



S5

Power Analyzer



- Max Measuring Accuracy: \pm (0.1% of reading + 0.1% of range)
- Bandwidth : DC, from 0.5Hz to 500kHz
- Power Measurement Channels: up to 3
- Voltage, current wide-range: Direct input (from 15 to 1000V, from 0.5 to 40A)
- Up to 50 harmonic orders
- Display: 5.7 inches TFT color LCD

SUITA ELECTRIC Corporation, founded in Suita, Osaka, Japan, is a company specializing in high-end equipment. Rooted in the technological achievements after years of research and development, the top-notch products of our company, with good quality, apply in many industries such as electric power, energy resource, transportation, automobile, telecommunication, and our advanced, reliable, and comprehensive solutions of test and measurement are provided to many R&D companies and manufacturers, systematic approaches meeting the deep demands of our customers to support the development and continuous update of the global industries.

Power analyzer of S5 series is a powerful instrument for measuring home appliances, OA products (office automation), and equipment with large power and process control automation. It is widely used in product measurement in the areas such as power industry and enterprise products (for example, air conditioner, printer and so on). This instrument is also equipped with the functions such as recording real time waveform and the waveform data record and analyzing the harmonic. Basic electrical parameters can be measured via this instrument, and specific inverter has been designed to accompany with this power analyzer with the features such as: more measurement modules available for simultaneously measuring input & output parameters, analyzing harmonics, measuring power factor, displaying the items including numeric, waveforms, trends, bars and so on. Instead of traditional instruments, our power analyzer ensures highly efficient and accurate measurement. This instrument is compact enough to be used conveniently in the laboratory and working site.



Functions and Advantages

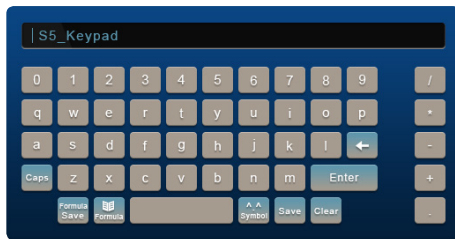
Touch Screen

You can touch and set the functions on the visualized screen which is friendly and intuitive.



User-friendly Keyboard Operation

The users can use the keyboard on this instrument to type uppercase and lowercase letters, numeric, symbols, and replay the characters or expressions which have been saved (editing history memory) to make the setup or editing more convenient and user-friendly.



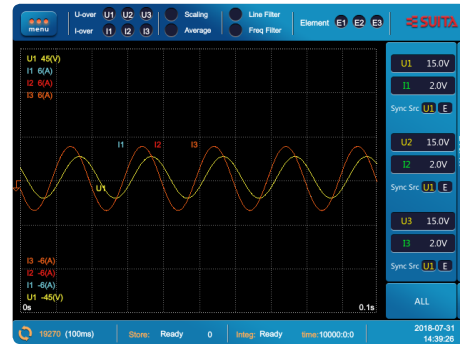
Powerful Display Function

Large amount of information can be displayed on one screen in various formats, such as numeric, waveform, bar, trend and vector. Multiple measured data can be displayed continuously.

Numeric Display



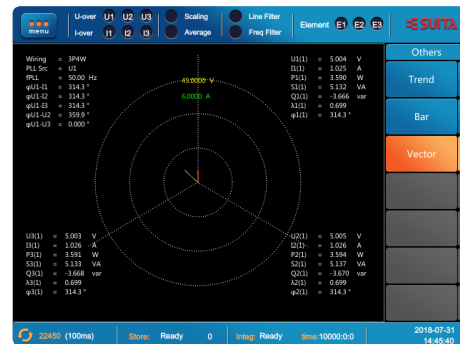
Waveform Display



Bar Display



Vector Display



Trend Display





Configuration Parameters Overview

Multiple configuration parameters can be displayed simultaneously on one screen, so that users can view and set the corresponding parameters as needed, convenient for comparing between various parameters.

