UNI-T®

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Datasheet

UTE300 Series Digital Power Meter

Key Specifications

- AC and DC voltage :
  UTE310 and UTE310G: 15V, 30V, 60, 150V, 300V, 600V
  UTE310H and UTE310HG: 15V, 30V, 60, 150V, 300V, 600V ,1000V
- AC and DC current :
  UTE310 and UTE310G: 5mA, 10 mA, 20 mA, 50 mA, 100 mA, 200 mA, 500 mA, 1A, 2A, 5A, 10A, 20A
  UTE310H and UTE310HG: 1A, 2A, 5A, 10A, 20A, 50A
- AC and DC power :
  UTE310 and UTE310G: 75mW ~ 1200W
  UTE310H and UTE310HG: 15W ~ 50000W
- Frequency Measurement: 0.1Hz ~ 300kHz
- Integration power: 0 ~ 10000 hours
- Four operations: A+B, A-B, AxB, A/B, A/B^2, A^2/B
- Harmonic Measurement: 1 ~ 50th
- Wave display: Voltage, current
- External sensor: Current
- DAC output: U, I, P, S, Q, LAMBda, PHI, FU, FI, UPK, IPK, WH, WHP, WHM, AH, AHP, AHM, MATH

User-friendly and easy-to-use Design

Graphical user interface, simple and convenient operation; help system for access information easily; USB data storage; multi-data display at one screen; USB for file management; USB online upgrade for maintenance and update the system of product.

Application

- Research & Education
- High speed measurement at manufacturing
- Laboratory and R&D measurements
- Lighting appliances
- Power tools
- Home appliances
- EV and electric heating appliances manufacturing and more.

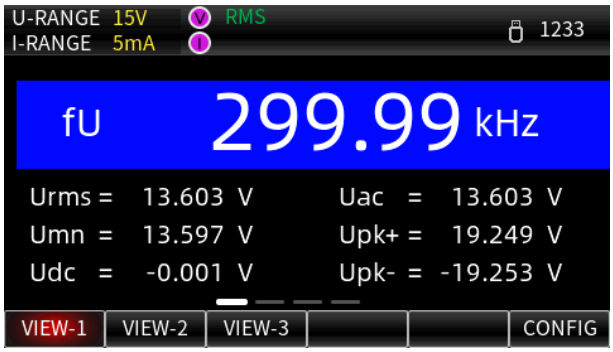
Main Features

- 4.3"TFT-LCD display resolution 480*272
- Measuring range of voltage and current RMS:
  UTE310 and UTE310G: 75mV ~ 600V / 25uA ~ 20A
  UTE310H and UTE310HG: 75mV ~ 1000V / 10mA ~ 50A
- Maximum resolution of voltage and current: 1mV/0.1uA
- Basic accuracy of voltage, current and power: 0.1%
- Maximum resolution of power: 0.001mW
- Measuring bandwidth: 0.1Hz~300 kHz

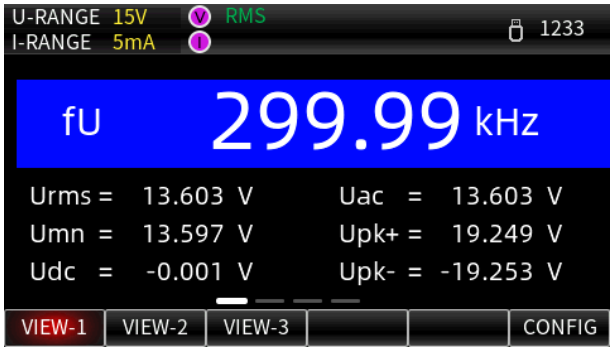
- Sampling rate: 1MHz
- Multiple interfaces: USB, RS-232, GP-IB, LAN
- Communication protocol: Modbus and SCPI
- Voltage and current waveform display, harmonic graphic display, D/A output for measurement recording, comparator function, current sensor input, USB data storage

