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Quick Guide

UTE300 Series Digital Power Meter

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File Version

UTE30020240907-V1.00

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1. Safety Instruction

This section contains information and warnings that must be followed to keep the instrument operating under safety conditions. In addition, user should also follow the common safety procedures.

Safety Precautions	
Warning	Please follow the following guidelines to avoid possible electric shock and risk to personal safety.
	Users must follow the following conventional safety precautions in operation, service and maintenance of this device. UNI-T will not be liable for any personal safety and property loss caused by the user's failure to follow the following safety precautions. This device is designed for professional users and responsible organizations for measurement purposes. Do not use this device in any way not specified by the manufacturer. This device is only for indoor use unless otherwise specified in the product manual.
Safety Statement	
Warning	"Warning" indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Personal injury or death may occur if the rules in the "Warning" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Warning" statement.
Caution	"Caution" indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Product damage or loss of important data may occur if the rules in the "Caution" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Caution" statement.
Note	"Note" indicates important information. It reminds users to pay attention to procedures, methods and conditions, etc. The contents of the "Note" should be highlighted if necessary.
Safety Sign	
	Danger	"Danger" indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Personal injury or death may occur if the rules in the "Danger" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Danger" statement.
	Warning	"Warning" indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Product damage or loss of important data may occur if the rules in the "Warning" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Warning" statement.
	Caution	It indicates possible danger, which may cause damage to this device or other equipment if you fail to follow a certain procedure or condition. If the "Caution" sign is present, all conditions must be met before you proceed to operation.

	Note	It indicates potential problems, which may cause failure of this device if you fail to follow a certain procedure or condition. If the "Note" sign is present, all conditions must be met before this device will function properly.
	AC	Indication range: Alternating current (AC).
	DC	Indication range: Direct current (DC).
	AC+DC	Indication range: Both alternating current (AC) and direct current (DC).
	Grounding	Frame and casing cover grounding terminal
	Grounding	Measurement grounding terminal
CAT 0		This instrument is suitable for measurements on circuits that are not directly connected to the grid power supply and circuits that are specially protected to be powered from the (internal) grid. In the latter case, the transient stresses are different, and the instrument should be used for this type of measurement to ensure that the peak transient voltage is less than 3000 V.
CAT I		Secondary electrical circuit connected to wall sockets through transformers or similar equipment, such as electronic instruments and electronic equipment; electronic equipment with protective measures, and any high-voltage and low-voltage circuits, such as the copier in the office.
CAT II		Primary electrical circuit of the electrical equipment connected to the indoor socket via the power cord, such as mobile tools, home appliances, etc. Household appliances, portable tools (e.g. electric drill), household sockets, sockets more than 10 meters away from CAT III circuit or sockets more than 20 meters away from CAT IV circuit.
CAT III		Primary circuit of large equipment directly connected to the distribution board and circuit between the distribution board and the socket (three-phase distributor circuit includes a single commercial lighting circuit). Fixed equipment, such as multi-phase motor and multi-phase fuse box; lighting equipment and lines inside large buildings; machine tools and power distribution boards at industrial sites (workshops).
CAT IV		Three-phase public power unit and outdoor power supply line equipment. Equipment designed to "initial connection", such as power distribution system of power station, power instrument, front-end overload protection, and any outdoor transmission line.
CE	Certification	The CE mark is a registered trademark of the European Union. If the device bears the CE mark, it indicates that the device meets at least the basic safety standards of the EU.
	Waste	Do not dispose of the equipment and its accessories in the trash bin. The items must be properly disposed of in accordance with local regulations.
	EFUP	This environment-friendly use period (EFUP) mark indicates that dangerous or toxic substances will not leak or cause damage within this indicated time period. The environment-friendly use period of this product is 40 years, during which it can be used safely. Upon expiration of this period, it should enter the recycling system.

Safety Requirements	
Warning	
Preparation before use	Please connect this device to AC power supply with the power cable provided. The AC input voltage of the line reaches the rated value of this device. See the product manual for specific rated value.

	The line voltage switch of this device matches the line voltage; The line voltage of the line fuse of this device is correct.
Check all terminal rated values	Please check all rated values and marking instructions on the product to avoid fire and impact of excessive current. Please consult the product manual for detailed rated values before connection.
Use the power cord properly	You can only use the special power cord for the instrument approved by the local and state standards. Please check whether the insulation layer of the cord is damaged or the cord is exposed, and test whether the cord is conductive. If the cord is damaged, please replace it before using the instrument.
Instrument Grounding	To avoid electric shock, the grounding conductor must be connected to the ground. This product is grounded through the grounding conductor of the power supply. Please be sure to ground this product before it is powered on.
AC power supply	Please use the AC power supply specified for this device. Please use the power cord approved by your country and confirm that the insulation layer is not damaged.
Electrostatic prevention	This device may be damaged by static electricity, so it should be tested in the anti-static area if possible. Before the power cable is connected to this device, the internal and external conductors should be grounded briefly to release static electricity. The protection grade of this device is 4 kV for contact discharge and 8 kV for air discharge.
Measurement accessories	Measurement accessories are of lower class, which are definitely not applicable to main power supply measurement, CAT II, CAT III or CAT IV circuit measurement.
Use the input / output port of this device properly	Please use the input / output ports provided by this device in a properly manner. Do not load any input signal at the output port of this device. Do not load any signal that does not reach the rated value at the input port of this device. The probe or other connection accessories should be effectively grounded to avoid product damage or abnormal function. Please refer to the product manual for the rated value of the input / output port of this device.
Power fuse	Please use power fuse of specified specification. If the fuse needs to be replaced, it must be replaced with another one that meets the specified specifications by the maintenance personnel authorized by UNI-T.
Disassembly and cleaning	There are no components available to operators inside. Do not remove the protective cover. Maintenance must be carried out by qualified personnel.
Service environment	This device should be used indoors in a clean and dry environment with ambient temperature from 0℃ to 40℃. Do not use this device in explosive, dusty or humid air.
Do not operate in humid environment	Do not use this device in a humid environment to avoid the risk of internal short circuit or electric shock.

Caution	
Abnormality	If this device may be faulty, please contact the authorized maintenance personnel of UNI-T for testing. Any maintenance, adjustment or parts replacement must be done by the relevant personnel of UNI-T.
Cooling	Do not block the ventilation holes at the side and back of this device; Do not allow any external objects to enter this device via ventilation holes; Please ensure adequate ventilation, and leave a gap of at least 15 cm on both sides, front and back of this device.
Safe transportation	Please transport this device safely to prevent it from sliding, which may damage the buttons, knobs or interfaces on the instrument panel.
Proper ventilation	Poor ventilation will cause the device temperature to rise, thus causing damage to this device. Please keep proper ventilation during use, and regularly check the vents and fans.
Keep clean and dry	Please take actions to avoid dust or moisture in the air affecting the performance of this device. Please keep the product surface clean and dry.
Note	
Calibration	The recommended calibration period is one year. Calibration should only be carried out by qualified personnel.

Warning

The UTE300 series digital power meters support the measurement of power supplies under CAT II(600V) overvoltage conditions (UTE310H and UTE310HG supports CAT II 1000V). Please use the instrument strictly in accordance with this measurement environment.

2. Introduction

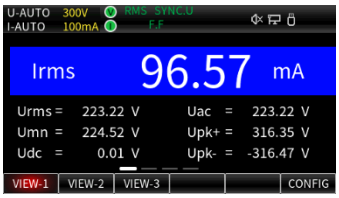
The UTE300 series is suitable for power measurements across various applications, from production lines to R&D fields, such as:The measurement of DC and single phase two-wire system;

- The measurement of DC and single phase two-wire system
- The measurement of the household appliances with high power, such as the air condition and the induction stave;
- The measurement of the office equipment, such as the display and the printer;
- The measurement of the energy equipment, such as LED, the power supply and the battery;
- The measurement of energy-saving performance of industrial equipment, such as the frequency converter and the large air condition.

2.1 Features

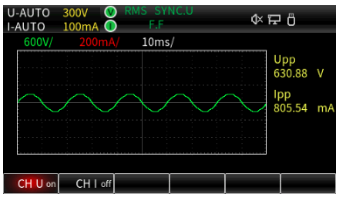
- **Intuitive display interface**

  The 4.3-inch true-color LCD display provides more intuitive readings



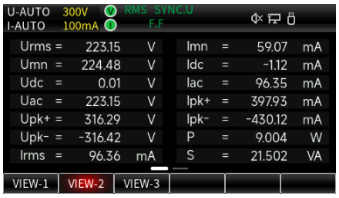
- **Oscillography**

  Observe the change of the measured signal in peak-to peak and waveform.



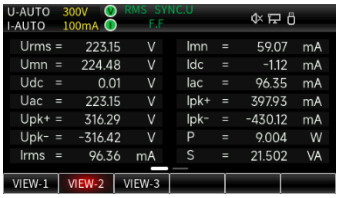
- **Basic power parameter measurement**

  Measure the basic power parameters of voltage, current, power factor, and support for measuring the AC and DC signals.



- **Harmonic measurement**

  Measure the basic power parameters of voltage, current, power factor, and support for measuring the AC and DC signals



- **Mathematical operation**

  The measured parameters can be added, subtracted, multiplied, and divided.

- **Current integral and power integral**

  The integration of q, q+, q-, WP, WP+, WP-, which can be set to continuous integral or normal integral mode.

- **Multiple interfaces**

  The user can remote control the instrument via USB, RS-232/GPIB and LAN interfaces.

- **Automatic range**

  This function can automatically select or change the range within the specified range.

- **Load and access the external memorizer**

  The instrument can connect the external memorizer to save the data of voltage, current, power and harmonic. And it can also export and import the configuration parameter of the instrument.

- **Built-in digital filter**

The instrument has line filter and frequency filter function. The user can enable the line filter or frequency filter to restrain unwanted noise and harmonic components during fundamental measurements.

- **PC analysis software**
  The software is used to remote control and set the UTE 310 digital power meter, for acquiring, displaying, analyzing and saving the measured value, harmonic and waveform data.
- **Holding the maximum value**
  RMS/Peak of voltage and current, active power P, relative power Q and apparent power S.
- **Sampling frequency**
  The sampling rate of the UTE300 series digital power meters is 1MHz
- **Bandwidth**
  The bandwidth of the UTE300 series digital power meters is DC, 0.1Hz～300kHz.
- **25μA low current measurement**
  The UTE310 and UTE310G can measure a minimum current of 25μA, enabling accurate measurement of standby power consumption in household appliances.
- **Input range of wide current sensor**
  50mV～10V, this sensor can be compatible with more sensors, and is very suitable for the power consumption measurement of intermittent operation equipment.
- **Input range of wide current**
  The current input range for the UTE310 and UTE310G is 5mA to 20A, while the current input range for the UTE310H and UTE310HG is 1A to 50A.
- **The data update interval can up to 0.1s**
  UTE300 digital power meter can freely set the data update interval: 0.1s, 0.25s, 0.5s, 1s, 2s, 5s, 10s, 20s, Auto, to meet the measurement needs of different frequency signals.