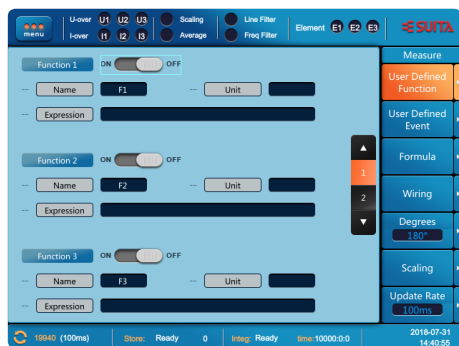


Simultaneously Measuring all Parameters

The power analyzer of this series can measure all DC and AC parameters. It can also measure harmonics and perform integration simultaneously without changing the measurement mode.

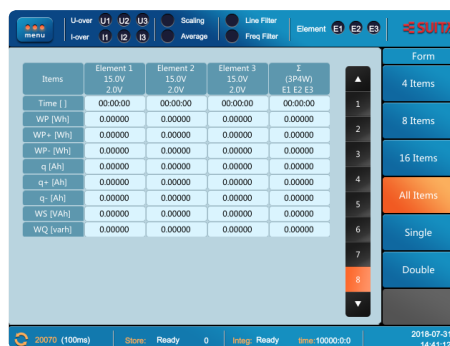
User-defined Function

Under this function, this instrument can compute the conversion efficiency, loss of power input and output, ripple factor of direct current. You can set up to 5 formulae depending on different coefficient. The displayed names of the formulae such as F1 and F2 can be changed.



Integration Function

In addition to integration functions of active power (WP), current (q), reactive power (WQ), and apparent power (WS), this power analyzer provides Charge & Discharge Bought & Sold modes and calculates the average active power within the integration period via the average feature, useful for evaluating the power consumed by intermittent-control instruments in which the power value fluctuates.



Harmonic Measurement

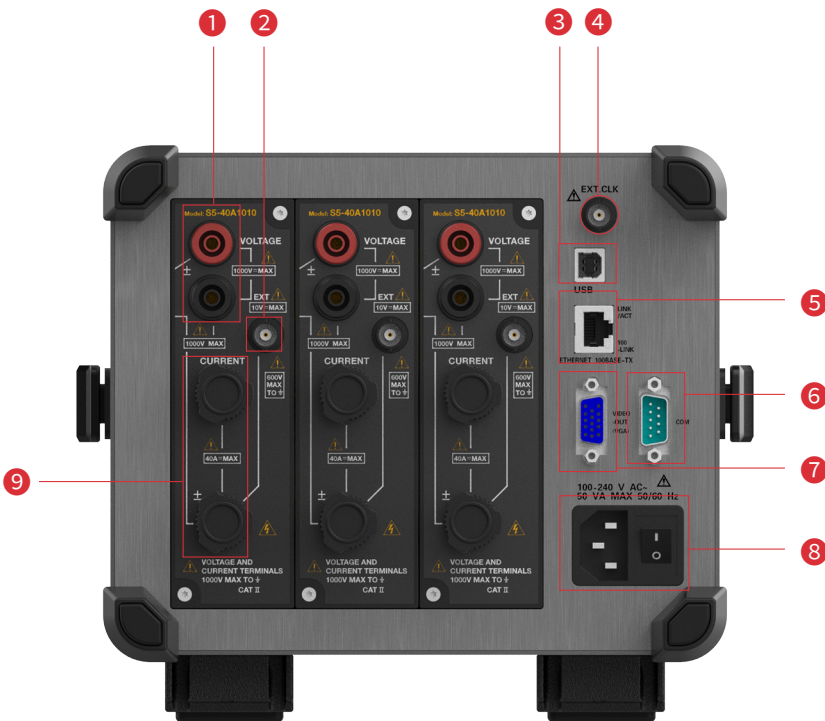
This instrument can simultaneously measure and analyze fundamental wave, harmonics and THD in harmonic measurement mode, and it can analyze harmonics up to 50th orders. Besides, it can simultaneously measure the harmonics on multi-channel and analyze the input and output measurement data, saving time.



