INNO INSTRUMENT

Three-phase Power Meter

SPA3200

SPA3100

INNO Instrument is a leading provider of high-end equipment with a focus on quality and innovation. Drawing from years of dedicated research and development, our company delivers top-notch products that span various industries, including electric power, energy resources, transportation, automobiles, and telecommunications. Our advanced, reliable, and comprehensive test and measurement solutions are sought after by R&D companies and manufacturers. Through systematic approaches, we address the intricate demands of our customers, actively contributing to the continuous development and updating of global industries.

Digital power meter is an instrument used to measure the power consumption of household appliances, office automation products, large power equipment and process control automation equipment. It is widely used in the power industry to test the power consumption of office or household appliances, batteries and other driving devices. The instrument also has functions such as real-time waveform, waveform data recording, and harmonic analysis. With the characteristics of small size, compact structure, convenient operation, cost-effectiveness, and accurate measurement, it is an ideal model suitable for power consumption testing stand and production line or testing workbench.

Functional advantages and features

All parameters are measured simultaneously

All AC and DC parameters can be measured, and integral measurement and harmonic measurement can be performed simultaneously without changing the measurement mode.

Fast display and data update rate

With the fast display function and data update rate of up to 50ms, the time for users to test the program can be shortened.

All parameters are measured simultaneously

All AC and DC parameters can be measured, and integral measurement and harmonic measurement can be performed simultaneously without changing the measurement mode.

Peak hold function

Display of relevant maximum values in the measurement process can be held in order to observe maximum values in the measurement process. Display of maximum values of the following measurement functions can be held: RMS/MEAN/DC/PEAK value of voltage and current, power peak value, active power, reactive power and apparent power.

Saving and loading of configuration parameters

The configuration file shall be saved, so that the configuration file saved can be loaded quickly when encountering similar measurement environment in the later period, and the time for users to set the parameters again can be reduced.

D/A output of measuring record

D/A output is used to output voltage, current, power and other measured data to the data recorder or other devices (±5V DC output).

Comparator function

The measured value is compared with the set value, and the values of +50 and -5v are output based on the comparison result.

Current sensor input

When measuring large current, voltage output type current clamp or current sensor can be used for measurement to expand the measuring current range of the instrument.

Operation function setting

The instrument supports multiple operation functions, which can set and display the value of efficiency, peak factor, arithmetic results and average active power.

Data storage function

The measured data can be stored, and the maximum available storage space inside the instrument is 4GB. The stored data cannot be read directly in the display frame of instrument, but can be analyzed by a computer or a connected application software through the communication function.

INNO PA Viewer software

INNO PA Viewer software is a PC application software that allows users to remotely control the instrument from PC and display the measured value, waveform, trend, bar chart, etc. on the PC display screen more intuitively. Users can connect the instrument to the computer through network interface.

Humanized operation interface

5.6-inch touch screen is adopted to support touch operation. The graphic function module design is convenient for users to operate intuitively. Compared with the traditional power meter with digital tube display, its operation and configuration are more convenient.

Product Overview

Navigation key
· Up, down, left and right keys
·Confirm key

Range setting
Automatic range indicator light
Range setting keyEXT key

Other function settings
·Data hold/exit key
·Single measurement key
· Local control/key lock key