2.2 Technical Index

f:Frequency(When f appears in the error calculation formula, the unit is kHz) **Rate**:Data update interval
CF: Crest factor **rdg.**:Reading **FS.**:Reading **λ /PF**:Power Factor ø:Phase Difference

Model	UTE310、UTE310G		UTE310H、UTE310HG	
Bandwidth	DC,0.1Hz～300kHz		DC,0.1Hz～300kHz	
Sampling Rate	1MHz		1MHz	
Voltage Range	CF=3	CF=6/6A	CF=3	CF=6/6A
	15V	7.5V	15V	7.5V
	30V	15V	30V	15V
	60V	30V	60V	30V
	150V	75V	150V	75V
	300V	150V	300V	150V

Model	UTE310、UTE310G		UTE310H、UTE310HG	
	600V	300V	600V	300V
	/	/	1000	500
Voltage Resolution	0.001V/0.01V	0.0001V/0.001V/0.01V	0.001V/0.01V/0.1V	0.0001V/0.001V/0.01V
Voltage Accuracy	DC,0.1Hz～45Hz:±(0.1% rdg.+ 0.2% F.S.)		DC,0.1Hz～45Hz:±(0.1% rdg.+ 0.2% F.S.)	
	45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)		4 45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)	
	66Hz～1kHz:±(0.1% rdg.+ 0.2% F.S.)		66Hz～1kHz:±(0.1% rdg.+ 0.2% F.S.)	
	1kHz～10kHz:±(0.07 * f)% rdg.+ 0.3% F.S.)		1kHz～10kHz:±(0.07 * f)% rdg.+ 0.3% F.S.)	
	10kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.04*(f-10)}% rdg.		10kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.04*(f-10)}% rdg.	
	For 110% to 130% of the rated range, add 50% of the reading error to the above accuracy.			
Current Range	CF=3	CF=6/6A	CF=3	CF=6/6A
	5mA	2.5mA		
	10mA	5mA		
	20mA	10mA		
	50mA	25mA		
Current Range	100mA	50mA		
	200mA	100mA		
	500mA	250mA		
	1A	0.5A	1A	0.5A
	2A	1A	2A	1A
	5A	2.5A	5A	2.5A
	10A	5A	10A	5A
	20A	10A	20A	10A
			50A	25A
Current Resolution	0.0001mA/0.001mA/0.01mA/0.1mA/1mA		0.1mA/1mA	0.01mA/0.1mA/1mA
Accuracy of Direct Current Input	DC: ±(0.1% rdg.+ 0.2% F.S.)		DC: ±(0.2% rdg.+ 0.2% F.S.)	
	0.1Hz～45Hz:±(0.1% rdg.+ 0.2% F.S.)		0.1Hz～45Hz:±(0.1% rdg.+ 0.2% F.S.)	
	45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)		45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)	
	66Hz～1kHz:±(0.1% rdg.+ 0.2% F.S.)		66Hz～1kHz:±(0.1% rdg.+ 0.2% F.S.)	
	1kHz～10kHz:±(0.07 * f)% rdg.+ 0.3% F.S.)		1kHz～10kHz:±(0.13 * f)% rdg.+ 0.3% F.S.)	
	10kHz～20kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.04*(f-10)}% rdg.		10kHz～20kHz: ±(0.13 * f)% rdg.+ 0.5% F.S.)	
	20kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.04*(f-10)}% rdg.			
	For 110% to 130% of the rated range, add 50% of the reading error to the above accuracy.			
Current Sensor Ext1	CF=3	CF=6/6A	CF=3	CF=6/6A

Model	UTE310、UTE310G		UTE310H、UTE310HG	
Channel Range	2.5V	1.25V	2.5V	1.25V
Current Sensor Ext1 Channel Range	5V	2.5V	5V	2.5V
	10V	5V	10V	5V
Current Sensor Ext2 Channel Range	50mV	25mV	50mV	25mV
	100mV	50mV	100mV	50mV
	200mV	100mV	200mV	100mV
	500mV	250mV	500mV	250mV
	1V	0.5V	1V	0.5V
	2V	1V	2V	1V
Accuracy of External Sensor Current Input	DC,0.1Hz～45Hz:±(0.1% rdg.+ 0.2% F.S.)		DC,0.1Hz～45Hz:±(0.1% rdg.+ 0.2% F.S.)	
	45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)		45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)	
	66Hz～1kHz:±(0.1% rdg.+ 0.2% F.S.)		66Hz～1kHz:±(0.1% rdg.+ 0.2% F.S.)	
	1kHz～10kHz:±(0.07 * f)% rdg.+ 0.3% F.S.)		1kHz～10kHz:±(0.07 * f)% rdg.+ 0.3% F.S.)	
	10kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.04*(f-10)}% rdg.		10kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.04*(f-10)}% rdg.	
Active Power Accuracy for Direct Current Input (PF=1)	DC:±(0.1% rdg.+ 0.2% F.S.)		DC: ±(0.3% rdg.+ 0.2% F.S.)	
	0.1Hz～45Hz:±(0.3% rdg.+ 0.2% F.S.)		0.1Hz～45Hz:±(0.3% rdg.+ 0.2% F.S.)	
	45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)		45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)	
	66Hz～1kHz:±(0.2% rdg.+ 0.2% F.S.)		66Hz～1kHz:±(0.2% rdg.+ 0.2% F.S.)	
	1kHz～10kHz: ±(0.1% rdg.+ 0.3% F.S.)±{0.067*(f-1)}% rdg.		1kHz～10kHz: ±(0.13 * f)% rdg.+ 0.3% F.S.)	
	10kHz～20kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.09*(f-10)}% rdg.		10kHz～20kHz: ±(0.13 * f)% rdg.+ 0.2% F.S.)	
	20kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.09*(f-10)}% rdg.			
Active Power Accuracy for External Sensor Current Input (PF=1)	DC:±(0.1% rdg.+ 0.2% F.S.)		DC:±(0.1% rdg.+ 0.2% F.S.)	
	0.1Hz～45Hz:±(0.3% rdg.+ 0.2% F.S.)		0.1Hz～45Hz:±(0.3% rdg.+ 0.2% F.S.)	
	45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)		45Hz～66Hz:±(0.1% rdg.+ 0.05% F.S.)	
	66Hz～1kHz:±(0.2% rdg.+ 0.2% F.S.)		66Hz～1kHz:±(0.2% rdg.+ 0.2% F.S.)	
	1kHz～10kHz: ±(0.1% rdg.+ 0.3% F.S.)±{0.067*(f-1)}% rdg.		1kHz～10kHz: ±(0.1% rdg.+ 0.3% F.S.)±{0.067*(f-1)}% rdg.	
	10kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.09*(f-10)}% rdg.		10kHz～100kHz: ±(0.5% rdg.+ 0.5% F.S.)±{0.09*(f-10)}% rdg.	
Frequency Measurement Range	Data update time	Frequency range	Data update time	Frequency range
	0.1 S	20Hz≤f≤300kHz	0.1 S	20Hz≤f≤300kHz
	0.25 S	10Hz≤f≤300kHz	0.25 S	10Hz≤f≤300kHz

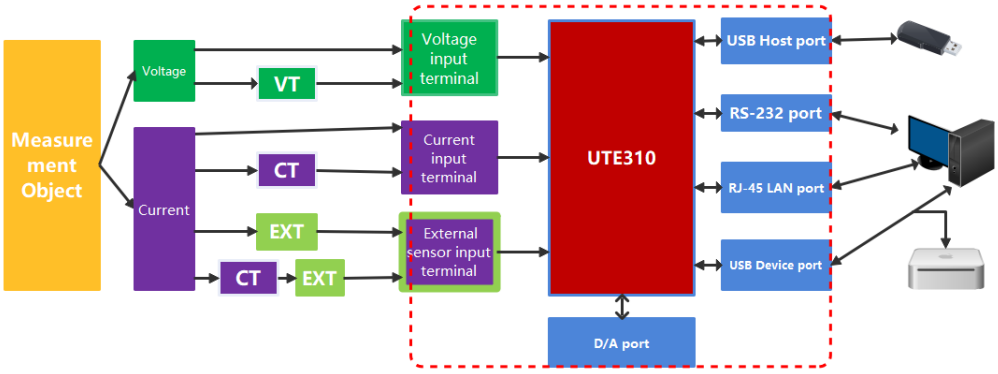
Model	UTE310、UTE310G		UTE310H、UTE310HG	
Frequency Measurement Range	0.5 S	5.0Hz≤f≤300kHz	0.5 S	5.0Hz≤f≤300kHz
	1 S	2.0Hz≤f≤300kHz	1 S	2.0Hz≤f≤300kHz
	2 S	1.0Hz≤f≤300kHz	2 S	1.0Hz≤f≤300kHz
	5 S	0.5Hz≤f≤300kHz	5 S	0.5Hz≤f≤300kHz
	10 S	0.2Hz≤f≤300kHz	10 S	0.2Hz≤f≤300kHz
	20 S	0.1Hz≤f≤300kHz	20 S	0.1Hz≤f≤300kHz
	Auto	0.1Hz≤f≤300kHz	Auto	0.1Hz≤f≤300kHz
	Note: When using direct current input with UTE310H or UTE310HG, the maximum measurement range is 20kHz.			
Power Range	75mW～12000W		15W～50KW	
Influence of Power Factor	When λ = 0: 45Hz≤f≤66Hz：±0.2% of S When f reaches up to 100kHz：±{0.2 + 0.2 x f}% of this is a reference value.The unit of f is kHz When 0＜λ ＜1: (Power Reading）x[（Power Reading Error %）+（Power Range Error %）x（$\frac{\text{Power Range}}{\text{Apparent Power Display Value}}$） +{tanø x（Influence When λ =0） %}]			
Accuracy of Apparent Power S	Voltage Accuracy + Current Accuracy			
Accuracy of Reactive Power Q	Apparent Power Accuracy +(√（1.0004 − λ²） − √（1 − λ²）)x100% of the Range			
Accuracy of Power Factor λ	$\pm[\left(\lambda - \frac{\lambda}{1.0002}\right) + \lvert\cos ø - \cos\{ø + sin^{-1}(\text{Influence of Power Factor when } \lambda = 0)\%/100\}\rvert] \pm 1\text{digit}$ The voltage and current are at the rated range, and ø is the phase difference between the voltage and current			
Accuracy of Phase Difference ø	$\pm[\lvert ø - cos^{-1}\left(\frac{\lambda}{1.0002}\right)\rvert + sin^{-1}\{($ Influence on Power Factor % when λ =0)/100}]			
When the line filter is turned on	f＜45Hz：Increase by 1% of the reading 45Hz≤f＜66Hz：Increase by 0.3% of the reading			
Temperature Coefficient	Within the range of 5°C to 18°C or 28°C to 40°C, add ±0.03%/°C of the reading.			
Waveform Display	Display Voltage and Current Waveforms			
Line Filtering	Standard Configuration			
Frequency Filtering	Standard Configuration			
Harmonic Measurement	Capable of measuring up to the 50th harmonic.			

Model	UTE310、UTE310G	UTE310H、UTE310HG
Integration Function	Capable of performing average active power integration and current integration	
Mathematical Operations	Standard Configuration	
D/A Output and Control	Standard configuration includes 4-channel D/A conversion output	
Communication Interface	LAN, USB,RS-232 (optional GPIB, with GPIB the model is UTE310G or UTE310HG)	

Explanation: The accuracy of voltage, current, and power in the table is the accuracy when CF = 3. When CF = 6 or 6A, the range error is twice the range error at CF = 3.

2.3 Application System

The application system chart of the UTE310 digital power meter is shown in the following figure.



2.4 Environmental Condition

UTE300 series digital power meter can only use indoors and non-condensing area, the general environmental requirements are shown as below table.

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

3. Getting Start

This chapter is to introduce the precautions and preparation for using the UTE300 series digital power meter for the first time.

3.1 General Inspection

Before using a new digital power meter, it is recommended that you follow the following steps to check the instrument.

3.1.1 Check for damage caused by transportation

If you find that the packing carton or the protective foam panel is badly damaged, contact your UNI-T distributor for assistance.

3.1.2 Checking Accessories

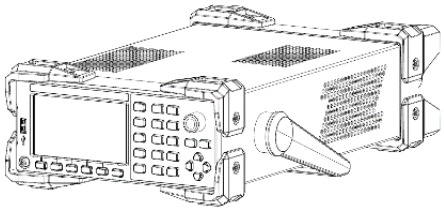
Checking the packing list whether is damaged or missing. Contact your UNI-T distributor for assistance if has any damage or loss.