Product Overview



- ① Esc key
- ② Selection knobs
- ③ Knobs for changing the current and voltage ranges
- ④ Display selection keys
- ⑤ Functions I
- ⑥ Power key
- ⑦ Conditions setup keys
- ⑧ Functions II
- ⑨ USB por
- ⑩ Screen



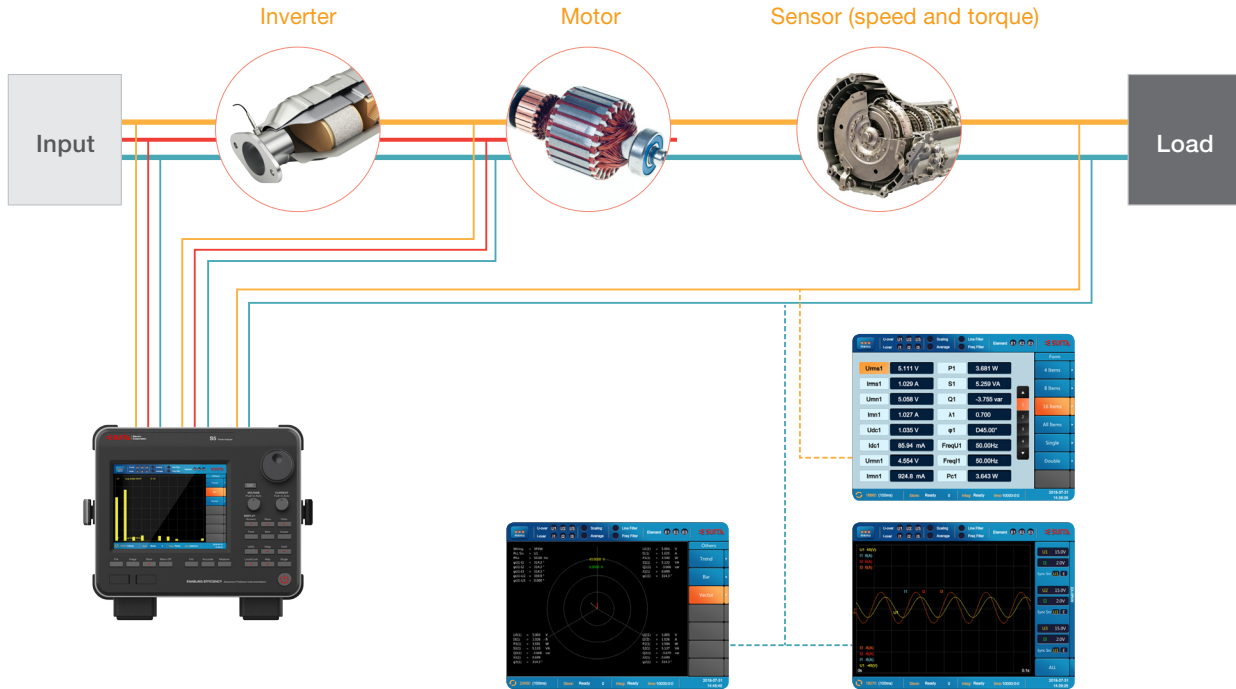
- ① Voltage input terminal
- ② EXT current sensor input terminal
- ③ Type B USB port
- ④ EXT clock input connector
- ⑤ Ethernet port
- ⑥ GP-IB connector/RS232 (Alternative)
- ⑦ VGA Connector
- ⑧ Power
- ⑨ Current input terminal

Applications

Power Efficiency Assessment:

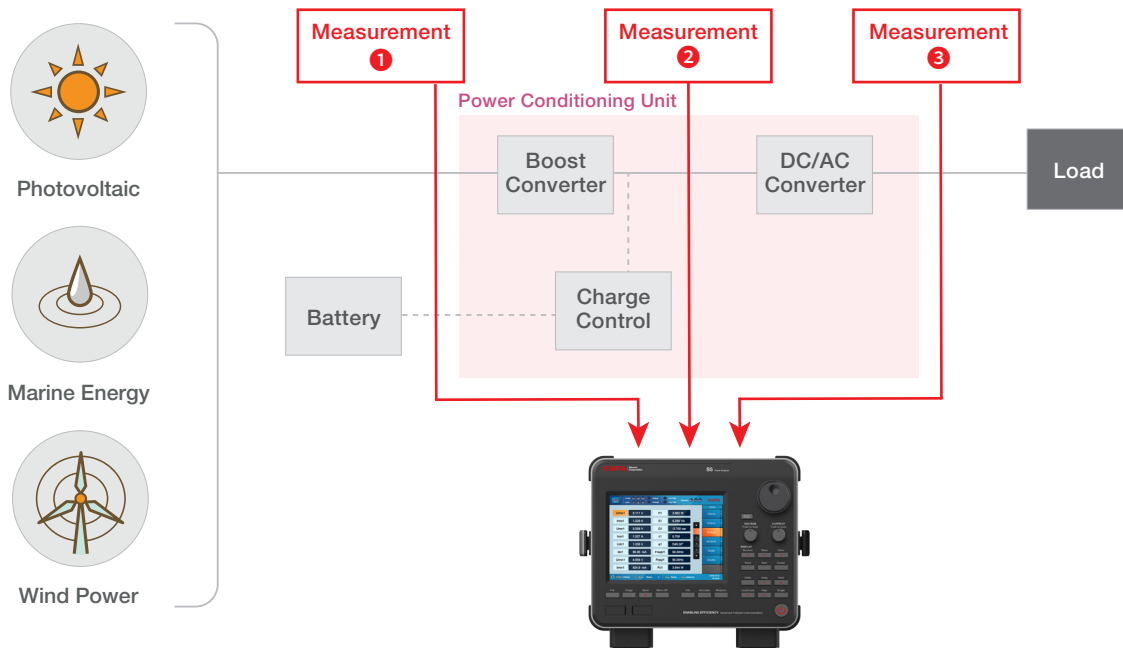
Hybrid Electrical Vehicle, Transducer, Variable Frequency Motor

Nowadays, motors or fans are widely used in various areas, and energy efficiency attracts more attention, therefore, it is very important to evaluate the power quality or access the inverters effectively. Multiple energy measurement functions (such as regarding voltage, current, power) in one, equipped with 3 measurement channels, this instrument can help to evaluate many aspects of the inverter. The NULL function specially designed is used to subtract the DC offset for a certain input channels, achieving more accurate measurement.



Power Efficiency Assessment: New Energy System

With the progress of new energy used, the power quality is becoming increasingly prominent. This product can be used to effectively monitor and evaluate the power energy problem arising from inter-harmonic, negative sequence component, or low voltage. For example, when the energy generated by photovoltaic module and wind turbine is changed from direct current to alternative current, the system of charge control will convert the energy so as to reduce the energy loss arising from the process of energy conversion and improve the efficiency of new energy conversion.



Functional Test to Home Appliances

Energy efficiency is becoming an increasing concern. To improve the energy efficiency in daily life, people select to use the appliances with low power consumption, including the air conditioner, washing machine, induction cooker, water heater. This instrument can test the home appliances. The power analyzer can test up to 3 pieces of appliances at the same time for measuring the voltage, current, power, frequency, power factor and THD, achieving highly effective measurement. Besides, the independent integration function allows starting and stopping integration for each input element separately.



Technical Specifications

Inputs

Items	Specifications
Input terminal type	Voltage (U): Plug-in terminal (Safety terminal) Current (A): · DC input: binding post · External current sensor input: Insulated BNC connector
Input type	Voltage (U): Floating input, resistive potential method Current (A): Floating input, Shunt input method
Measurement range	Voltage CF3: 15V, 30V, 60V, 100V, 150V, 300V, 600V, 1000V CF6: 7.5V, 15V, 30V, 50V, 75V, 150V, 300V, 500V
	Direct input CF3: 500mA, 1A, 2A, 5A, 10A, 20A, 40A CF6: 250mA, 500mA, 1A, 2.5A, 5A, 10A, 20A
	External current sensor input CF3: 50mV, 100mV, 200mV, 500mV, 1V, 2V, 5V, 10V CF6: 25mV, 50mV, 100mV, 250mV, 500mV, 1V, 2.5V, 5V
Input resistance	Voltage Input resistance: Approximately 2M Ω Input capacitance: Approximately 13pF(paralleled with resistance)
	Current Direct input: Approximately 2.5m Ω +approximately 0.1 μ H External current sensor input: Approximately 100k Ω
Continuous maximum allowable input	Voltage Peak voltage of 1.5kV or RMS of 1 kV, whichever is lower
	Current Direct input: Peak current of 100 A or RMS of 45 A, whichever is lower External current sensor input: Peak current is less than 5 times of the rated range
Continuous maximum common mode voltage (50/60Hz)	Voltage input terminals: 1000Vrms Current input terminals: 1000Vrms External current sensor input connector: 600Vrms
Rated voltage to ground	Voltage input terminals: 1000V Current input terminals: 1000V External current sensor input connector : 600V
Sampling rate	100KS/s
A/D converter	Simultaneous voltage and current input conversion Resolution: 16-bit Maximum conversion rate: 10us

