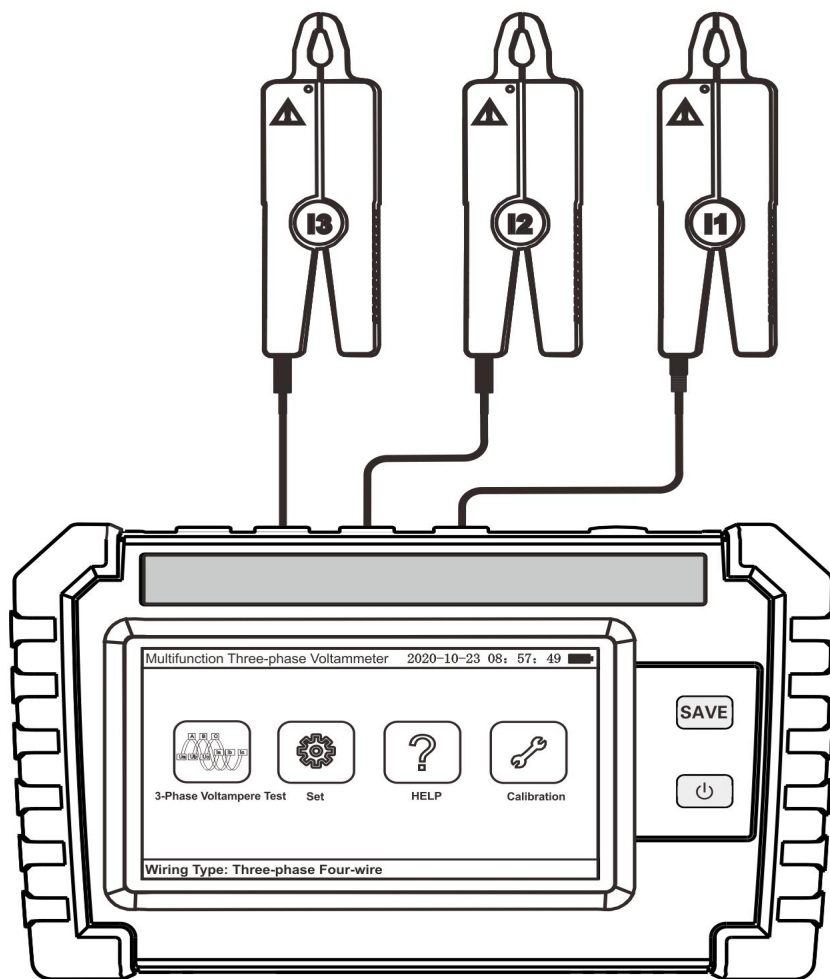


# VKCR4400 THREE PHASE DIGITAL PHASE METER

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**MANUAL**

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## Precautions For Use

Thank you for purchasing **VKCR4400 Multifunction Three-phase Phase Voltammeter**. In order to better use the product, please be sure:

——**Read the instruction manual in detail.**

——**Comply with safety regulations and cautions listed in manual.**

- ◆ In any case, shall pay special attention on safety when using the meter.
- ◆ Pay attention to the text labeled on the panel and backplane of the meter.
- ◆ Confirm that the meter and accessories are in good condition, and the meter and test line insulation layer is not damaged, exposed or disconnected before using.
- ◆ Please confirm the voltage test line and the clamp current sensor are wiring connection correctly before using.
- ◆ The wiring type should be selected before using. When the test lead is connected to the live terminal, do not change the wiring type arbitrary.
- ◆ When using, please confirm that each clamp current sensor is well connected with the corresponding current test line interface.
- ◆ When using, please confirm that each voltage lines is well connected with the corresponding voltage interface.
- ◆ It is strictly forbidden to touch the exposed conductor and the measured circuit during the measurement. Confirm that connector plug of line has been inserted in the meter interface closely.
- ◆ Each clamp current sensor is one-to-one corresponding with the belong handheld terminal and interface, and cannot be interchanged.
- ◆ The instrument has the function of automatic shutdown without operation for 15 minutes, and the instrument will prompt automatic shutdown
- ◆ If the meter will not use for a long time, please charge the battery once every 1-2 months.
- ◆ Pay attention to measurement range and usage environment stipulated for the meter.
- ◆ Use, disassembly, calibration, and repair of this tester must be performed by authorized personnel.
- ◆ Due to the reason of this instrument, if it is dangerous to continue using, should stopped and sealed immediately ,and handled by an authorized agent.

