecting Example

8.2.1 PC connect to UTE9811+ via RS232

- The number in block diagram represents the pin number of DB9 interface.
- Use direct serial port line to connect PC and UTE9811+. The factory provides direct serial port line.
- This connecting method supports SCPI and Modbus instruction.

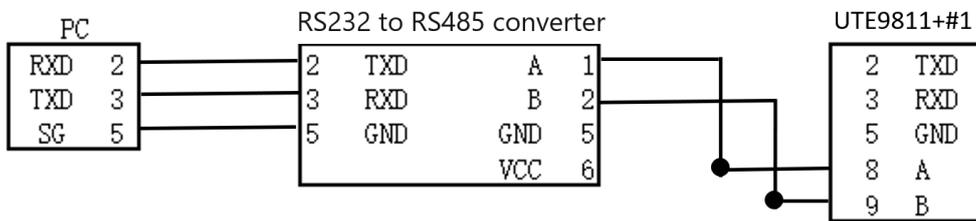
As shown in the following figure.



8.2.2 PC connect to a single UTE9811+ via RS485

- The number in block diagram represents the pin number of DB9 interface.
- Use direct serial port line to connect PC and the RS232 to RS485 convertor.
- This connecting method is only support Modbus instruction.

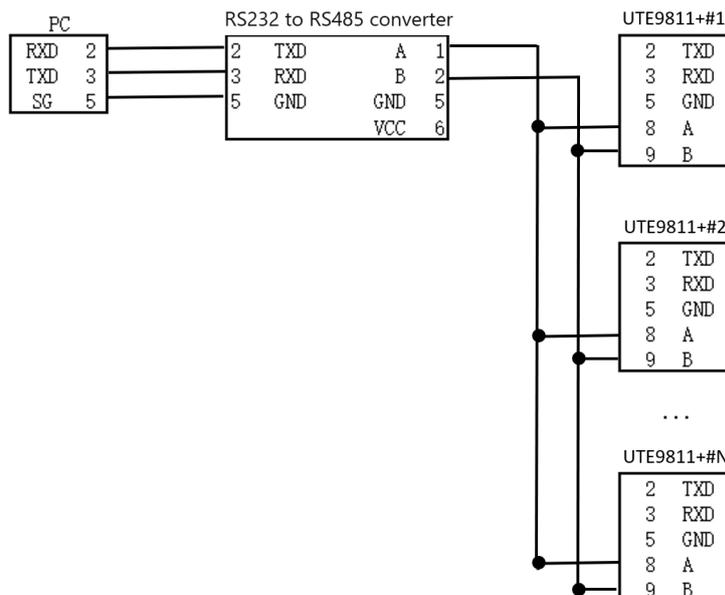
As shown in the following figure.



8.2.2 PC connect to multiple UTE9811+ via RS485

- The number in block diagram represents the pin number of DB9 interface.
- Use direct serial port line to connect PC and the RS232 to RS485 convertor.
- A , B port of the RS232 to RS485 convertor parallel connect to A , B port of multiple UTE9811+.
- This connecting method is only support Modbus instruction. The baud rate of the PC must be the same as that of each UTE9811+, and the IP address of each UTE9811+ must be different.

As shown in the following figure.



Chapter 9 Storage and Calibration

9.1 Notice Matters for Storage

9.1.1 The instrument should be stored in the environment which specified in the user manual, refer to Chapter 2.2 storage temperature in Technical Index table. Do not store the instrument in a place with high temperature, high humidity, temperature rapid change or easy condensation. The recommended storage environment is dry and at a temperature of about 20°C.

9.1.2 Keep product's packaging materials (cardboard boxes, padding, plastic bags, etc.) for later delivery of instruments. Using packaging materials to transport instruments can protect them from sudden temperature changes, shocks and vibrations, and protect them from damage during transportation.

9.1.3 Do not store the instrument in an environment with dust, fumes or chemical gases.

9.1.4 Avoid direct sunlight.

9.2 Trouble-shooting

No.	Problem	Solution
1	No widow display when enable the instrument	(1) Make sure the power cable is well connecting. (2) Make sure the supply power is within the allowed power range.
2	Displayed measurement value is incorrect	(1) Make sure the operating temperature and humidity within the allowed range. (2) Make sure the display is away from noise interference. (3) Check whether the test wire is well connecting. (4) Check whether the wire is connect correctly. (5) Check whether data display is in the lock state. (6) Reboot the instrument.
3	Key function failure	(1) Check whether key is stuck.
4	Communication failure	(1) Check whether communication cable is well connecting, (TX / RX or A / B signal is connect correctly) . (2) Check whether the instrument address, communication mode and baud rate is match with the upper computer.

Other situation refer to Notes in each chapter.

9.3 Notice Matters for Calibration

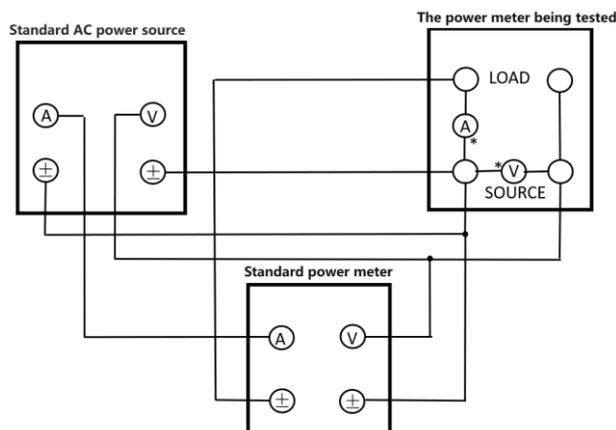
Verification and Calibration

The precision of standard meter should over a grade than measured meter, standard source should be stable. All the instrument power on 15 minute and wait it to stabilize, and then slowly adjust the output voltage or current of the standard AC source. Observing the standard meter to reading out the required value precisely, record the data of the standard meter and measured meter after the data is stable, and calculating the measuring error value to judge whether is within the error range. The requirements of environment temperature of verification and calibration as the following table.

