OPERATION MANUAL

PCE-PA 7500

POWER ANALYZER

Table of Contents

Chapter 1 Overview

Thank you for purchasing and using our company's products. Before you use this instrument, please confirm the final "complete set and warranty" chapter of the manual. If there is an incompatible situation, please contact us as soon as possible to protect your rights and interests.

1.1 Profile

PCE-PA 7500 digital power analyzer (digital power meter) uses high-speed 32-bit processors and professional DSP digital signal processors. It has fast speed, frequency bandwidth, full function, compact structure, stable testing, simple operation and good human-machine interface, etc. It is a new generation of digital power analyzers. The main parameters that can be measured are: voltage current validity value, voltage current AC component, voltage current DC component,active power,reactive power,apparent power, electric energy timing, power factor, Frequency, voltage current peak value factor, voltage current peak value, etc. According to the different instrument models, some instruments do not have harmonic analysis functions.

PCE-PA 7500 two channel power analyzer, It covers the advantages of a larger input bandwidth (10 ~ 100Hz). At the same time, the Handler interface, RS232C/ RS485 interface, and USBTMC and USBCDC interfaces of the instrument. It provides conditions for the instrument for the automatic sorting system and the remote operation of the computer; The main difference between different models is the measurement range of the current and the function of whether it has a harmonious analysis. The maximum test current is 20A and the measurement accuracy is stable.

The main characteristics of the instrument:

4.3 -inch LCD display;

Soft power switch;

Chinese and English optional operation interface;

Input frequency range (10 ~ 100Hz);

The range automatically/manual control;

The maximum test current is 20A (related to the model), and the minimum current can reach 0.001A

Provide a 5kHz line filter switch;

Flexible energy integration control;

Parameter comparison and Handle controllable output function;

Parameter gear select function;

Harmony analysis function (related to specific models);

Wave shape display function;

Support U disk file storage, the instrument program can be upgraded through the U disk;

Serial interface: RS-232C provides great convenience for the serial communication of the instrument and peripheral device. The peripherals can set the functions and parameters of the instrument through the interface, which can basically replace the function of the panel keyboard.

1.2 Open package inspection

After the package is opened, you should check whether the instrument appearance is damaged due to the transportation. We do not recommend that you call the instrument when the appearance is damaged.

The front panel of the instrument is marked with the specific model and the main measurement scope of the instrument. Check whether the model you ordered is consistent. Please confirm it according to the packing list.

Instrument models and basic functions in Table 1-1:

Note: It is best to keep the packaging box properly after opening the box,

to avoid the instrument causing unnecessary damage due to the unsuitable packaging box in the future transportation.

1.3 Use condition

1.3.1 Power connection

Power voltage: 100 ～ 240 VAC

Power frequency: 45 ～ 440Hz

Power supply power range: not less than 30 VA.

The power supply input live wire L, Neutral wire N, Earth E should be the same as the power plug in this instrument.

This instrument has been carefully designed to reduce the wave interference caused by the input of the AC power supply end. However, it should still be used as much as possible in a low noise environment. If it cannot be avoided, please install the power filter.

Warning: In order to prevent leakage from causing damage to instruments or human, users must ensure that the ground wire of the power supply is earthing reliably.

1.3.2 Fuse

In the package, there is a fuse, the user should use the fuse of which offered by the factory.

1.3.3 Environment

Normal working temperature:0℃~40℃, Humidity: 20～80% RH

Reference work temperature: 20℃±8℃, Humidity: < 80% RH

Transportation environment temperature：0℃~55℃, Humidity：93% RH

Please do not use it under dust, vibration, direct sunlight or corrosive gases.

In order to ensure good ventilation in this test instrument, do not block the left wind holes to maintain accuracy of this instrument.

This instrument has been carefully designed to reduce the wave interference caused by the input of the AC power supply side. However, it should still be used as much as possible in a low noise environment. If it cannot be avoided, please install the power filter.

If the instrument is not used for a long time, please place it in the ventilation room with a temperature of 5 ° C ~ 40 ° C in the original packaging box or similar box, and the relative humidity is less than 85% RH and avoid direct sunlight.

1.3.4 Preheat

In order to ensure the precise measurement of the instrument, the preheating time should be not less than 30 minutes.

Do not switch the instrument frequently to avoid causing internal data confusion.