## 1. Introduction

**VKCR4400 Multifunction Three-phase Phase Voltammeter**, is a multifunction meter with touch screen, which can<sup>2</sup> measure voltage amplitude, current amplitude, voltage phase, current phase, frequency, power, active power, reactive power, harmonics, and can display the vector illustration of three-phase voltage and three-phase current in real time. In addition, it can also judge the three-phase phase sequence, inductive and capacitive circuits, test the secondary circuit, check whether the wiring of the watt-hour meter is correct or not, inspect and repair the line equipment, etc. This meter is simple to operate, easy to use, fast, stable and reliable in measurement. Widely used in electric power, petrochemical, metallurgy, railway, meteorological and other department.

**VKCR4400 Multifunction Three-phase Phase Voltammeter** consists of the host, clamp current sensor, and voltage test line. the meter equip with 5-inch touch color screen, uses the large-capacity rechargeable lithium battery, which can automatic measurement, simple and fast operation, accurate and reliable, has the functions such as data storage, data query, automatic shutdown, USB data upload and export, etc. Since adopt the dedicated metering chip, the meter has very high-precision electrical parameter measurement, can display the changes of the measured parameters in real time, and has the function of saving data with one key.

This meter has the following functions and features:

- 1.High measurement accuracy, voltage and current accuracy up to 0.3; phase accuracy up to  $\pm 0.3^\circ$ ;
2. Measurement mode: Single-phase, two-phase, three-phase, three-phase four-wire system and three-phase three-wire system;
3. Analyze and measure harmonics within the 21st order of voltage and current;
- 4.The measurement personnel only need to connect the wires, the instrument will automatically measure and update the data in real time, which is convenient for on-site analysis;
- 5.The instrument adopts complete isolation technology to avoid safety accidents;
- 6.Touch color screen, easy and fast operation.

## 2. Electrical Symbols

|                                                                                   |                                                                                                                                                                         |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Extremely dangerous! The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident. |
|  | Dangerous! The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident.           |
|  | Warning! Operators must strictly follow safety rules , otherwise personal injury or equipment damage may occur                                                          |
|  | AC                                                                                                                                                                      |
|  | DC                                                                                                                                                                      |
|  | Double insulation                                                                                                                                                       |

## 3. Technical Specification

### 3.1.Base Conditions and Working Conditions

| Influence Quantity                                                        | Base Condition                                                   | Working Conditions | Remark |
|---------------------------------------------------------------------------|------------------------------------------------------------------|--------------------|--------|
| Environment Temperature                                                   | 23℃±1℃                                                           | -10℃~40℃           |        |
| Environment Humidity                                                      | 40%~60%                                                          | < 80%              |        |
| Signal Waveform                                                           | sine wave                                                        | sine wave          | β=0.01 |
| Signal Frequency                                                          | 50Hz±1Hz                                                         | 45Hz~65Hz          |        |
| Meter Working Voltage                                                     | 7.4V±0.2V                                                        | 7.4V±1V            |        |
| The current amplitude when measure the phase frequency and phase sequence | 4A±10mA                                                          | 1mA~20A            | ----   |
| The voltage amplitude when measure the phase frequency and phase sequence | 100V±10V                                                         | 2V~700V            | ----   |
| The current amplitude when measure the power and power factor             | 4A±10mA                                                          | 1mA~20A            | ----   |
| The voltage amplitude when measure the power and power factor             | 100V±10V                                                         | 2V~700V            | ----   |
| External Electric Magnetic Field                                          | To be avoided                                                    |                    |        |
| The Tested Wire Position                                                  | Measured wire at approximately the geometric center of the clamp |                    |        |