3.1.3 Check the Instrument

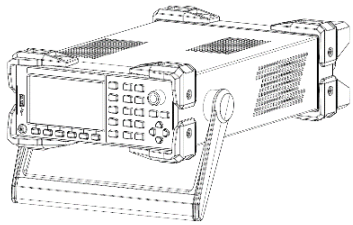
- Please contact your UNI-T distributor for assistance if you find the appearance of the instrument is broken, or the instrument does not work properly, or fails the performance test.
- If the instrument is damaged due to transportation, retain the packaging and notify the shipping department and contact your UNI-T distributor for assistance.

3.1.4 Checking the Handle

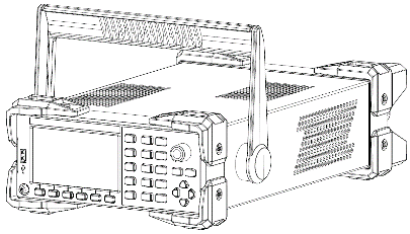
The instrument's handle can adjust to four positions by appropriate strengths. Hold the handle and pull to two sides to remove it. Adjusting the handle to the position as shown in the following figure.



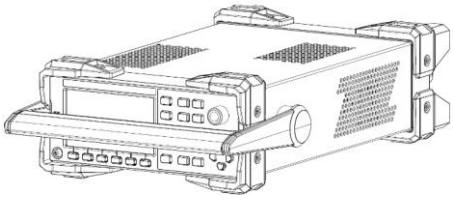
1.Original position



2.Testing position



3.Removal position



4.Lifting position

If the instrument's handle cannot adjust to four positions as above, please contact your UNI-T distributor for assistance.

3.2 Before Use

Before using the instrument, do a quick inspection to check that the instrument is operating properly. Please follow the following steps.

3.2.1 Key Inspection

Check whether the key can be pressed and popped up normally. If the key cannot operate functionally, contact your UNI-T distributor.

3.2.2 Boot-up Inspection

The power supply voltage of the power meter is 100V~240V and the frequency is 50/60Hz. Connect the power meter to the power supply by using the power cable in the accessory or other power cable that conform to the standard of your country. When the power switch is pressed, the instrument will turn on. If the instrument fails to power up properly, contact your UNI-T distributor for assistance.

4. Front Panel

This chapter is to introduce the front panel and its key function of the UTE310 digital power meter, as shown in the following figure.

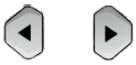
UTE310

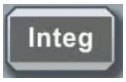
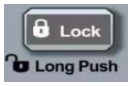
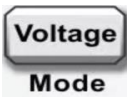
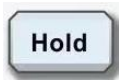
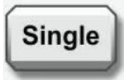
UTE310H

Note:

The front panel photos only display the UTE310 and UTE310H models. When the user purchases a model equipped with a GPIB communication interface, the model designation on the nameplate will be changed to UTE310G or UTE310HG. The default configuration includes an RS-232 interface, and the corresponding model designation on the nameplate will be UTE310 or UTE310H

4.1 Key Function on Front Panel

Key	Function
	**The power switch** ON/OFF: Press one time to turn on the instrument, press it again to shut down the instrument.
	**Common function key** This indicates the different functions according to the corresponding parameters of the display.
	**Up/Down selection key** Use the up/down key to select an item when setting the parameters. For the sake of simplicity, the up/down keys are indicated by the two buttons [▲][▼].
	**Left/Right selection key** Use the left/right key to select an item to the left or right when setting the parameters. It is usually used to move the editing bit in numerical editing. For the sake of simplicity, the left/right keys are indicated by the two buttons [◀][▶].
	**Enter key** Save the current settings and exit.
	**Esc key** Exit the current setting page; Return to the previous step
	**Encoder knob** When editing the numerical value, clockwise rotating the encoder knob to increasing the value, anticlockwise rotating the encoder knob to decreasing the value;

Key	Function
	**Second function auxiliary key** Press this key and press other key with the second function to enabling auxiliary function.
	**General parameter measurements** This function page includes three measurement/display styles, VEW-1, VEW-2 and VEW-3, measuring total of 24 parameters.
	**Harmonic measurements** Harmonic measurement and harmonic settings (including harmonic display and mode settings)
	**Waveform display** Display the waveform of voltage and current.
	**Integral key** The average active power and current can be integrated.
	**Lock key** Press this key to disable other keys, long press 1 second to unlock keys.
	**Voltage settings** Press this key to set the voltage, use "▲,▼" to select the range, and press the "Enter" key to save the selected range and exit (or wait for 10 seconds to automatically save the settings and exit); The second function of this key is measurement mode switching, which can switch to DC, RMS or MN.
	**Current settings** Press this key to set the current, use "▲,▼" to select the range, and press the "Enter" key to save the selected range and exit (or wait for 10 seconds to automatically save the settings and exit); The second function of this key is zero calibration.
	**Max hold** Hold the maximum value, the data is updated only when a measured value that is larger than the value that has been held.
	**Data hold** Hold the measured data that test by the input terminal.
	**Start key** Press this key to starting the integral.
	**Stop key** Press this key to pausing the integral. Press the Shift key with this key is to reset the integral or zeroing the integral.
	**Single measurement** In data hold, press the Single key to measure one time, the measured data is kept after the measurement is finished.
	**Function settings** Press this key to set the synchronous source, line filter, frequency filter, crest factor, data update interval (SETUP), average filter (AVG), external current sensor input (EXT), VT/CT scale factor (SCALE), range jump (JUMP), D/A output and control.
	**System settings** System information (INFO), SET, RS232/GPIB, IP and USB.

4.2 Key Combination

[Shift + Mode]

Each time the [Shift + Mode] key is pressed, the measurement mode will be switched once, and there are three measurement modes, DC, RMS, and MN.

[Shift + Cal]

Zero calibration

[Shift +Reset]

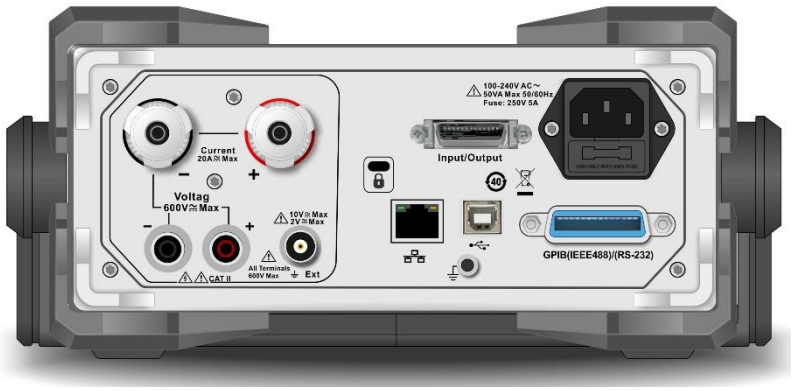
Rest the integral

[Shift +Single]

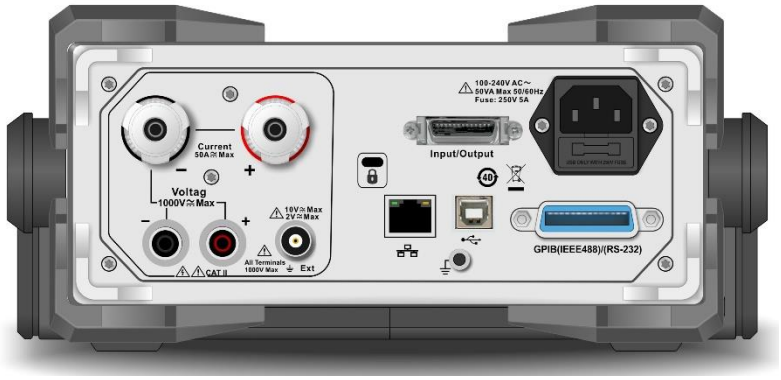
Screenshot

5. Rear Panel

The rear panel structure of the UTE300 series digital power meters integrates various interfaces, including voltage and current measurement input terminals, the instrument power supply socket, D/A output and control interface, RS-232/GPIB communication interface, USB communication interface, LAN Ethernet communication interface, and safety grounding, as shown below.

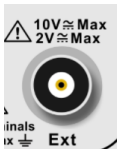
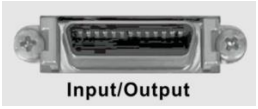
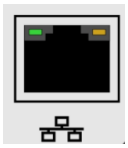


UTE310、UTE310G



UTTE310H、UTE310HG

5.1 Rear Panel of UTE300

No.	Picture	Function Description
1		Voltage input terminal The maximum allowable input voltage is 600V for UTE310 and UTE310G, and 1000V for UTE310H and UTE310HG.
2		Current input terminal The maximum allowable input current is 20A for UTE310 and UTE310G, and 50A for UTE310H and UTE310HG.
3		External current sensor input terminal The maximum allowable input voltage is 10V when EXT1 is selected. The maximum allowable input voltage is 2V when EXT2 is selected.
4		RS-232/GPIB communication interface The UTE310 and UTE310H are equipped with RS-232 interfaces, while the UTE310G and UTE310HG are equipped with GPIB interfaces.
5		D/A output and control interface
6		USB communication interface
7		LAN communication interface
8		Anti-theft lock hole
9		Three-wire power socket and fuse Fuse specification：AC 250V 5A.
10		Measurement Grounding Screw Hole / Knurled Cylinder Head Slotted Screw

6. User Interface

This chapter is to introduce the user interface and the parameter of UTE300 series digital meter.

6.1 Description of Display Icon

Display Contents	Function Description
U-RANGE 15V 30V 150V 300V 600V 1000V	Indicates that the voltage is a fixed range of 15V /30V /150V /300V /600V /1000V respectively (each range is one-half of the current range when CF=6 or 6A).
U-AUTO 15V 30V 150V 300V 600V 1000V	Indicates that the voltage is an automatic range of 15V /30V /150V /300V /600V /1000V respectively (each range is one-half of the current range when CF=6 or 6A).
I-RANGE 5mA 10mA 20mA 50mA 100mA 200mA 500mA 1A 2A 5A 10A 20A 50A	Indicates that the current is a fixed range of 5mA /10mA /20mA /50mA /100mA /200mA /500mA /1A /2A /5A /10A / 20A /50A (each range is one-half of the current range when CF=6 or 6A).
I-AUTO 5mA 10mA 20mA 50mA 100mA 200mA 500mA 1A 2A 5A 10A 20A 50A	Indicates that the current is an automatic range of 5mA/ 10mA /20mA /50mA /100mA /200mA /500mA /1A /2A /5A /10A / 20A /50A respectively (each range is one-half of the current range when CF=6 or 6A).
EXT1	Indicates that the current selection is EXT1 (the external current sensor 1).
EXT2	Indicates that the current selection is EXT2 (the external current sensor 2).
I-RANGE 2.5V 5V 10V	Indicates that the current is fixed range 2.5V /5V /10V of EXT1 respectively (each range is one-half of the current range when CF=6 or 6A).
I-AUTO 2.5V 5V 10V	Indicates that the current is automatic range 2.5V /5V /10V of EXT1 respectively 2.5V/ 5V/ 10V (each range is one-half of the current range when CF=6 or 6A).
I-RANGE 50mV 100mV 200mV 500mV 1V 2V	Indicates that the current is fixed range 50mV/ 100mV/ 200mV/ 500mV/ 1V/ 2V of EXT2 respectively. 50mV/100mV/200mV/500mV/1V/2V (each range is one-half of the current range when CF=6 or 6A).
I-AUTO 50mV 100mV 200mV 500mV 1V 2V	Indicates that the current is automatic range 50mV/ 100mV/ 200mV/ 500mV/ 1V/ 2V of EXT2 respectively. 50mV/100mV/200mV/500mV/1V/2V (each range is one-half of the current range when CF=6 or 6A).
SCALE	Indicates that the scaling transformation is enabled.
SCALE	Indicates that the line filter is enabled.
L.F	Indicates that the frequency filter is enabled.

