

Online monitoring device for power quality

User Manualv1.0

About this manual

This manual provides accurate information on how to use the online power quality monitoring device in a safe manner. The manual provides a detailed introduction, as well as the usage process of various measurement modes. Please read this manual thoroughly before using the device.



Figure1-1 Schematic diagram of product



Precautions

1. For safe and correct use of the device, please read this manual carefully.
2. When using this product, please strictly follow the relevant regulations and rules of the power system.
3. Do not use this product near explosive gases, vapors, or dust.
4. Please ensure that the equipment is turned off when transporting and storing this product.
5. If there is any abnormality in the device or maintenance is needed, do not disassemble it yourself. Please contact our company in a timely manner. Please refer to "Contact Us" for contact information.

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Chapter 1 Parameter specifications

1.1 General parameters

mechanical		environment	
size	230*145*83mm	work environment	0 °C~+45 °C, humiditybelow90rh%
weight	2.0kg	Storage environment	-20 °C~+50 °C, humiditybelow95rh%
source		storage	
AC input voltage	100V-240V,50Hz	type	EMMC
		capacity	8G (able to store historical data continuously for one year)
power	7W	standard	
		measuring method	IEC 61000-4-30
Battery Save	LCD backlight brightness adjustable	Measurement performance	IEC 61000-4-30ClassA
		Flicker	IEC 61000-4-15
display		harmonic	IEC 61000-4-7
size	112.8 x 84.6mm	Power decomposition	IEEE 1459
color	260000 colors	crosstalk	
resolving power	640 × 480	Between voltage input terminals	-60dBat nominal frequency
brightness	Maximum brightness350 cd/m²(Typ.), brightness Adjustable	Voltage and current Input end	-95dBat nominal frequency
contrast ratio	500:1(Typ)	Common mode suppression	
viewing angle	70/70/50/70 (Typ.) (CR ≥ 10)	CMRR	>60dB
electromagnetic compatibility		Environmental reliability	
standard	Grade4:GB/T 17626.2-2006Static Electricity Discharge immunity	standard	GB/T 2423.1-2008Low Temperature
	Level3:GB/T 17626.3-2006RF Electromagnetic field radiation immunity		GB/T 2423.2-2008High Temperature
	Level3:GB/T 17626.4-2008Electric Fast Fast transient pulse group immunity		GB/T 2423.4-2008Alternating Damp Heat
	Level3:GB/T 17626.5-2008surge (Impact) Immunity		GB/T 2423.5-1995Impact
	Level3:GB/T 17626.8-2006Power Frequency Magnetic field immunity		GB/T 2423.10-2008Vibration
	Level3:GB/T 17626.9-1998Pulse Magnetic field immunitys		GB/T 2423.22-2002Temperature Changes
	Level3:GB/T 17626.12-1998oscillation Wave immunity		
Compliant with standards	GB 4793.1-2007/IEC 61010-1:2001, "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use" Part 1: General Requirements. Safety level:CATIII 1000V/CATIV 600V		

1.2 Measurement parameters

function	Parameter type	Parameter items
Recording and statistical records	Real time waveform	A. Real time waveforms of voltage and current for phases B,C, and N
	Voltage and current frequency	Frequency value, voltage effective value, voltage phase angle, voltage positive peak value, voltage negative peak value, current effective value, current phase angle, current positive peak value, current negative peak value
	Power and electrical energy	Active power, reactive power, apparent power, power factor,1-50thharmonic power
	Voltage harmonics	THD,DC,1-50thharmonic amplitude value,1-50thharmonicphase angle,1-50thharmoniccontent,0-49thharmonic amplitude,0-49thharmonic content, 1-35th higher harmonicamplitude,1-35thhigher harmonic content
	Current harmonics	THD,DC,1-50thharmonic amplitude value,1-50thharmonicphase angle,1-50thharmoniccontent,0-49thharmonic amplitude,0-49thharmonic content, 1-35th higher harmonicamplitude,1-35thhigher harmonic content
	Harmonic power	THD,DC,1-50thharmonic power
	Flicker	PST(short flicker),PLT(long flicker)
	Imbalance	Positive sequence voltage, positive sequence current, negative sequence voltage, negative sequence current, zero sequence voltage, zero sequence current, voltage negative sequence imbalance, current negative sequence imbalance, voltage zero sequence imbalance, current zero sequence imbalance
	Event recording	Voltage temporary rise, voltage temporary drop, voltage interruption, impulse current, short flicker exceeding limit, long flicker exceeding limit, voltage upper limit, voltage lower limit, frequency upper limit, frequency lower limit, steady-state voltage fluctuation, voltage imbalance exceeding limit, voltage THD exceeding limit, voltage harmonic exceeding limit, current 2-25th harmonic exceeding limit
	Recording function	Equipped with automatic/manual fault recording function
	Analysis and recording function	Having professional analysis software for power quality, able to provide power quality analysis reports; The power quality monitoring data and reports can be integrated into the backend monitoring system.

1.3 Parameter accuracy

parameter	type	describe
frequency	Nominal frequency	50Hz
	Measurement method	Operated by 10 cycles
	Resolving power	0.001Hz
	Measurement width	42.5Hz-57.5Hz
	Measurement accuracy	$\pm 0.001\text{Hz}$
Effective voltage value	Measurement method	Calculated from the root mean square value of 10/12 cycles
	Resolving power	0.001V
	Measuring range	1V -1000V
	Measurement accuracy	0.1% of nominal voltage
Current value	Measurement method	Calculated from the root mean square value of 10/12 cycles
	Resolving power	0.001A
	Measuring range	Different transformers have different ranges
	Measurement accuracy	0.1%+CT accuracy
power	Measurement method	Active power: The square of the instantaneous value product of 10 cycles of voltage and current. Apparent power: The effective value of 10 cycles of voltage multiplied by the effective value of current. Reactive power: The square of apparent power minus the square root of active power Power factor: ratio of active power to apparent power
	Resolving power	0.001W
	Measuring range	Depending on voltage range and current transformer range
	Measurement accuracy	0.5%+CT accuracy
Voltage and current harmonics	Measurement method	Compliant with IEC 61000-4-7, with an analysis window amplitude of 10 cycles
	Measurement type	Effective value, content, phase angle
	Frequency/f	50 times/50Hz-3150Hz
	Measurement accuracy	When the voltage harmonics are greater than 1% of the nominal value: the error is less than 1% of the reading When the voltage harmonic is less than 1% of the nominal value, the error is less than 0.05% of the nominal voltage value. When the current harmonic is greater than 3% of the nominal value, the error is less than 1% of the reading + CT accuracy When the current harmonic is less than 3% of the nominal value: the error is less than 0.05% of the current range + CT accuracy
Harmonics between voltage and current	Measurement method	Compliant with IEC 61000-4-7, with an analysis window amplitude of 10 cycles
	Measurement type	Effective value, content, phase angle
	Frequency/f	50 times/25Hz-3150Hz

	frequency	
	measurement accuracy	When the voltage harmonics are greater than 1% of the nominal value: the error is less than 1% of the reading When the voltage harmonic is less than 1% of the nominal value, the error is less than 0.05% of the nominal voltage value. When the current harmonic is greater than 3% of the nominal value, the error is less than 1% of the reading + CT accuracy When the current harmonic is less than 3% of the nominal value: the error is less than 0.05% of the current range + CT accuracy
Harmonic power	Measurement method	Compliant with IEC 61000-4-7, with an analysis window amplitude of 10 cycles
	Measurement type	Effective value, content, phase angle
	Frequency/frequency	50 times/50 Hz - 3150 Hz
	measurement accuracy	When the voltage and current harmonics are greater than 1% of the nominal value: the error is less than 1% of the reading + CT accuracy When the voltage and current harmonics are less than 1% of the nominal value: the error is less than 0.05% of the nominal value + CT accuracy