Item	Reference Value or Range	Reference Value or Range
Environment temperature °C	23	±5
Environment humidity % RH	45 ~ 75	
Barometric pressure KPa	86 ~ 106	
AC power supply voltage V	100 ~ 240	±2%
AC power supply frequency Hz	50	±1%
Ac power supply waveform	Sine	$\beta = 0.05$
External electromagnetic field interference	Avoid	
Ventilation	Well-condition	
Sunlight	Avoid direct sunlight	

Notes: The inspect equipment should meet the specifications of the regular metrological verification, measurement period is one year.

Wiring scheme of verification and calibration as shown in the following figure.



Chapter 10 Optional and Fuse

10.1 Optional Testing Wire

Uni-trend company provides optional testing wire, there are three model UTE-L16A, UTE-L10A, UTE-L16C, as shown in the following figure. User can purchase one or multiple testing wires according your own needs. The following table is match solution for user to reference. Please note the specifications and the maximum current and voltage in the table.



Notes: The above figure is optional testing wire, not equipped with the instrument. It should purchase by your own.

Match Solution of Testing Wire

Match Solution	Name	Component and Name	Specification of Voltage/Current	Length	Recommended Appliance
Solution 1	10A testing wire and accessories	UTE-L10A 10A three-pronged plug convert banana head connect wire	250V/10A	1.2m	Small appliances, such as fan, hairdryer, rice cooker and other appliances with a current not exceeding 10A
		UTE-L16C 16A connect wire with alligator clip	220V/16A		
Solution 2	16A testing wire and accessories	UTE-L16A 16A three-pronged convert banana head connect wire	250V/16A	1.2m	High power appliances, such as air conditioner, electric water heater and other appliances with a current not exceeding 16A
		UTE-L16C 16A connect wire with alligator clip	220V/16A		

Connect scheme of testing wire as shown in the following figure.



Warning: Before connect with circuit, please make sure the power is cut off to prevent from electric shock.

10.2 Specification of Fuse

This instrument has 1 spare fuse stored in the fuse box. If the fuse was burned out, replace the fuse as the follow steps.

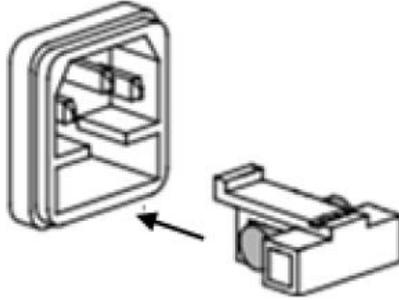
- 1) Pull out the power cable, use small screwdriver to take out the fuse box, as shown in the following figure.



If the fuse was burned out, please replace the same specification fuse with the instrument. The specification fuse with the instrument, see the following table.

Model	Specification of Fuse
UTE9811+	AC250V F0.5A

- 3) After the replacement, please put the fuse box back , as shown in the following figure.



Appendix 1 Symbol and Formula of Measurement

Normal Measurement

Measurement Function [Unit]	Operation Formula	Explanation
Voltage U [V]	$U = \sqrt{\frac{1}{N} \cdot \sum_{n=1}^N u(n)^2}$	u(n) represents instantaneous value of voltage; i(n) represents instantaneous value of current; N represents ADC sampling time within the measurement range.
Current I [A]	$I = \sqrt{\frac{1}{N} \cdot \sum_{n=1}^N i(n)^2}$	
Active power P [W]	$P = \frac{1}{N} \cdot \sum_{n=1}^N [u(n) \cdot i(n)]$	
Power Factor [PF]	$\frac{P}{U \cdot I}$	

Harmonic Measurement

Measurement Function [Unit]	Operation Formula	Explanation
Voltage U(k) [V]	$U(k) = \sqrt{U_r(k) + U_j(k)}$	k represents harmonics times, it is fundamental wave when k=1; r is the real part, j is imaginary part.
Current I(k) [A]	$I(k) = \sqrt{I_r(k) + I_j(k)}$	
Active power P(k) [W]	$P(k) = U_r(k) \cdot I_r(k) + U_j(k) \cdot I_j(k)$	
Total RMS voltage of 1~50 times U [V]	$U = \sqrt{\sum_{k=1}^{50} U(k)^2}$	

Total RMS current of 1~50 times I [V]	$I = \sqrt{\sum_{k=1}^{50} I(k)^2}$	
Total RMS active power of 1~50 times P [W]	$P = \sum_{k=1}^{50} P(k)$	
Voltage harmonic distortion factor U _{hdf} (k) [%]	$\frac{U(k)}{U(1)} \cdot 100$	
Current harmonic distortion factor I _{hdf} (k) [%]	$\frac{I(k)}{I(1)} \cdot 100$	
Voltage total harmonic distortion factor U _{thd} [%]	$\frac{\sqrt{\sum_{k=2}^{50} U(k)^2}}{U(1)} \cdot 100$	
Current total harmonic distortion factor I _{thd} [%]	$\frac{\sqrt{\sum_{k=2}^{50} I(k)^2}}{I(1)} \cdot 100$	
Measured value of voltage total harmonic distortion U _{thd} [V]	$\sqrt{\sum_{k=2}^{50} U(k)^2}$	
Measured value of current total harmonic distortion I _{thd} [A]	$\sqrt{\sum_{k=2}^{50} I(k)^2}$	

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