Touch display

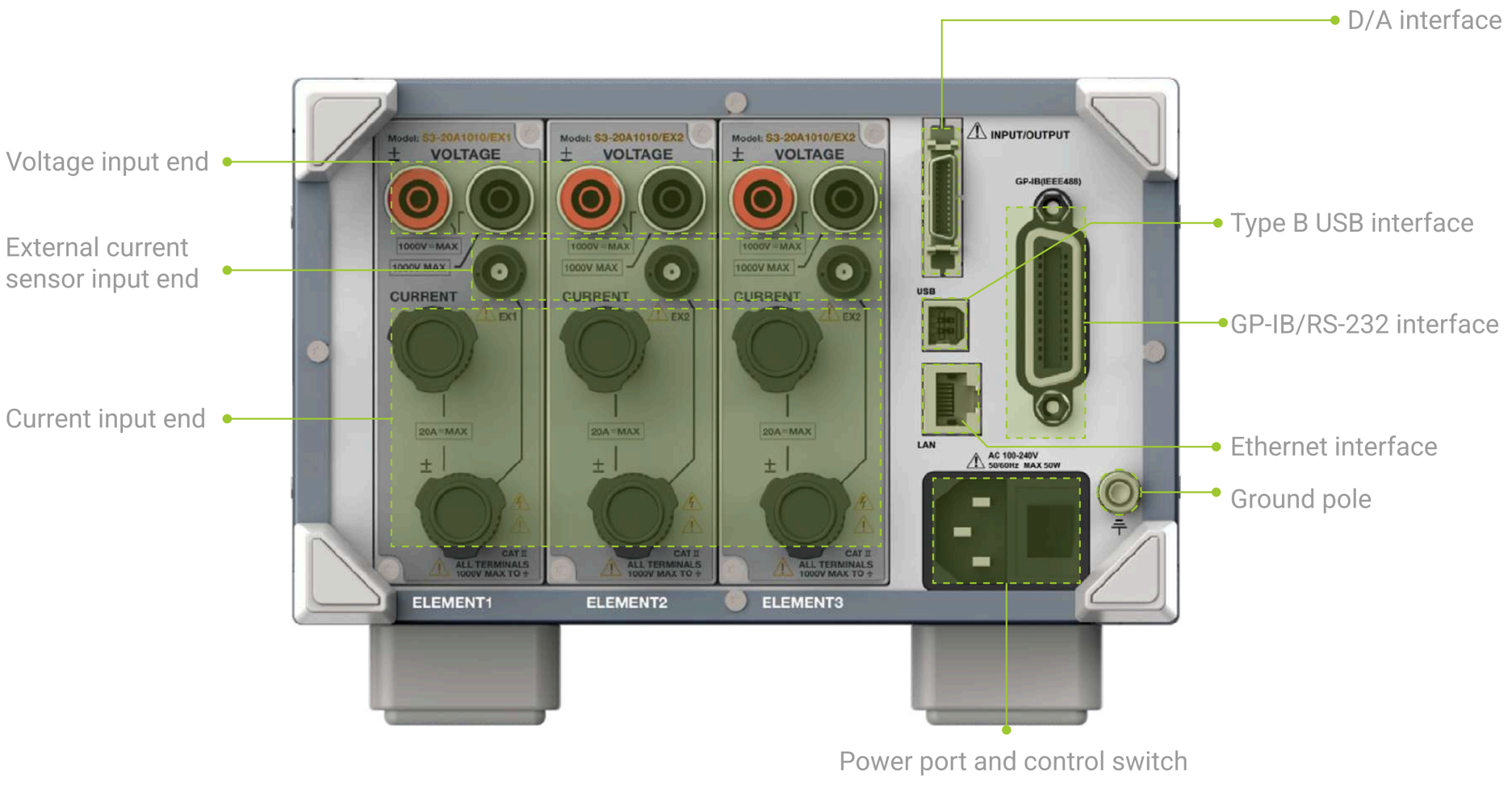
Menu key
Numerical key
Integral key

Measurement condition setting
·Setup key·System key
·Harmonic measurement setting

·Maximum hold indicator light
·Proportion indicator light
·Average indicator light
·Line filter indicator light
·Frequency filter indicator light