Features

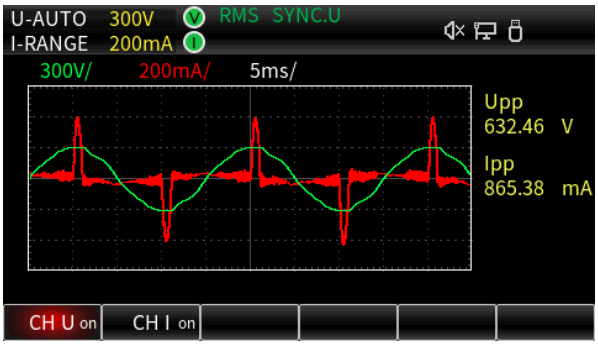
4.3"TFT, multi-parameter displays at one screen

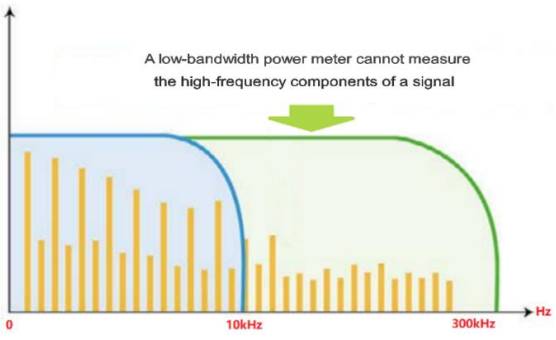


300 kHz analog bandwidth for capturing higher frequency signal

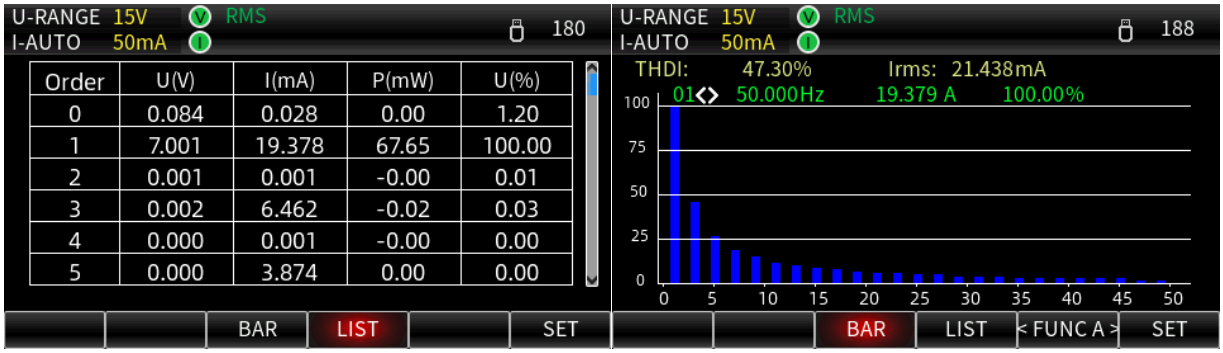


Sampling rate 1MHz for accurately measuring transient signal

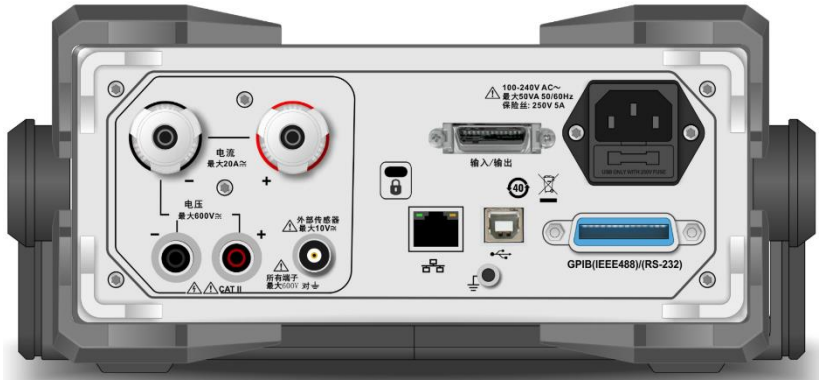




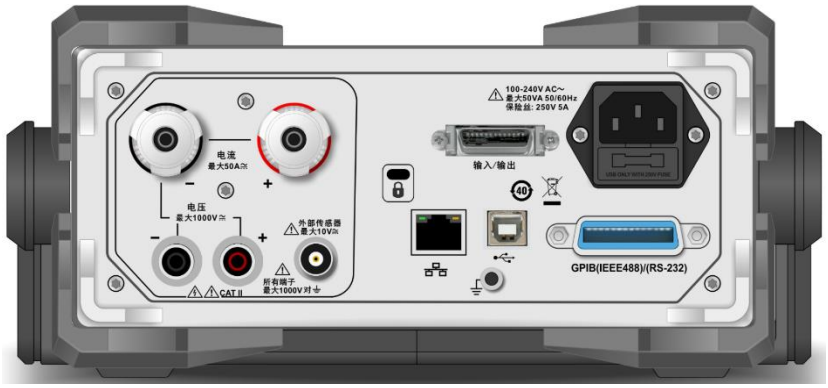
50th harmonic supports IEC61000-4-7



Multi-channel communication port



UTE310/UTE310G



UTE310H/UTE310HG

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 ⌀: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
	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.)		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.)	

Model	UTE310、UTE310G		UTE310H、UTE310HG	
Accuracy of Direct Current Input	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 Channel Range	CF=3	CF=6/6A	CF=3	CF=6/6A
	2.5V	1.25V	2.5V	1.25V
	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
	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

<table>
<tr><th>Model</th><th colspan="2">UTE310、UTE310G</th><th colspan="2">UTE310H、UTE310HG</th></tr>
<tr><td rowspan="4">Frequency Measurement Range</td><td>10 S</td><td>0.2Hz≤f≤300kHz</td><td>10 S</td><td>0.2Hz≤f≤300kHz</td></tr>
<tr><td>20 S</td><td>0.1Hz≤f≤300kHz</td><td>20 S</td><td>0.1Hz≤f≤300kHz</td></tr>
<tr><td>Auto</td><td>0.1Hz≤f≤300kHz</td><td>Auto</td><td>0.1Hz≤f≤300kHz</td></tr>
<tr><td colspan="4">Note: When using direct current input with UTE310H and UTE310HG, the maximum measurement range is 20kHz.</td></tr>
<tr><td>Power Range</td><td colspan="2">75mW ~ 12000W</td><td colspan="2">15W ~ 50KW</td></tr>
<tr><td>Influence of Power Factor</td><td colspan="4">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) %}]</td></tr>
<tr><td>Accuracy of Apparent Power S</td><td colspan="4">Voltage Accuracy + Current Accuracy</td></tr>