Continued

parameter	type	describe
High order harmonics of voltage and current	Measurement method	Compliant with IEC61000-4-7, with an analysis window amplitude of 10 cycles
	Measurement type	Effective value, content, phase angle
	Frequency/frequency	35 times/2100Hz-8900Hz
	measurement accuracy	When the voltage harmonics are greater than 1% of the nominal value: the error is less than 1% of the reading When the voltage harmonic is less than 1% of the nominal value, the error is less than 0.05% of the nominal voltage value. When the current harmonic is greater than 3% of the nominal value, the error is less than 1% of the reading + CT accuracy When the current harmonic is less than 3% of the nominal value: the error is less than 0.05% of the current range + CT accuracy
Unbalance degree	Measurement method	Voltage negative sequence imbalance: ratio of negative sequence voltage to positive sequence voltage, voltage zero sequence imbalance: ratio of zero sequence voltage to positive sequence voltage Current negative sequence imbalance: ratio of negative sequence current to positive sequence current Current zero sequence imbalance: ratio of zero sequence current to positive sequence current
	resolving power	0.001%
	measurement accuracy	Voltage imbalance: $\pm 0.2\%$ Current imbalance: $\pm 0.5\%$
Flicker	Measurement items	Short flicker (PST) long flicker (PLT)
	Measurement method	Calculate PST(10 minutes) and PLT(2 hours) according to IEC61000-4-15 standard
	Measurement range	0-20
	measurement accuracy	$\pm 5\%$

Chapter 2 basic operation

2.1 Interface Description

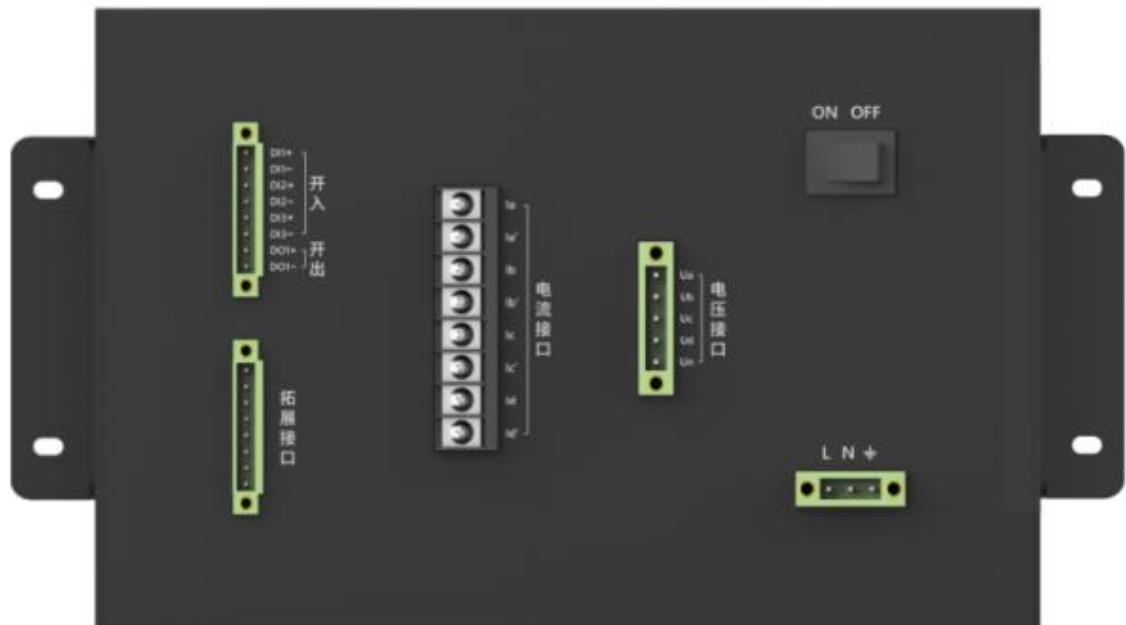


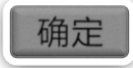
Figure2-1Rear Appearance and Interface Description of THE DEVICE

As shown in Figure2-1, the monitoring device is an interface between analog and action signals.

2.2 Key Function Description

The front of the monitoring device contains 11 buttons, and the button functions are divided into the following parts, as shown in Table2-1.

Table2-1Key List

Keys	Function Description
	On/Off: Turn on/off function.
	Function keys: F1~F5 form function keys, specific functions depend on the current form menu bar prompt.
	Direction keys: Adjust the screen focus to move up, down, left, and right. Not all interfaces have directional functions.
	Confirm key: used for text editing and list selection.
	Return key: used to return to the submenu

Chapter 3 Wiring instructions

3.1 Wiring requirements

There are 4 voltage channels, 4 current channels, and 1 earth channel on the back of the monitoring device; All interfaces adopt Phoenix terminal interfaces.

Before starting the wiring, it is necessary to set up analytical instruments according to the requirements of the power system line voltage, frequency, and wiring method to be measured. If possible, please try to disconnect the power system and perform wiring operations, and wear protective equipment as much as possible. Before wiring, the connecting wires should be tightened to prevent short circuiting caused by exposed wires outside the terminal block. When wiring, please follow the corresponding parameters shown on the rear panel of the device and tighten the nuts to avoid loosening.

3.1.1 Safety precautions

To ensure the safe operation and personal safety of the device, the device casing must be reliably connected to the grounding network of the substation and power plant. At the same time, to ensure the reliable operation of the device in a strong electromagnetic interference environment, many isolation, filtering, and safety measures have been considered. To be effective, the device must have good grounding. Therefore, the grounding of the device is very important.

The device is equipped with a dedicated grounding screw on the power plug, which is reliably connected to the device casing. When grounding, it must be used with a minimum of 4mm²A dedicated grounding wire (yellow green dual color) will reliably connect the grounding screw and the terminal to the grounding grid.

Attention: Before powering on the device, it is necessary to check whether the grounding of the device is reliable to prevent personal accidents and equipment damage!

3.2 Wiring method

This device supports a total of three measurement modes. Before connecting the measurement wires, please configure the measurement mode of the instrument correctly. For detailed procedures, please refer to the wiring configuration below. Please refer to the wiring diagram below for the wiring of various measurement modes.