### 3.2.General Specification

|                      |                                                                                                     |
|----------------------|-----------------------------------------------------------------------------------------------------|
| Power Supply         | DC 7.4V 5200mAH rechargeable battery                                                                |
| Function select      | Select on touch screen                                                                              |
| Display Mode         | 5 inch touch colorful screen                                                                        |
| LCD Size             | 108mmX65mm                                                                                          |
| Meter Size           | 210mmX129mmX68mm                                                                                    |
| Weight               | Host:870g; Total weight: 2kg(with accessories&packing)                                              |
| Test Lines           | 1pcs each voltage test line of yellow, green,red, black                                             |
| Clamp Current Sensor | CT size: φ8mm, 3pcs                                                                                 |
| Data Store           | 1000 groups                                                                                         |
| Data Query           | Yes                                                                                                 |
| Data Upload          | USB interface, the test record data upload to computer, and can export with EXCEL format file       |
| Battery Voltage      | With battery power state indicator, battery voltage lower than 10% will remind to charge in time    |
| Automatic Shutdown   | 15minutes without any operation after power up, will automatic shutdown, and remind before shutdown |

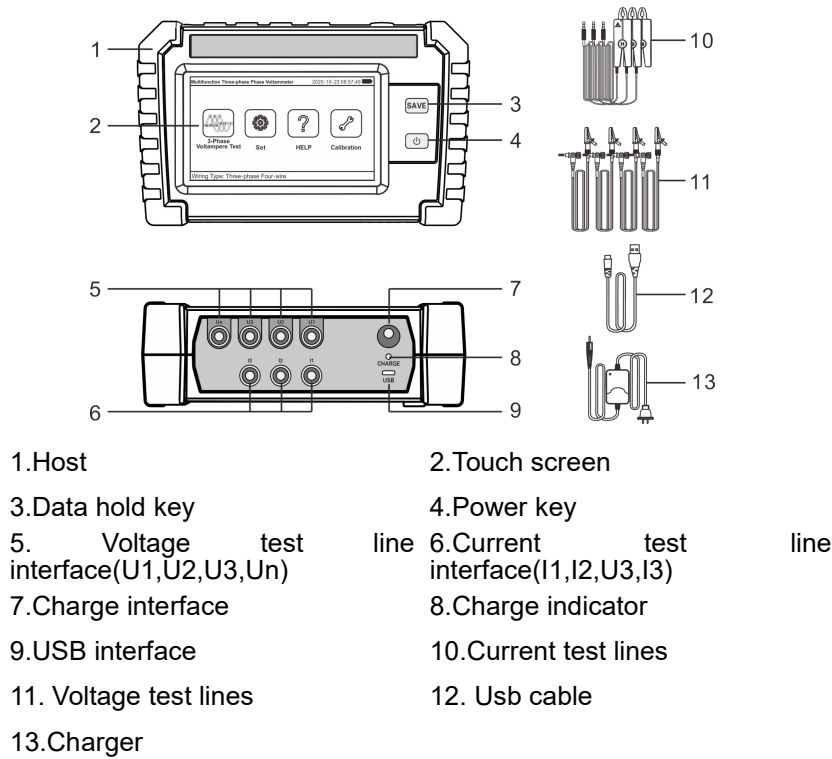
|                    |                                                                |
|--------------------|----------------------------------------------------------------|
| Working Time       | Continue working about 12 hours with full charge battery power |
| Power Consumption  | Working(backlight is 50): 320mA                                |
| Working Condition  | -20℃~50℃；Relative humidity: 0~95%HR non-condensing             |
| Storage Conduction | -30℃~60℃；Relative humidity: 0~75%HR                            |

### 3.3.Intrinsic Error And Performance Index Under Base Conditions

| Category                                                   | Measure Range  | Accuracy            | Resolution |
|------------------------------------------------------------|----------------|---------------------|------------|
| Voltage                                                    | 0.01V~100V     | ±0.3%Fs             | 0.0001V    |
|                                                            | 100V~700V      |                     | 0.0001V    |
| Current                                                    | 0.001A~1A      | ±(0.3%Fs ± 0.2%rdg) | 0.0001A    |
|                                                            | 1A~10A         |                     | 0.0001A    |
|                                                            | 10A~20A        |                     | 0.0001A    |
| Harmonic                                                   | 2~21 orders    | --                  | --         |
| Phase                                                      | 0°~360°        | ±1°                 | 0.1°       |
| Frequency                                                  | 45Hz~65Hz      | ±0.03Hz             | 0.0001Hz   |
| Power(include active pwer, reactive power, apparent power) | 0.002W~1000 W  | ±0.3%Fs             | 0.0001W    |
|                                                            | 1000W~10000 W  |                     | 0.0001W    |
|                                                            | 10000W~14000 W |                     | 0.0001W    |
| Power Factor                                               | -1.000~1.000   | ±0.03               | 0.001      |

**Note:** The measurement error under working conditions is not more than twice the base condition, and the phase error: 20mA ~ 20A is ±2°; below 20mA ±6°.

