ITECH ELECTRONICS
Your Power Testing Solution

IT9100 Power Meter

IT9100 power meter can provide a maximum input of 1000 Vrms and 50 Arms and measurement bandwidth of 100 KHz, and can be easily used for measuring the voltage, current, power, frequency, harmonics and other parameters. Whether you need basic power measurement, or more high-end frequency, harmonic and accumulation measurement and other functions, it can provide you with the most stable and reliable, comprehensive and accurate solutions. It is widely applied in test of motors, household appliances, UPS, etc.

Applications

Motors, household appliances, UPS ,etc.

Feature

- 4.3-inch color LCD (TFT)
- Input range: 1000 Vrms / 50 Arms
- Harmonic components
- The accuracy of voltage and current measurement is up to 0.1%
- The voltage, current, power, harmonics and other parameters can be measured at the same time
- The power meter has a function of harmonic measurement, and can be used for measuring up to 50 harmonics
- The power meter has rich and powerful accumulation functions, and can be used for measuring electric energy purchased or sold from/to the grid.
- The USB interfaces is available, the user can save data into external storage
- Standard built-in USB, GPIB, RS232 and Ethernet communication interfaces

Self-define Interface display style

IT9100 power meter provides a 4.3-inch color high-resolution TFT LCD for the user, and real-time values can be displayed with high brightness and remarkable colors even in a dark test environment. In addition, the IT9100 power meter provides multiple interface display styles (View1, View4 and View12). The user can customize the screen display parameter type and display sequence. The humanized design meets engineers' measurement demands in different tests.


Abundant measurement function

IT9100 power meter can measure all AC and DC parameters, including active power, reactive power, apparent power, power factor, voltage, current, frequency, phase difference, etc.. IT9100 provides integrated measurement and up to 50 times of the harmonic measurement function. It is widely used in electronic motors, home appliances PCB board, UPS power supply and other test areas.

Model	Voltage	Current	Power
IT9121	600V	20A	1/2 2U
IT9121C	600V	50A	1/2 2U
IT9121H	1000V	20A	1/2 2U

Power Meter

Oscilloscope function

IT9100 power meter can display the waveform basing on sampling data. You can choose to display or hide the waveform of the input voltage and current. Oscilloscope function of IT9100 power meter allows users to directly observe the display fluctuations of voltage, current and power trends when testing household appliances performance, and can set the display trends, waveforms, values, histograms. Users can directly capture the waveform and record the value without external oscilloscope via external USB storage interface.

Integral measurement function

IT9100 Power Integration feature measures the sold / purchased power with the grid interconnections. IT9100 power meter provides current integration and active power integration (Wh). IT9100 automatically switches the range and performs the integral measurement accurately according to the size of the input level in the mode of buying electricity and selling electricity.
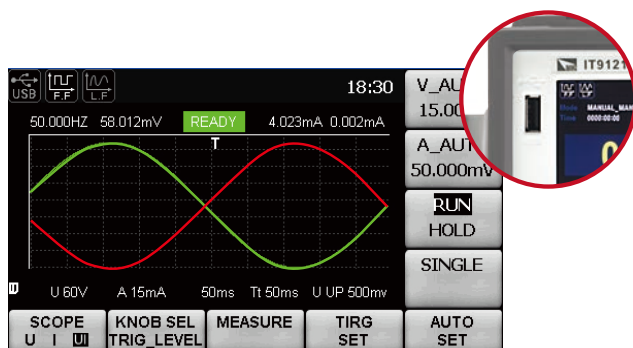
Harmonic Measurement

IT9100 power meter has a bandwidth of 100 kHz, which can realize high-speed harmonic measurement within a wider dynamic range. In the harmonic mode, the voltage, the current, the active power, reactive power and phase of each harmonic and the factor of total harmonic distortion (THD) can be tested.

Line and frequency filtering

IT9100 filters out useless frequency components in the signal, improves the waveform purity, thereby improving the accuracy of the test. Frequency filtering filters out the high frequency components of the interference, making the measured frequency parameters more accurate.

The waveform before turned on line filtering

The waveform after turned on line filtering

Current sensor input

IT9100 power meter provides voltage 0~1000V, the current 0~50A measuring value range. For current measurements above 20A, voltage input type current clamp or current sensor are all usable. IT9100 allows users to choose 50mV-2V (EX1) or 2.5V-10V (EXT2) range

IT-E185 Power meter fixture

IT-E185 is an optional accessory , it can facilitate wiring test of IT9100 power meter for users.