Typical wiring diagrams include three types, as shown in the following diagrams:

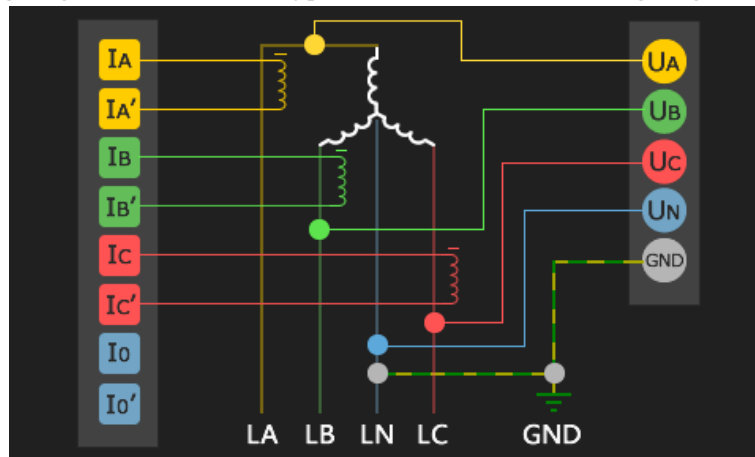


Figure-1

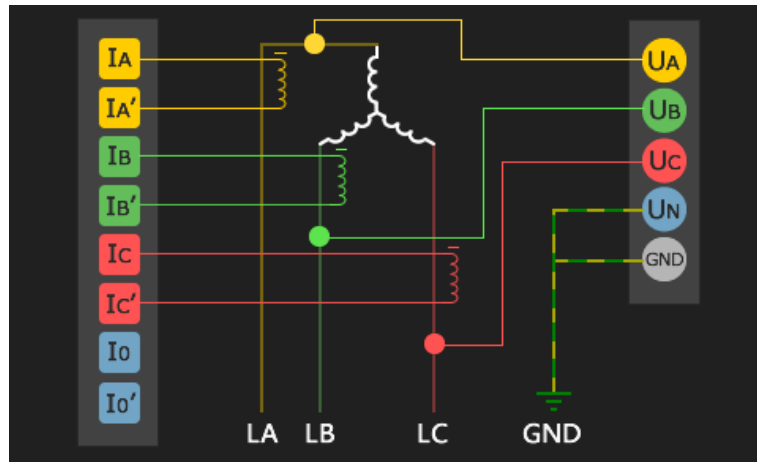


Figure-2

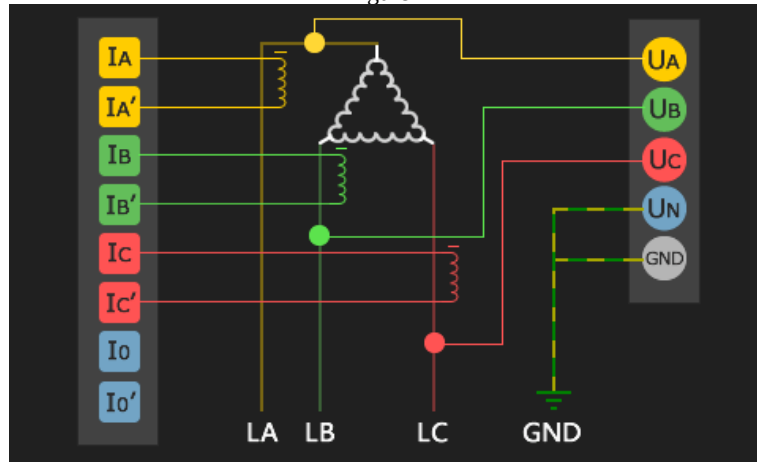


Figure-33 Three phase 3 wire delta connection method

Note: The names of each channel in the picture correspond one-to-one with the screen printed text of device plug in2.

Chapter 4 Software Introduction

4.1 Function Overview

In order to ensure the simplicity of user operation, the device removes the secondary structure from the main menu to the function menu. Instead, it adopts a first level menu structure that is consistent with the function keys on the screen, and users can directly access the corresponding function menu page through shortcut keys. As shown in Figure4-1, this is the menu structure of THE DEVICE.



Figure4-1 THE DEVICE Menu Structure

The detailed functions of THE DEVICE terminal software are shown in Table4-1:

Table4-1Functional Overview of THE DEVICE

Function Name	explain
Main menu	Selection of entry points for main functional modules.
Real time waveform	The waveform mode displays the waveform effect diagram and vector diagram of the current ABCN voltage and current sampling, and real-time displays the effective values and phase angles of the current ABC three-phase voltage and current.
harmonic analysis	Real time display of measured voltage, current, and effective power THD (total harmonic distortion),DC(direct current component),1-50thharmonic content, effective value, and phase angle. Real time display of inter harmonic, high-order harmonic, and harmonic subgroup values of voltage, current ABCN four phases.
Unevenness	Real time display of voltage, current negative sequence imbalance, zero sequence imbalance, and other related parameters.
harmonic analysis	Real time measurement of voltage, current, and harmonic power THD (total harmonic distortion),DC(direct current component) The content, effective value, and phase angle of1-50harmonics, as well as the values of harmonics, inter harmonics, and higher-order harmonics.
Power energy	Real time display of the active power, reactive power, apparent power, and power factor of the current measurement circuit, as well as the accumulated electrical energy value.

Fluctuation flicker	Real time display of Pst(short flicker) and Plt(long flicker) of ABC voltage.
Trend chart	Display the trend of changes in the main electrical parameters during the measurement time, helping to understand the long-term power quality situation.
Parameter configuration	Configure system parameters, measurement parameters, and event parameters.
file management	Browsing, deleting, and other operations on files or images saved on the device.
Wave recording	Collect the original waveforms of voltage and current in the circuit, record and upload the waveforms, and provide the upper computer with analysis of the power quality in the circuit.
Statistical records	Monitor all electrical parameters and record and analyze electrical events in the circuit, supporting the configuration of parameter items.

4.2Interface Introduction

As shown in Figure4-2, this is the running page of THE DEVICE.



Figure4-2 Overview of THE DEVICE Interface

After the device is started, it is mainly divided into five parts, namely: navigation bar, status indicator area, system status bar, work space, and menu bar.

The navigation bar is located in the upper left corner of the screen, indicating the location of the current page's menu. There are a total of 10 sub-menus in the navigation bar, including real-time waveform, harmonic analysis, imbalance, power and energy, fluctuation flicker, trend diagram, parameter configuration, file management, recording, and statistical recording.

The system status bar is located in the upper middle area of the screen, marking the current wiring method, nominal voltage and current settings, and time and date.

The status indicator area is shown in Table 4-2.

Table4-2Explanation of Record Status Indications

name	icon	explain
	nothing	The statistical recording function is not enabled
	have	Statistical recording in progress
	nothing	The statistical wave recording function is not enabled
	have	Statistical recording in progress
	Showing ×	Ethernet not connected
	Not showing ×	Ethernet connected
		The percentage of used storage capacity of the device

There are a total of 5 items in the menu bar, corresponding to function keys F1~F5. Note that on some pages, only some menu items have operation labels. If there are no labels, it indicates that the current page does not support this function key.