## 4. Meter Structure



## 5. Measurement Wiring Connection

### 5.1.Voltage Test Line Wiring

Connect the voltage test lines(yellow, green, red, black) to the U1 (yellow), U2 (green), U3 (red), and Un (black) terminals of the host, and ensure that there is no looseness, as shown in Figure 1:

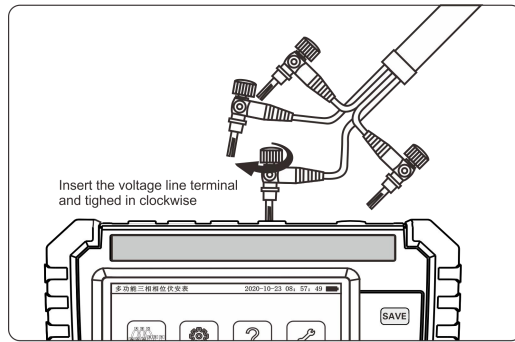


Figure1 Voltage line wiring connection

## 5.2. Y Type Wiring Connection

Clamp the Un voltage line terminal (line color is black) to the meaused voltage signal netural line, clamp the U1, U2, U3 voltage lines terminal (line color is yellow, green, red) to three-phase phase line A, B, C; If only need to measure single phase voltage, clamp the Un voltage line terminal to the neutral line, and clamp the U1 voltage line terminal to the tested phase line (the meter can use any measurement interface to measure a certain phase voltage); if measure two-phase voltage , clamp the Un voltage line terminal to the neutral line, and clamp the U1 and U2 terminals to the tested phase.

The red dot on the clamp current sensor marks the positive direction of current flow. Clamp I1, I2, and I3 current sensor (the round label on the current sensor as yellow, green, and red) to the three-phase phase lines of A, B, and C. If only need to measure one channel current, clamp the I1 clamp current sensor to the tested current line (the meter can measure a certain phase current at will); if measure two channels current, clamp the I1 and I2 clamp current sensors to the tested current line. The wiring diagram is shown in Figure 2:

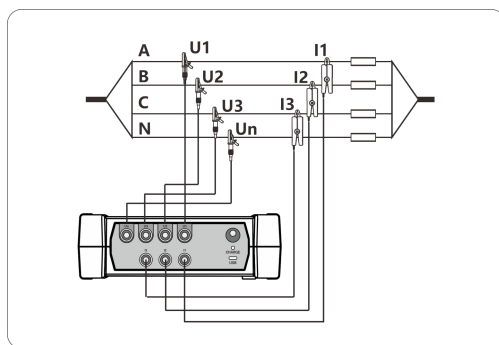


Figure2 Ytype wiring connection

## 5.3. Triangle Type Wiring Connection

### 5.3.1. Three clamp wiring connection method

Clamp U1, U2, and U3 voltage line terminals (lines colors are yellow, green, and red) to the three-phase phase lines A, B, and C. The arrow on the side of the clamp current sensor indicates the current flow direction, and Un is not connected. Clamp I1, I2, and I3 clamp current sensor (the round label on the sensors are yellow, green, and red) to the three-phase phase lines A, B, and C. The wiring diagram is shown in the figure3:

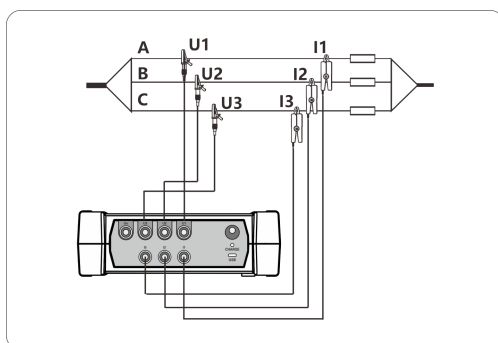


Figure3 Triangle three clamps wiring connection

5.3.2. Tow clamp wiring connection method

Clamp U1, U2, and U3 voltage line terminals (lines colors are yellow, green, and red) to the three-phase phase lines A, B, and C. The arrow on the side of the clamp current sensor indicates the current flow direction, and Un terminal is not connected. Clamp I1, and I3 clamp current sensor (the round label on the sensors are yellow and red) to the three-phase phase lines A and C. The wiring diagram is shown in the figure4:

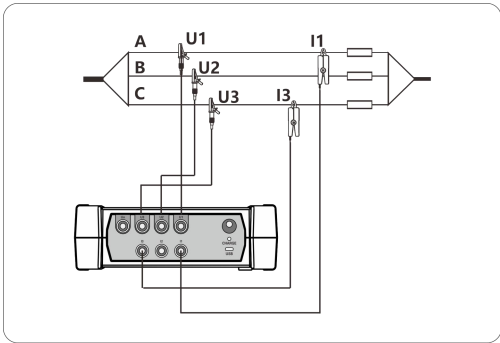


Figure4 Triangle two clamps wiring connection

6. Operation

6.1.Power On/Off & Battery Power

6.1.1.Power on. The meter is power off state, press the power key to start on, and enters the start-up interface, as shown in Figure 5. After the initialization is completed (about 5 seconds), enter to the main menu interface.After the meter power on and enter the main menu interface, just click the corresponding function icon to enter the corresponding function option (the calibration function belongs to our calibration personnel and is not available to users). As shown in Figure 6

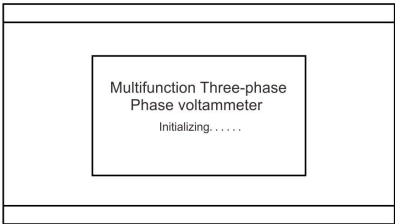


Figure5 Initialize interface

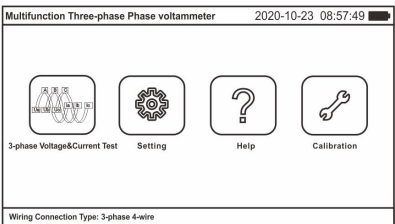


Figure6 Main interface

6.1.2. Power off. When the meter is on the state of power on, press the power button to power off. When the meter power up and without any operation for 15 minutes, a page as shown in Figure 7 will pop up, prompting that the meter will be shut down, click stop key, and the normal operation will resume.

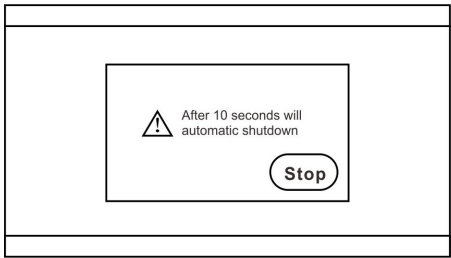


Figure7 Automatic shutdown interface

6.1.3. Battery power. In the power-on state, the percentage of battery power and icons will be displayed in the upper right corner, and different colors have different colors, a total of 5 colors are displayed, red [red square], yellow [yellow square], light green [light green square], green [green square], dark green [dark green square].

