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Datasheet

UTE310 Digital Power Meter

Common Measurement Function

AC and DC voltage: 15V, 30V, 60, 150V, 300V, 600V
AC and DC current: 5mA, 10 mA, 20 mA, 50 mA, 100 mA, 200 mA, 500 mA, 1A, 2A, 5A, 10A, 20A
AC and DC power: 75mW~1200W
Frequency Measurement: 0-300kHz
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, λ, Ø, fU, fI, Upk, Ipk, WP, WP±, q, q±, MATH

Humanized 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 Fields

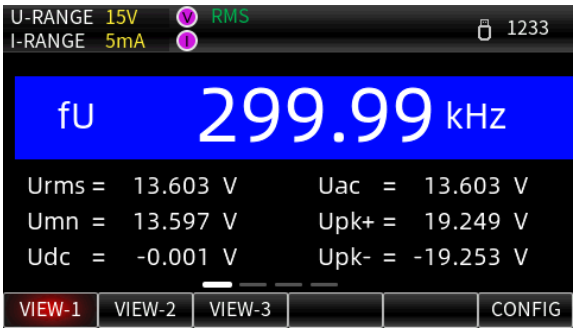
Research & Education
High speed measurement at the production field
Laboratory and R&D measurements
Lighting appliances
Power tools
Household appliances
Production lines of manufacturers in the fields of electric motors, electric heating appliances, etc.

Main Features

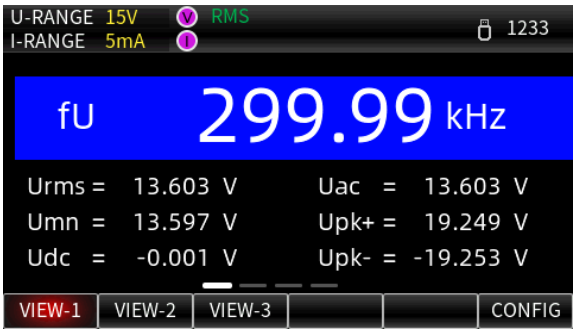
4.3″TFT-LCD display resolution 480*272
Measuring range of voltage and current RMS: 25uA~20A / 75mV~600V
Maximum resolution of voltage and current: 1mV/0.1uA
Basic accuracy of voltage, current and power: 0.1%
Maximum resolution of power: 0.001mW
Measuring bandwidth: 0.1Hz~300 kHz
Sampling rate: 1MHz
Multiple interfaces: USB, RS-232 or GP-IB (optional), 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

Design Features

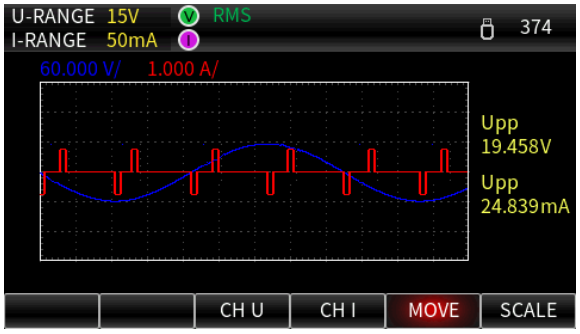
4.3"TFT, multi-parameter displays at one screen

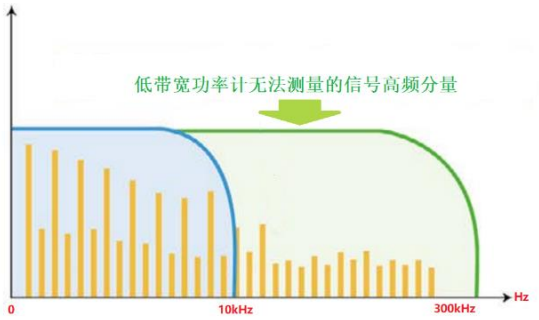


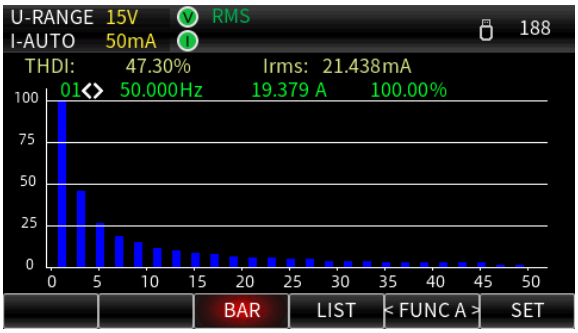
300 kHz analog bandwidth for capturing higher frequency signal