Chapter 5 Parameter configuration

The main menu is the default interface for THE DEVICE after startup. You can choose to enter parameter configuration and then set system parameters, measurement parameters, event parameters, etc. based on the current measurement environment. You can also enter the parameter configuration page through the shortcut key [配置].



Figure5-1Parameter Configuration Interface

Parameter settings are divided into system parameters, measurement parameters, and event parameters.

5.1 system parameter

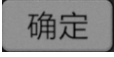
After the THE DEVICE is started, the page defaults to the main menu page. Enter the system parameter settings page through the [配置] key. The operation interface is shown in Figure5-2.



Figure5-2 Parameter Settings

Firstly,display system information, which includes the corresponding software and hardware versions and device serial numbers. Press the []key to select the settings item in the current submenu.Press[]to enter or exit the settings page in the submenu, as shown in Figure5-3. The details of key operation instructions are shown in Table5-1.

Table5-1Key Operation Instructions

button	explain
	① Select configuration items ② When editing parameters, modify their content
	① Left click to exit the submenu configuration item, right click to enter the submenu configuration item ② Modifying parameter content during editing
	Press once to modify the corresponding parameter, then press again to confirm the modification content
	Return to the main menu interface
	Select the corresponding submenu content

Setting		3P4W-3CT 220.000V 5.000A 50Hz 2024-04-22 10:50:12	0%
Information	Device Time	2024-04-22 10:50:04	
Device Info	Lock Time	OFF	
Comm Info	Screen Light	5%	
User Info	IP Address	...	
DIDO	Gateway	192.168.1.1	
	Mask Address	255.255.255.0	
	Mac Address	04:7c:16:08:95:e2	
System		Measure	Event
			Apply

Figure5-3System Parameters-Equipment Configuration

In the system parameters - device configuration, time, screen lock, and brightness can be adjusted. The IP address, subnet mask, and gateway address are set according to the network parameters of the corresponding upper computer and server, enabling the device to establish Ethernet data communication.

After completing the device configuration, press the [] key to select the next parameter setting. Press [] to enter the corresponding setting content for selection. After entering the user configuration, as shown in Figure5-4

Setting

3P4W-3CT | 220.000V | 5.000A | 50Hz
2024-04-22 10:50:23

SD
0%

Information	Language	English
Device Info	User Name	user
Comm Info	Position	pos
User Info	Line Name	A B C
DIDO	Line Color	Zh Standar
	A	
	B	
	C	
	N	

System

Measure

Event

Apply

Figure5-4System Parameters-User Settings

In the system parameters - user configuration, it can support switching between Chinese and English. The content of the user name and measurement location will be presented in the output test report and the upper computer. After setting the relevant options, press[F5] to complete the parameter application.(Note:Other parameter setting operations are also completed by following the above key operation steps to set the corresponding submenu.)

The basic parameters, voltage parameters, and current parameters of the equipment will be set in the measurement parameters, and the wiring method and voltage current ratio will be changed in the corresponding settings of the measurement parameters. As shown in Figures5-5, the basic parameters will be set for the frequency and wiring method of the tested line.

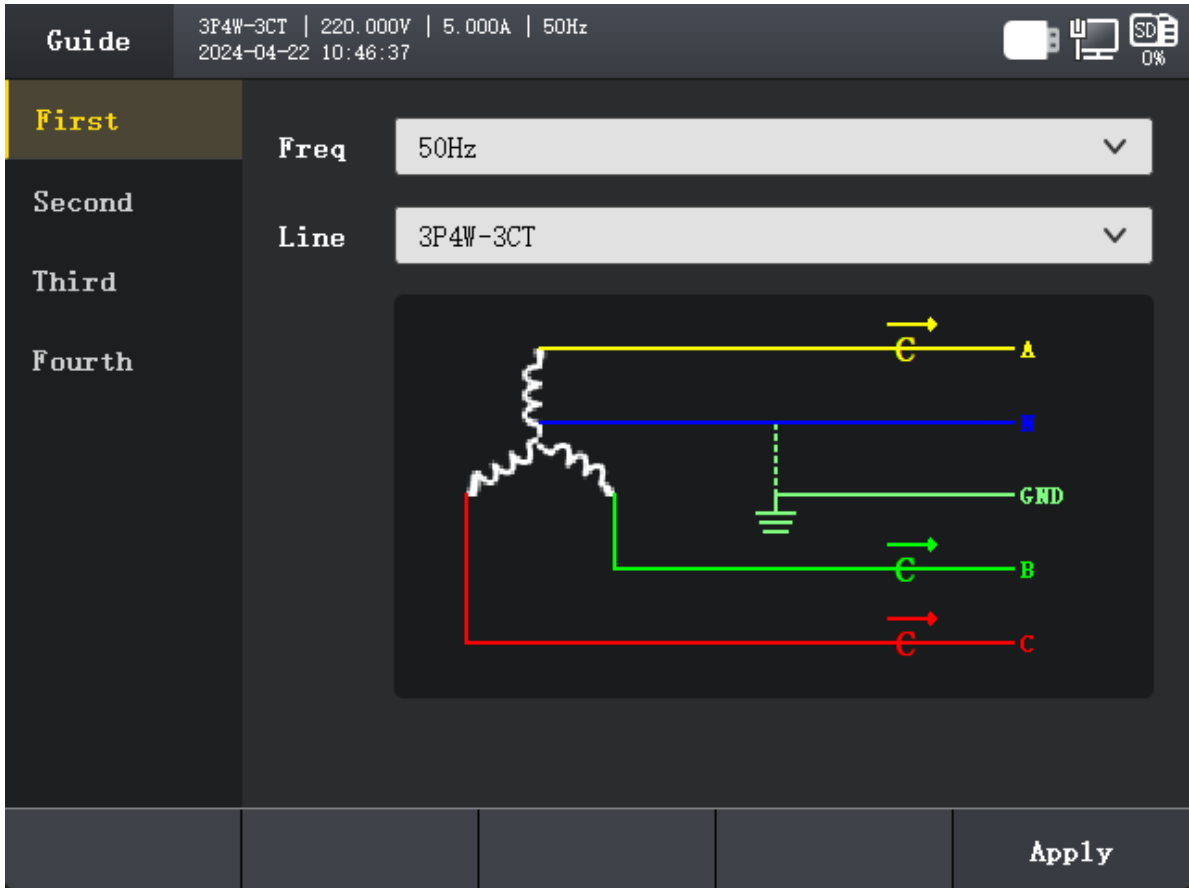


Figure5-5Measurement Parameters-Basic Settings

Set the voltage ratio ofTHE DEVICEbased on the voltage ratio provided by the measurement point, as shown in Figure5-6.