Save key
USB Interface

OFF
key



D/A interface

Voltage input end

Type B USB interface

External current
sensor input end

GP-IB/RS-232 interface

Current input end

Ethernet interface

Ground pole

Power port and control switch

Applications

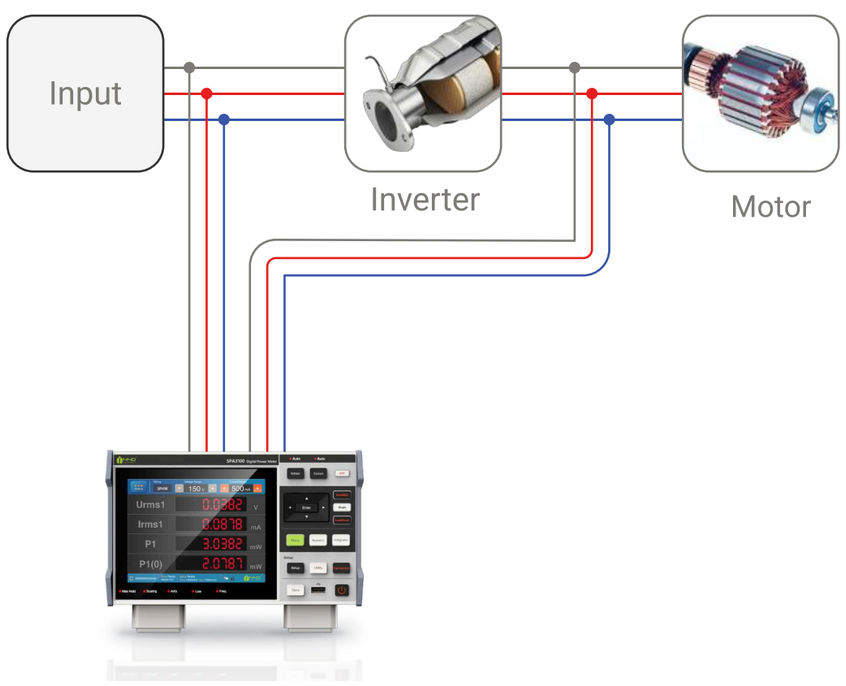
Digital power meter is easy to use, cost-effective and accurate in measurement, and can meet a wide range of application needs in production, testing, evaluation, and R&D fields.

Performance testing of household appliances or office equipment

As more and more attention is paid to energy efficiency, reducing the functional loss of ordinary household appliances (e.g. air conditioners, washing machines, induction cookers, water heaters, etc.) has also become a major breakthrough point in improving domestic energy efficiency. Digital power meter supports the electric energy test of household appliances. In order to perform high-efficiency measurement, one digital power meter can undertake the measurement work of three instruments simultaneously, measuring parameters such as voltage, current, power, frequency, power factor and harmonic distortion.

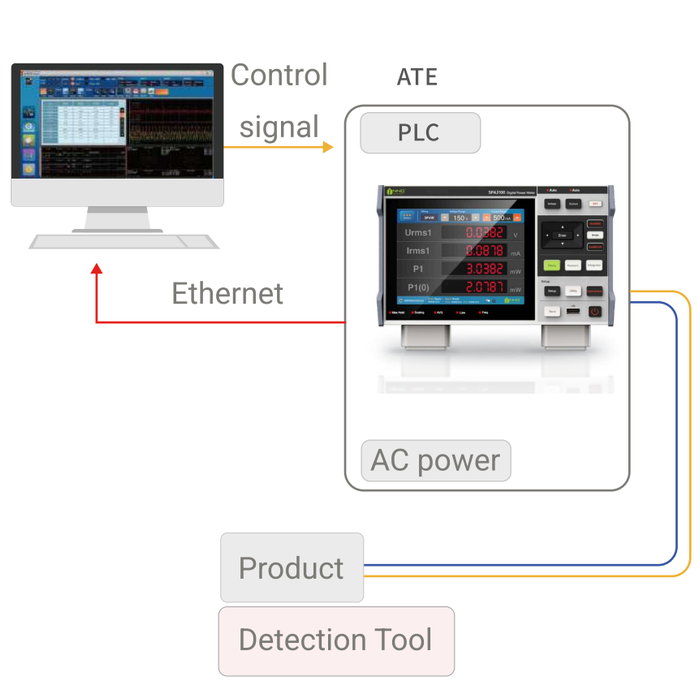
Industrial equipment and transportation use

Efficiency evaluation system for automotive batteries and drive devices
It can directly measure current up to 50A. Without using any external sensors, it can test the DC drive system for cars, providing affordable and accurate solutions.