Power Meter
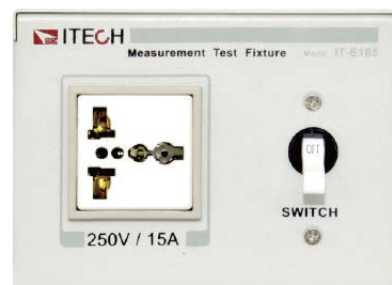
Specification

General Specification

Model	IT9121 & IT9121C & IT9121H
AC input voltage	100 VAC — 240 VAC 47-63 Hz
Warm-up time	Above 30 minutes
Operating environment	Temperature : 5℃ — 40℃ Humidity : 30% RH— 75% RH（No condensation） Altitude : 2000 m or less 2000 m
Storage environment	Temperature : -20℃ — 50℃ Humidity : 30% RH— 75% RH（No condensation） Altitude : 2000 m or less 2000 m
Installation	Indoors
Safety	IEC 61010-1, EN 61010-1, Measurement CAT Ⅱ
Maximum power consumption	50 VA

Screen Display

	Detailed Information
Display type	Dimension : 4.3-inch color TFT display Full screen pixel: 480（horizontal）*272（vertical）points Waveform display pixel: 384（horizontal）*194（vertical）points Operating temperature: -20℃~ 70℃ Storage temperature: -30℃~ 80℃ Value display：matrix display

Input

Item		Specifications
Input terminal type		voltage；plug-in terminal（safety terminal）
Input type		Current Direct input: large binding post External current sensor input DB9 connector
Input type		Voltage: Floating input through resistive voltage divider Current: Floating input through shunt
Voltage	Crest factor 3	IT9121：15V/30V/60V/150V/300V/600V IT9121C：15V/30V/60V/ 150V/300V/600V IT9121H：5V/ 30V/ 60V/150V/300V/600V/1000V(CF=1.5)
	Crest factor 6	IT9121：7.5V/15V/30V/75V/150V/300V IT9121C：7.5V/15V/30V/75V/150V/300V IT9121H：7.5V/15V/30V/75V/150V/300V/500V(CF=3
Direct Current input	Crest factor 3	IT9121：5mA/10mA /20mA /50mA /100mA / 　　　　200mA /0.5A/1A/2A/5A/10A/20A IT9121C：1A/2A/5A/10A/20A/50A IT9121H：5mA/10mA /20mA /50mA /100mA / 　　　　200mA /0.5A/1A/2A/5A/10A/20A
	Crest factor 6	T9121：2.5 mA /5mA/10mA/25mA/50mA/100mA/ 　　　　250mA/0.5A/1A/2.5A/5A/10A. IT9121C：1A/2A/5A/10A/20A/50A IT9121H：2.5 mA /5mA/10mA/25mA/50mA/100mA/ 　　　　250mA/0.5A/1A/2.5A/5A/10A.
External Current sensor input (/EX1)	Crest factor 3	IT9121：2.5V/5V/10 V IT9121C：5V/10 V IT9121H：2.5V/5V/10 V
	Crest factor 6	IT9121：1.25V/2.5V/5V IT9121C：2.5V/5V IT9121H：1.25V/2.5V/5V
External Current sensor input (/EX2)	Crest factor 3	IT9121：50mV/100mV/200mV/500mV/1V/2V IT9121C：100 mV /250 mV /500 mV /1V/2.5V IT9121H：50mV/100mV/200mV/500mV/1V/2V
	Crest factor 6	IT9121：25mV/50mV/100mV/250mV/500mV/1V IT9121C：50 mV /125 mV /250 mV /0.5V/1.25V IT9121H：25mV/50mV/100mV/250mV/500mV/1V

Input impedance	Voltage: Input resistance: Approx. 2 MΩ, input capacitace: Approx.13 pF (in parallel with the resistance) current: ● Direct input range 5 mA ~ 200 mA: 　　Input resistance: Appro x 505 mΩ 　　Input inductance: Appro x 0.1 µH ● Direct input range 0.5A ~ 20 A: 　　Input resistance: Appro x 5 mΩ 　　Input inductance: Appro x 0.1 µH ● Sensor input: 　　Input resistance:Appro x 100 kΩ （2.5 V ~ 10 V) 　　Input resistance:Appro x 20 kΩ （50 mV ~ 2 V)
Input bandwidth	DC, 0.5 Hz ~ 100kHz
Line filter	select OFF, cut off frequency of 500 Hz
Frequency filter	select OFF, cut off frequency of 500 Hz
Range	range of each unit can be set separately
A/D converter	Simultaneous conversion voltage an current inputs Resolution: 18-bit Maximum conversion rate: 10 µs