1.4 Instrument and other characteristics

Power consumption:about 16 VA

Shelf size(W*H* D): 215mm * 88mm * 335mm

Dimension(W*H* D): 235mm * 105mm * 360mm

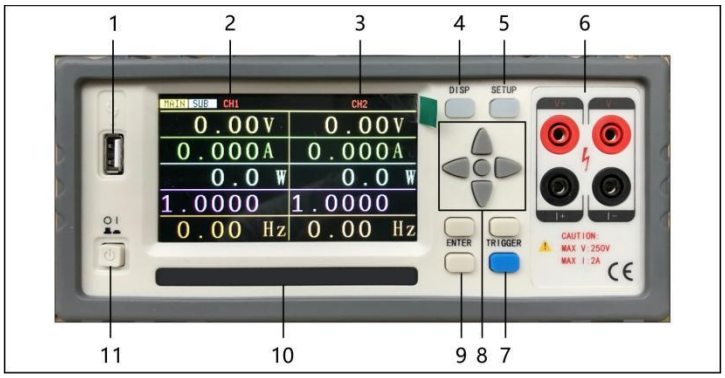
Weight:about 3.0kg

Chapter 2 The front and rear panel description and basic operation

This chapter describes the basic operation steps of the PA7500 instrument. Before using the PA7500 instrument, please read the content of this chapter in detail so that you can quickly be familiar with the operation of the PA7500 instrument.

2.1 Front panel description

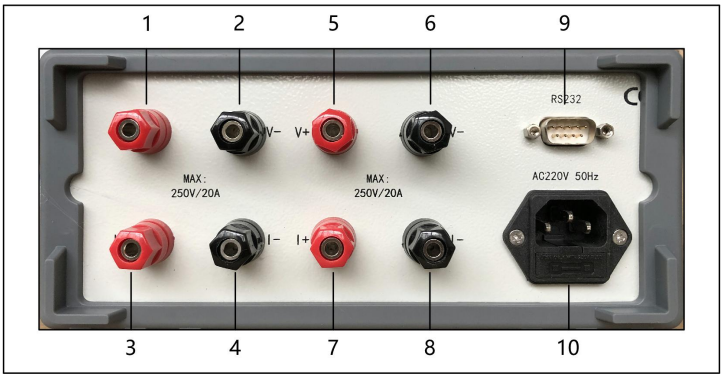
Figure 2-1 briefly explained the front panel of PCE-PA 7500



1	USB HOST	USB Host interface is used for U disk storage and upgrade.
2	Ch1	Display the Ch1 electrical parameter, and switch the main/sub -parameter through the left and right keys.
3	Ch2	Display the Ch2 electrical parameter, and switch the main/sub -parameter through the left and right keys.
4	DISP	Switch from the setting interface to the display interface.
5	SETUP	Switch from the display interface to the setting interface.
6	Ch1 front wiring port	Ch1 front wiring port, Maximum support 2A current
7	Clear zero Cumulative electricity	Press this key to clear zero the cumulative electricity of sub-parameters.
8	Universal direction keys (CURSOR)	Universal direction keys (CURSOR) Four direction buttons and confirmation keys up, down, left and right.
9	ENTER	After the direction key moves the cursor position, the soft key area corresponds to different functions. Press to modify the corresponding parameter value.
10	Model bar	Shows device model, brand information
11	POWER	Power switch
Figure 2-1 front panel description		

2.2 Rear panel description

Figure 2-2 briefly description on the rear panel of the PCE-PA 7500



10	Power socket	Input AC power
9	RS232C port	Serial communication with the computer (optional)
8	Channel 1 Load Negative (N)	
7	Channel 1 Load Positive (L)	
6	Channel 1 Voltage Negative (N)	
5	Channel 1 Voltage Positive (L)	
4	Channel 2 Load Negative (N)	
3	Channel 2 Load Positive (L)	
2	Channel 2 Voltage Negative (N)	
1	Channel 2 Voltage Positive (L)	
Figure 2-2 rear panel description		

Chapter 3 Basic Operation Instructions

Basic operation description of the PCE-PA 7500 buttons:

1) Use menu buttons (DISP, SETUP) and soft keys to select the page you want to display.

2) Use direction keys (←, ↑, →, ↓) to move the cursor to the parameter area that can be set, and the corresponding area will become a cursor color (blue)

3) The soft key function corresponding to the parameter of the current cursor area will be displayed in the "soft key area". The corresponding operation is performed by the soft key under the LCD or you can press the ENTER key to quickly circulate the enumeration status of the selected parameter.

3.1 Turn on the device

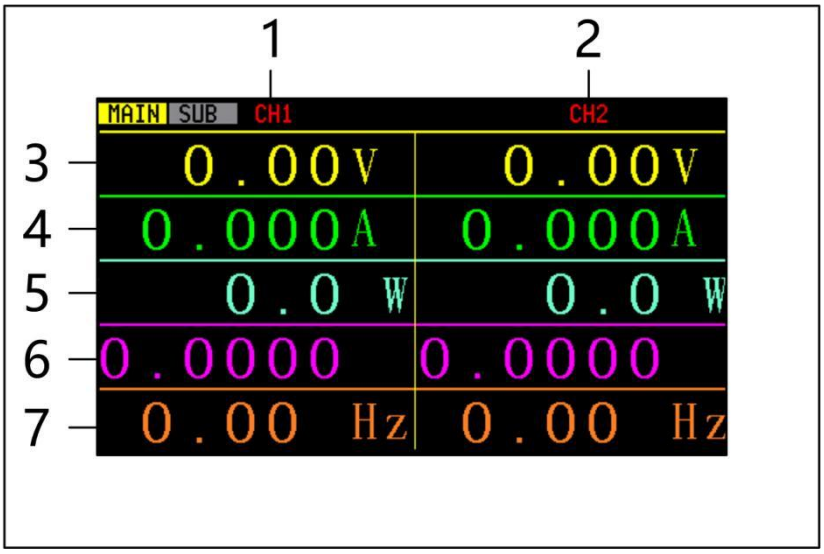
Plug in a 3 wire power cable to ensure the reliable connection of the power supply Ground. Press the power switch in the lower left corner of the instrument front panel, the instrument is turned on, displaying the display screen.

