IT9121 AC power meter

The IT9121 AC power meter can provide the maximum input of 600Vrms and 20Arms and measurement bandwidth of 100KHZ, and can be easily used for measuring the voltage, current, power, frequency, harmonics and other parameters. The standard configuration includes USB, GPIB, RS232 and LAN communication interfaces and also interfaces for USB-based peripheral devices. The user can save the measured parameters into the external storage medium. The basic voltage and current accuracy is 0.1%. Moreover, the power meter has rich integrating functions, such as the active power. It is widely applied in test of motors, household appliances, UPS, etc.

IT9121 AC power meter

Feature

- 4.3-inch color LCD (TFT)
- The row number of matrix displayed on the screen can be set freely and common measurement parameters can be displayed.
- Input range: 600Vrms/20Arms
- The voltage, current, power, harmonics and other parameters can be measured at the same time.
- The accuracy of voltage and current measurement is up to 0.1%.
- The power meter has a function of harmonic measurement, and can be used for measuring up to 50th harmonics.
- The interfaces for USB-based peripheral devices are provided, and the user can store data into the external storage medium.
- The power meter has rich and powerful integrating functions, and can be used for measuring electric energy which is bought or sold.
- The power meter also has a function of frequency measurement.

Communication interface

The standard configuration of the IT9121 AC power meter includes, the USB,GPIB,RS232 and Ethernet communication interfaces. Remote control of the power analyzer can be realized via these interfaces. In addition, IT9121 is also equipped with a USB-Host interface for connection of U discs and other devices, and the user can save screenshots into the U disc.

Rich measurement functions

The IT9121 AC power meter can measure all AC and DC parameters, including the active power, reactive power, apparent power, power factor, voltage, current, frequency, phase difference, etc. It also has the function of integral measurement and up to 50th harmonic measurement, and can display individual harmonic components. It is widely applied in tests of motors, household PCB, UPS, etc.

Current transducer input

The IT9121 AC power meter can be used for measuring the voltage of 0-600V and current of 0-20A. For measurement of the current above 20A, the voltage input type current clamp or current transducer can be applied. When IT9121 is used, the user is allowed to select the range of 50mV-2V (EX1) or 2.5V-10V (EXT2).

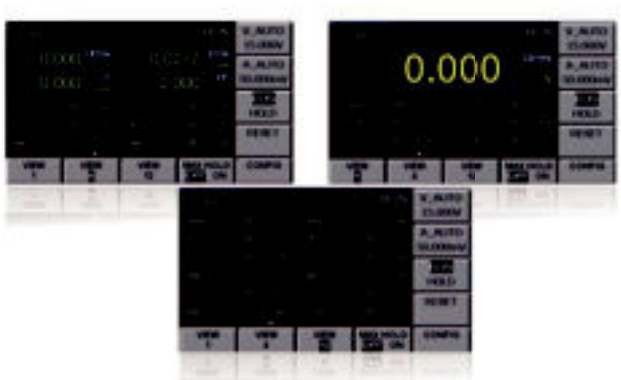
Integral measurement function

Due to the power integral function, the sold/bought electric energy in the interconnected power grids can be measured. The IT9121 AC power analyzer can provide the current integral and active power integral (Wh). Automatic range switching and accurate integral measurement can be carried out in the Buy and Sell mode, according to the input level.

TFT high-resolution LCD

IT9121 provides a 3.5-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 IT9121 AC power meter provides multiple interface display styles (View1,View4 and View12). The user can customize the screen display parameter type and display sequence, and roll over the screen display via the keys “Left” and “Right”. The humane design meets engineers’ measurement demands in different tests.



Harmonic measurement

The IT9121 AC power meter has a bandwidth of 100KHZ, 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. In addition, IT9121 can be used for measurement of multiple harmonics, 50 harmonics of the fundamental frequency can be measured at most.

The parameters of each harmonic measured by the IT9121 AC power meter can be displayed in the bar chart and the list, so as to facilitate analysis of measurement results.