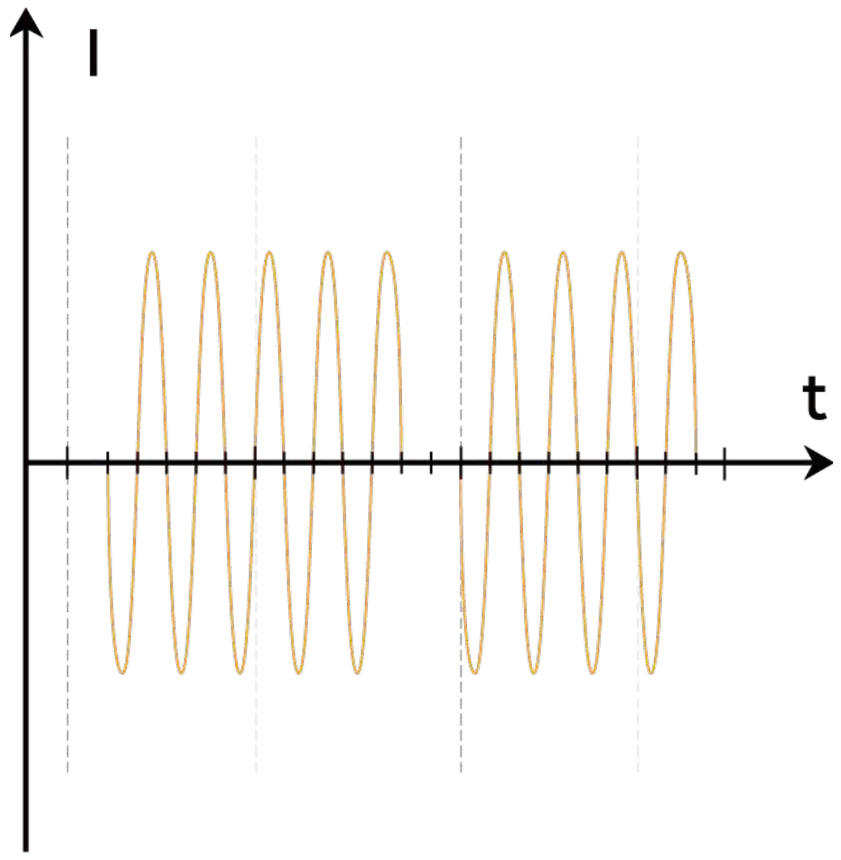
Production line test

SPA3100/SPA3200 has a compact structure, and the width of half rack can be easily installed on the test rack of the production line. With a favorable price, it is suitable for users to build a cost-effective test platform. It can measure parameters such as voltage, current, frequency, power, power factor and harmonics simultaneously, so as to effectively improve testing efficiency and shorten testing man-hours.

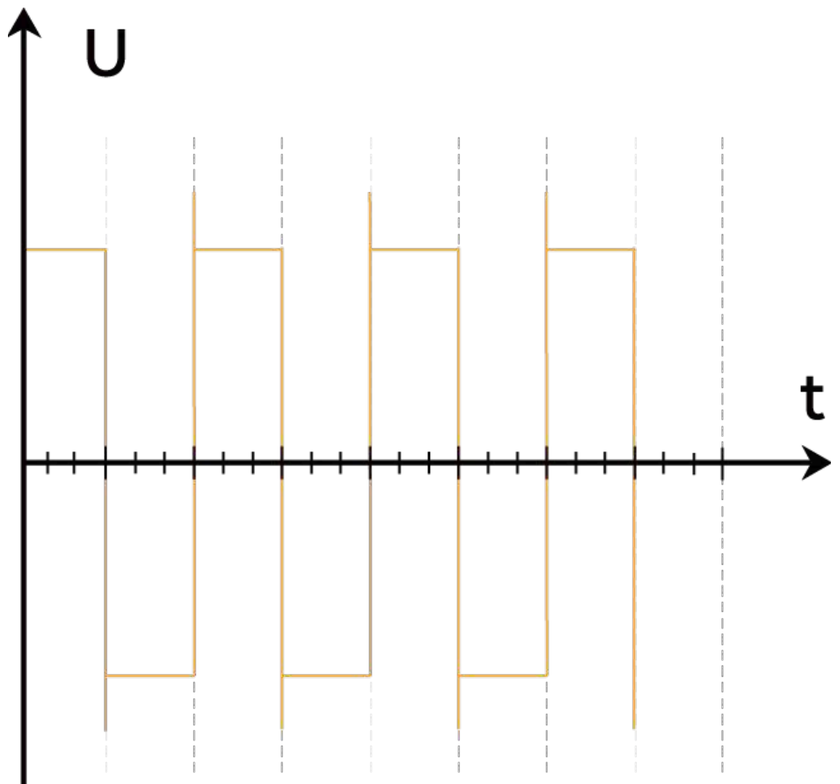


Evaluation testing of special waveform driving device and distorted waveform containing DC component

With a frequency range of DC, 0.1Hz~100kHz, the digital power meter can be used to measure the RMS value of distorted waveforms such as square wave or special waveform driving device. Through the average active power measurement function, it can provide accurate power consumption data for impulse wave control devices and other fluctuating power devices. Therefore, the distorted waveform can be accurately measured without any special mode setting.