<tr><td>Accuracy of Reactive Power Q</td><td colspan="4">Apparent Power Accuracy +($\sqrt{(1.0004-\lambda^2)}$ $-\sqrt{(1-\lambda^2)}$)x100% of the Range</td></tr>
<tr><td>Accuracy of Power Factor λ</td><td colspan="4">$\pm[(\lambda-\frac{\lambda}{1.0002})+$ |cosø-cos{ø+sin^{-1}(Influence of Power Factor when $\lambda=0$)%/100}|]±1digit
The voltage and current are at the rated range, and ø is the phase difference between the voltage and current</td></tr>
<tr><td>Accuracy of Phase Difference ø</td><td colspan="4">±[|ø-$cos^{-1}\left(\frac{\lambda}{1.0002}\right)$| + sin^{-1}{(Influence on Power Factor % when λ =0)/100}]</td></tr>
<tr><td>When the line filter is turned on</td><td colspan="4">f < 45Hz: Increase by 1% of the reading
45Hz≤f < 66Hz: Increase by 0.3% of the reading</td></tr>
<tr><td>Temperature Coefficient</td><td colspan="4">Within the range of 5°C to 18°C or 28°C to 40°C, add ±0.03%/°C of the reading.</td></tr>
<tr><td>Waveform Display</td><td colspan="4">Display Voltage and Current Waveforms</td></tr>
<tr><td>Line Filtering</td><td colspan="4">Standard Configuration</td></tr>
<tr><td>Frequency Filtering</td><td colspan="4">Standard Configuration</td></tr>
<tr><td>Harmonic Measurement</td><td colspan="4">Capable of measuring up to the 50th harmonic.</td></tr>
<tr><td>Integration Function</td><td colspan="4">Capable of performing average active power integration and current integration</td></tr>
<tr><td>Mathematical Operations</td><td colspan="4">Standard Configuration</td></tr>
<tr><td>D/A Output and Control</td><td colspan="4">Standard configuration includes 4-channel D/A conversion output</td></tr>
<tr><td>Communication Interface</td><td colspan="4">LAN, USB,RS-232 (optional GPIB, with GPIB the model is UTE310G or UTE310HG)</td></tr>
</table>