Guide		3P4W-3CT 220.000V 5.000A 50Hz 2024-04-22 10:46:47		0%	
First	Nominal Volt	220.000 V			
Second	DC Volt	10.000 V			
Third	Volt Range	400V ▼			
Fourth	Volt Range N	400V ▼			
	PT	1:1			
	PT N	1:1			
					Apply

Figure5-6Measurement Parameters-Voltage Parameters

Set the current ratio of THE DEVICE based on the current ratio provided by the measurement point, as shown in Figures 5-7

Guide

3P4W-3CT | 220.000V | 5.000A | 50Hz
2024-04-22 10:46:54

SD

0%

First

Nominal Curr

5.000 A

Second

Clamp Type

NC_10A

Third

Clamp Type N

NC_10A

Fourth

CT

1:1

CT N

1:1

Apply

Figure 5-7 Measurement Parameters-Current Parameters

According to the actual needs of the measurement points, set the current clamp and current ratio. The specific parameter settings are shown in Table 5-2,

Table 5-2 Current Parameters	
Parameter Name	set range
Current ratio	1:99999-99999:1
Current to current ratio(N)	1:99999-99999:1
Minimum short-circuit capacity	0.001-99999.999

When setting voltage parameters, the basic list is shown in Table 5-3.

Table 5-3 Basic Voltage Parameters	
Parameter Name	set range
Voltage range	120V,230V,400V,1000V
Nominal voltage	1V-2000V
Voltage ratio	1: 10000-10000:1
Voltage ratio(N-phase)	1: 10000-10000:1
Voltage level	0.38KV,6KV,10KV,35KV,66KV,110KV,220KV

After setting the measurement parameters, you will reach the save interface, as shown in Figure 5-8. Pressing F5 to save completes the parameter settings.



Figure 5-8 Saving Settings

5.2 Eventparameter settings

The eventparametersettingsconsist of basic events, voltage harmonics, current harmonics, and transient events.Event parameters provide settings for exceeding limits and thresholds of various electrical energies, in order to record electrical energy events during detection or monitoring.

Enter the parametereditingpagewith the [↩️]key,select the parameteritems with the [⬆️]key,edit the parameterswith the [⬅️]key,exit the parametereditingwith the [⏏️]key, and adjusttootherparametersettingswith the directional keys,asshown in Figure5-9.



Figure5-9Event Parameter Interface

Voltage harmonic setting item, asshown in Figure5-10

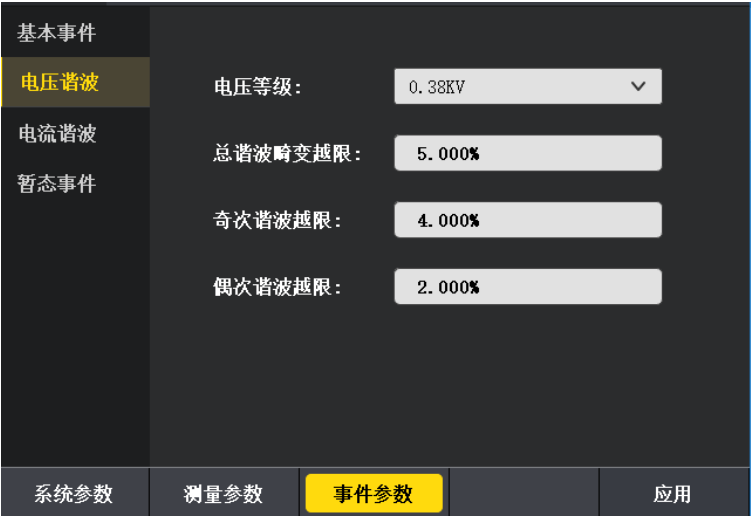


Figure5-10EventParameters-Voltage Harmonics

The event parameter settings page provides parameter settings for harmonic out of limit currents. Asshown in Table5-5, the allowable harmonic current valuesfor the 2-25thharmonic current at different voltage levels are shown.

Table5-5Harmonic current exceeding limit

Harmonic current exceeding limit							
Voltage level(kV)		zero point three eight	six	ten	thirty-five	sixty-six	one hundred and ten
Reference short-circuit capacity(MVA)		ten	one hundred	one hundred	two hundred and fifty	five hundred	seven hundred and fifty
Permissible values for each harmonic(A)	two	seventy-eight	forty-three	twenty-six	fifteen	sixteen	twelve
	three	sixty-two	thirty-four	twenty	twelve	thirteen	nine point six
	four	thirty-nine	twenty-one	thirteen	seven point seven	eight point one	six
	five	sixty-two	thirty-four	twenty	twelve	thirteen	nine point six
	six	twenty-six	fourteen	eight point five	five point one	five point four	four
	seven	forty-four	twenty-four	fifteen	eight point eight	nine point three	six point eight
	eight	nineteen	eleven	six point four	three point eight	four point one	three
	nine	twenty-one	eleven	six point eight	four point one	four point three	three point two
	ten	sixteen	eight point five	five point one	three point one	three point three	two point four
	eleven	twenty-eight	sixteen	nine point three	five point six	five point nine	four point three
	twelve	thirteen	seven point one	four point three	two point six	two point seven	two
	thirteen	twenty-four	thirteen	seven point nine	four point seven	five	three point seven
	fourteen	eleven	six point one	three point seven	two point two	two point three	one point seven
	fifteen	twelve	six point eight	four point one	two point five	two point six	one point nine
	sixteen	nine point seven	five point three	three point two	one point nine	two	one point five
	seventeen	eighteen	ten	six	three point six	three point eight	two point eight
Permissible values	eight	eight	four	two	one	one	one point

for each harmonic(A)	een	point six	point seven	point eight	point seven	point eight	three
	ninet een	sixtee n	nine	five point four	three point two	three point four	two point five
	twent y	seven point eight	four point three	two point six	one point five	one point six	one point two
	twent y-one	eight point nine	four point nine	two point nine	one point eight	one point nine	one point four
	twent y-two	seven point one	three point nine	two point three	one point four	one point five	one point one
	twent y-thre e	fourteen	seven point four	four point five	two point seven	two point eight	two point one
	twent y-four	six point five	three point six	two point one	one point three	one point four	one
	twent y-five	twelv e	six point eight	four point one	two point five	two point six	one point nine

Note: According toGB/T 14549-1993l

Current harmonic setting item, asshown in Figure5-11

Figure5-11Event Parameters-Current Harmonics

Transient event settings, asshown in Figures5-12

Figure5-12Event Parameters-Transient Events

The eventparametersettingpagecontains a large number of electrical energyparameters,so a tab pagemethod is usedforsetting. The event parameters that can be set areshownin Table5-6.

Parameter Name	set range
Voltage temporary rise reference value	{nominal voltage}
Temporary voltage	[101.00200.00]

rise exceeding limit	
Voltage temporary rise hysteresis value	[0.01100.00]
Voltage sag reference value	{nominal voltage}
Voltage temporary drop exceeding limit	[100,99.00]
Voltage sag hysteresis value	[0.01100.0]
Voltage interruption exceeding limit	[100,99.00]
Voltage interruption hysteresis value	[0.01,10]
Impulse current exceeding limit	[0.01200.00]
Impulse current hysteresis value	[0.01100.00]
Short flicker	[0.01,99.99]
Long flicker	[0.01,99.99]
Voltage over limit	[101.00200.00]
Voltage out of limit	[100,99.00]
Frequency over limit	[50.1,99.9]
Frequency below limit	[25.00, 49.90]
Maximum fluctuation exceeding limit	[0.1, 20.0]
Total voltage distortion content	[0.01,99.99]
Odd harmonic exceeding limit	[0.01,99.99]
Even harmonic exceeding limit	[0.01,99.99]
Voltage imbalance exceeding limit	[0.01,99.99]

Table5-6Event Parameter Setting Table

Chapter 6 Statistical records

Statistical recording is the main function of THE DEVICE data recording, which can record, analyze, capture events, and obtain waveforms for all electrical parameters. At the same time, statistical records support functions such as backend recording and scheduled recording. You can enter the statistical record page by pressing the shortcut key [记录].