Display Contents	Function Description
F.F	Indicates that the measurement mode is RMS/DC/MN.
RMS DC MN	Indicates that the synchronous source is not set.
SYNC.OFF	Indicates that the voltage is set as a synchronous source.
SYNC.U	Indicates that the current is set as a synchronous source.
	Indicates the condition for automatically lowering the range (indicating that the voltage measurement is below 30% of the range): if the voltage range is already at the minimum, the blue background indicator will not appear, even if the measurement is below 30% of the range.
	When CF=3: Indicates that the voltage measurement is between 30% and 130% of the range (not including 130%). If the 15V range is selected, this indicator appears when the voltage measurement is below 130% of the range. When CF=6: Indicates that the voltage measurement is between 30% and 130% of the range. If the 7.5V range is selected, this indicator appears when the voltage measurement is below 260% of the range. When CF=6A: Indicates that the voltage measurement is between 30% and 260% of the range (not including 260%). If the 7.5V range is selected, this indicator appears when the voltage measurement is below 260% of the range.
	Condition for Automatic Range Increase: When CF=3 or 6: Indicates that the voltage measurement is between 130% and 140% of the range (not including 140%). When CF=6A: Indicates that the voltage measurement is between 260% and 280% of the range (not including 280%).
	Indicates Overrange: When CF=3 or 6: Indicates that the voltage measurement is between 140% and 300% of the range (excluding 300%). When CF=6A: Indicates that the voltage measurement is between 280% and 600% of the range (excluding 600%). Note: For UTE310H and UTE310HG, if the voltage exceeds 1.08 times the maximum range (1000V), i.e., 1080V, it is considered overrange.

Display Contents	Function Description
	Indicates Peak Overrange: When CF=3: Indicates that the voltage measurement is greater than or equal to 300% of the range. For the maximum range of UTE310H and UTE310HG, if the peak exceeds 1800V, it is considered a peak overrange. When CF=6 or 6A: Indicates that the voltage measurement is greater than or equal to 600% of the range. For the maximum range of UTE310H and UTE310HG, if the peak exceeds 1800V, it is considered a peak overrange.
	The condition for automatically lowering the range (indicating that the current measurement is below 30% of the range): if the current range is already at the minimum, the blue background indicator will not appear, even if the measurement is below 30% of the range.
	When CF=3: Indicates that the current measurement is between 30% and 130% of the range (excluding 130%). If the 5mA range is selected, this indicates that the current measurement is below 130% of the range. When CF=6: Indicates that the current measurement is between 30% and 130% of the range (excluding 130%). If the 2.5mA range is selected, this indicates that the current measurement is below 130% of the range. When CF=6A: Indicates that the current measurement is between 30% and 260% of the range (excluding 260%). Indicates that the measured voltage is at the rated range of 30% ~ 260% (not include 260%) when CF=6 or 6A.
	When CF=3 or 6: Indicates that the current measurement is between 130% and 140% of the range (excluding 140%). When CF=6A: Indicates that the current measurement is between 260% and 280% of the range (excluding 280%).
	Indicates Overrange: When CF=3 or 6: Indicates that the current measurement is between 140% and 300% of the range (excluding 300%). When CF=6A: Indicates that the current measurement is between 280% and 600% of the range (excluding 600%). Note: For the maximum current range of UTE310H and UTE310HG, if the measurement exceeds 110% of the range, it is considered overrange (220% when CF=6 or 6A).

Display Contents	Function Description
	Indicates Peak Overrange: When CF=3: Indicates that the current measurement is greater than or equal to 300% of the range. When CF=6 or 6A: Indicates that the current measurement is greater than or equal to 600% of the range.
	Indicates that the key tone is off (left image) / key tone is on (right image).
	Indicates that the network connection is established.
	Indicates that a USB flash drive is inserted.

6.2 Measurement Interface

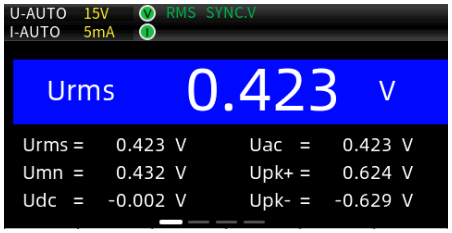
6.2.1 Common Measurement

Pressing the [Meter] key to enter the common measurement interface. VIEW-1 has four test interfaces, the first interface displays the voltage (such as RMS voltage, voltage calibration average value, voltage AC component, voltage DC component, voltage positive peak value, voltage negative peak value); the second interface displays the current (such as RMS current, current calibration average value, current AC component, current DC component, current positive peak value, current negative peak value); the third interface displays the power (such as average active power, apparent power, reactive power, positive peak value of average active power, negative peak value of average active power, power factor); the fourth interface displays the frequency, crest factor, phase and synchronizing frequency of measurement parameter.

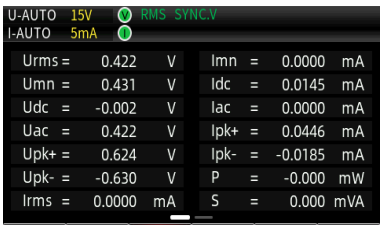
The four display interfaces can be switched by the [◀] or [▶] key, and each of the measurement interfaces can also set a parameter as the main display parameter (displayed in blue background with large font), which can be configured by the [CONFIG] key under the corresponding interface.

VIEW-2 can display multiple parameters at the same time.

Under VIEW-3 display style, mathematical operation can be carried out according to the user's demand, supporting the display of four areas A, B, C, D. Each area can be set and displayed independently, and the parameters displayed in A, B area can also be set to be displayed in the C area after arithmetic operation. The fourth measurement interfaces is shown in the following figure.



VIEW-1



VIEW-2

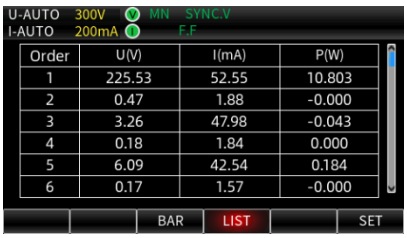
VIEW-3

VIEW-1 and VIEW-2 displays the measurement parameter. VIEW-3 displays different measurement parameters and mathematical operation results based on the selected measurement mode.

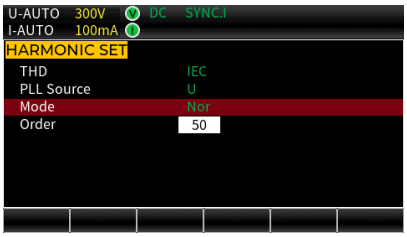
6.2.2 Harmonic Measurement

Pressing the [Harmonic] key to enter the harmonic measurement interface. The harmonic measurement has two display modes, one is a bar graph (BAR) mode and the other is a list mode (LIST). It can measure the RMS value/inclusion rate of each harmonic component from 1~50, and can also measure the total harmonic distortion factor (THD). In the "SET" interface, the calculation formula of THD can be set to IEC or CSA, and PPL source, harmonic analysis mode (Nor or IEC) and maximum harmonic analysis order (Order) can also be set. The measurement interface is shown in the following figure.

BAR Mode



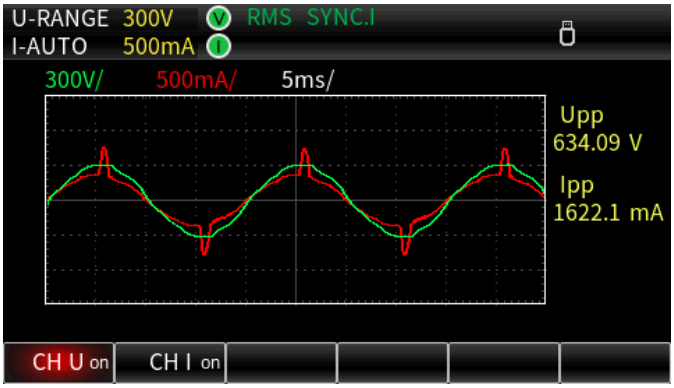
LIST Mode



SET (Harmonic Setting) Interface

6.2.3 Wave Display

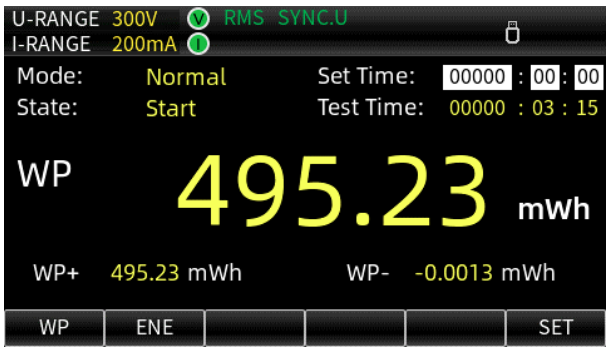
Pressing the [Wave] key to enter the wave display interface. UTE310 supports display the waveform of voltage and current at the same time or display one of them. Rotating the encoder knob to adjust the time axis, the vertical axis is automatically set according to the measured range. In the wave display interface, the peak-to-peak of voltage and current can be viewed, as shown in the following figure.



Wave Display Interface

6.2.4 Integration Interface

UTE300 supports the average active power integration and the current integration. Pressing the [Integ] key to enter the integration interface. The instrument has three integration modes, manual integration (set the integration timer to 00000: 00: 00 in the normal mode), standard integration (Normal) and continuous integration. The integration interface displays the integrated value and integration time and can set the integration time. The measurement interface is shown in the following figure.

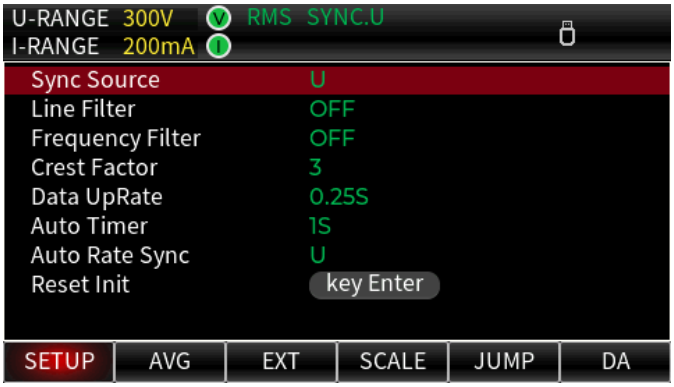


Average Active Power Integration

Current Integration

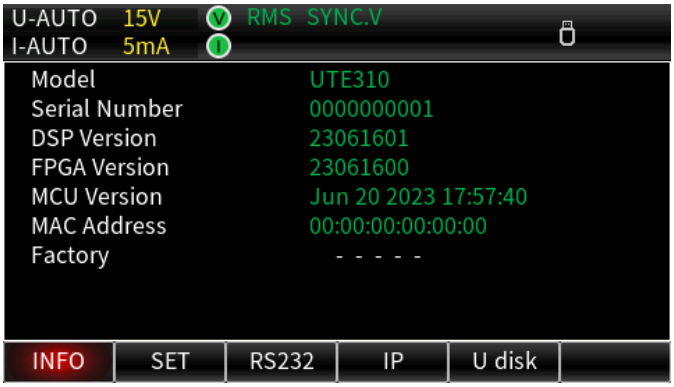
6.2.5 Setup Menu

Pressing the [SETUP] key to enter the Setup menu, to set the the parameter of data synchronization source, digital filter, crest factor, data update interval, automatic timeout, automatic data synchronization source, average filter (AVG), external current sensor input (EXT) and external proportional converter VT/CT/PT, JUMP (skipping range), D/A Output and Control, etc. The setting interface is shown in the following figure.



6.2.6 System Menu

Pressing the [System] key to enter the system settings, which includes the system information, display brightness, key sound, Communication Baud Rate/GPIB Address, IP address and USB. The system interface is shown in the following figure.



7. Measurement Preparation

This chapter is to introduce the measurement range, measurement mode and wiring connection.

7.1 Range Settings

7.1.1 Voltage Range Settings

·Steps

1. In any interface, press the [Voltage] key to pop out the selection window of voltage range;
2. Press the [▲] or [▼] key to select the voltage range;
3. Press the [Enter] key to save the selected voltage range and exit the selection window or wait for 10s to automatically save and then exit.