Effect of temperature changing after the zero level compensation or range is changed

DC Voltage: Add 0.02% of the range per °C to the DC voltage accuracy.

DC Current: Add the following values to the DC current accuracy:

UTE310 and UTE310G: (range of 5mA/10mA/20mA/50mA/100mA/200mA): 5 μA/℃

UTE310 and UTE310G: (range of 0.5A/1A/2A/5A/10A/20A): 500 μA/℃

EX1: 1 mV/℃

EX2: 50 μV/℃

DC power: In DC power accuracy, consider the impact of voltage and current.

The accuracy of wave display, Upk and Ipk

Increase the following values to the above accuracy (the reference value):

Valid input range is ± within the range of 300% (Crest factor=6 or 6A, ± within the range of 600%).

Voltage input: 1.5× range√(15/range)%

Direct current input range:

UTE310 and UTE310G: (range of 5mA/10mA/20mA/50mA/100mA/200mA): 3×range√(0.005/ range)%

UTE310 and UTE310G: (range of 0.5A/1A/2A/5A/10A/20A): 3×range√(0.5/ range)%

UTE310H and UTE310HG: Direct current input: 3×range√(1/ range)%

External current sensor input range:

EX1: 3×range√(2.5/ range)%

EX2: 3×√(2.5/ range)%

Effect of self-heating due to voltage input

AC Voltage Accuracy: Add 0.0000001×U^2% of the reading to the AC voltage accuracy..

DC Voltage Accuracy: Add 0.0000001×U^2% of the reading + 0.0000001×U^2% of the range to the DC voltage accuracy, where U is the voltage reading (V)

AC Power Accuracy: Add 0.0000001×U^2% of the reading to the AC power accuracy.

DC Power Accuracy: Add 0.0000001×U^2% of the reading + 0.0000001×U^2% of the range to the DC power accuracy.

U is the voltage reading (V). Even after the voltage input decreases, the effect of self-heating will continue until the temperature of the input resistor drops.

Effect of self-heating due to current input

UTE310 and UTE310G:

AC Current Accuracy: Add 0.00013×I^2% of the reading to the AC current accuracy.

DC Current Accuracy: Add 0.00013×I^2% of the reading + 0.004×I^2mA to the DC current accuracy for the 0.5A/1A/2A/5A/10A/20A range.

DC Current Accuracy: Add 0.00013×I^2% of the reading + 0.00004×I^2mA to the DC current accuracy for the 5mA/10mA/20mA/50mA/100mA/200mA range.

AC Power Accuracy: Add 0.00013×I^2% of the reading to the AC power accuracy.

DC Power Accuracy: Add 0.00013×I^2% of the reading + 0.004×I^2mA to the DC power accuracy for the 0.5A/1A/2A/5A/10A/20A range.

DC Power Accuracy: Add 0.00013×I^2% of the reading + 0.00004×I^2mA to the DC power accuracy for the 5mA/10mA/20mA/50mA/100mA/200mA range.

I is the current reading (A). Even after the current input decreases, the effect of self-heating will continue until the temperature of the shunt resistor drops.