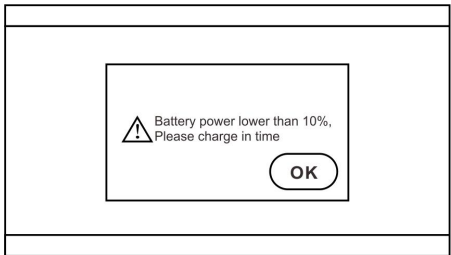


Figure8 Battery power lower interface

## 6.2. Meter Interface Operation

6.2.1. After entering to the test interface shown in Figure 9 and Figure 10, the meter will automatically measure the data and display the test data every 0.3 seconds. If need to measure the single phase, only need to connect the wiring of the measured phase, and do not connect the other phases, otherwise the accuracy will be affected. If want to save the data, just click the save key, and the buzzer will sound once when saving the data. Click the Harmonic Analysis key to enter the harmonic analysis interface (as shown in Figure 11 below), and click U1 key to display the 2nd ~ 21st harmonic content and histogram of the voltage U1, corresponding to the present harmonic analysis below "U1", the vertical axis of the histogram on the left will also display "U1 Histogram". Similarly, click U2, U3, I1, I2 or I3 will display the corresponding data, and only one parameter data can be viewed at the same time (U1, U2, U3, I1, I2 or I3) . click the BACK key return to voltage drop test interface. Click the Waveform key to enter the waveform display interface (as shown in Figure 12 below), and the two cycles waveforms of the three channel voltages and three channel currents can be displayed on the same screen. Click the U1 button to display the yellow waveform of U1, click the U2 button to display the green waveform of U2, click the U3 button to display the red waveform of U3, click the I1 button to display the orange waveform of I1, click the I2 button to display the dark green waveform of I2, click The I3 button displays the purple waveform of I3, and the waveform will disappear when the button is clicked again, and the vertical coordinate can be zoom-in by clicking the corresponding zoom-in button to make the waveform amplitude larger, otherwise, the zoom-out button can make the waveform amplitude smaller. Exit the page (click the HOME key or the left arrow under the page) to stop the test.

**Note: When the wiring connection type is three-phase three-wire, the test interface will be different. Only the voltage, current, voltage phase, current phase, frequency, total power factor, and total active power in total reactive power and total apparent power of the three-phase three-wire will be measured during three-phase three-wire operation. Waveforms can only analyze the shape, not the phase relationship between them.**

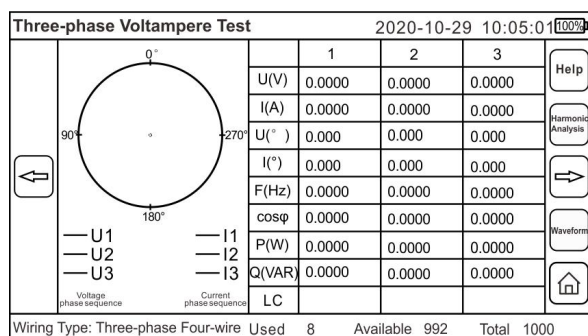


Figure9 3-phase 4-wire test interface

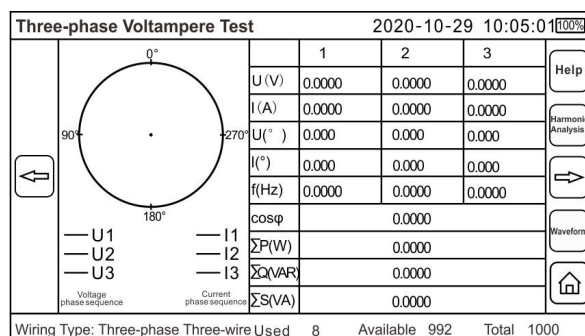


Figure10 3-phase 3-wire test interface

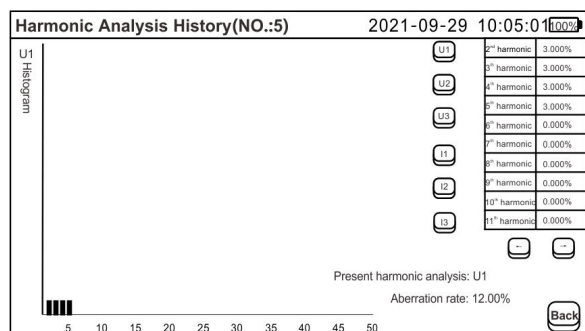


Figure11 Harmonic analysis interface

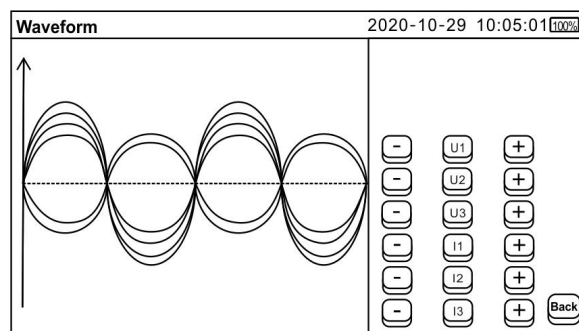


Figure12 Waveform display interface

6.2.2. Harmonic distortion rate (also known as distortion rate) is the ratio of the root-mean-square value of the harmonic content to the root-mean-square value of the fundamental component in a periodic AC quantity. The harmonic content rate is the ratio of the effective value of a multiple harmonics content to the effective value of the fundamental component in the periodic AC quantity.

