ITECH
YOUR POWER TESTING SOLUTION

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Product

IT9100 Power Meter

Features



- Oscilloscope Display
- Harmonic Measurement
- High Precision Measurement up to 0.1%
- Input Range 1000Vrms/50Arms

IT9100 Power Meter

APPLICATIONS

- Power Supplies Tests
- Motor Tests
- Household Appliances Tests
- Electronics
- Energy Star
- Test Systems

Your Power Testing Solution

IT9100
Power Meter



The IT9100 power meter can provide the 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. The standard configuration includes USB, RS232 and LAN communication interfaces and also interfaces for USB-based peripheral devices. Users 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.

Features

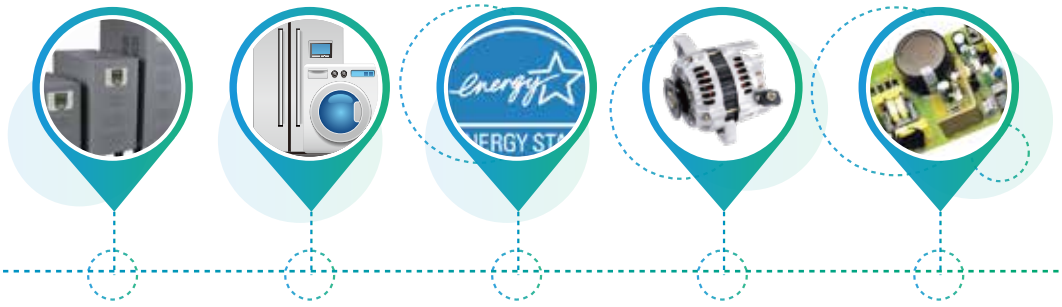
- 4.3-inch color LCD (TFT)
- Input range: 1000 Vrms / 50 Arms
- Harmonic Detection
- The accuracy of voltage and current measurement is up to 0.1%
- The voltage, current, power, harmonics and other parameters can be measured at the same time
- The power meter has a function of harmonic measurement, and can be used for measuring up to 50th harmonics *1
- The power meter has rich and powerful integrating functions, and can be used for measuring electric energy which is bought or sold
- The interfaces for USB-based peripheral devices are provided, and the user can *save data into the external storage medium
- Standard built-in USB, RS232 and Ethernet communication interfaces *2

*1 Optional function for IT9121E

*2 For any GPIB interface option request , check with ITECH for availability.

Electronic devices with power source unit

- UPS
- Household appliances
- Motor
- Energy Star
- Switching Power Supply



Self-define Interface display style

IT9100 series power meter provide 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 IT9121 power meter provides multiple interface display styles (View1,View4 and View12). The user can customize the screen display parameter type and display sequence. The humane design meets engineers' measurement demands in different tests.



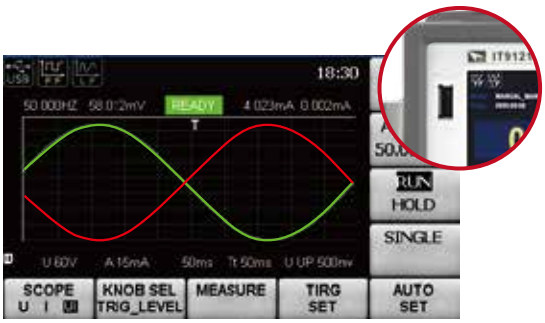
Rich Measurement Functions

The IT9100 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. It is widely applied in tests of motors, household PCB, UPS, etc.



Oscilloscope function

IT9100 series 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 series power meter allow 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

Due to the power integral function, the sold/bought electric energy in the interconnected power grids can be measured. IT9100 series 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.

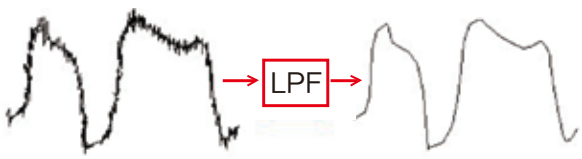
Harmonic Measurement

The IT9121 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.



Line and frequency filtering

IT9100 filter out the useless frequency components in the signal, improve the purity of the waveform, so as to improve the test accuracy. The frequency filter refers to filter out the high frequency components of interfere, making the measured frequency parameters more accurate.



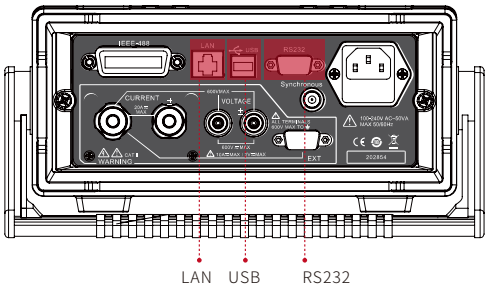
The waveform before turned on line filtering

The waveform after turned on line filtering

Built-in abundant interfaces

IT9100 series power meter built-in RS232/USB/LAN interfaces without extra purchase, high selectivity, save cost, and provide USB-Host interface for users, which can be used to connect with U disk directly and save the data and waveform of user test interface.