Inter-harmonic shock wave



Square wave

Specifications and Parameters

Signal input

Item	Specifications
Type of input terminal	**Voltage:** Plug-in terminal (safety terminal) **Current:** Outside the binding post **Current sensor:** Insulated BNC interface
Input type	**Voltage:** Floating input, resistor voltage division mode **Current:** Floating input, shunt input mode
Measuring range	**Voltage** 15V, 30V, 60V, 150V, 300V, 600V, 1000V (peak factor 3), 1500V (peak factor 2) 7.5V, 15V, 30V, 75V, 50V, 300V, 500V (peak factor 6), 750V (peak factor 6) **Current** **• Direct input** **SPA3100-5A:** 100mA, 200mA, 500mA, 1A, 2A, 5A (peak factor 3) 50mA, 100mA, 250mA, 500mA, 1A, 2.5A (peak factor 6) **SPA3200-50A:** 1A ,2A, 5A, 10A, 20A, 50A (peak factor 3) 500mA, 1A, 2.5A, 5A, 10A, 25A (peak factor 6) **External current sensor** 50mV, 100mV, 200mV, 500mV, 1V, 2V, 2.5V, 5V, 10V (peak factor 3) 25mV, 50mv, 100mV, 250mV, 500mv, 1V, 1.25V, 2.5V, 5V (peak factor 6)
Input impedance	**Voltage** Input resistance is about 2MΩ, and input capacitance is about 13pF (in parallel with the resistor) **Current** **• Direct input** **SPA3100-5A:** In case of 0.1A~5A, input resistance is about 20mΩ, and input inductance is about 0.1μH (in series with the resistor) **SPA3200-50A:** In case of 0.1A~5A, input resistance is about 20mΩ, and input inductance is about 0.1μH (in series with the resistor) **• External current sensor** Input resistance is about 20kΩ (50mV~10V)
Instantaneous continuous maximum allowable input value	**Voltage** Take the smaller value between the peak value of 3kV and the voltage effective value of 1.5kV **• Direct input** **SPA3100-5A:** Take the minimum value between the peak value of 45A and the current effective value of 15A **SPA3200-50A:** Take the minimum value between the peak value of 100A and the current effective value of 55A **• External current sensor** The peak value shall not exceed 5 times the rated range
A/D converter	**Voltage and current input are converted simultaneously** **Resolution:** 16 bits **Conversion rate (sampling rate):** 10μs

Measurement accuracy

Frequency range of input signal	Voltage	Current	Power
DC	0.1+0.05	0.1+0.05	0.1+0.05
0.5Hz≤f<45Hz	0.1+0.15	0.1+0.15	0.25+0.2
45Hz≤f≤66Hz	0.1+0.05	0.1+0.05	0.1+0.05
66Hz＜f≤1kHz	0.1+0.15	0.1+0.15	0.1+0.15
1kHz<f≤10kHz	0.06*f+0.3	0.06*f+0.3	0.08*f +0.25
10kHz<f≤100kHz	0.04*f +0.5	0.04*f +0.5	0.07*f +0.5