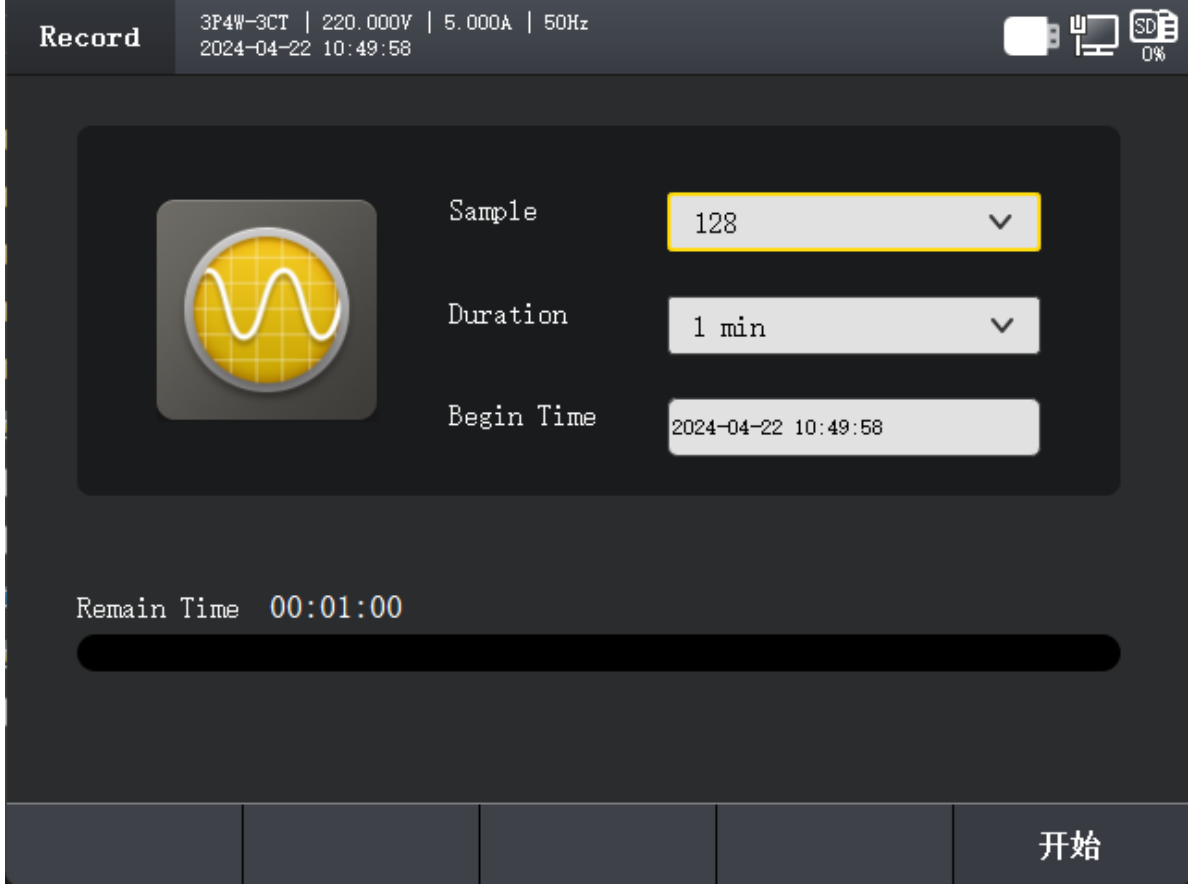


Figure6-1Statistical Records

The interface for setting statistical records is shown in Figure6-1. By setting the statistical interval, start time, duration, and statistical items, press [F5] to start the statistical record data recording function. The statistical items support user-defined parameter selection. Pressing [F1] can switch to the parameter selection and statistical recording interface. THE DEVICE classifies all electrical energy parameters, as shown in Table6-1.

Table6-1Statistical Record Parameter Items

Parameter category	Parameter Name
Basic data	☒ 频率值 ☒ 电压有效值 ☒ 电压相位角 ☒ 电压正峰值 ☒ 电压负峰值 ☒ 电流有效值 ☒ 电流相位角 ☒ 电流正峰值 ☒ 电流负峰值

Harmonic data	☒ 电压总谐波畸变率 ☒ 总谐波畸变率 ☒ 电压直流分量 ☒ 电流直流分量 ☒ 1~31次谐波电压幅值 ☒ 1~31次谐波电流幅值 ☒ 32~63次谐波电压幅值 ☒ 32~63次谐波电流幅值 ☒ 1~31次谐波电压相位 ☒ 1~31次谐波电流相位 ☒ 32~63次谐波电压相位 ☒ 32~63次谐波电流相位 ☒ 1~31次谐波电压含有率 ☒ 1~31次谐波电流含有率 ☒ 32~63次谐波电压含有率 ☒ 32~63次谐波电流含有率
Interharmonic data	☒ 0~30次间谐波电压幅值 ☒ 0~30次间谐波电流幅值 ☒ 31~62次间谐波电压幅值 ☒ 31~62次间谐波电流幅值 ☒ 0~30次间谐波电压含有率 ☒ 0~30次间谐波电流含有率 ☒ 31~62次间谐波电压含有率 ☒ 31~62次间谐波电流含有率
High frequency harmonic data	☒ 1~35次高次谐波电压幅值 ☒ 1~35次高次谐波电流幅值 ☒ 1~35次高次谐波电压含有率 ☒ 1~35次高次谐波电流含有率
Unbalanced data	☒ 正序电压 ☒ 负序电压 ☒ 零序电压 ☒ 电压负序不平衡度 ☒ 电压零序不平衡度 ☒ 正序电流 ☒ 负序电流 ☒ 零序电流 ☒ 电流负序不平衡度 ☒ 电流零序不平衡度
Power data	☒ 有功功率 ☒ 无功功率 ☒ 视在功率 ☒ 功率因数 ☒ 1~31次谐波功率 ☒ 32~63次谐波功率

On this basis, users can select recording parameter items to customize statistical records.

Use the up, down, left, and right buttons to select parameter items, and press[F5] to start. The statistical record running page is shown in Figure 6-2.