Voltage and Current Accuracy

Item	Specifications
Requirements	temperature：23 ± 5℃ humidity：30~75% RH Input waveform: Sine wave crest factor: 3, common-mode voltage: 0 V Number of displayed digits: 5 digits (6 digits when including the decimal point) Frequency filter : Turn on to measure voltage or current of 200 Hz or 30 minutes after warm-up time has passed After zero-level compensation or measurement range is changed
Accuracy	DC: ± (0.1% of reading + 0.2% of range) 10 Hz ≤ f < 45 Hz: ± (0.1 % of reading + 0.2 % of range) 45 Hz ≤ f ≤ 66 Hz: ± (0.1 % of reading + 0.1 % of range) 66 Hz < f ≤ 1kHz: ± (0.1 % of reading + 0.2 % of range) 1 kHz < f ≤ 10 kHz: ± (0.07 *f) % of reading + 0.3% of range) 10 kHz < f ≤ 100 kHz: ± (0.5 % of reading + 0.5 % of range) ± [{0.04×(f-10)}% of reading

Active Power Accuracy

Item	Specifications
Requirements	same as the conditions for voltage and current. Power factor:1
Accuracy	DC: (0.1 % of reading + 0.2 % of range) 10Hz ≤ f < 45 Hz: ± (0.3 % of reading + 0.2 % of range) 45 Hz ≤ f ≤ 66 Hz: ± (0.1 % of reading + 0.1 % of range) 66 Hz < f ≤ 1kHz: ± (0.2 % of reading + 0.2 % of range) 1 kHz < f ≤ 10 kHz: ± (0.1 % of reading + 0.3 % of range) ± [{0.067×(f-1)}% of reading] 10 kHz < f ≤ 100 kHz: ± (0.5 % of reading + 0.5 % of range) ± [{0.09×(f-10)}% of reading]
Influence of power factor	when power factor (λ)=0 (S:apparent power) ● ± 0.2 % of S for 45 Hz ≤ f ≤ 66 Hz ● ± {(0.2 + 0.2 × f) % of S } for up to 100 kHz as reference data f is frequency of input signal in kHz when 0 < λ < 1 (Φ: phase angle of the Voltage and current) (power reading)×[(power reading error%)+(power range %)×(power range/indicated apparent power value)+{tanΦ×(influence when λ=o)%}]
When the line filter is turned ON	45 ~ 66 Hz: Add 0.3 % of reading < 45 Hz: Add 1 % of reading
Temperature coefficient	same as the temperature coefficient for voltage and current
Accuracy when the crest factor is set to 6	accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3
Accuracy of apparent power S	voltage accuracy +current accuracy
Accuracy of reactive power Q	accuracy of apparent power + [(√1.0004 - λ2) - (√1 - λ2)] ×100 %

Power Meter

Accuracy of power factor λ	± [(λ-λ/1.0002)+│cosø-cos{ø+sin-1 (influence from the power factor when λ = 0%/100)}│] ±1digit when voltage and current are at the measurement range rated input
Accuracy of phase difference Φ	± [│ø-cos-1(λ/1.0002)│+sin-1(influence from the power factor when λ = 0 %/100)] ± 1digit when voltage and current are at the measurement range rated input

Voltage, Current and Power Measurements

Item	Specifications
Measurement method	Digital sampling method
Crest factor	3 or 6
Wiring system	(one element model): single-phase , two-wire(1 P2 W)
Range select	select manual or auto ranging
Auto range	auto-range increase auto-range decline

	Name	Symbols And Meanings
Measurement parameters	Voltage current	Select RMS (the effective RMS value of voltage andcurrent)、MEAN:(the rectified mean value calibrated to the RMS value of the voltage and the true RMS value of the current)、RMN (rectified mean value of voltage and current DC:(simple average of voltage and current) AC: alternating current、PP: (peak value of voltage and peak value of current)
	Active power [W]	P
	Reactive power [var]	Q
	Apparent power [VA]	S
	Power factor	λ
	Phase di fference (°)	φ
	Frequency (Hz)	fU(FreqU) : voltage frequency fI(FreqI) : current frequency
	Max/min of voltage (V)	Upk+: voltage positive peak Upk-: voltage negative peak
	Max/min of current (A)	Ipk+: current positive peak Ipk-: current negative peak
	Crest factor	CfU: crest factor of voltage CfI: crest factor of current
	Integration	TM: integration time, WP：sum of positive and negative watt hour, WP+：positive power sum, WP-：negative power sum, q: sum of positive and negative ampere-hour, q+: positive ampere -hour sum, q-: negative ampere-hour sum
Measurement synchronization source		Select voltage , current , or the entire period of the data updata interval for the signal used to achieve synchronization during measurement.
Line filter		Select OFF or ON (cut off frequency at 500 Hz)
Peak measurement		Measures the peak (max, min) value of voltage, current or power from the instantaneous current or instantaneous power that is sampled.