Auto range function	Range up (When one of the following conditions is met)	<ul style="list-style-type: none"> Urms or Irms exceeds 110% of the range selected 110%. When in crest factor 3: Upk or lpk of the input signal exceeds 330% of the range selected. When in crest factor 6: Upk or lpk of the input signal exceeds 660% of the range selected.
	Range down (When all the following conditions is met)	<ul style="list-style-type: none"> Urms or Irms is less or equal to 30% of the measurement range. When in crest factor 3: Upk and lpk of the input signal are less than 300% of the next lower measurement range. When in crest factor 6: Upk and lpk of the input signal are less than 600% of the next lower measurement range.

Measurement Accuracy

Conditions: Temperature: 23 \pm 5 $^{\circ}$ C, Humidity: 30 to 75%RH, Input waveform: Sine wave, Power factor (λ): 1, Common mode voltage: 0 V, Crest factor: CF3, Line filter: OFF Frequency filter: 440Hz or less when ON, after warm-up. Zero setting before wiring; Frequency f with unit kHz; within half a year after calibrated.

Format: \pm (% of reading + % of range)

Range of frequency of input signal	Voltage	Current	Active Power
DC	0.1+0.1	0.1+0.1	0.1+0.1
0.5Hz \leq f<45Hz	0.1+0.15	0.1+0.15	0.2+0.2
45Hz \leq f \leq 66Hz	0.1+0.1	0.1+0.1	0.1+0.1
66Hz<f \leq 1kHz	0.1+0.1	0.1+0.1	0.2+0.1
1kHz<f \leq 10kHz	(0.1*f)+0.1	(0.1*f)+0.1	(0.1+0.1*f)+0.1
10kHz<f \leq 50kHz	(0.2+0.07*f)+0.2	(0.2+0.07*f)+0.2	(0.1+0.1*f)+0.2
50kHz<f \leq 100kHz	(0.2+0.08*f)+0.2	(0.2+0.08*f)+0.2	(0.25+0.14*f)+0.2

Measurement Conditions

Items	Specifications
Crest Factor	3 or 6
Measurement period	Interval for determining the measurement function and performing calculations, The measurement period is set by the zero crossing of the synchronization source.
Synchronization source	U1~U3, I1~I3, EXT CLK, None



Wiring	1P2W (single-phase, two-wire), 1P3W (single-phase, 3-wire), 3P3W (3-phase, 3-wire), 3P4W (3-phase, 4-wire), 3P3W (3V3A) (3-phase, 3-wire, 3-volt/3-amp measurement). However, the number of available wiring systems varies depending on the number of installed input elements.
Line filter	Select OFF, 500Hz or 5.5 kHz
Frequency filter	Select OFF or ON (cutoff frequency: 500Hz)
Averaging	<p>1) Type Exponential averaging: Select an attenuation constant from 2 to 64. Moving average: Select the number of averages from 8 to 64.</p> <p>2) Application The average calculations below are performed on the normal measurement parameters of voltage U, current I, power P, apparent power S, and reactive power Q. Power factor λ and phase angle ϕ are determined by calculating the average of P and S. Harmonic measurement: Only exponential averaging is available.</p>
Data update interval	100ms, 200ms, 500ms, 1s, 2s or 5s
Hold	Hold the display data
Single	Execute a single measurement during measurement hold.
Null	The NULL feature is used to subtract the DC offset. NULL feature used for the input signals such as: U and I signals of each input element, i.e. U1, U2, U3, I1, I2, I3 The upper limit of the NULL value is $\pm 10\%$ of the range.
Zero-level compensation	Purpose: to improve the accuracy of the measurement by this instrument Method: Manual, Auto