IT9121 series power meter built-in RS232/USB/LAN interfaces without extra purchase, high selectivity, save cost.



Your Power Testing Solution

IT9100 power meter

Current sensor input

IT9100 power meter provide measurement range with voltage 0 ~ 1000V, current 0 ~ 50A. For current measurement above 50 A, voltage input current clamp or current sensor can be used.
IT9100 allow users to select 50mV-2V (EX1) or 2.5V-10V (EXT2) range.



IT-E185 power meter fixture

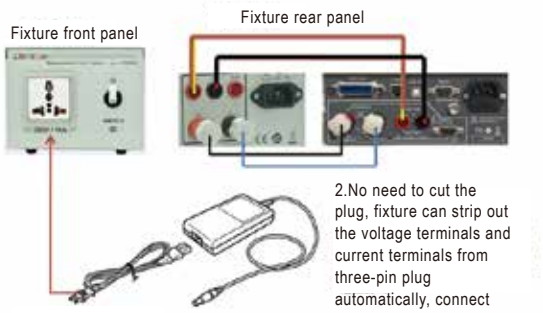
IT-E185 power meter fixture is an optional accessory that ITECH provide, users can easily implement IT9100 series power meter wiring test.



- **IT9100 series power meter provide optional accessories Test IT-E185(250V/15A), Easy to use**

- **Applications**

Test the AC input power consumption of the AC-DC adapter, IT9100 is required to be series to the lines between adapter and civil use AC network. Users can wire simply without destroying the original plug by using IT-E185.



1.Connect input port of the DUT with a three-point socket of fixture point panel

2.No need to cut the plug, fixture can strip out the voltage terminals and current terminals from three-pin plug automatically, connect voltage and current terminals with corresponding voltage and current terminals of 9121 power meter.

IT9100 Power Meter Application

Energy Star applications

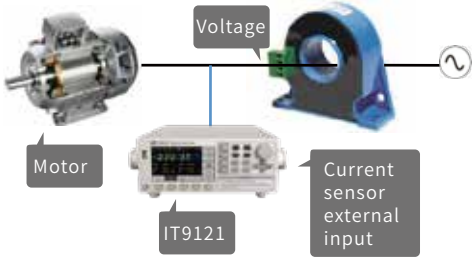
Minimum current range of IT9100 series power meter is 5mA, the measured display number is 5, IT9100 can more accurately measure the standby product's current value, as well as power value, meet the ENERGY STAR test requirements.

Household appliances power consumption testing applications

- ☑ 5mA range help to low current measurements
- ☑ Auto range function in integral mode
- ☑ IT9100 series power meter can measure power factor, harmonic, efficiency, power consumption, crest factor and other parameters.

Motor testing applications

- ☑ long time integral measurement
- ☑ Frequency bandwidth: DC, 0.5Hz to 100kHz
- ☑ IT9100 power integration function can measure the power grid to sell / buy electricity. IT9100 power meter provides current integration and active power integration (Wh). Can buy and sell electricity in the mode, according to the size of the input level, IT9100 can automatically switch range and accurately perform integral measurement according to the input level in the buy electricity and sell electricity mode.



Charging station industry application

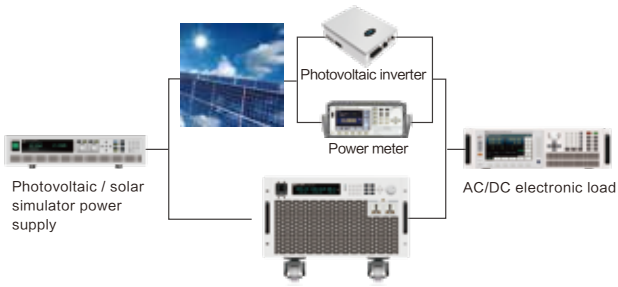
In recent years, with the increasing subsidy efforts of the state on the new energy automotive industry, coupled with gradual improvement of supportive policies, the new energy automotive industry has made considerable progress. However, the construction of supporting facilities such as charging stations will also need to be resolved urgently. ITECH power meter provides a full range of test solutions for the overall equipment of charging station, designed to help users provide a strong basis for charging station design.

- Charging station efficiency measurement
- Charging station input harmonic measurement
- Charging station standby power consumption measurement

Photovoltaic wind power industry applications

The IT9100 series power meter can accurately measure the input, output voltage, current, power, and other electrical parameters of new energy inverters. And can provide accurate efficiency, harmonics and low voltage ride through testing and other functions.