Application advantages

- Power quality analysis of UPS

As an important backup power supply in the communication industry, the steady-state properties, dynamic properties, power quality and other parameters of UPS should be analyzed. Due to internal nonlinear devices, a large number harmonic components will be produced during operation of the UPS power supply, which may cause interference to operation of the communication system. The IT9121 power meter can measure the AC/DC signal, power factor, harmonics, frequency, distortion factor and other, and the power properties of UPS can be analyzed systematically and comprehensively.

- Performance test of household electrical appliances

Along with the large-scale promotion of the concept of reasonable and environment-friendly energy, more and more household electrical appliances adopt the variable frequency control technology to reduce the power consumption. The IT9121 power meter can measure the inrush current, active power, crest factor and other parameters.

IT912X series AC power meter specification

General Specification

Model	IT9121
AC input voltage	100VAC－240VAC 50/60HZ
Warm-up time	Apporx 30 minutes
Operating environment	Temperature ：5℃－40℃ Humidity：20%RH－80%RH（No condensation） Altitude ：2000m or less 2000m
Storage environment	Temperature：－20℃－50℃ Humidity： 20%RH－80%RH（No condensation） Altitude ： 2000m or less 2000m
Installation	Indoors
Safety	IEC 61010－1、EN 61010－1 、Measurement CAT II
Maximum power consumption	50VA

Screen Display

	detailed information
Display type	Dimension：4.3-inch color LCD (TFT) 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
Measure range	Voltage：15V，30V，60V，150V，300V，600V current： Direct input：5mA，10mA，20mA，50mA，100mA，200mA，0.5A，1A，2A，5A，10A，20A Sensor input ：EX1：50mV，100mV，200mV，500mV，1V，2V；EX2：2.5V，5V，10 V。
Input impedance	Voltage: Input resistance: Approx.2MΩ,input capacitace: Approx.13pF(in parallel with the resistance) current: • Direct input range5mA~200mA: Input resistance: Approx.505mΩ Input inductance: Approx0.1μH • Direct input range0.5A~20A: Input resistance: Approx 5mΩ Input inductance: Approx0.1μH • Sensor input: Input resistance: Approx 100kΩ（2.5V~10V） Input resistance: Approx 20kΩ（50mV~2V）
Continuous maximum allowable input	Voltage: peak value of 1.5kV or RMS value of 1kV, whichever is less current: • Direct input range 5mA~200mA: peak value of 30A or RMS value of20A,whichever is less • Direct input range 0.5A~20A: peak value of 100A or RMS value of30A,whichever is less • Sensor input :Peak value less than or equal to 5 times of the rated range
Instantaneous maximum allowable input（1s）	Voltage: peak value of 2kV or RMS value of 1.5kV, whichever is less
Instantaneous maximum allowable input（1s）	Current: • Direct input range 5mA~200mA: peak value of 30A or RMS value of20A,whichever is les • Direct input range 0.5A~20A: peak value of 150A or RMS value of40A,whichever is less Sensor input : • Peak value less than or equal to 10times of the rated range
Input bandwidth	DC，0.5Hz~1MHz
Continuous maximum Common-mode voltage	600Vrms，CAT II
Line filter	select OFF, cutoff frequency of 500Hz
Frequency filter	select OFF, cutoff frequency of 500Hz
Range	range of each unit can be set separately
A/D converter	Simultaneous conversion voltage an current inputs Resolution:18-bit Maximum conversion rate: 10μs