Display

Items	Specifications
Display	5.7-inch color TFT LCD display
Total number of pixels	640(horizontal) \times 480(vertical) dots
Display types	Numeric, Waveform, Vector, Bar, Trend
Display update rate	Same as the data update rate, except the following case: When data update rate ≤ 500 ms, the numeric and non-numeric display update period is 1s.
Touch screen	Available

Numeric Display

Items	Specifications
Display resolution	5-bit, 4-bit
Display format	Select 4, 8, 16-value, All, Harmonic Single List, or Harmonic Dual List.
Display items	Items that this instrument can measure

Waveform Display

Items	Specifications
Display format	Single, Dual, Triad, Quad
Time axis	1ms, 2ms, 5ms, 10ms, 20ms, 50ms, 100ms, 200ms, 500ms
Vertical zoom	Ratio: within the range from 0.1 to 100.0
Waveform mapping	Auto, Fixed, User-defined
Interpolation types	Lines: Data points are connected with straight lines Dots: Only the data points are displayed
Grid display	Grid, scale value, no display
Display Items	Voltage and current of each input element(from U1 to U3, from I1 to I3)

Vector Display

Items	Specifications
Display items	Display the relationships of phase difference and amplitude (RMS) of the voltage and current fundamental harmonic for each input element
Measurement objects	Wiring systems
Range of U/I scale	From 0.1 to 100

Bar Display

Items	Specifications
Display modes	Single, Dual, Triad
Measurement objects	U, I, P, S, Q, λ , ϕ , ϕU , ϕI , Z, Rs, Xs, Rp, Xp

Trend Display

Items	Specifications
Display modes	Single, Dual, Trisection, Quartered
Measurement objects	Any data that need to be measured.
Time axis	3s, 9s, 18s, 36s, 90s, 3min, 6min, 15min, 30min, 1h, 3h, 6h, 12h, 1day
Type of interpolation	Line: Displays the numeric data in a sequential line between two dots Dot: only displays the numeric data in a format of dot
Display channel	Number of measurement channels: Up to 8 parameters

Frequency Measurement Function

Items	Specifications
Measured source	The voltage or current frequencies for all the input elements
Measurement method	Reciprocal method



	Data Update Interval	Measurement Range
Frequency measuring range	100ms	20Hz≤f≤100kHz
	200ms	10Hz≤f≤100kHz
	500ms	5Hz≤f≤100kHz
	1s	1.5Hz≤f≤100kHz
	2s	1Hz≤f≤100kHz
	5s	0.5Hz≤f≤100kHz
Accuracy	±0.05% of reading	
Minimum frequency resolution	0.0001Hz	

Harmonic Measurement Function

Items	Specifications			
Measured source	All installed elements			
Method	PLL synchronization method			
PLL source	U1-U3, I1-I3, EX CLK			
Frequency range	Fundamental frequency of the PLL source is in the range of 10 Hz to 1.2 kHz.			
Sample rate, window width, and upper limit of the measured order	Fundamental frequency	Sampling range	Window width	Upper limit of measured order
	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~1.2kHz	f*64	16	4
Accuracy: ±(...% of reading+ ...% of range)	Add the following accuracy to the accuracy at normal measurement.			
	When the line filter is off:			
	Frequency	Voltage	Current	Active Power
	10Hz≤f<45Hz	0.15+0.2	0.15+0.2	0.35+0.3
	45Hz≤f≤440Hz	0.15+0.2	0.15+0.2	0.25+0.3
	440Hz<f≤1kHz	0.2+0.2	0.2+0.2	0.4+0.3
1kHz<f≤1.2kHz	0.7+0.3	0.7+0.3	1.7+0.3	

Cursor Function

Items	Specifications
Cursor type	Cursor C1+, Cursor C2x
Cursor application	You can set the position of cursor displayed on the waveforms, trends, or bars graphs, in order to view the measured values at a certain position.
Display items for cursor measurement	Waveform display: Y+, Yx, ΔY, X+, Xx, ΔX Trend display: Y+, Yx, ΔY, X+, Xx, ΔX, D+, Dx Bar display: Y+, Yx, ΔY, X+Order, XxOrde