UTE310H and UTE310HG:

AC Current Accuracy: Add 0.00006×I^2% of the reading to the AC current accuracy.

DC Current Accuracy: Add 0.00006×I^2% of the reading + 0.001×I^2mA to the DC current accuracy.

AC Power Accuracy: Add 0.00006×I^2% of the reading to the AC power accuracy.

DC Power Accuracy: Add 0.00006×I^2% of the reading + 0.001×I^2mA to the DC power accuracy.

I is the current reading (A). Even after the current input decreases, the effect of self-heating will continue until the temperature of the shunt resistor drops.

The accuracy changing due to the data update interval

When the data update rate is 0.1 seconds, add 0.05% of the reading to the accuracy in the 0.5Hz to 1kHz range.

The accuracy guarantee range for frequency, voltage, and current (direct input) is as follows:

In the 0.1Hz to 10Hz range, all accuracy values are for reference only.

For DC, 10-45Hz, and 400Hz-30kHz ranges, if the current exceeds 20A, the current accuracy is for reference only.

When the frequency exceeds 30kHz to 100kHz, the maximum current input is 6A(Applies only to UTE310 and UTE310G).

Item	Specification
Crest factor	3 or 6
Wire Method	Single phase 2-wire system (1P2W)
Range Switching	Manual or Auto
Automatic Range	Range Increasing The range increases when any of the following conditions are met. ● Crest factor=3 Urms or Irms exceeds 130% of the current set range. The Upk and Ipk values of the input signal exceed 300% of the current set range. ● Crest factor=6 Urms or Irms exceeds 130% of the current set range. The Upk and Ipk values of the input signal exceed 600% of the current set range. ● Crest factor=6A Urms or Irms exceeds 260% of the current set range. The Upk and Ipk values of the input signal exceed 600% of the current set range.

Item	Specification
Automatic Range	Range Decreasing The range decreases when any of the following conditions are met. ● Crest factor=3 Urms or Irms is less than or equal to 30% of the measuring range Urms or Irms is less than or equal to 125% of the lower range. The Upk and Ipk values of the input signal are less than 300% of the current set range. ● Crest factor=6 Urms or Irms is less than or equal to 30% of the measuring range Urms or Irms is less than or equal to 125% of the lower range. The Upk and Ipk values of the input signal are less than 600% of the current set range.
Display Mode Switching	RMS (TRMS of voltage and current), VOLTAGE MEAN (rectified average value calibrated to RMS voltage), DC (simple average of voltage and current)
Measurement synchronization Source	The entire interval of the signal's voltage, current, or data update interval can be selected as the synchronization source for the measurement.
line Filter	OFF or ON (cut-off frequency 500Hz)
Peak Measurement	The instantaneous voltage, instantaneous current, or instantaneous power obtained from the sampling Measure the peak (maximum, minimum) value of voltage, current, or power.
Zero Level Compensation	Remove the offset from internal

Item	Specification
Lead and lag phase detection (Phase angle Phi: +(lead) and -(lag))	The overrun and hysteresis of the input voltage and current can be detected correctly under the following condition. ● Sine waveform ● When the measured value is greater than or equal to 50% of the measuring range (greater than or equal to 100% at peak factor=6) ● Frequency: 20Hz ~ 2kHz ● Phase difference: ±(5°~ 175°)
Ratio	When inputting the output of external sensor VT and CT to the instrument, the sensor conversion ratios: VT ratio, CT ratio and power coefficient should be set. ● Valid digits: Automatically set according to the effective number of digits for voltage and current ranges. ● Setting range: 0.001 ~ 9999
Average	Choose from the following two methods: ● Exponential Mean, ● Moving Average Choose the decay constant for exponential averaging or the moving average constant from 8, 16, 32, and 64
Crest factor	Calculate the peak factor (peak /RMS value) of the voltage and current.
Four Operations	There are a total of 6 types of operations (A+B, A-B, A×B, A/B, A^2/B, A/B^2)