6.2.3. Check the record operation, the interface is shown as Figure 13. Just click the right arrow key on the test interface to enter the three-phase history record interface, and the test date and serial number will be displayed. Click the line where the serial number is located to enter the three-phase test record interface, as shown in Figure 14, showing the details of measurement data. Click the left arrow key on the detail interface to return to the previous page, and then click the left arrow key to return to the test interface. During operation, if find that there are too many data, can use the clear button on the record interface to clear all the data. If the record need to be saved permanently, it can be exported to an EXCEL form through the USB connection to the host computer. Click the waveform display and harmonic analysis to view the waveform and harmonic records, as shown in Figure 15 and Figure 16.

| Three-phase Voltampere Test History |                     |        | 2020-10-29 10:05:01             | 100% |
|-------------------------------------|---------------------|--------|---------------------------------|------|
| No.                                 | Test Date           |        |                                 |      |
| 1                                   | 2020-10-29 09:47:02 | ↑      | Help                            |      |
| 2                                   | 2020-10-29 09:47:11 | ↑      |                                 |      |
| 3                                   | 2020-10-29 09:47:21 | ↓      |                                 |      |
| 4                                   | 2020-10-29 09:47:40 | ↓      |                                 |      |
| 5                                   | 2020-10-29 09:47:44 | ↓      |                                 |      |
| 6                                   | 2020-10-29 09:47:49 | ↓      |                                 |      |
| 7                                   | 2020-10-29 09:47:52 | ↓      |                                 |      |
| 8                                   | 2020-10-29 09:47:58 | Delete |                                 |      |
| 0                                   |                     |        |                                 |      |
| Wiring Type: Three-phase Four-wire  |                     |        | Used 8 Available 992 Total 1000 |      |

Figure13 Three-phase voltampere history interface

| Three-phase Voltampere Test Record(No.:8) |           |           | 2020-10-29 10:05:01             | 100% |
|-------------------------------------------|-----------|-----------|---------------------------------|------|
|                                           |           | 1         | 2                               | 3    |
| U(V)                                      | 99.9912   | 99.9990   | 99.9931                         |      |
| I(A)                                      | 5.0040    | 5.0038    | 5.0039                          |      |
| U(°)                                      | 0.0       | 239.9     | 119.9                           |      |
| I(°)                                      | 359.9     | 239.9     | 119.9                           |      |
| f(Hz)                                     | 49.9989   | 49.9988   | 49.9986                         |      |
| cosφ                                      | 0.9999    | 0.9999    | 0.9999                          |      |
| P(W)                                      | 500.3581  | 500.3811  | 500.3630                        |      |
| Q(VAR)                                    | 1.4350    | 1.8527    | 1.1969                          |      |
| LC                                        | Inductive | Inductive | Inductive                       |      |
| Wiring Type: Three-phase Four-wire        |           |           | Used 8 Available 992 Total 1000 |      |

Figure14 Three-phase voltampere test interface

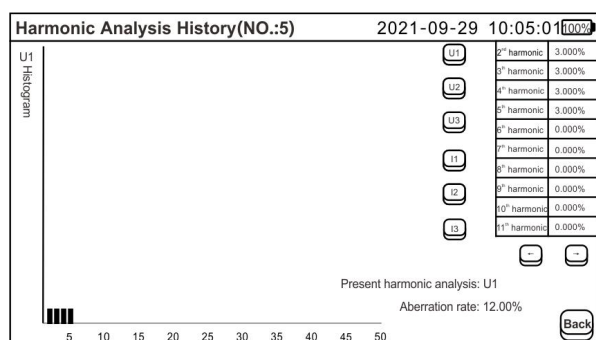


Figure15 Harmonic analysis record interface

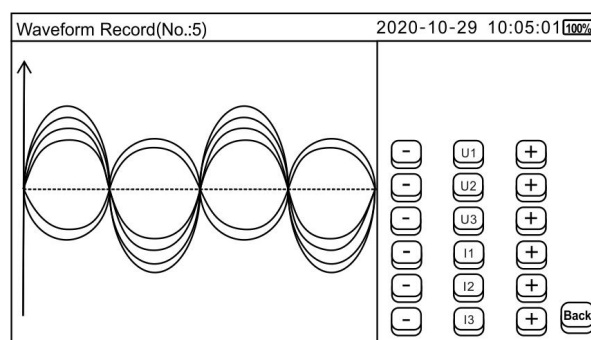


Figure16 Waveform record interface

### 6.3. Setting Interface Operation

Enter the setting interface, can set the time, wiring type, and backlight brightness. As shown in Figure 17. when exit this interface, the meter will automatically save the parameters set by the user.