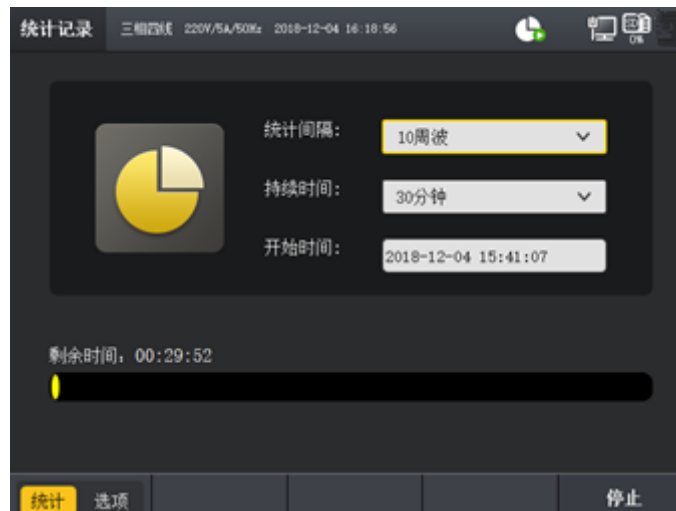


Figure6-2Statistical Record Run Page

On the statistics record running page, you can view and return to the main menu for other operations. Press the [返回] key to return to the main menu. As shown in Figure6-3, the identification of statistical record operation is displayed in the status indicator area.



Figure6-3Main Menu

While recording statistics, you can switch to other pages to view data and support backend data recording functionality.

Chapter 7 Wave recording

In the process of electrical energy monitoring, sometimes it is necessary to collect and analyze the original waveform. The THE DEVICE waveform recording can fully sample and record the original waveform, and combine it with the upper computer for data analysis. This makes the monitoring of electricity more comprehensive and comprehensive, while supporting backend recording, making monitoring more convenient.

Select the recording record from the main menu to enter the recording page, as shown in Figure 7-1.



Figure 7-1 Recording page

By using the up and down keys, set the recording parameters. Select the recording points column and press the [F5] key to select the recording points. The recording provides a selection of 128/256/512/1024, with a continuous setting range of 1/3/10/30/60 minutes and a full recording [F5] key to start recording, as shown in Figure 7-2. When the recording is running, the recording icon [F5] will be displayed in the status bar.



Figure 7-2 Wave recording page

The recording operation page not only displays the current recording progress, but also displays the start time, end time countdown, and number of points per week of the recording. When the system time reaches the end time, the recording will automatically end, and manual recording can also be stopped. Press [F5] to stop the current recording. After recording stops, automatically return to the recording start page. **During the recording process, you can switch to other pages.**

Chapter 8 real-time data

Real time data viewing is a very important real-time viewing function of THE DEVICE. Real time data is divided into six functional items on the main menu, namely: real-time data, harmonic analysis, imbalance, power and energy, fluctuation flicker, and trend diagram, as shown in 8-1.



Figure 8-1 Real time data function items

8.1 Real time waveform

Real time waveform is the real-time display of voltage and current waveforms in the current circuit, as well as the current tabular and phasor diagrams. Users can check whether the voltage and current waveforms are qualified based on waveform diagrams, table diagrams, and phasor diagrams. At the same time, the real-time waveform page provides selection of voltage, current and other waveforms, as shown in Figure 8-2. Pressing the [波形] key can quickly switch to this interface.

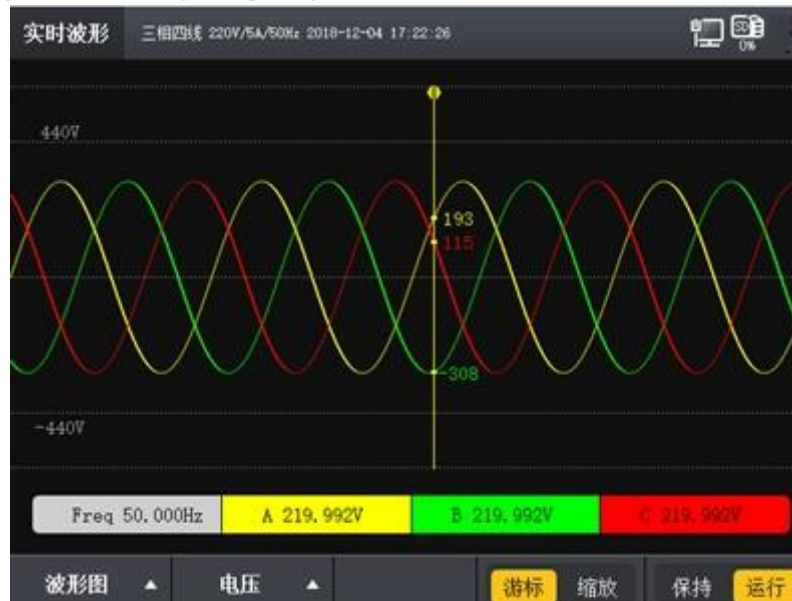


Figure 8-2 Real time waveform

Press the [F2]key,up and down keys, and confirm key to switch to the voltage and current waveform of ABC single-phase or three-phase, as shown in Figure 8-3.

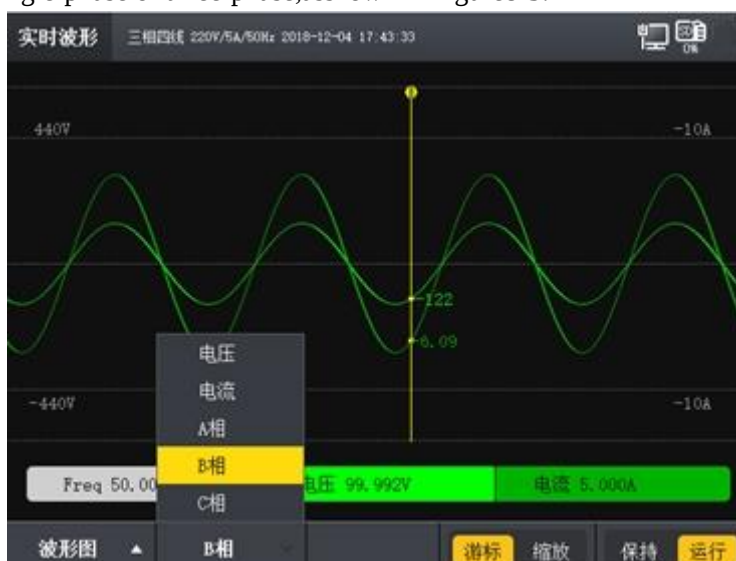


Figure 8-3 Real time waveform - waveform diagram 1

Press the [F4]key to switch between cursor and zoom functions, and the cursor can be adjusted using the left and right buttons. Scaling can be done horizontally and vertically by using the up, down, left, and right keys, as shown in Figure 8-4.



Figure 8-4 Real time waveform - waveform diagram 2

Press the [F5]key to switch between hold and run states. If in hold state, the waveform will pause refreshing and the current waveform will be fixed for analysis. When in operation, the waveform is updated in real-time.

Press the [F1]key, the up and down keys, and the OK key to switch the display interface to waveform, table, and phasor diagrams,as shown in Figure8-5. The table displays the current voltage and current effective values, phase angle, positive and negative peak values, as well as the nominal value, deviation value, and frequency of the voltage for each phase.