Item	Specification
Average Active Power at Integration	Calculating the average active power during the integration period

integral

Item	Specification
Mode	Manual integration, Normal integration, Repeat integration
Timer	Automatic stopping the integration by setting the timer Setting range: 0 hour 00 minute 00 second ~ 10000 hours 00 minutes 00 seconds (for 0 min 00 sec 00 sec, it is automatically set to manual integration mode)
Timer Overflow	WP: 999999MWh/-99999MWh q: 999999MAh/-99999MAh When the integration time reaches the maximum integration time of 10000 hours, or when the integration value reaches the maximum displayable integration value (999999 or -99999), the integration time and value are maintained and the integration is stopped.
Accuracy	±(Power accuracy (or current accuracy) + 0.1% of reading)(fixed range) Note: In the automatic range, no measurement is performed when the range is changed. The first measured value after the range change and the period of non-measurement will be added.
Range Setting	Automatic range, fixed range The range switching see the measurement section of voltage, current and active power for details
Effective Frequency Range of Integration	Active power: DC ~ 45kHz Current: when the measurement mode is RMS, DC, the lower frequency ~ 45kHz determined by data update interval. When the measurement mode is VOLTAGE MEAN, DC, the lower frequency ~ 45kHz determined by data update interval.
Timer Accuracy	± 0.02%
Remote Control	Use external sensor signal to start, stop or rest the integration

Harmonic measurement

Item	Specification
Mode	PLL synchronization
Frequency Range	Fundamental frequency of PLL source is within the range of 10Hz~1.2kHz.
PLL Source	Select the voltage or current of each input unit Input level When the Crest factor=3, larger than or equal to 50% of the rated range When the Crest factor=6, larger than or equal to 100% of the rated range When the fundamental frequency is less than or equal to 200Hz, the frequency filter must be turned on.
FFT Data Length	1024/512
Window	Rectangle

Harmonic Measurement Mode: use the fixed count 1024 to perform FFT calculation

Fundamental Frequency	Sampling Rate
10Hz ≤ fundamental frequency ＜75Hz	f×1024
75Hz ≤ fundamental frequency ＜150Hz	f×512
150Hz ≤ fundamental frequency ＜300Hz	f×256
300Hz ≤ fundamental frequency ＜600Hz	f×128
600Hz ≤fundamental frequency ≤1200Hz	f×64
f in the formula is the basic frequency of the input signal. * The upper limit of the number of analyses can be reduced.	

IEC harmonic measurement mode (measured according to IEC61000-4-7:2002 standard) : 200ms time window is used for FFT calculation, and the maximum number of THD calculation is 40

Signal System	Sampling Rate
50 Hz	f×512
60 Hz	f×512

The power accuracy when the line filter is turned off. indicator ±(% reading +% range)

Item	Specification
Frequency	Voltage
10 Hz ≤ f<45 Hz	0.15% +0.35%
45 Hz ≤ f ≤ 440 Hz	0.15% +0.35%
440 Hz<f ≤ 1 kHz	0.20% +0.35%
1 kHz<f ≤ 2.5 kHz	0.80% +0.45%
2.5 kHz<f ≤ 5 kHz	3.05%+0.45%

* When the crest factor=3
* When λ(crest factor)=1
* The power over 1.2 kHz is the reference value.
* For direct current range, increase 10 μA to the current accuracy, increase (10 μA/ direct current range)×100% of range to the power accuracy
* For external current sensor, increase 100 μA to the current accuracy, increase (10 μA/ 100 μV/the rated range of external current sensor)100% of range to the power accuracy
* For harmonic input, increase the n^{th} harmonic reading of ({n/(m+1)}/50)% on the (n+m) and (n-m) harmonics of voltage and current, and ({n/(m+1)}/25)% on the (n+m) and (n-m) harmonics of power;
* Increases its reading of (n/500) on the n^{th} harmonic of voltage and current, and increase its reading of (n/250) % on power.

*The accuracy at the crest factor=6, the accuracy is same as the crest factor =3 with double range.