Figure 3-1 shows the display screen of PCE-PA 7500

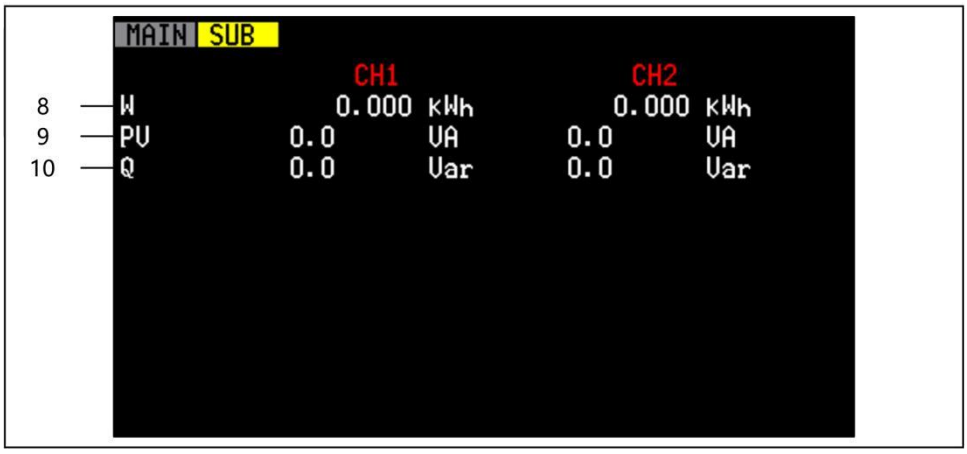
3.2 Display area definition

PCE-PA 7500 uses 24 -bit color 4.3 -inch color LCD screen with a resolution of 480 × 272. The content of the screen display is divided into the following display area,

3-1：Main parameter display screen



3-2：Sub-parameter display screen



The meaning of each area is shown in Table 3-1

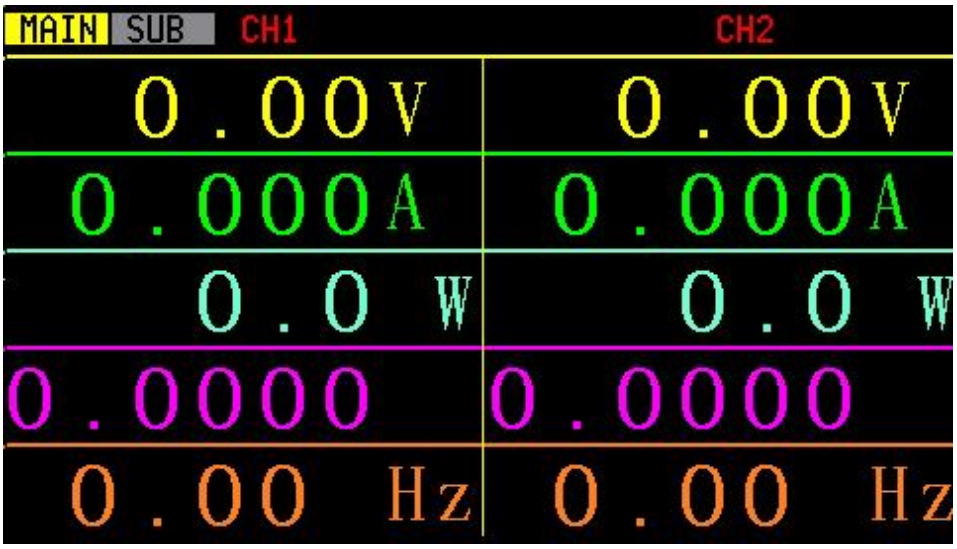
1	Channel 1 parameter	This column shows the parameter of Channel 1
2	Channel 2 parameter	This column shows the parameter of Channel 2
3	Voltage value	This row shows the voltage value of each channel
4	Current value	This row shows the current value of each channel
5	Active power	This row shows the active power value or each channel (voltage value* current value*power factor)
6	Power factor	This row shows the power factor of each channel
7	Frequency	This row shows the input voltage frequency of each channel
8	Cumulative electricity	This row shows the cumulative electricity of each channel
9	Apparent power	This row shows the apparent power value of each channel (voltage value*current value)
10	Reactive power	This row shows the reactive power value of each channel (apparent power-active value)
Table 3-1 the description of each area		

3.3 Display interface switch

The DISP button and the Setup button are the most frequent two buttons in the page switching process, which are entrances to the test related page and setting related pages.