Frequency Measurement

Item	Specifications	
Measurement item	Voltage or current frequencies applied to one selected input element can be measured	
Frequency test range	Vaties depending on the data update interval (see description given later) as follows	
	Data update interval	Measurement range
	0.1 s	25 Hz ≤ f ≤ 100 kHz
	0.25 s	10 Hz ≤ f ≤ 100 kHz
	0.5 s	5 Hz ≤ f ≤ 100 kHz
	1 s	2.5 Hz ≤ f ≤ 100 kHz
	2 s	1.5 Hz ≤ f ≤ 50 kHz
	5 s	0.5 Hz ≤ f ≤ 20 kHz
Frequency filter	Select OFF or ON (cut off frequency of 500 Hz)	
Accuracy	Requirements : When the input signal level is 20 % or more of the measurement range and the crest factor is set to 3 (40 % or more if the crest factor is set to 6).	

Harmonic Measurement

Measured item	All installed elements
Method	PLL synchronization method
Frequency range	Fundamental frequency of the PLL source is in the range of 10 Hz to 1.2 kHz
PLL source	Select voltage of current of each input element
FFT data length	1024

	Name	Symbols and Meanings	
measurement parameter	Voltage (V)	U(k) : voltage effective value of Kth harmonic	U(Total) voltage effective value
	Current (A)	I(k) : curent effective value of Kth harmonic	I(Total) : curent effective value
	Active power (W)	P(k) : active power of Kth harmonic	P(Total) : Active power
	Apparent power (VA)	S(k) : apparent power of Kth harmonic	S(Total) : total apparent power
	Reactive power (var)	Q(k) : reactive power of Kth harmonic	Q(Total) : total reactive power
	Power factor	λ(k) : power factor of Kth harmonic	λ(Total) : Total power factor
	Phase difference	φ(k) : phase difference between voltage and current of Kth harmonic φU(k) voltage phase difference between Kth harmonic(UK) and fundamental wave(U1) φI(k) : current phase difference between Kth harmonic(IK) and fundamental wave(I1)	φ:total phase difference
	Harmonic distortion factor(%)	Uhdf(k) : Voltage ratio of Kth harmonic(Uk) and fundamental wave(U1) current Ihdf(k) : ratio of Kth harmonic （Ik) and fundamental wave(I1) active power Phdf(k) : ratio of Kth harmonic(Pk)and fundamental wave (P1)or total distortion wave(Ptotal) or Total distortion wave(Itotal) or total distortion wave(Utotal)	
	（THD) total harmonic distortion	Uthd : voltage ratio of total harmonic and fundamental wave(U1) or total distortion wave(Utotal). Ithd : current ratio of total harmonic and fundamental wave(I1) or total distortion wave(Itotal). Pthd : active power ratio of total harmonic and fundamental wave(P1) or total distortion wave(Ptotal)	
Window function	Rectangle		

Note

- This function is only available for IT9121, optional function for IT9121E.
- K is a integer from 0 to upper limit of harmonic analyse times. 0th means DC parameter.
- User can configure the maximum number of harmonic times manually or auto-decided by equipment, taking the minmum value between the two methods.
- IT9121 can measure up to 50th harmonic.

Fundamental Frequency

Fundamental frequency	Sample rate	Window width	Upper limit of* analysis orders
10 Hz ~ 75 Hz	f * 1024	1	50
75 Hz ~ 150 Hz	f * 512	2	32
150 Hz ~ 300 Hz	f * 256	4	16
300 Hz ~ 600 Hz	f * 128	8	8
600 Hz ~ 1200 Hz	f * 64	16	4

* the upper limit of analysis orders can be decreased

Accuracy

* When line filter is off, the accuracy shown below is the sum of reading and range errors

Frequency	Voltage	Current	Power
10 Hz ≤ f ＜ 45 kHz	0.15%of reading +0.35%of range	0.15%of reading +0.35%of range	0.15%of reading +0.50%of range
45 Hz ≤ f ≤ 440 kHz	0.15%of reading +0.35%of range	0.15%of reading +0.35%of range	0.20%of reading +0.50%of range
440 Hz ＜ f ≤ 1 kHz	0.20%of reading +0.35%of range	0.20%of reading +0.35%of range	0.40%of reading +0.50%of range
1 kHz ＜ f ≤ 2.5 kHz	0.80%of reading +0.45%of range	0.80%of reading +0.45%of range	1.56%of reading +0.60%of range
2.5 kHz＜ f ≤ 5 kHz	3.05%of reading +0.45%of range	3.05%of reading +0.45%of range	5.77%of reading +0.60%of range

Interface
- USB
- Ethernet
- GPIB
- RS232

Power Meter