·Explanations

The selectable voltage ranges for UTE310 and UTE310G are Auto, 15V, 30V, 60V, 150V, 300V, 600V (CF=3);

The selectable voltage ranges for UTE310H and UTE310HG are Auto, 15V, 30V, 60V, 150V, 300V, 600V, 1000V(CF=3).

Auto represents the automatic range.

When CF=6 or 6A, all ranges are reduced to half of their original values, meaning:.

For UTE310 and UTE310G, the selectable ranges are Auto, 7.5V, 15V, 30V, 75V, 150V, 300V.

For UTE310H and UTE310HG, the selectable ranges are Auto, 7.5V, 15V, 30V, 75V, 150V, 300V, 500V.

7.1.2 Current Range Settings

·Steps

1. In any interface, press the [Current] key to pop out the selection window of current range;
2. Press the [▲] or [▼] key to select the current range;

3. Press the [Enter] key to save the selected current range and exit the selection window or wait for 10s to automatically save and then exit.

Common Measurement

The selectable current ranges for UTE310 and UTE310G are Auto, 5mA, 10mA, 20mA, 50mA, 100mA, 200mA, 500mA, 1A, 2A, 5A, 10A, 20A. Auto represents the automatic range.

The selectable current ranges for UTE310H and UTE310HG are Auto 1A, 2A, 5A, 10A, 20A,50A.

Auto represents the automatic range.

When CF=6 or 6A, all ranges are reduced to half of their original values, meaning:

The selectable current ranges for UTE310 and UTE310G are Auto, 2.5mA, 5mA, 10mA, 25mA, 50mA, 100mA, 250mA, 500mA, 1A, 2.5A, 5A, 10A.

The selectable current ranges for UTE310H and UTE310HG are Auto, 500mA, 1A, 2.5A, 5A, 10A, 25A.

When use EXT CH (the external current sensor) to measure

When using Ext1, the range can select to Auto, 2.5V, 5V, 10V

When using Ext2, the range can select to Auto, 50mV, 100mV, 200mV, 500mV, 1V, 2V.

The display interface will synchronize the currently selected current range.

Auto represents the automatic range.

When CF=6 or 6A, all ranges will be reduced to half of the original, i.e. Ext1: Auto, 1.25V, 2.5V, 5V.

Ext2: Auto, 25mV, 50mV, 100mV, 250mV, 500mV, 1V.

7.2 Measurement Mode

UTE310 series has three measurement modes. The user can set the mode according to the signal type or the value to be displayed.

Setting Steps

1. Press the [Shift] key and then press the [Voltage/Mode] key to switch the measurement mode;
2. Repeat the first step can step through the measurement mode to RMS, DC or MN;
3. Press the [Enter] key to select the current option and save.

Explanations

Display value in different measurement mode

Measurement Mode	Voltage	Current
RMS	Display RMS	Display RMS
DC	Display the simple average value	Display the simple average value
MN	Display the voltage calibration average value	Display the voltage calibration average value

RMS mode: select this mode to display the RMS of voltage and current, the calculation formula is as follows.

$$\sqrt{\frac{1}{T}\int_0^T f(t)^2 \mathrm{dt}}$$

f(t): Input signal

T: Period of input signal

DC mode: select this mode when input DC voltage and current, calculating the simple average for the input signal. The calculation formula is as follows.

$$\frac{1}{T}\int_0^T f(t)\mathrm{dt}$$

f(t): Input signal

T: Period of input signal

MN: select this mode to display the rectified average value calibrated to the RMS value, calculated by the following formula.

$$\frac{\pi}{2\sqrt{2}} \times \frac{1}{T}\int_0^T |f(t)|\mathrm{dt}$$

f(t): Input signal

T: Period of input signal

7.3 Wire Connection

The UTE300 series digital power meter only supports a single two-wire power supply measurement. The measurement can be in accordance with the several wiring methods described in this subsection for wire connection, and to ensure that the measurement of the voltage and current is within the input range of the instrument. The UTE310 has two input methods for voltage measurement, four input methods for current measurement, and a total of eight input methods for power measurement. These are shown in the table below.

Current / Voltage	Direct Input	CT Transformer	EXT Input	CT + EXT Input
Direct Input	①	②	③	④
VT Input	⑤	⑥	⑦	⑧

Explanation

VT: voltage transformer

CT: output current type current sensor, such as current transformer, current output clamp current sensor

EXT: current sensor/shunt of output voltage type

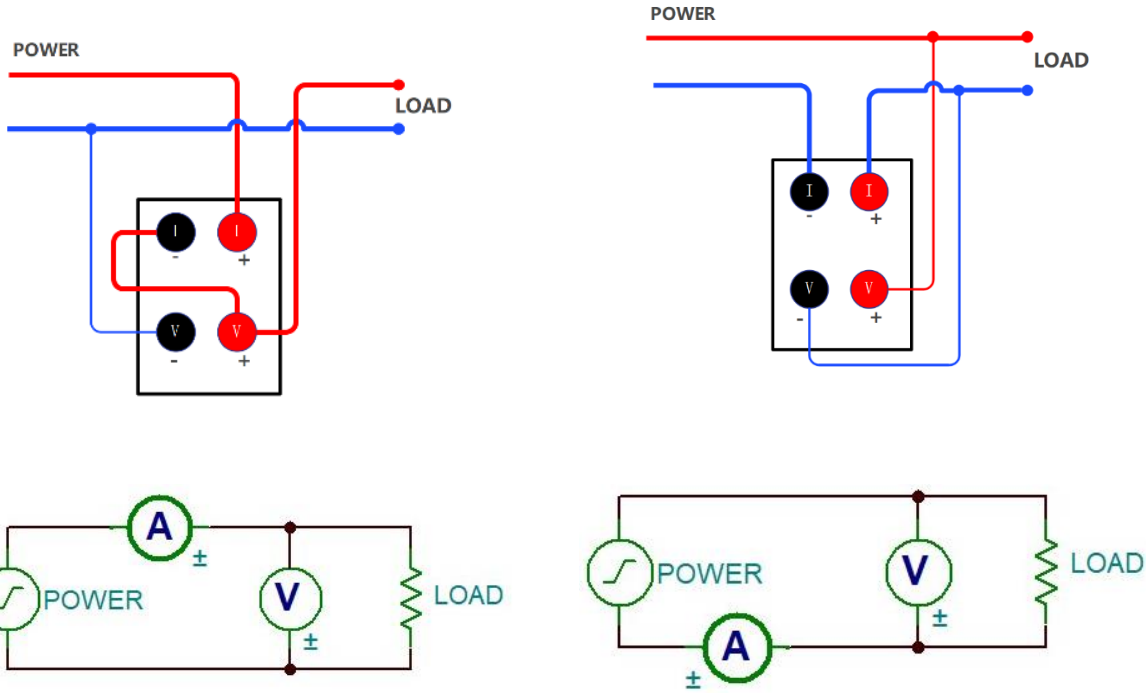
In this section, the shunt is mainly used to illustrate the wiring diagram, and the voltage output clamp current sensor is also used in the practical application.

Notes

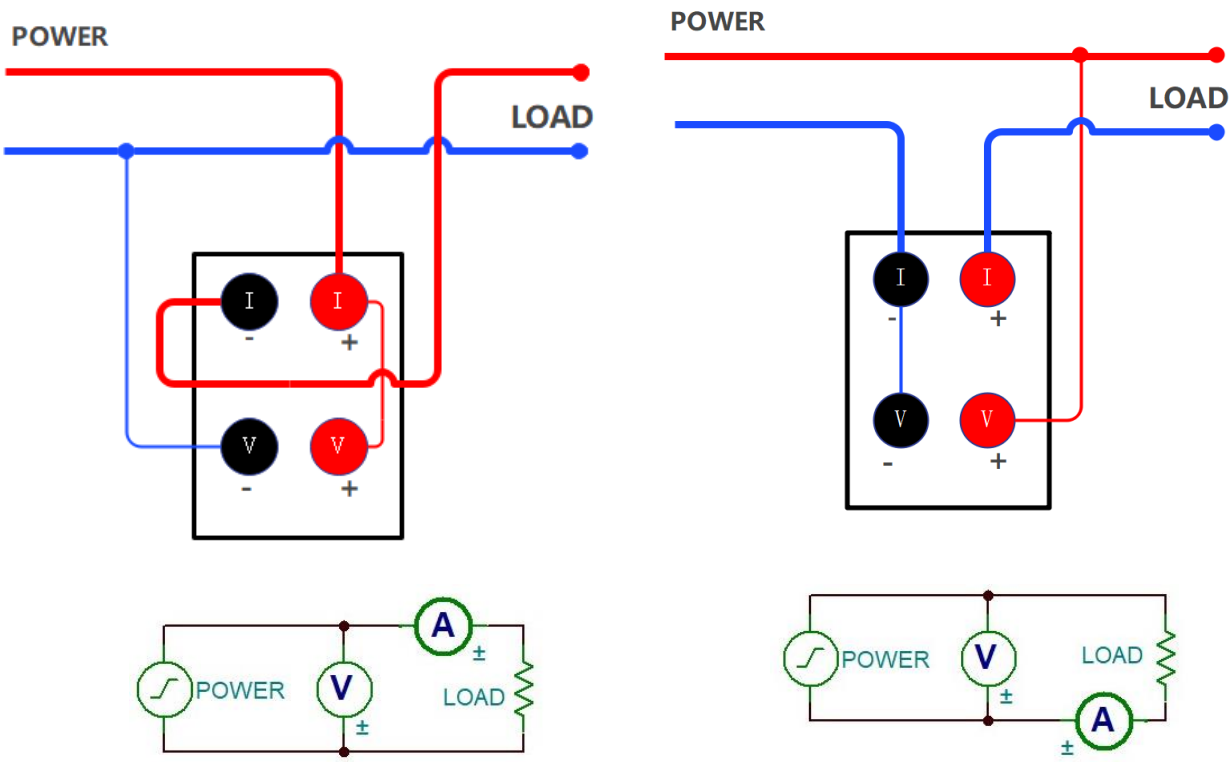
1. The load current flows along the thicker wires in the wiring diagram below, so that these wires need have a sufficiently large safe current-carrying capacity.
2. Turn off the power supply of the load and the instrument when the load end is wiring.
3. When measuring large currents/voltages or the current containing high frequency components, special attention should be paid to the possibility of mutual interference and noise problems when wiring.
4. To avoid stray capacitance affecting the measurement results, the test leads should be as short as possible.
5. In order to minimize the distributed capacitance to ground, the wire and grounding line should be as far away from the casing as possible.

7.3.1 Wire Connection of Direct Input Voltage and Current (①)

- Wire connection schematic diagram when measuring the signal with large current



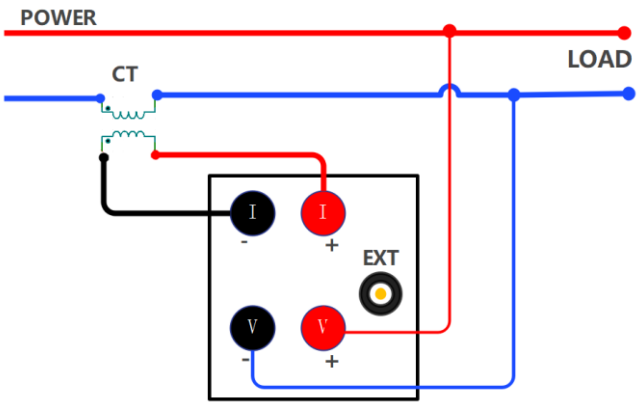
- Wire connection schematic diagram when measuring the signal with small current



Explanation

In order to minimize the effect of stray capacitance on the measurement results, the measurement can be connected to the current input of the power meter as close as possible to the power supply ground, and use the thicker and shorter wires for the wire connection.