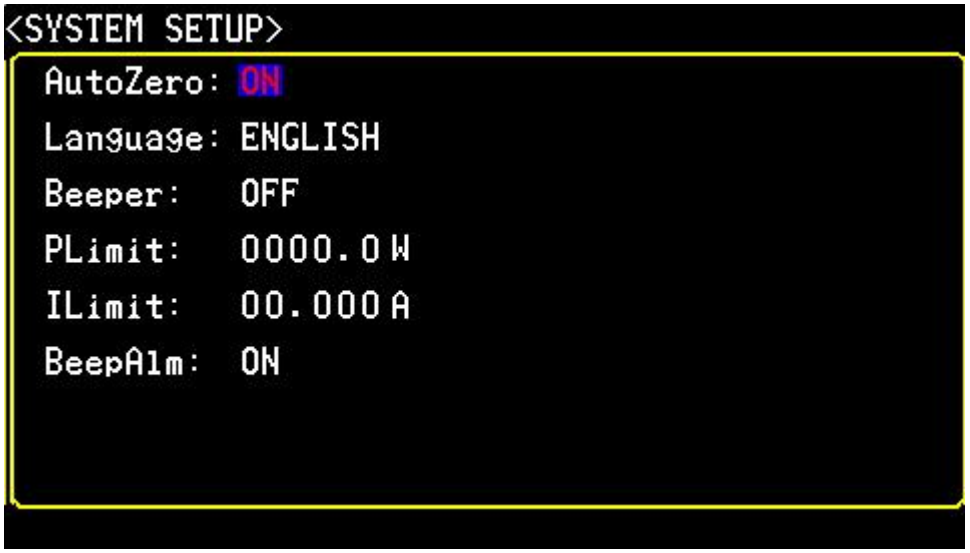
3.3.1 Measurement display button DISP

Press DISP button, enter the measurement display homepage



3.3.2 Measurement setting button SETUP

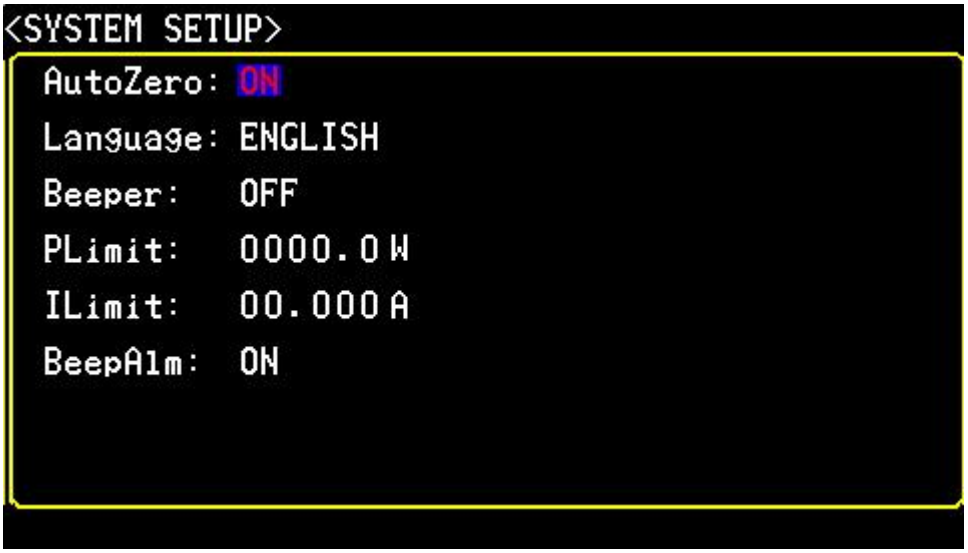
Press SETUP button, enter the system setting homepage



Chapter 4 System settings

Press SETUP key into the system settings interface

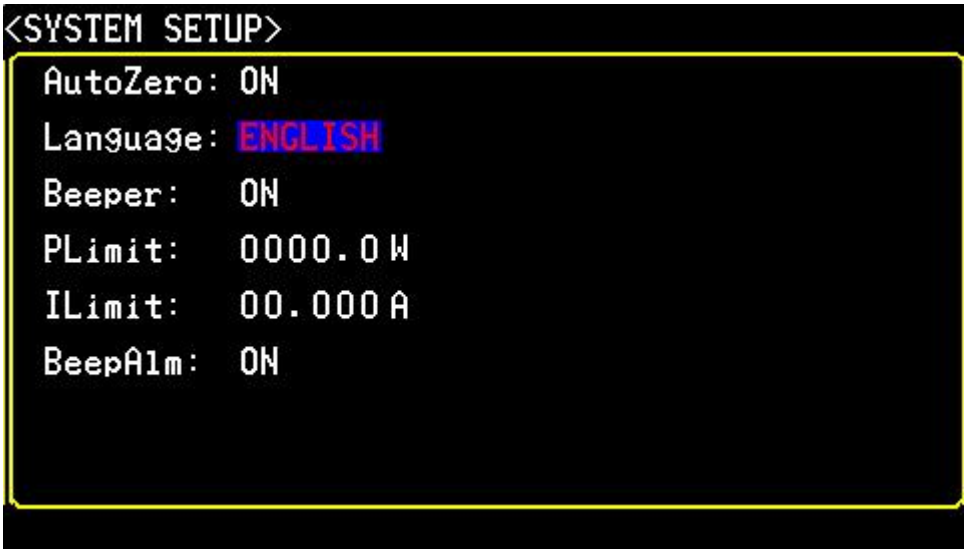
4.1 Electric energy automatically returns to zero settings:



The instrument can set the electric energy automatically to zero, set ON or OFF, the user can set it according to their own needs, the setting steps are as follows:

Use the cursor key to move the cursor to the AutoZero area, press the [ENTER] key, and then press the upper and lower keys to select, "ON" and "OFF" two options. After selecting, press [ENTER] to complete the settings. When the electric energy AutoZero is ON, the total of the previous electric energy is cleared to zero when each turning on the device. When the electric energy AutoZero is OFF, it will not clear the last cumulative electric energy when turning on the device. No matter what settings are settled, the cumulative electric energy can be cleared on the test interface through the blue TRIGGER key.

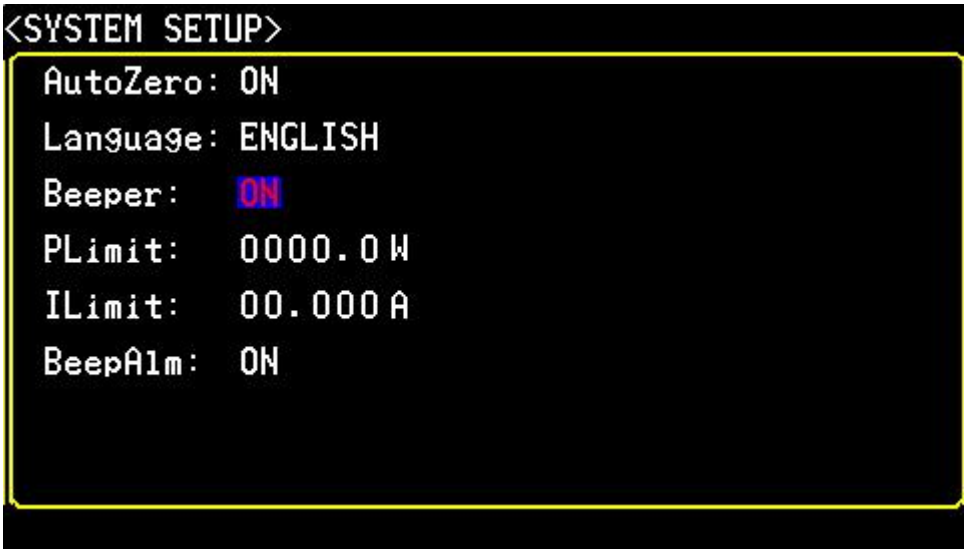
4.2 System language setting:



Set up system language and provide two system language choices: Chinese/English. The setting steps are as follows:

Use the cursor key to move the cursor to the language area, press the [ENTER] key, and then press the upper and lower keys to select. After selecting, press the [ENTER] key to complete the settings.

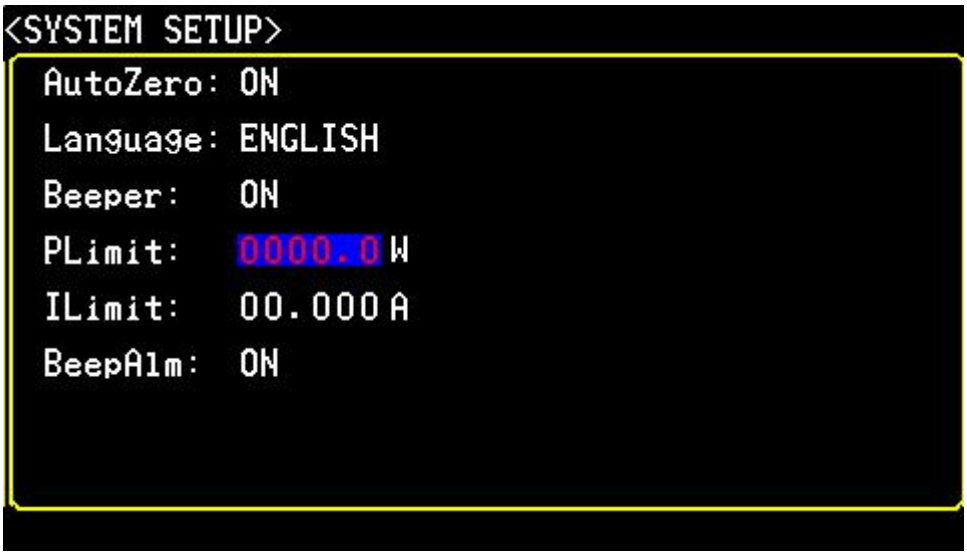
4.3 Key sound:



ON or OFF the key sound. The setting steps are as follows:

Use the cursor key to move the cursor to the Beeper area, press the [ENTER] key, and then press the upper and lower keys to select. After selecting, press the [ENTER] key to complete the settings.