Measurement conditions

Item	Specifications
Peak factor	3 or 6
Measurement interval	The interval of measurement function and performing operation, which is determined by the zero crossing point of synchronous source signal (when synchronous source is none, the measurement interval is the data update interval)
Synchronous source	voltage, Current, None
Metering mode	RMS (true effective value of voltage and current) MEAN (average rectified value calibrated to voltage effective value) DC (simple mean of voltage and current)
Wiring mode	1P2W, 1P3W, 3P3W, 3V3A, 3P4w The number of available wiring modes depends on the number of input units installed
Scale factor	When inputting the output from external sensor, VT or CT, the conversion ratio, VT ratio, CT ratio and power coefficient of the current sensor can be set. The setting range is 0.001 ~ -9999
Line filter	OFF or ON can be selected (cutoff frequency: 500Hz)
Average calculating operation	Exponential average: Select the attenuation constant from 8, 16, 32 and 64 Linear average: Select the average number from 8, 16, 32 and 64 Harmonic measurement can only be exponentially averaged
Data update rate	50ms, 100ms, 250ms, 500ms, 1s,c 2s, 5s, Auto
Peak measurement	Measure the peak value (maximum value, minimum value) of voltage, current or power from the instantaneous voltage, instantaneous current or instantaneous power sampled
Zero level compensation	Remove internal offset

Display function

Item	Specifications
Type of display	3 or 6
Display item	Display 4 items simultaneously
Unit symbol	m, k, M, V, A, W, VA, var, °, Hz, h±, Tl ME, %
Response time	The maximum is twice the data update cycle (The time required for the displayed value to reach the final accuracy state when the rated value of the range changes from 0 to 100% or from 100% to 0)
Hold	Hold the displayed value
Single update	When data is held, the displayed value is updated every time the Single key is pressed

Frequency measurement function

Item	Specifications
Measuring object	Measure the frequency of voltage or current of all input units simultaneously
Methods of measurement	Reciprocal method
Frequency measuring range	Data update rate / Frequency measuring 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≤100kHz 5s / 0.5Hz≤f≤100kHz
Frequency accuracy	When the peak factor is 3, the input signal level is greater than or equal to 30% of the measuring range (when the peak factor is 6, it is greater than or equal to 60%). When the measured voltage or current is less than or equal to 200Hz, open the frequency filter accuracy: ± (0.06% of reading)
Minimum resolution	0.0001 Hz

Integral function

Item	Specifications
Mode	Standard integral mode or repeated integral mode is optional
Timer	Automatically stop integral by setting a timer Setting range: 00:00:00 ~ 10000:0:0
Integral stop	Integral time reaches the set value The integral value reaches the maximum or minimum displayable value
Accuracy	In case of fixed range: ± (power accuracy (or current accuracy) + 0.1% of reading); in case of automatic range: when the range changes, no measurement will be performed. The first measured value after range change and the non-measurement period will be added
Timer accuracy	± 0.02% of reading

D/A interface

Item	Specifications
Output voltage	±5V full scale (about ±7.5V at most), relative to each rated value
Output channel diagram	12-channel output
Output item	Set U, I, P, S, Q,fU, fl, Upk, Ipk, WP, WP±, q, q±, and MAT of each channel
Accuracy	± (accuracy of each measurement item + 0.2% of full scale (FS)) (FS=5V)
D/A conversion accuracy	16-bit
Minimum load	100kΩ
Update cycle	Same as data update cycle
Temperature coefficient	Temperature coefficient ± 0.05% of full scale/℃

Harmonic measurement function

Item	Specifications			
Measuring object	All installed units			
Frequency Range	Fundamental frequency range of PLL source is 8Hz~1.5kHz PLL source: Voltage and current of each input unit			
Upper limits of sampling rate, window width and number of measurements	1024 points, when the data update rate is 100ms or 250ms			
	Fundamental frequency	Window width	Window width	Window width
	20Hz~40Hz	1	50	
	40Hz~440 Hz	2	50	
	440Hz~1KHz	10	50	
	1KHz~1.5KHz	16	40	
	1024 points, when the data update rate is 100ms or 250ms			
	Fundamental frequency	Window width	Window width	Window width
	8Hz~40 Hz	1	50	
	40Hz~440 Hz	2	50	
	20Hz~40Hz	10	50	
	20Hz~40Hz	16	40	
Accuracy of harmonic measurement (Indicator: ±% of reading + % of range)	1024 points, when the data update rate is 100ms or 250ms			
	Fundamental frequency	Window width	Window width	Window width
	8Hz≤f≤45Hz	1	50	50
	45Hz≤f≤440Hz	2	50	50
	440Hz≤f≤1KHz	10	50	50
	1KHz≤f≤1.5KHz	16	40	40