7.3.2 Direct Input Voltage and CT Input Current (②)

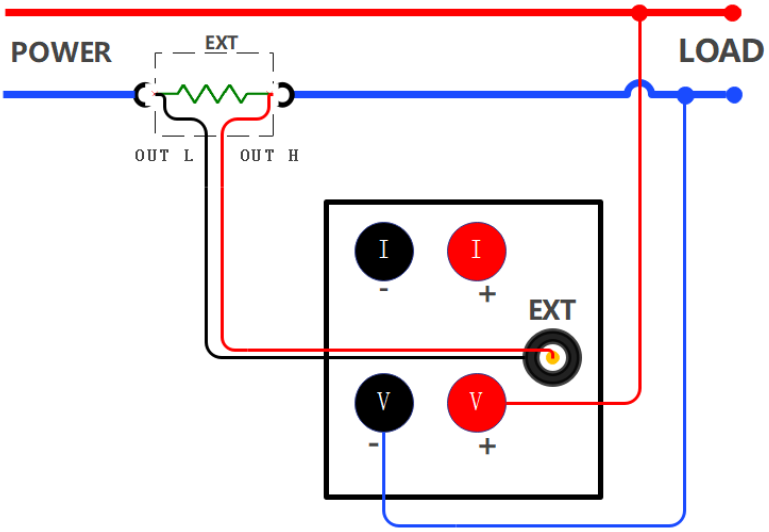


Danger

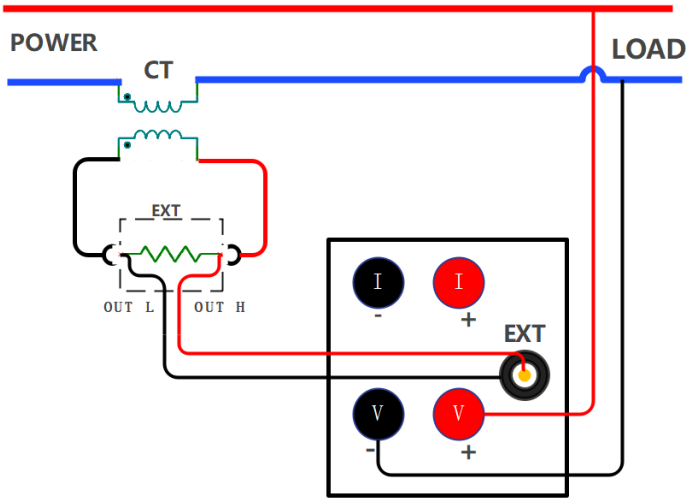
Do not use bare wire and sensor. It is important to avoid leaving the secondary side of a current transformer (CT) open-circuited, as it can cause high voltage transients and electric shock.

7.3.3 Direct Input Voltage and EXT Input Current (③)

The current sensor of output voltage type must be selected when using EXT CH. The measurement circuit connecting method is shown in the following figure.



7.3.4 Direct Input Voltage and CT + EXT Input Current (④)



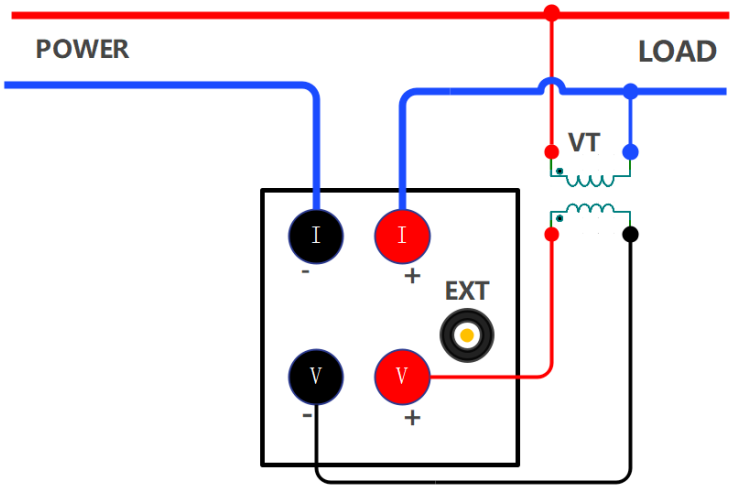
Warning

When using this wire connection for measurement, connecting the secondary side of CT to the input terminal of EXT, and then connecting the input terminal of EXT to the sensor input of the instrument, and finally connecting CT to the circuit to be tested.

Cautions

The measurement accuracy of this method is very rely on the accuracy of external sensor. If use this way to measure the equivalent accuracy of current sensor, the measured data error will be enlarged, so do not use this measurement method unless it is necessary.

7.3.5 VT Input Voltage and Direct Input Current (⑤)

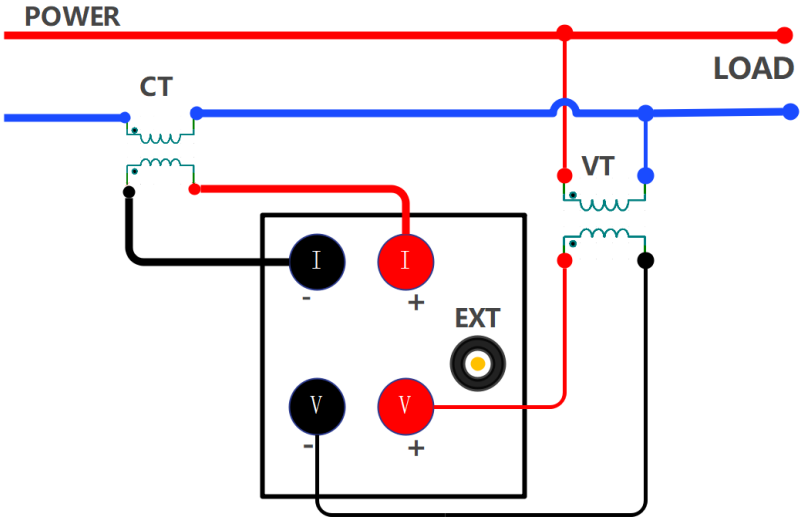


7.3.6 VT Input Voltage and CT Input Current (⑥)

When the maximum current or voltage of the measuring object is over than the maximum measurement range of the instrument, it must use the CT and VT before measuring.

When using this wire connection for measurement, connecting the secondary side of CT to the current input terminal of power meter, and the secondary side of VT to the voltage input terminal of power meter, and finally connecting CT and VT to the circuit to be tested.

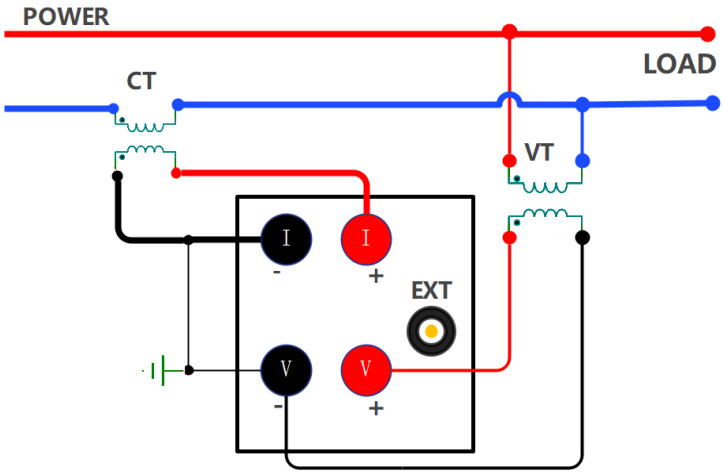
The wire connection example is shown in the following figure.



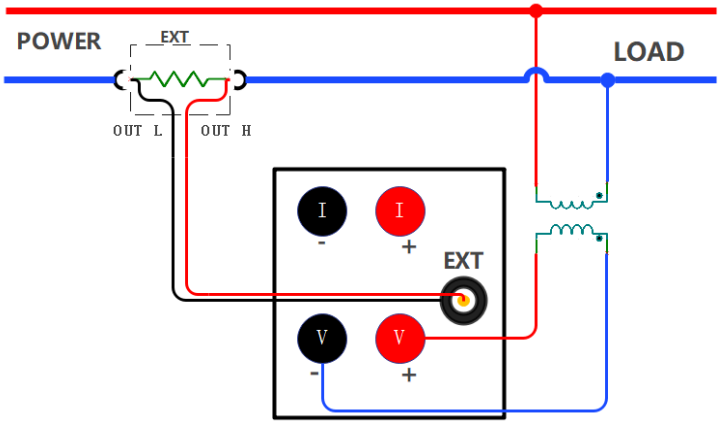
Warning

The secondary side of CT will product high voltage when using the CT. When the current is flowing on the primary side, please avoid the secondary side of CT is open-circuit, otherwise,

it will be very dangerous. Connecting the common port (-) on the secondary side of VT/CT to ground to ensure security, as shown in the following figure.



7.3.7 VT Input Voltage and EXT Input Current (⑦)



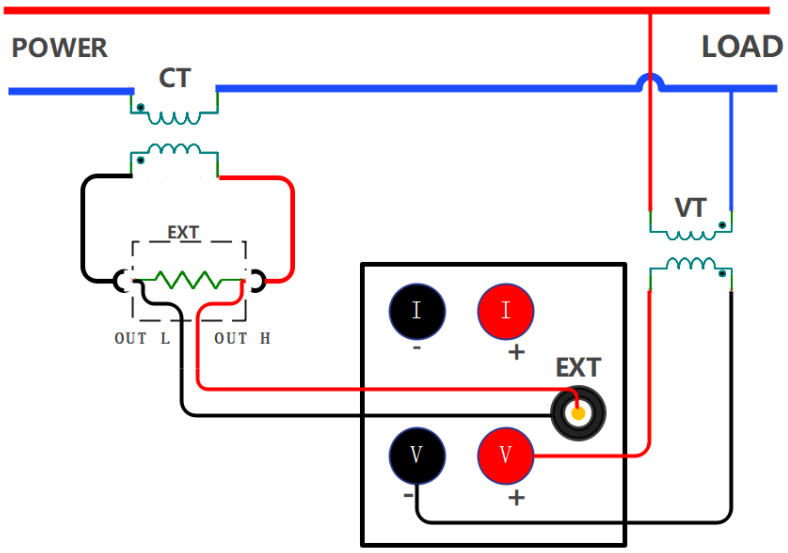
Warning

Do not use bare sensor, it may cause electric shock. Please make sure that the sensor is intact and the energized parts of the sensor are insulated from the box, and the sensor need have sufficient voltage-resistant for the voltage used in the measuring circuit.

When using EXT, do not wiring in the state of power-on. Do not touch the circuit, there is voltage on EXT when it is power on. The power of the measuring circuit must be disconnected when wiring.

7.3.8 VT Input Voltage and CT + EXT Input Current (⑧)

The measurement accuracy of this method is very rely on the accuracy of external sensor. If use this way to measure the equivalent accuracy of current sensor, the error in the measured data will be larger than the error in using a single current sensor alone, so do not use this measurement method unless it is necessary.



Warning

When using the CT, be sure to fully understand the specification of voltage and clamp current sensor, the operating method and the dangerous factors (such as electric shock).

When using the EXT, do not touch the CT or connecting test cables. When the power of measuring circuit on EXT is enabled, the CT will produce the voltage, so it is dangerous.

Please use the connector that has safety design to connect the EXT of the instrument. In the event that a connector is dislodged, a voltage is generated at the conductive part, which is very dangerous.

7.3.9 Connecting Power Supply

Plug the power socket on the rear panel and use the specified power voltage, the power socket should be with ground wire. After checking that the wiring is correct, open the instrument switch on the front panel, the instrument will enter to the measurement state.