Computation and Event Functions

Items	Specifications
Formula regarding apparent power, reactive power, and corrected power	Apparent power formula: Urms*Irms, Umean*I _r mean, Udc*I _d c, Umean*Irms, Urmean*Irmean Applicable standards for corrected power Pc formula: IEC76-1(1976), IEC76-1(1993) Coefficient P1,P2: 0.0001~9.9999
User-defined function	Create the formula by combining the measurement functions; numerical data (up to 5 equations) can be calculated out. The results can be calculated by combining the measurement function symbols and the operators.
User-defined event	Up to 4 events can be defined as Event1 , Event2 , Event3 , Event4
Efficiency equation	Up to 2 efficiency equations can be set.

Integration Function

Items	Specifications
Mode	Select a mode from Normal, Continuous, Real Time Normal, and Real Time Continuous.
Integration timer	Integration can stop automatically according to the timer setting: 00:00:00~10000:00:00
Count over (Conditions of integration stopping)	If the integration time reaches the maximum integration time If the integration value reaches maximum/minimum display integration value
Integration methods of WP±Type	Charge/Discharge, Bought/Sold
Current integration mode	I_{rms}: True rms value I_{mn}: Rectified mean value calibrated to the rms value I_{dc}: Simple mean value I_rrmn: Rectified mean value I_{ac}: AC component
Accuracy	Fixed range: ±(power accuracy or current accuracy + 0.1% of reading)
Timer accuracy	±0.02% of reading

File and Data Save Function

Items	Specifications
Operations	Create, rename, copy, cut, paste, delete the files or folders, and so on.
Format of file save	.CSV format
Media of file storage	Internal SSD drive or external USB
Format of image save	.PNG, .BMP, .JPG
Storage mode	Manual, Real-time, Synchronous integration, Trigger event, Single shot
Number of storages	Within the range from 1 to 9999999

Storage interval	00:00:00~ 99:59:59
Max storage duration	It depends on the number of storages and the media.

Hardware Interfaces

Item	Specification
External Clock Input	BNC connector; TTL level; Square waveform with a duty ratio of 50%.
VGA Output	15-pin D-Sub(socket); Analog RGB output
Type A USB Interface	Conforms to USB Rev.2.0; 5 V; 500 mA (Power supply)

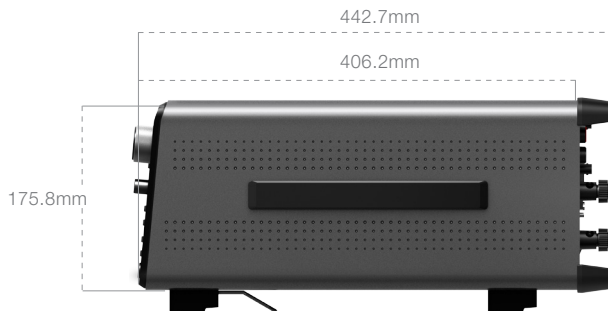
Communication Interfaces

Items	Specification
Type B USB Interface	Conforms to the USB Rev.2.0; USBTMC-USB488(USB Test and Measurement Class Ver.1.0)
Ethernet Interface	RJ-45 connector; Conforms to IEEE802.3; Ethernet 100BASE-T, 100BASE-TX, 10BASE-T
RS-232 Interface	9-pin, D-Sub (plug); Conforms to EIA-574, standard of 9-pin EIA-232(RS-232)
GP-IB Interface	Conforms to IEEE Standard 488-1978 (JIS C 1901-1987); Conforms to the IEEE Standard 488.2-1992

General Specifications

Items	Specifications
External dimensions	442.7mm*237.1mm*210.9mm
Rated supply voltage	From 100 to 240 VAC
Permitted supply range voltage	From 90 to 264 VAC
Rated supply frequency	50/60Hz
Permitted supply voltage frequency range	From 48 to 63 Hz
Max. power consumption	80VA
Warm-up time	Approximately 30 minutes
Operation environment	Temperature: 5°C ~ 40°C Humidity: from 20% to 80%RH(no condensation)
Operating altitude	2000m or less
Applicable environment	Indoors
Storage environment	Temperature: -25°C ~ 60°C Humidity: from 20% to 80%RH(no condensation)
Weight	Approximately 7.45kg
Battery backup	Setup parameters are backed up with a lithium battery.