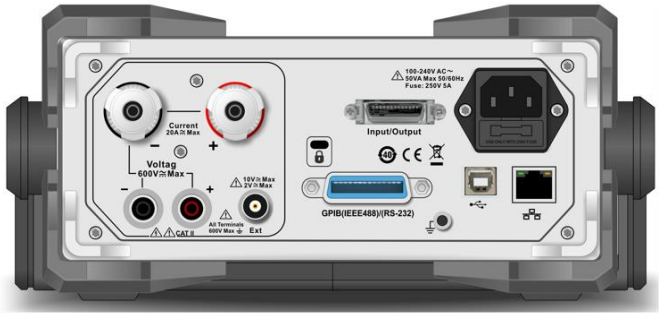
Sampling rate 1MHz for accurately measuring transient signal







Multi-channel communication port



Technical Index

Item	Range	Resolution	Crest factor Range	Frequency(Hz)	Accuracy (The following accuracy is the sum of reading error and range error) f in the formula is the frequency of the input signal (unit is kHz)
Voltage	15V 30V 60V 150V 300V 600V	1mV 1mV 1mV 10mV 10mV 10mV	15-600V (Crest factor =3)	0(DC)	±(0.1% rdg. + 0.2% F.S.)
				0.1-45	
				45-66	±(0.1% rdg. + 0.05% F.S.)
				66-1K	±(0.1% rdg. + 0.2% F.S.)
				1K-10K	±(0.07 * f) % rdg. + 0.3% F.S.)
				10K-20K	±(0.5% rdg. + 0.5% F.S.)
				20K-100K	±{0.04*(f-10)} % rdg.
Current	5mA 10mA 20mA 50mA 100mA 200mA 500mA 1A 2A 5A 10A 20A	0.1uA 0.001mA 0.001mA 0.001mA 0.01mA 0.01mA 0.01mA 0.1mA 0.1mA 0.1mA 1mA 1mA	Crest factor =3	0(DC)	±(0.1% rdg. + 0.2% F.S.)
				10-45	
				45-66	±(0.1% rdg. + 0.05% F.S.)
				66-1K	±(0.1% rdg. + 0.2% F.S.)
				1K-10K	±(0.07* f) % rdg. + 0.3% F.S.)
				10K-20K	±(0.5% rdg. + 0.5% F.S.) ±{0.04*(f-10)} % rdg.
				20K-100K	
EX1,EX2	50mV 100mV 200mV 500mV 1V 2V 2.5V 5V 10V	1uV 10uV 10uV 10uV 100uV 100uV 100uV 100uV 1mV	Crest factor =3	Same as the measurement accuracy of voltage	

Input Range	The rated range of voltage or current: 1-130% (maximum display is 140%)（maximum of the range600V, 20A is 100%.） (In addition, for the rated range of 110-130%, the reading error is increased by ×0.5 based on the above accuracy.) When Crest factor =6, The rated range of voltage or current: 2-260% (maximum display is 280%). Except for the increase condition of the automatic range and the valid input range, the other operations are the same as when the Crest factor is set to 6. The level of synchronization source must conform to the level of the frequency measurement input signal.

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

Increased by the range of 0.02%/℃ based on the DC voltage accuracy.

The DC current accuracy is increased by the following values.

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

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

EX1: 1 mV/℃

EX2: 50 μV/℃

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, ± within the range of 600%).

Voltage input: 1.5× range√(15/range)%

DC direct input range

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

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

Increase $0.0000001\times U^2$% of the reading to the AC voltage accuracy.

Increase $0.0000001\times U^2$% of the reading and $0.0000001\times U^2$% of the range to the DC current accuracy. U is the voltage reading (V).

Even after the voltage input becomes smaller, the effect of self-heating continues to act until the temperature of the input resistor decreases.

Effect of self-heating due to current input

UTE310

Increase $0.00013\times I^2$% of the reading to the AC current accuracy.

Increase 0.00013×I2%+0.004×I2mA (range of 0.5A/1A/2A/5A/10A/20A) of the reading to the DC current accuracy.

Or increase $0.00013\times I^2$%+$0.00004\times I^2$mA (range of 5mA/10mA/20mA/50mA/100mA/200mA) of the reading to the DC current accuracy.

I is the current reading (A).

Even after the current input becomes smaller, the effect of self-heating continues to act until the temperature of the shunt resistor decreases.

The accuracy changing due to the data update interval

When data update rate is 100ms, increase the reading of 0.05% to 0.5Hz ~ 1kHz accuracy.

All accuracy within the range of 0.5-10Hz are the reference value.
Within the range of DC, 10-45Hz, 400Hz-30kHz, if the current over 20A, the current accuracy is the reference value.
Only for UTE310
When the frequency is over 30kHz-100kHz, the maximum current input is 6A.