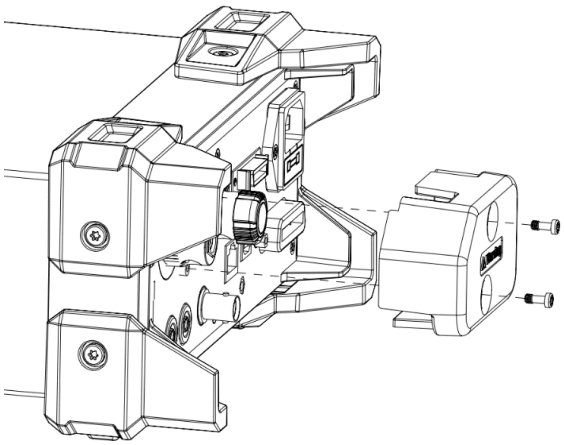
Cautions

In order to ensure the stability of the instrument measurement data, the instrument should be warmed up for 30 minutes before starting the measurement. After cutting off the power supply of the instrument, it should be waited for more than 5 seconds before powering up again. It is strictly prohibited to switch the power supply repeatedly within a short period of time, or else it will shorten the life of the instrument, and may cause the instrument to malfunction. After use, please turn off the instrument power and unplug it to prevent the instrument from being damaged by possible lightning strikes.

Warning

When using the current input terminals (types ①、②、⑤、⑥ connections) for measurement, the protective cover should be securely locked after completing the circuit connection. This is to prevent accidental contact with the terminals, which could lead to electric shock. Additionally, the exposed parts

of the test leads must be entirely covered by the protective cover. The installation direction and position of the protective cover are shown below.



8. Remote Control

UTE310 digital power meter can be remotely controlled by communicating with a computer via the USB, RS-232/GPIB interface, or RJ-45 Ethernet interface. For remote control, the user can use only one of the several communication interfaces for communication.

UTE310 digital power meter supports two remote control methods.

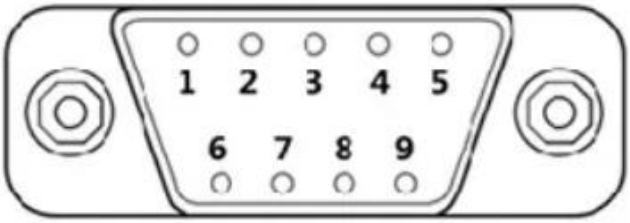
- User-defined programmed control based on SCPI and Modbus commands
- UTE310 host computer software

8.1 RS-232 Interface

RS-232 is a widely used serial communication interface standard. It was originally established by the Electronic Industries Alliance (EIA) in 1962 to specify the electrical and mechanical characteristics of serial binary data exchange between data communication devices.

The RS-232 standard defines 25-pin or 9-pin connectors. The UTE300 series digital power meter uses a 9-pin RS-232 connector. Users can send SCPI commands to the power meter remotely via the RS-232 interface from a PC. After receiving the relevant SCPI commands, the power meter will execute the corresponding functions of the front panel buttons and can return measurement and calculation data, control panel settings parameters, status bytes, error codes, and more.

The RS-232 communication interface uses a DB9 male connector, and the pin definitions are shown in the diagram below.



1	NC
2	RXD (RS-232 data input)
3	TXD (RS-232 data output)
4	NC
5	GND (RS-232 signal ground)
6	NC
7	NC
8	NC
9	NC

Notes

Before operating communication, UTE310 should match with the following parameters of the control host.

(1) Baud rate: 1200,4800, 9600, 19200, 38400, 57600, 115200.

(2) Check bit: NONE (fixed value)

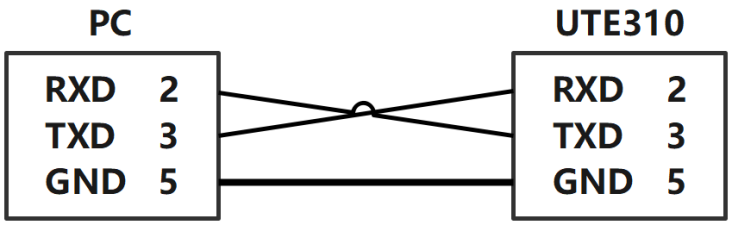
(3) Data bit: 8 (fixed value)

(4) Stop bit: 1 (fixed value)

8.1.1 RS-232 Settings

1. **Communication protocol**: Set the communication control protocol of the power meter to SCPI,for the setting method, refer to section 7.2.3 of the UTE300 series digital power meter user manual..
2. **Baud rate**: Set the communication baud rate of the UTE300 to be consistent with the control host. For the setting method, refer to section 7.3.1 of the UTE300 series digital power meter user manual..

8.1.2 PC Connect to UTE310 via RS-232



Explanation

- In order to ensure stable communication, it is forbidden to use other interfaces for communication when using RS-232 interface.
- The number 2, 3, 5 mentioned in the above schematic indicates the pin numbers of DB9 interface, other pins not listed are not used.
- The above schematic is using a cross-serial cable, please use a cross-serial cable to connect the PC to the UTE310.
- The above wiring method only supports a PC with RS-232 interface. If the PC has no RS-232 interface, please use USB convert RS-232 serial line to connect a PC to UTE310.
- This wiring method only supports SCPI.

8.2 LAN Interface

UTE310 is equipped with a LAN port, so the user can send commands to the power meter by LAN port. When the power meter receives the command, the power meter will execute the function which corresponding to the key on the front panel and return the measured and calculated data, the setting parameters and state bytes of control panel and the error codes.

Port number	1
Interface type	RJ-45
Electrical and mechanical specifications	IEEE802.3
Transmission system	LAN (100BASE-TX, 10BASE-T)
Transmission rate	Maximum 100Mbps
Communication protocol	Modbus-TCP/IP
Support services	DHCP, Remote control (Modbus-TCP/IP)

8.2.1 LAN Settings

1. **Communication protocol**: Set the communication control protocol of the power meter to Modbus or SCPI. For the setting method, refer to section 7.2.3 of the UTE300 series digital power meter user manual.
2. **Selecting IP mode**: DHCP (automatic acquire) or MANU (manually acquire).

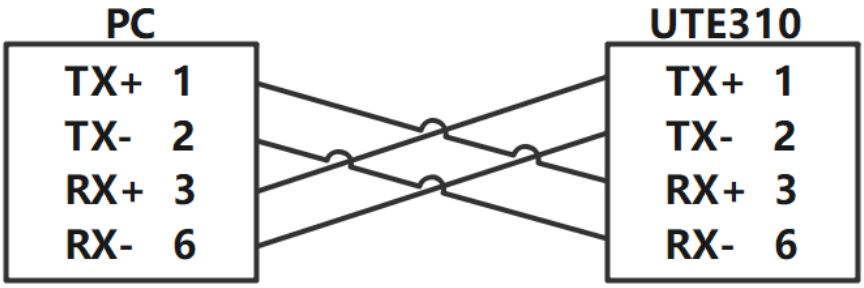
Explanation

1. When the IP mode is set to manual, the user needs to correctly configure the power meter's IP address, subnet mask, and gateway.

2. When using the SCPI protocol, select port 5025; when using the Modbus communication protocol, select port 502.

8.2.2 PC Connect to UTE310 via LAN

- PC Connect to a Single UTE310



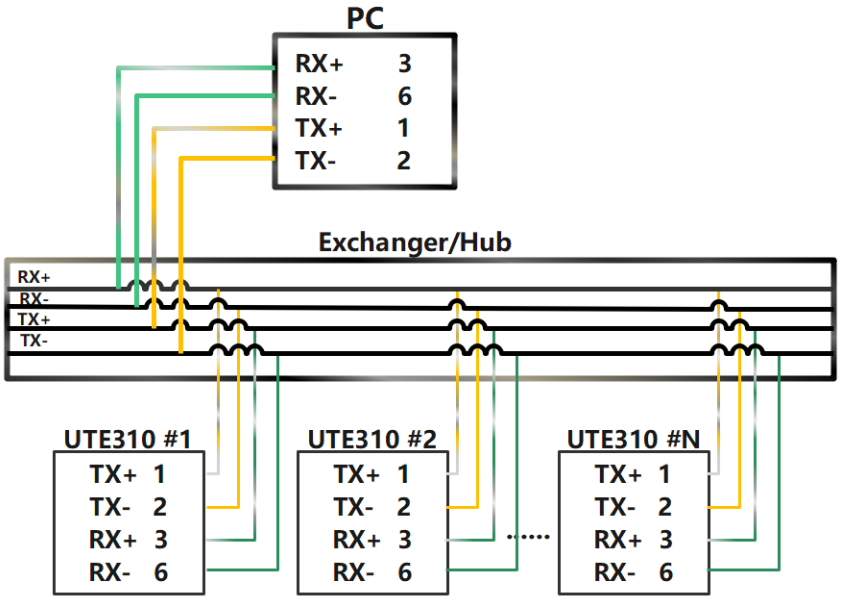
Explanation

1. The connections shown in the diagram are for illustration purposes only; in actual use, network cables are used for the connections.

2. The numbers in the diagram represent the pin numbers of the RJ-45 connector.

- PC Connect to Multi-UTE310

A PC connects to multiple UTE310 should through the concentrator or switch, as shown in the following figure.



Explanation

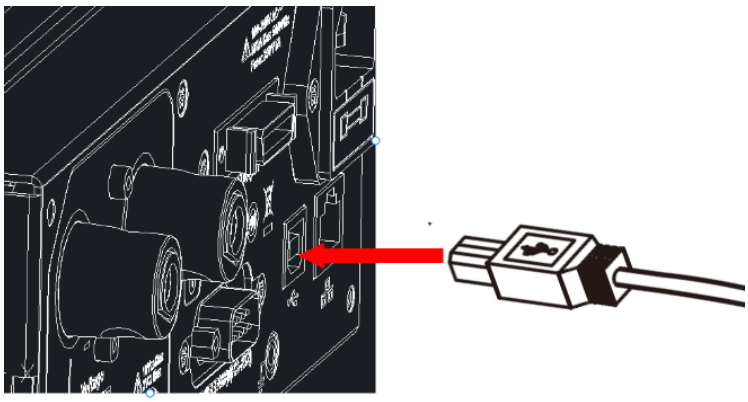
- To ensure stable communication, when using the Ethernet interface for communication, other interfaces must not be used simultaneously.
- In order to ensure stable communication, it is forbidden to use other interfaces for communication when using RJ-45 interface.
- The above wiring represents the connection between the send end and the receive end of the data, and does not fully represent the actual physical connection.

8.3 USB Interface

When use USB interface to communication, it is not necessary to set USB parameters on the instrument.

Port number	1
Interface type	B type USB (plug)
Electrical and mechanical specifications	USB 2.0
Transmission system	HS(high speed;480Mbps) and FS(full speed;12Mbps)
Transmission rate	User-defined
PC requirement	32-bit or 64-bit Windows 7 and higher systems with USB ports

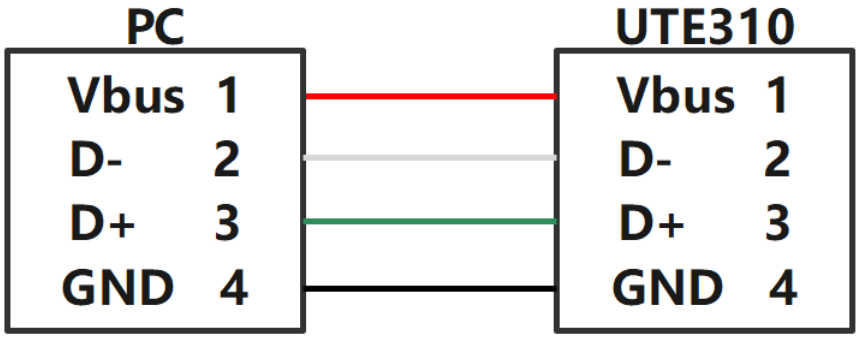
USB Connecting Figure



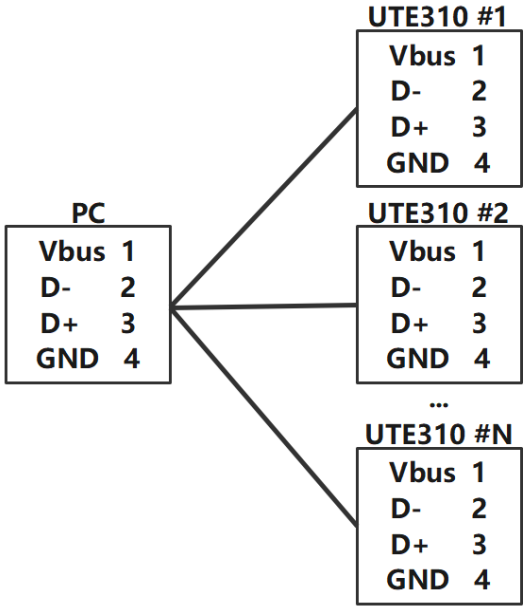
USB Connecting Figure

8.3.1 PC Connect to UTE310 via USB

- PC Connect to a Single UTE310



- PC Connect to Multi-UTE310



Cautions

- When use USB interface to communication, do not connect other interface to the PC.
- USB cable should reliably connect to the instrument and the PC.