4.4 Power upper Limit

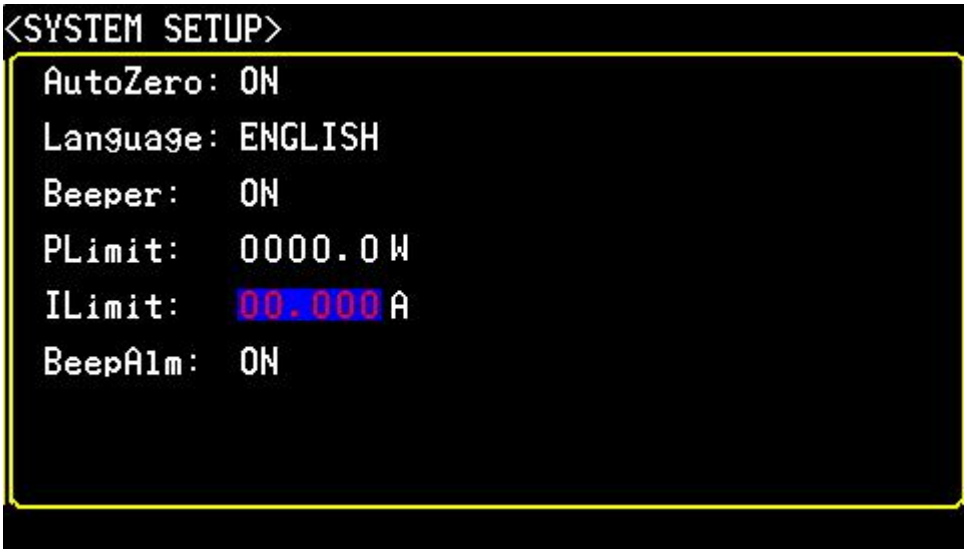


Set the power upper limit,It will alarm if exceed this setting value. The setting range is 0000.0 ~ 9999.9W.

The setting steps are as follows:

Use the cursor key to move the cursor to the PLimit area, press the [ENTER] key, and then press the upper and lower keys to select the value, ↑add value,↓ reduce the value, ←move the setting number to the left, →and move the setting number to the right. After setting, press the [ENTER] key to complete the setting.

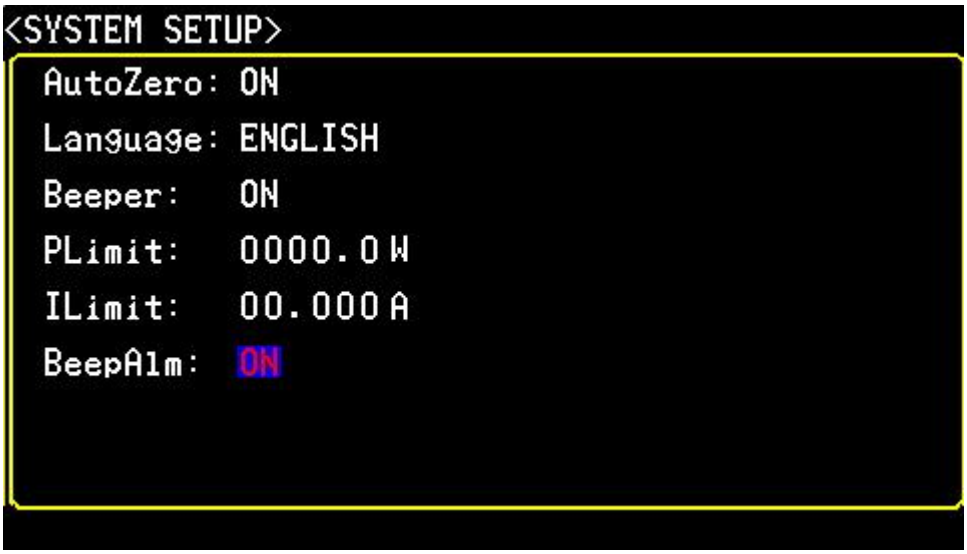
4.5 Current upper limit



Set up the current limit, It will alarm if exceed this setting value. The setting range is 00.000 ~ 20.000A. The setting steps are as follows:

Use the cursor key to move the cursor to ILimit area, press the [ENTER] key, and then press the upper and lower keys to select the value, ↑add value,↓ reduce the value, ←move the setting number to the left, →and move the setting number to the right. After setting, press the [ENTER] key to complete the setting.