| Set                                |                           | 2020-10-29 10:02:35                                                                 |                                                                                     |
|------------------------------------|---------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Time Set                           |                           | Wiring Type Setting(diagram indicate CT)                                            |                                                                                     |
| 2018                               | 8 27 8 1 24               |  |  |
| 2019                               | 9 28 9 2 25               |  |                                                                                     |
| 2020                               | Y 10 M 29 D 10 H 3 M 26 S |                                                                                     |                                                                                     |
| 2021                               | 11 30 11 4 27             |                                                                                     |                                                                                     |
| 2022                               | 12 31 12 5 28             |                                                                                     |                                                                                     |
|                                    |                           | Backlight Brightness Setting                                                        |                                                                                     |
|                                    |                           | 50                                                                                  |                                                                                     |
| <b>Confirm</b>                     |                           | <b>BACK</b>                                                                         |                                                                                     |
| Wiring Type: Three-phase Four-wire |                           |                                                                                     |                                                                                     |

Figure17 Set interface

#### 6.3.1. Time set

The time setting can be modified by sliding up and down the screen. After the modification, click **Confirm** to modify it successfully.

#### 6.3.2. Wiring type set

There are three types of wiring types: three-phase four-wire, three-phase three-wire two-clamp method and three-phase three-clamp method.

**Note: When the wiring type is selected as three-phase four-wire, the 1, 2, and 3 of all test interfaces are represented as U1, U2, and U3 respectively; when the wiring type is selected as three-phase three-wire, the 1, 2, and 3 of all test interfaces are represented as U12, U23, U31 respectively;**

#### 6.3.3. Backlight brightness set

The default value of this item is 50, and the backlight brightness is divided into 100 levels. It can modify any backlight brightness by inputting the number within 1-100. Note that the brighter the backlight, the greater the power consumption.

## 7. Software Download

Before use, need to install the USB driver and the meter software.

Please open the link to download the software:  
<http://www.VKCR-instruments.com>

Choose to enter "phase voltmeter series" in the link, and choose to download "multifunctional three-phase phase voltmeter software".

## 8. Other Instructions & Attention

### 8.1. Use of Clamp Current Sensor

8.1.1. There are 3pcs dedicated clamp current sensor of each meter, and cannot be changed to another meter to use, and each clamp current sensor corresponds to I1, I2, and I3 on the meter, and cannot be connected incorrectly, otherwise it will affect test accuracy.

8.1.2. The clamp current sensor should avoid falling and impacting, the clamp jaw must be kept clean, and the test is reliable only when the clamp jaw completely closed.

(3) After the clamp current sensor is used, the dust on the clamp jaw surface should be removed in time. Do not use rough objects or corrosive agents to clean the jaw surface. It is better to use soft cloth and lubricant (such as: WD-40 lubricant) to wiping it. It must be cleaned before use.

### 8.2. Attention for using the meter

8.2.1. This meter is only used for detection of secondary circuit and low-voltage circuit, and cannot be used to measure the current in high-voltage circuit to prevent electric shock.

8.2.2. When the meter use to measure three phases, the displayed phase are all based on the A phase voltage as reference, and the displayed phases are all relative to the absolute phase of the A phase voltage.

## 9. Accessories

|                                                |                                               |
|------------------------------------------------|-----------------------------------------------|
| Host                                           | 1 PCS                                         |
| Clamp Current Sensor                           | 3 PCS                                         |
| Voltage Test Line                              | 1 set(each 1pcs of red, yellow, green, black) |
| USB Data Cable                                 | 1 PCS                                         |
| Charger adaptor (DC 12V)                       | 1 PCS                                         |
| Meter Case                                     | 1 PCS                                         |
| Manual , Warranty card and quality certificate | 1 SET                                         |

**Our company is not responsible for other losses caused by use.**

**The contents of this user manual cannot be used as a reason to use the product for special purposes.**

**Our company reserves the rights to change specifications or designs described in this manual without notice and without obligations.**