Input measurement	Input measurement	Statistical Analysis
MPPT	Harmonic analysis	Low voltage ride through test
Electrical parameters (input)	Conversion efficiency	Anti-islanding protection test
	Power factor	Over voltage / under voltage protection
	Electrical parameters (output)	Over / under frequency protection
	DC component	



Power industry applications

Switching power supply and UPS power supply are currently one of the most used powers. Switching power supply is widely used in almost all electronic devices with small size, light weight and high efficiency. And UPS is using the inverter principle, to provide stable, uninterrupted power supply to load. Because of the large number of uses, international standards give a clear indicator for switching power supply on the grid harmonic pollution. IT9100 switching power supply can provide a comprehensive parameter measurement for research and development and production stage of switching power supply.



Set the maximum number of THD calculations

- Just one power meter can complete the efficiency measurement
- Average active power measurement in integral mode

	IT9121	IT9121C	IT9121H	IT9121E
Measuring range	600Vrms/20Arms	600Vrms/50Arms	1000Vrms/20Arms	600Vrms/20Arms
Voltage range	15V~600V A total of 6 ranges	15V~600V A total of 6 ranges	15V~1000V A total of 7 ranges*1	15V~600V A total of 6 ranges
Direct input current range (CF=3)	5mA~20A A total of 12 ranges	1A~50A A total of 6 ranges	5mA~20A A total of 12 ranges	5mA~20A A total of 12 ranges
External current input (CF=3)	EX1:50mV~2V A total of 6 ranges	EX1:5V/10V A total of 2 ranges	EX1:2.5V/5V/10V A total of 3 ranges	EX1:50mV~2V A total of 6 ranges
	EX2:2.5V/5V/10V A total of 3 ranges	EX2:100mV~2.5V A total of 6 ranges	EX2:50mV~2V A total of 6 ranges	EX2:2.5V/5V/10V A total of 3 ranges
Accuracy	0.1%	0.1%	0.1%	0.1%
Bandwidth	DC,0.5HZ~100KHZ	DC,0.5HZ~100KHZ	DC,0.5HZ~100KHZ	DC,0.5HZ~100KHZ
Communication Interface*	USB	USB	USB	USB
	USB peripheral interface	USB peripheral interface	USB peripheral interface	USB peripheral interface
	RS232	RS232	RS232	RS232
	Ethernet	Ethernet	Ethernet	Ethernet
Measure the voltage, current, power and harmonic parameters at the same time	√	√	√	√
Frequency measurement function	√	√	√	√
Frequency filter	Select OFF or ON (cutoff frequency is 500HZ)	Select OFF or ON (cutoff frequency is 500HZ)	Select OFF or ON (cutoff frequency is 500HZ)	Select OFF or ON (cutoff frequency is 500HZ)
Line filter	Select OFF or ON (cutoff frequency is 500HZ)	Select OFF or ON (cutoff frequency is 500HZ)	Select OFF or ON (cutoff frequency is 500HZ)	Select OFF or ON (cutoff frequency is 500HZ)
Harmonic measurement	Standard	Standard	Standard	Optional
Measure the number of harmonics	50 times	50 times	50 times	50 times
Single harmonic analysis function	√	√	√	√
Oscilloscope function	√	√	√	√
Current integration, active power integration	√	√	√	√
Automatic range	√	√	√	√
Measure the synchronization source	√	√	√	√
Display	TFT 4.3-inch color LCD TFT	TFT 4.3-inch color LCD TFT	TFT 4.3-inch color LCD TFT	TFT 4.3-inch color LCD TFT
Characteristic	Freely set the screen display matrix number of columns and commonly used measurement parameter value display			

*1. 1000V range CF=1.5

*For any GPIB interface option request, check with ITECH for availability.

Your Power Testing Solution

IT9100 power meter

Specification

General Specification	
Model	IT9121 & IT9121E & 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/E：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/E：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/E：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/E：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/E：2.5V/5V/10 V IT9121C：5V/10 V IT9121H：2.5V/5V/10 V
	Crest factor 6	IT9121/E：1.25V/2.5V/5V IT9121C：2.5V/5V IT9121H：1.25V/2.5V/5V
External Current sensor input (/EX2)	Crest factor 3	IT9121/E：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/E：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) ± [{0.04x(f-10)}% of reading

Power Measurement	
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) ± [{0.067x(f-1)}% of reading] 10 kHz ＜ f ≤ 100 kHz： ± (0.5 % of reading + 0.5 % of range) ± [{0.09x(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 + $((\sqrt{1.0004-\lambda_2})-(\sqrt{1-\lambda_2}))\times 100\%$

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(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 200 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	Varies 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 200 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 fundmental wave(U1) current Ihdf(k) : ratio of Kth harmonic（Ik）and fundmental wave(I1） active power Phdf(k) : ratio of Kth harmonic(Pk)and fundmental 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 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

- 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
- RS232
- Ethernet

* For any GPIB interface option request , check with ITECH for availability.



This information is subject to change without notice.For more information, please contact ITECH.

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