4.6 Beep alarm switch

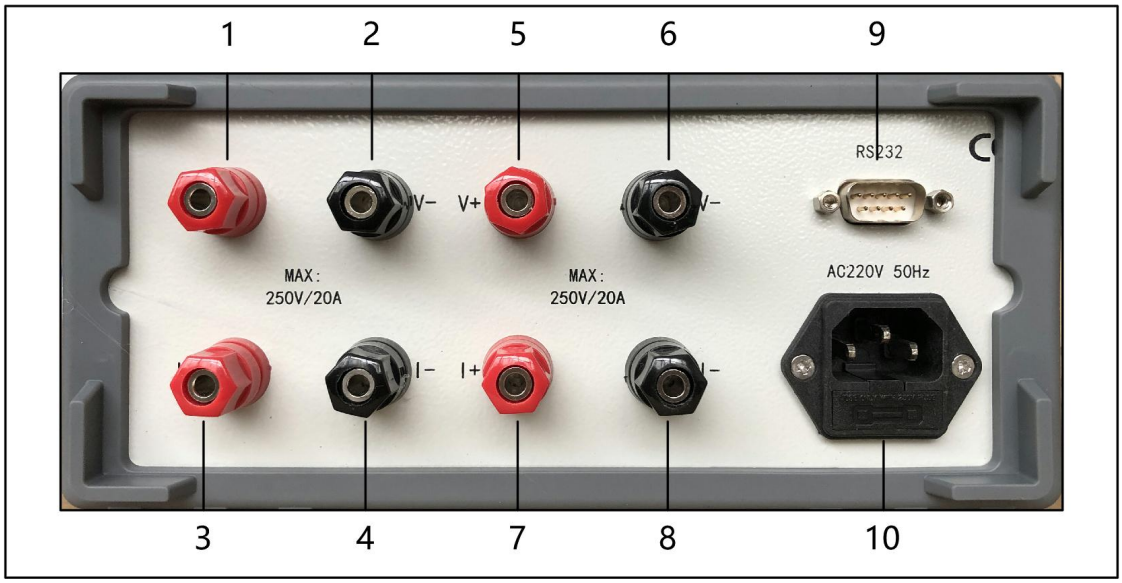


When the option is ON, it will alarm when the power/current exceeds the setting value. The setting steps are as follows:

Use the cursor key to move the cursor to the BeepAlm area, press the [ENTER] key, and then press the upper and lower keys to select. After selecting, press the [ENTER] key to complete the settings

Chapter 5 Wiring method

PCE-PA 7500 instrument provides four test wiring input terminals, namely voltage high-end, voltage low-end, load high-end, load low-end.



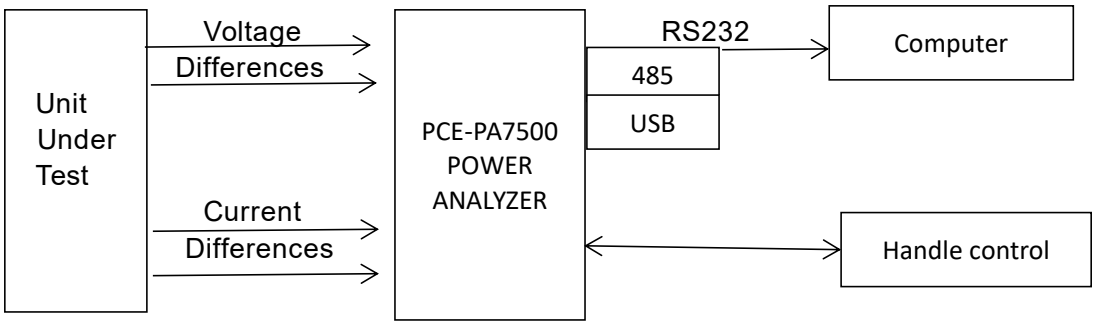
As shown in the above figure: connect the channel 1 voltage input into the terminal 5-6 (pay attention to distinguish L/N), connect the channel 1 load to the terminal 7-8 (pay attention to distinction L/N), then Channel 1 wire connection is finished.

As shown in the above figure: connect the channel 2 voltage input into the terminal 1-2 (pay attention to distinguish L/N), connect the channel 2 load to the terminal 3-4 (pay attention to distinction L/N), then Channel 2 wire connection is finished.

Chapter 6 Basic Principles and Technical Index

6.1 Basic principles

The system principle and principle diagram, as shown in Figure 6-1:



（Figure 6-1 System structure）

The main structure of PCE-PA 7500 two channel single -phase power analyzer is to input the UUT system to the Power Analyzer through the voltage and current of the Power Analyzer by Difference input. Through the amplification, filtering, sampling, and AD conversion inside the instrument, the simulation signal of the upcoming voltage and current is converted into a digital amount Ui and Ii. Then the CPU obtain the parameters such as the voltage validity value, current validity value, active power and power factors through the discrete integral with following formulas, then send this parameters to LCD display.

Because the calculation of the effective value contains AC components and DC components, AC wave forms may become non -standard wave forms due to partial distortion. So here the value calculations are real effective values, that is, TRMS.