Item	Data Update Interval	Bandwidth
Frequency Measurement	0.1s	DC, 20 Hz ≤ f ≤ 300 kHz
	0.25s	DC, 10 Hz ≤ f ≤ 300 kHz
	0.5s	DC, 5 Hz ≤ f ≤ 300 kHz
	1s	DC, 2.0 Hz ≤ f ≤ 300 kHz
	2s	DC, 1.0 Hz ≤ f ≤ 300 kHz
	5s	DC, 0.5 Hz ≤ f ≤ 300 kHz
	10s	DC, 0.2 Hz ≤ f ≤ 300 kHz
	20s	DC, 0.1 Hz ≤ f ≤ 300 kHz
	Auto	DC, 0.1 Hz ≤ f ≤ 300 kHz
When the line filter is enabled	45 ~ 66 Hz: increase 0.2% of the reading ＜ 45 Hz: increase 0.5% of the reading	
Temperature Coefficient	Within 5~18℃ or 28~40℃: increase ± 0.03%/℃ of the reading	
The accuracy at Crest factor=6	Crest factor=3, the measuring range error is two times.	

Effect of temperature changing after the zero level compensation or range is changed
Increase the influence of voltage and current to the DC power accuracy
DC voltage accuracy: 0.02%/℃ of the range
DC current accuracy:
UTE310 (range of 5mA/10mA/20mA/50mA/100mA/200mA): 5 μA/℃
UTE310 (range of 0.5A/1A/2A/5A/10A/20A): 500 μA/℃
EX1: 1mV/℃
EX2: 50μV/℃

Effect of self-heating due to voltage input
Increase $0.0000001\times U^2\%$ of the reading to the AC power accuracy.
Increase $0.0000001\times U2\%$ of the reading and $0.0000001\times U2\%$ of the range to the DC power accuracy.
U is the voltage reading (V).
Even after the voltage input becomes smaller, the effect of self-heating continues to act until the temperature of the input resistor decreases.

Effect of self-heating due to current input
UT310
Increase $0.00013\times I^2\%$ of the reading to the AC power accuracy.
Increase $0.00013\times I^2\%$ of the reading and $0.004\times I^2$mA of the range to the DC power accuracy.
(range of 0.5A/1A/2A/5A/10A/20A) or $0.00013\times I^2\% + 0.00004\times I^2$mA of the reading
(range of 5mA/10mA/20mA/50mA/100mA/200mA), I is the current reading (A).

Even after the current input becomes smaller, the effect of self-heating continues to act until the temperature of the shunt resistor decreases.

The accuracy changing due to the data update interval

When the data update rate is 100ms, increase 0.05% of the reading 0.5Hz ~ 1kHz accuracy.

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. * Urms or Irms exceeds 130% of the current set range * Crest factor=3, the input signal of Upk and Ipk exceeds 300% of the current set range * Crest factor=6, the input signal of Upk and Ipk exceeds 600% of the current set range When using PA300 series high precision power meter, If any input unit meets the above conditions, the next measurement value update range will be increased. Range Decreasing The range decreases when any of the following conditions are met. * 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 * Crest factor=3, the input signal of Upk and Ipk exceeds 300% of the lower range * Crest factor=6, the input signal of Upk and Ipk exceeds 600% of the lower range If any input unit meets the above conditions, the next measurement value update range will be decreased.
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.
When the line filter is enabled	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
D(LEAD)/G(LAG) Phase detection (D(LEAD)/G(LAG) of Phase angle Ø)	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	2 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	6 regular operations (A+B, A-B, A×B, A/B, A^2/B, A/B^2)
Average Active Power at Integration	Calculating the average active power during the integration period

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

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.	

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.

Item	Specification	
Display Type		
Simultaneous Display		
Maximum Display		
Display Item	Display digit at 5	Display digit at 4
U, I, P, S, Q	99999	9999
λ	1.0000 ~ -1.0000	1.000 ~ -1.000
Ø	G180.0 ~ d180.0	G180.0 ~ d180.0
fU, Fi	99999	9999
WP, WP±, q, q± * When the unit of I is MWh or MAh. *When the unit of I is not MWh or MAh.	999999 (-99999 is negative watt-hours and negative ampere-hours) -99999	999999 -99999
TIM		
Integration Time	Display Indicator	Display Resolution
0 ~ 99 hours 59 minutes 59 seconds	0.00.00 ~ 99.59.59	1 second
100 ~ 9999 hours 59 minutes 59 seconds	100.00 ~ 9999.59	1 minute
10000 Hours	10000	1 hour
Efficiency (only for PA323, PA333)	100.00 ~ 999.99 (%)	100.0 ~ 999.9 (%)
Crest factor	99999	9999
Four Operations	99999	9999
Average Active Power	99999	9999
Voltage Peak	99999	9999
Current Peak	99999	9999
Power Peak	99999	9999
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/

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, λ, Ø fU, fI, Upk, Ipk, WP, WP±, q, q±, 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%/℃

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

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, 11520 (default 9600)

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)

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 Feature

Parameter	Description
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

Download guide of User's manual 1 piece