- If the PC uses USB interface to connect multiple devices, the instrument should be connected to the USB interface closest to the PC side.

8.4 GPIB Interface (Optional)

UTE310's optional interface is GPIB. If the optional GPIB interface is selected, the RS-232 will not be equipped. When the optional GPIB interface is selected, the user can send the command to the power meter via GPIB, the power meter will execute the function which corresponding to the key on the front panel and return the measured and calculated data, the setting parameters and state bytes of control panel and the error codes.

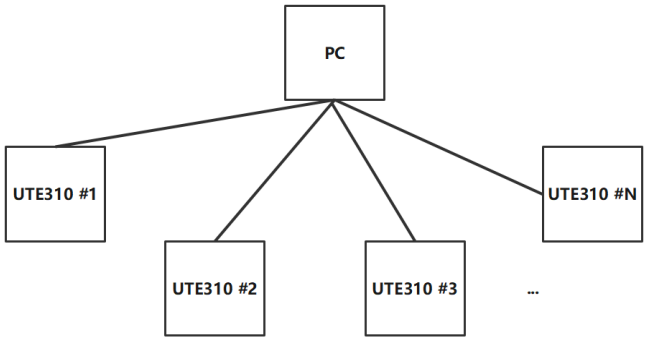
Applicable Equipment	American National Instrument PCI-GPIB or PCI-GPIB+, PCIe-GPIB or PCIe-GPIB+ PCMCIA-GPIB or PCMCIA-GPIB+ (Windows Vista or not support Windows 7) GPIB-USB-HS uses NI-488.2M Ver. 2.8.1 or update drive
Electrical and Mechanical Specifications	IEEE-488

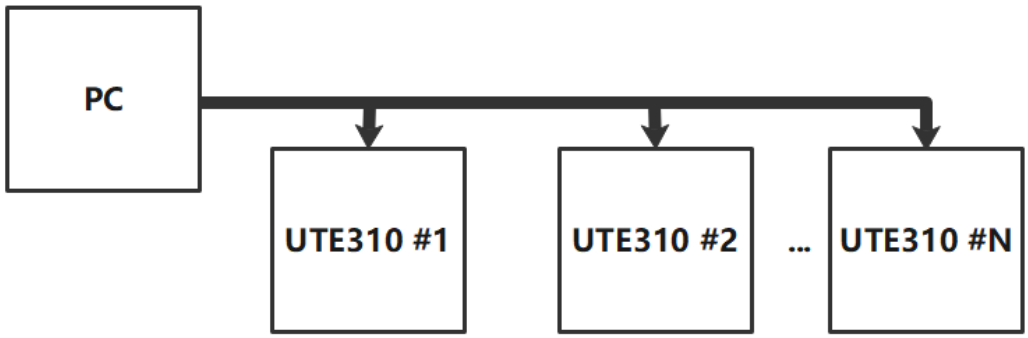
Explanation

To ensure reliable and stable GPIB communication, please use genuine GPIB cables. Each GPIB device has a unique GPIB address, which is used to distinguish different GPIB devices. Therefore, when using the GPIB interface of the power meter, the user needs to set the GPIB address of the power meter first.

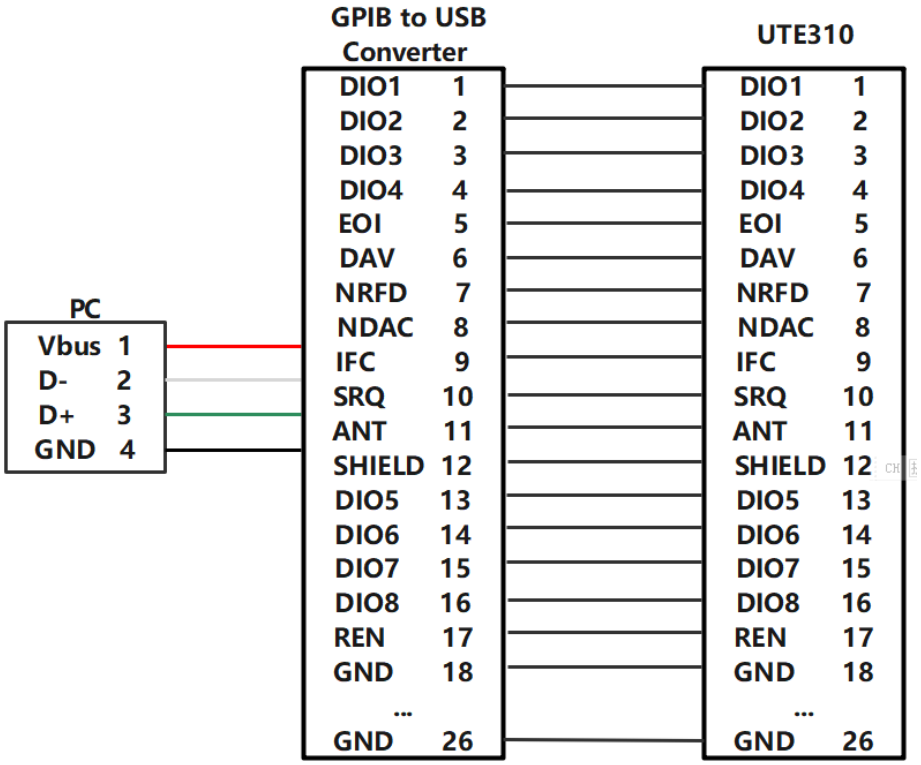
8.4.4 PC Connect to UTE310 via GPIB

When using the GPIB interface for communication, please use genuine GPIB cable and do not use the longer wire. The connection is shown in the following figure.





In normal condition, PC has no GPIB interface, the user can connect through the GPIB to USB converter card, as shown in the following figure.

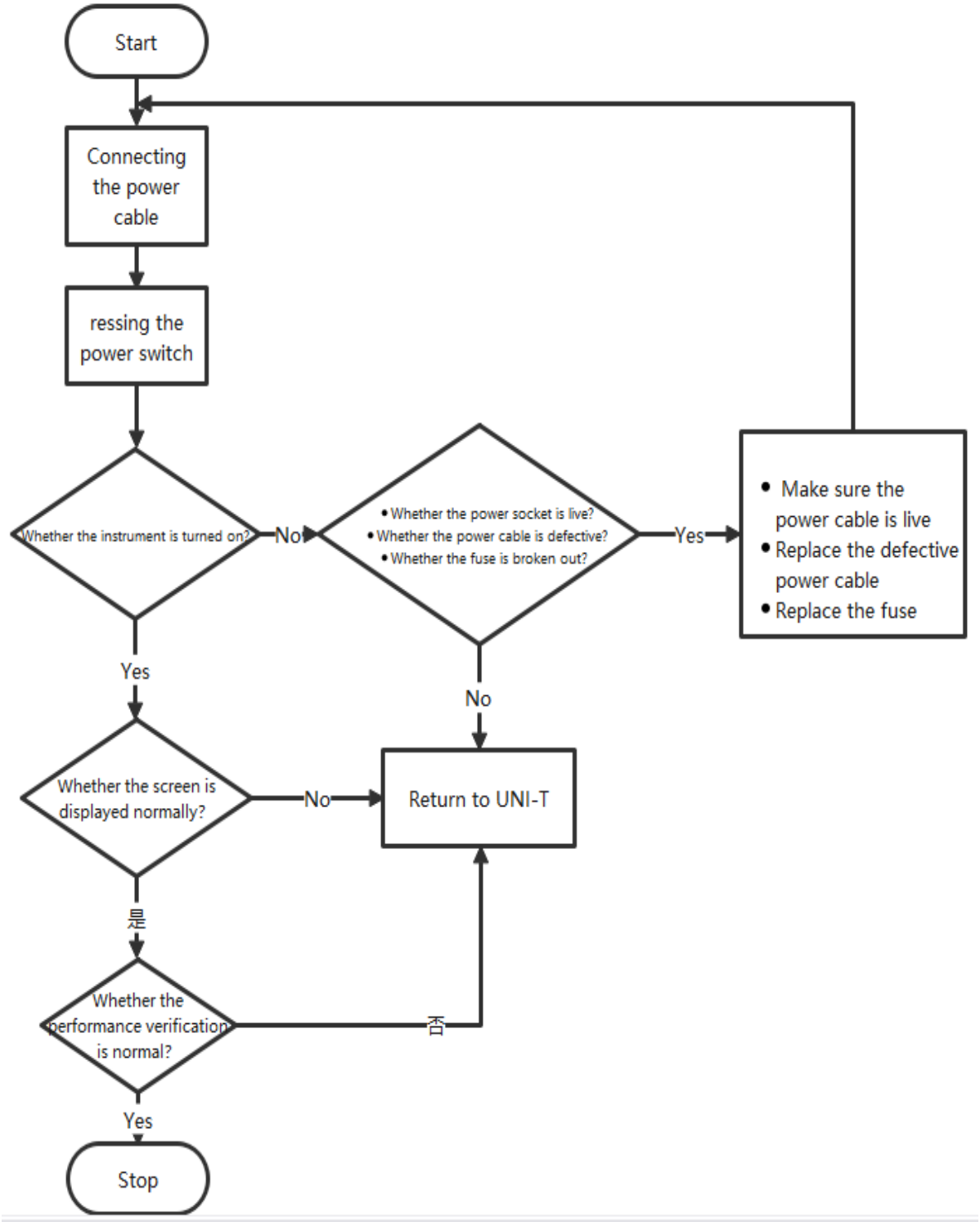


Explanation

- To ensure stable communication, when using the GPIB interface to communicate, other interface is forbidden.
- The number in the above block diagram indicates the pin numbers of the computer's USB or the pin numbers of the GPIB.
- When using the GPIB interface for communication, please use genuine GPIB cable.

9. Trouble-shooting

After pressing the power switch button, the power meter does not start normally. The fault can be handled according to the following process.



10. Contact Us

If the use of this product has caused any inconvenience, if you in mainland China you can contact UNI-T company directly.

Service support: 8am to 5.30pm (UTC+8), Monday to Friday or via email. Our email address is infosh@uni-trend.com.cn

For product support outside mainland China, please contact your local UNI-T distributor or sales center.

Many UNI-T products have the option of extending the warranty and calibration period, please contact your local UNI-T dealer or sales center.

To obtain the address list of our service centers, please visit our website at URL: http://www.uni-trend.com

P/N:110401112216X

说明书菲林做货要求：

序号	项目	内容
1	尺寸	285*210mm
2	材质	60g书纸
3	颜色	单色印刷
4	外观要求	完整清晰、版面整洁，无斑墨、残损、毛边、刀线错位等缺陷。
5	装订方式	钉装
6	表面处理	无
7	其它	无
版本		0
修改页码		

DWH 设 计	宣浩	MODEL 机型: UTE310	Part NO. 物料编号: 110401112216X
CHK 审核		UNI-T® 优利德科技(中国)股份有限公司 UNI-TREND TECHNOLOGY (CHINA) CO., LTD.	
APPRO. 批准			