* The accuracy guarantee ranges for frequency, voltage and current are the same as those for common measurements.

If the amplitude of the high-frequency component is large, it may appear to have an effect of about 1% on a particular harmonic, which depends on the size of its frequency component; therefore, if the frequency component is small relative to the rated range, it will not cause a problem.

External current sensor input

Crest factor	Measuring Range
3	EX1:2.5V/5V/10V EX2:50mV/100mV/200mV/500mV/1V/2V/
6	EX1:1.25V/2.5V/5V EX2:25mV/50mV/100mV/250mV/0.5V/1V/

D/A output

Item	Specification
Output Voltage	±5V full scale (maximum approximate ±7.5V), relative to each rated value
Output Parameter	Setting channel: U、I、P、S、Q、LAMBda、PHI、FU、FI、UPK、IPK、WH、WHP、WHM、AH、AHP、AHM、MATH
Accuracy	±(each parameter accuracy + 0.2% of full scale (FS))(FS=5V)
D/A Conversion Resolution	16 bits
Minimum Load	100k
Update Interval	Same as data update interval *When the data update interval is set to AUTO, it is almost the same as the signal interval. But at 100ms or more.
Temperature Coefficient	±full scale of 0.05%/℃

Waveform display

Item	Specification
Number of Display Grid	300
Display Format	p-p packed data
Sampling Rate	About 1MS/s
Time Axis	500us/div, 1ms/div , 2ms/div , 5ms/div , 10ms/div , 20ms/div , 50ms/div , 100ms/div , 200ms/div , 500ms/div , 1s/div , 2s/div.
Vertical Axis	Voltage waveform display: (voltage range /3) /div Current waveform display: (current range /3) /div
Turn on/off Wave Display	Turn on/off the waveform display of each voltage or current

USB Interface

Item	Specification
Port Number	1
Port Type	B type interface (socket)
Specification of Electrical and Mechanical	USB Rev. 2.0
Transmission Mode	HS (high speed;480Mbps) and FS (full speed;12Mbps)
Protocol	User-defined protocol
PC Requirements	Equipped with USB port, running English or Chinese version of Windows7 (32-bit/64-bit) Windows Vista (32-bit) or Windows XP (32-bit, SP2 or update version)

Serial Interface (RS-232)

Item	Specification
Port Type	D-Sub 9-pin (plug)
Specification of Electrical	EIA-574(EIA-232(RS-232)9
Baud Rate	1200, 2400, 4800, 9600, 19200,38400,57600,11520 (default 115200)

Ethernet Interface

Item	Specification
Port Number	1
Port Type	RJ-45
Specification of Electrical and Mechanical	IEEE802.3
Transmission System	Ethernet (100BASE-TX, 10BASE-T)
Transmission Rate	Maximum 100Mbps
Communication Rate	TCP/IP
Support Services	DHCP, remote control

General characteristics

Rated power voltage	110VAC/220VAC
Preheat Time	≥ 30 minutes
Operating Environment	Full accuracy 5℃ ~40℃, 20% R.H.~80%R.H., non-condensation
Storage Temperature	-25℃ ~60℃, 20% R.H.~80%R.H., non-condensation
Altitude	2000 meters
Calibration Period	12 months
Rated Power Frequency	50/60Hz
Allowable Range of Power Frequency	48Hz ~ 63Hz
Maximum Power Consumption	50VA
Weight	4.3kg (gross weight), 2.6kg (net weight)
Safety Standard	Applicable standard: IEC 61010-1-2012, EN 61010-2-030 EMC: EN 61326-1 Class A, EN 61000-3-2,EN 61000-3-3 The communication output line and a shield line Safety degree: II Pollution degree: 2

Packing List

- Power cable 1 piece
- Safety test lead 1 pair (1 red and 1 black)
- Y type terminal 4 pieces
- Alligator clip 2 pieces
- Protective cover (with "Warning" engraved insert) 1 piece
- Product Calibration Certificate 1 piece
- Warranty card and certificate of conformity 1 piece
- Download guide of User's manual 1 piece