Voltage and Current Accuracy

Item	Specifications
Requirements	temperature：23±5° C，humidity：30 ~ 75%RH. Input waveform : Sine wave crest factor:3, common-mode voltage: 0V Number of displayed digits :5digits (6 digits when including the decimal point) Frequency filter : Turn on to measure voltage or current of 200Hz 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) 0.5Hz≤f<45Hz：±(0.1% of reading+0.2% of range) 45Hz≤f≤66Hz：±(0.1% of reading+0.2% of range) 66Hz<f≤1kHz：±(0.1% of reading+0.2% of range) 1kHz<f≤10kHz：(0.1% of reading+0.2% of range) ±(0.07*f)% of reading+0.3% of range) 10kHz<f≤100kHz： ±(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) 0.5Hz≤f<45Hz：±(0.3% of reading+0.2% of range) 45Hz≤f≤66Hz：±(0.1% of reading+0.1% of range) 66Hz<f≤1kHz：±(0.2% of reading+0.2% of range) 1kHz<f≤10kHz： ±(0.1% of reading+0.3% of range)±[{0.067×(f-1)}% of reading] 10kHz<f≤100kHz： ±(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 45Hz≤f≤66Hz • ±{(0.2+0.2×f)% of S }for up to 100kHz 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	45~66Hz:Add 0.3% of reading <45Hz: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%

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(1P2W)
Range select	select manual or auto ranging
Auto range	Range increase Range increase

	Name	Symbols and meanings
Measurement parameters	voltage current	Select RMS(the true RMS value of voltage andcurrent) 、MEAN:(the rectified mean value calibrated to theRMS value of the voltage andthe 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 difference (°)	φ
	frequency (Hz)	fU (FreqU) : voltage frequency fI (FreqI): current frequency
	max/mix of voltage (V)	Upk+: voltage positive peak Upk- : voltage negative peak
	max/mix 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 (cutoff frequency at 500Hz)	
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 filter	vaties depending on the data update interval (see description given later)as follows	
	Data update interval	measurement range
	0.1s	25Hz ≤ f ≤100kHz
	0.25s	10Hz ≤ f ≤ 100kHz
	0.5s	5Hz ≤ f ≤ 100kHz
	1s	2.5Hz ≤ f ≤ 100kHz
	2s	1.5Hz ≤ f ≤ 50kHz
	5s	0.5Hz ≤ f ≤ 20kHz
Frequency filter	select OFF or ON (cutoff frequency of 500Hz)	
Accuracy	requirements : When the input signal level is 30% or moreof the measurement range if the crest factor is set to 3 (60% or more if the crest factor is set to 6) ,Frequency filter is ON when measuring voltage or current of 200Hz or less. Accuracy:±(0.06%of reading)	

Harmonic measurement

Measured item	all installed elements
Method	PLL synchronization method
Frequency range	fundamental frequency of the PLL source is in the range of 10Hz to 1.2kHz
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 fundmental wave(U1) or total distortion wave(Utotal) Ihdf(k): current ratio of Kth harmonic (Ik) and fundmental wave(I1) or Total distortion wave(Itotal) Phdf(k): active power ratio of Kth harmonic(Pk)and fundmental wave (P1)or total distortion wave(Ptotal)	
	(THD) total harmonic distortion	Uthd: voltage ratio of total harmonic and fundmental wave(U1) or total distortion wave(Utotal). Ithd: current ratio of total harmonic and fundmental wave(I1) or total distortion wave(Itotal). Pthd: active power ratio of total harmonic and fundmental wave(P1) or total distortion wave(Ptotal)	
Window function	Rectangle		

Note: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
10Hz ~75Hz	f*1024	1	50
75Hz ~150Hz	f*512	2	32
150Hz ~ 300Hz	f*256	4	16
300Hz ~ 600Hz	f*128	8	8
600Hz ~1200Hz	f*64	16	4

*the upper limit of analysis orders can be decrease

Accuracy

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

Frequency	Voltage	Current	Power
10Hz≤f<45Hz	0.15%of reading +0.35%of range	0.15%of reading +0.35%of range	0.15%of reading +0.50%of.range
45Hz≤f≤440Hz	0.15%of reading +0.35%of range	0.15%of reading +0.35%of range	0.20%of reading +0.50%of range
440Hz<f≤1kHz	0.20%of reading +0.35%of range	0.20%of reading +0.35%of range	0.40%of reading +0.50%of range
1kHz<f≤2.5kHz	0.80%of reading +0.45%of range	0.80%of reading +0.45%of range	1.56%of reading +0.60%of range
2.5kHz<f≤5kHz	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 interface
- GP-IB interface
- Ethernet interface
- RS232 interface