External hardware interface

Item	Specifications
Mode	±5V, about ±7.5V at most, TTL level

D/A interface

Item	Specifications
Type-B USB interface	USB complies with USB Rev.2.0 USBTMC-USB488 (USB Test and Measurement Ver.1.0)
Ethernet interface	RJ-45 interface, which complies with IEEE802.3; 1000BASE-T, 100BASE-TX, 10BASE-T
RS-232 interface	9-pin D-Sub (plug), which complies with EIA-574 (EIA-232 (RS-232) 9-pin standard)
GP-IB interface	Complies with IEEE standard 488-1978 (JIS C 1901-1987) and IEEE St'd 488.2-1992

General features

Item	Specifications
Size	220.02mm*402.87mm*153.22mm
Nominal supply voltage	AC100 ~ 240V
Allowable voltage fluctuation range	AC90 ~264V
Rated power supply frequency	50/60Hz
Allowable frequency fluctuation range	48 ~ 63Hz
Maximum power consumption	50VA
Preheating time	About 30 minutes
Operating environment	Temperature: 5℃~40℃ Humidity: 20%~80% RH(no condensation)
Working altitude	2,000m or below
Suitable place	Indoor
Storage environment	Temperature: -25℃~60℃ Humidity: 20%~80% RH(no condensation)
Weight	About 6kg
Standby battery	Standby battery for clock

Fittings

Model and specifications (codes)

	DC	AC	Accuracy	Measuring bandwidth	Transformation ratio KN	Measuring resistance Rm	Hole diameter	Interface	Power supply
SCTH60	0-60A	60Apeak	±(0.05% of rdg + 15μA)	DC-800kHz	1: 600	0--25Ω	Ø28mm	D-Sub 9 pin	±12V~±15V
SCTH200	0-200A	200Apeak	±(0.05% of rdg + 15μA)	DC-500kHz	1: 1000	0--25Ω	Ø28mm	D-Sub 9 pin	±12V~±15V
SCTH600	0-600A	600Apeak	±(0.05% of rdg + 15μA)	DC-300kHz	1: 1500	0--25Ω	Ø30.9mm	D-Sub 9 pin	±15V~±24V
SCTH1000	0-1000A	1000Apeak	±(0.05% of rdg + 15μA)	DC-300kHz	1: 2000	0--25Ω	Ø30.9mm	D-Sub 9 pin	±15V~±24V

Boxes

Name	Model	Sample	Usage
PTB01	Single-phase Junction Box		It is used for single phase circuit connection to measure power parameters conveniently via power analysis wavecorder
PTB03	Three-phase Junction Box		It is used for three- phase circuit connection to measure power parameters conveniently via power analysis wavecorder (The length of the line is about 2m)

Connectors and Cables

Name	型号	示意	规格
Fork terminal adapter	PAC-1001		Used when attaching banana plug to binding post. Specification: 1000V, CAT II, 20A Color: red, black
BNC Conversion adapter	PAC-1002		Connector: Conversion between safety BNC and banana jack Specification: 600V, CAT III
Safety adapter	PAC-1003		Connector: Safety connector; Solder can be used for tightening the test cables. Specification: 600V, CAT II, 20A Color: red, black
Safety adapter	PAC-1004		Connector: safety connector, spring-hold type Specification: 600V, CAT II, 10A Color: red, black
Safety clamp	PAC-1005		Connector: hook shape connector Specification: 1000V, CAT III, 4A Color: red, black
Large alligator adapter	PAC-1006		Connector: safety connector Specification: 600V, CAT , 19A Color: red, black
Small alligator adapter	PAC-1007		Connector: safety connector Specification: 300V, CAT II, 15A Color: red, black
Measurement lead	PAL-1001		Connector: safety connector Specification: 1000V, CAT II, 32A , 600V, CAT III Color: red, black
Safety BNC cable	PAL-1002		Connector: BNC connector Specification: 1000V, CAT II, 600V, CATIII Color: black
External sensor Cable	PAL-1003		Connector: one BNC safety connector Specification: 300V, CAT II, 2A Color: black

INNO Instrument Inc

Website: www.innoinstrument.com

Email: support@innoinstrument.com