Dimensions of the Instrument

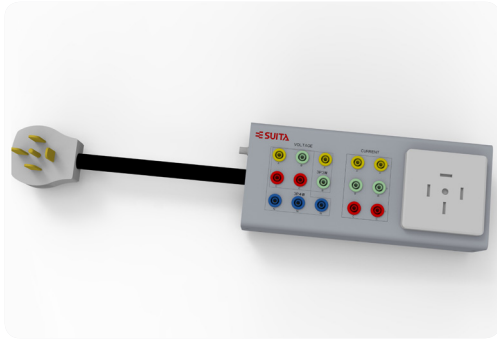


Accessories

Current Sensor of SHT Series

Item \ Model	SHT60	SHT200	SHT600	SHT1000
DC	0-60A	0-200A	0-600A	0-1000A
AC	60Apeak	200Apeak	600Apeak	1000Apeak
Accuracy	$\pm(0.05\% \text{ of rdg} + 15\mu\text{A})$	$\pm(0.05\% \text{ of rdg} + 15\mu\text{A})$	$\pm(0.05\% \text{ of rdg} + 15\mu\text{A})$	$\pm(0.05\% \text{ of rdg} + 15\mu\text{A})$
Measuring bandwidth	DC-500KHz	DC-300KHz	DC-200KHz	DC-150KHz
Ratio K_N	1: 600	1: 1000	1: 1500	1: 2000
Resistance R_m	0--25 Ω	0--25 Ω	0--12 Ω	0 -- 4 Ω
Aperture	\varnothing 28mm	\varnothing 28mm	\varnothing 30.9mm	\varnothing 30.9mm
Connector	DB9	DB9	DB9	DB9
Supply	\pm 12V~ \pm 15V	\pm 12V~ \pm 15V	\pm 15V~ \pm 24V	\pm 15V~ \pm 24V


Boxes

Name	Single-phase Junction Box	Three-phase Junction Box
Model	PG01A	PG02A
Sample		
Usage	It is used for single phase circuit connection to measure power parameters conveniently via power analyzer	It is used for three- phase circuit connection to measure power parameters conveniently via power analyzer

Connectors and Cables

Name	Model	Sample	Specification
Fork terminal adapter	PAC-1001		Used when attaching banana plug to binding post. Specification: 1000V, 20A Color: red, black
BNC Conversion adapter	PAC-1002		Connector: Conversion between safety BNC and banana plug Specification: Ø4mm , 1000V, 1A
Safety adapter	PAC-1003		Connector: Safety adapter; Screw can be used for tightening the test cables. Specification: Ø4mm , 1000V, 20A Color: red, black
Safety adapter	PAC-1004		Connector: safety adapter, spring-hold type Specification: Ø4mm, 600V, 10A Color: red, black
Safety clamp	PAC-1005		Connector: hook shape Specification: 1000V Color: red, black
Large alligator adapter	PAC-1006		Connector: safety adapter Specification: Ø4mm , 1000V Color: red, black
Small alligator adapter	PAC-1007		Connector: safety adapter Specification: Ø4mm , 300V Color: red, black
Measurement lead	PAL-1001		Connector: safety connector Specification: Ø4mm , 1m, 600V, 32A Color: red, black
Safety BNC cable	PAL-1002		Connector: BNC plug Specification: 1m Color: black

Case

Sample	Model	Size
	PY01A	456.7mm*565.0mm*290.0mm

Models and Codes

Name	Model	Descriptions
Instrument	S5	Power analyzer
Input Module	S5-40A1010	40A, 1000V, 0.1%+0.1%
Function Module (Option)	/CE	Ethernet
	/CU	USB
	/CR	RS232 (or GPIB)
	/CG	GP-IB (or RS232)
	/HA	Harmonic Measurement
Accessory mounted on the support	PAA1002	Used when the instrument mounted on the support
	PAA2002	Used when the instrument mounted on the support(two instruments)

* Product specifications and models are subject to change without notice.