The calculation power also contains the AC and DC components of the voltage current, so the power calculation is the average power, and it is also the real power value, that is, the active power. The positive and negative sign of power represents the direction of power (respectively represents the energy provided by the power supply to the load, or the energy provided by the load to the power supply).

The power factor is the ratio of power (total power) in power (total power). In theoretically, the power factor is not divided into positive and negative signals. Between ~+1, it is exactly the leading current of voltage, and the negative sign represents the voltage backward current.

The power factor is the ratio of the active power and apparent power (total power).

Theoretically, power factor is no positive and negative numbers,

However, in the application of the power meter, the phase relationship of the voltage current is judged by positive and negative numbers. Value between -1 and +1, positive value represents voltage lead current, negative value represents the voltage backward current.

6.1.1 Measurement parameters and symbols

Freq：Input source frequency

PF：Power factor

P：Active power

VA：Apparent power

VAR：Virtual power

E：Electric energy

6.1.2 Calculation formula

Measurement parameter	Calculation formula/calculation method
URMS	$\sqrt{\frac{1}{T}\int_0^T u^2(t)dt}$
IRMS	$\sqrt{\frac{1}{T}\int_0^T i^2(t)dt}$
P	$\frac{1}{T}\int_0^T u(t)i(t)dt$
VA	*URMS * I RMS*

VAR	$\sqrt{VA^2 - P^2}$
PF	$\frac{P}{VA}$
UDC	$\frac{1}{T}\int_0^T u(t)dt$
IDC	$\frac{1}{T}\int_0^T i(t)dt$
UAC	$\sqrt{U_{RMS}{}^2 - U_{DC}{}^2}$
I AC	$\sqrt{I_{RMS}{}^2 - I_{DC}{}^2}$
UPK+	The maximum value of u(t) during a sampling cycle
UPK-	The minimum value of u(t) during a sampling cycle
I PK+	The maximum value of i(t) during a sampling cycle
I PK-	The minimum value of i(t) during a sampling cycle
CFi	The ratio of the maximum sampling point absolute value and the Current valid value during a sampling cycle
THDu/THD i	Calculation of total harmonics of voltage and current, Provide two computing standards, namely IEC standards and CSA standards. For details, please see the remarks under the table.
Energy	$\int_0^T u(t)i(t)dt$ the T here is the integration time set by the user
Freq	Obtained at zero -point detection

The total harmonic calculation is according to the International Electricity Commission (IEC Standard) and the Canadian Standards Association (CSA Standard), and two calculation methods (optional on the harmonic settings page) are given accordingly. The introduction is as follows:

IEC Standard: Calculate the ratio (%) between the rms of 2 to 50 harmonics components valid value and fundamental harmonic valid value.

The calculation formula is as follows:

$\mathrm{THD} = \sqrt{\sum_{k=2}^{N}(C_k)^2}/C_1$ ____Total harmonic calculation

% ____K harmonics percentage component calculation

CSA Standard: Calculate the ratio(%) between the rms of 2 to 50 harmonics component valid value and the rms of 1 to 50 harmonics component valid value.

The calculation formula is as follows

6.2 Instrument parameter

$$THD = \sqrt{\sum_{k=2}^{N}(C_k)^2} / \sqrt{\sum_{k=1}^{N}(C_k)^2}$$

____Total harmonic calculation

$$C_k\% = C_k \Big/ \sqrt{\sum_{k=1}^{N}(C_k)^2} * 100\%$$

__k harmonics percentage component calculation

Explanation of the character meaning used in the two formulas above:
C 1: The valid value of the fundamental harmonic (that is, the one -time harmonic) of U (voltage) or I (current);
C k: The valid value of the K harmonics of U (voltage) or I (current);
k: Harmonic times index, 2 ~ 50
N: The maximum harmonic coefficient, that is, 50.
C k %: The percentage component calculation results of voltage or current K harmonics.

Wiring method	Single phase
Display	LCD
Measurement item	Voltage V, Current A, Active Power W, Power Factor PF, Frequency Hz
Measurement mode	Trms
Voltage range	2V~300V AC (Range automatic switch)
Current range	0.001A~20A AC (Range automatic switch)
Power range	0.1W~6kW
Power Factor range	0.001~1.000
	Calculation: Watt (W) ÷[Voltage(V)* Current (A)]=PF
Frequency range	10~100Hz
Basic accuracy	±(0.4% reading+ 0.1 range)
Measurement speed	0.1s, 0.25s, 0.5s, 1s, 2s, 5s
Input impedance	2KΩ/V
Power supply	100~240V AC 45-440Hz, 100-300V DC
Communication port	Standard RS232 or RS485, Relay output function optional
Accessories	Power cable, warranty card, manual, communication cable

7 Disposal

For the disposal of batteries in the EU, the 2006/66/EC directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose.

In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law.

For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations.

If you have any questions, please contact PCE Instruments.

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