Figure8-5Real time waveform - Table Figure 3

Press the button to switch to the phasor diagram, as shown in Figures8-6, which displays the current, voltage, and phase values of each phase.



Figure8-6Real time waveform phasor diagram

8.2 harmonicanalysis

Harmonicanalysis focuses on the analysis of harmonic phenomena in the power grid. Under this function page, you can viewparameters such asvoltageandcurrent harmonicamplitude, rate, and phase anglein the power grid.At the same time, it supports displaying the harmonic content of each order in a bar chart format. The page is shownin Figure8-7, and pressing the [谐波]keycan quickly switch to this interface.



Figure8-7Harmonic Analysis Table Chart

Press[F4][F1] to switchto the harmonicbarchart.Under the display interface of the bar chart,press[]to switch each phase of the three-phase for separate display,asshown in Figure8-8.

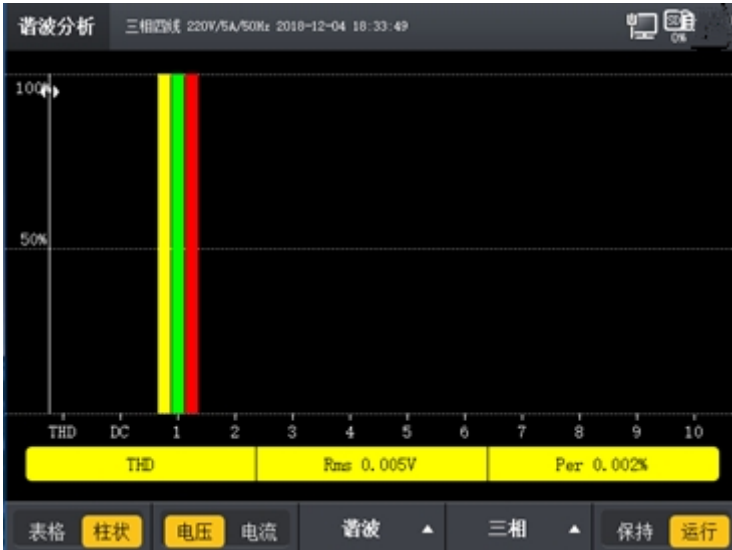


Figure8-8Harmonic Analysis - Bar Chart

Press[F2] to switch the harmonic display of voltage or current to each other.
Press[F3] to switch between harmonics, interharmonics, and higher-order harmonics,asshown in Figures8-9.



Figure8-9Harmonic Analysis - Harmonic Switching

Press[F4] to display the amplitude or content of harmonics,asshown in Figure8-10.



Figure8-10Harmonic Analysis - Harmonic Switching 1

Press[F5] to switch between data operation or maintenance functions.

8.3 Unbalanced degree

Due to the uneven load of each phase, three-phase electricity can experience three-phase imbalance. The imbalance function page provides monitoring of the parameters of each phase that are unbalanced, including imbalance degree, sequence component, voltage, current value, and phase angle. The unbalanced page is shown in Figure 8-11, and pressing the [不平衡] key can quickly switch to this interface.

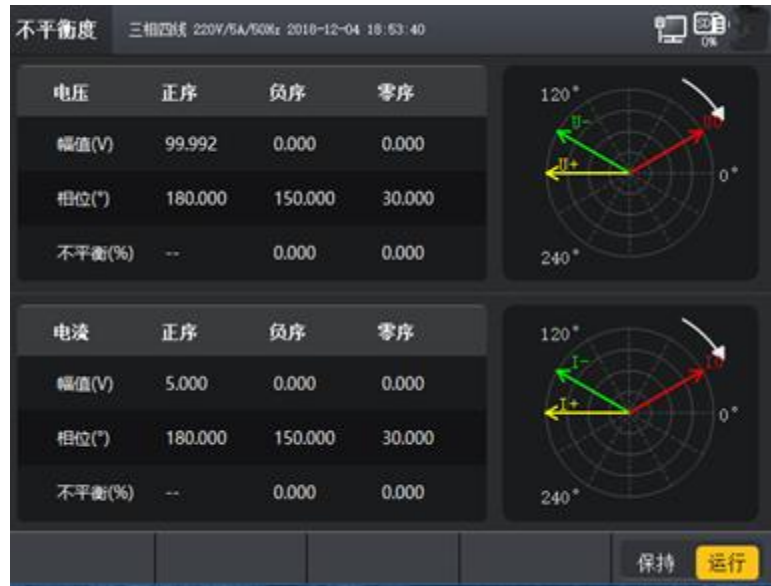


Figure 8-11 Unbalance degree

Press [F5] to switch between data operation or maintenance functions.

8.4 Power and electrical energy

The power and electrical energy page statistically analyzes the power related parameters in the current power grid. The monitored parameters include active power, reactive power, apparent power, power factor, fundamental power factor, voltage effective value, current effective value, and corresponding electrical energy values. The page is shown in Figures 8-12. Press the [功率] key to quickly switch to this interface.



Figure 8-12 Power and Energy

Press[F1] to display harmonic power by mutual cutting, as shown in Figure 8-13.

谐波 ▼	A	B	C	总
P-Harm1	1099.865	1099.872	1099.872	0.000
P-Harm2	0.000	0.000	0.000	0.000
P-Harm3	0.000	0.000	0.000	0.000
P-Harm4	0.000	0.000	0.000	0.000
P-Harm5	0.000	0.000	0.000	0.000
P-Harm6	0.000	0.000	0.000	0.000
P-Harm7	0.000	0.000	0.000	0.000
P-Harm8	0.000	0.000	0.000	0.000
P-Harm9	0.000	0.000	0.000	0.000
P-Harm10	0.000	0.000	0.000	0.000
P-Harm11	0.000	0.000	0.000	0.000
P-Harm12	0.000	0.000	0.000	0.000
P-Harm13	0.000	0.000	0.000	0.000

Figure 8-12 Power and Energy

Press[F4] to reset all data for reanalysis. Press[F5] to switch between data operation or maintenance functions.

8.5 Fluctuation flicker

Flashing refers to the degree of interference to the human eye caused by flickering lights caused by voltage amplitude changes. The flicker monitoring page monitors the voltage that causes this phenomenon and calculates the corresponding long and short flicker values within the corresponding time. The page is shown in Figure 8-13, and pressing the [闪变] key can quickly switch to this interface.

PST	A	B	C	时间
1	35.873	35.884	35.600	17:10:00
2	35.961	35.992	35.709	17:20:00
3	35.961	35.992	35.709	17:30:00
4	35.961	35.992	35.709	17:40:00
5	35.961	35.992	35.709	17:50:00
6	35.961	35.992	35.709	18:00:00
7	35.961	35.992	35.709	18:10:00
8	35.961	35.992	35.709	18:20:00
9	35.961	35.992	35.709	18:30:00
10	35.961	35.992	35.709	18:40:00
11	35.961	35.992	35.709	18:50:00
12	35.961	35.992	35.709	19:00:00

Figure 8-13 Flashover Analysis

Press[F1] to switch between long and short flashing lists.

Note: Short flicker count once every 10 minutes, long flicker count once every 2 hours

8.6 Trend chart

The trend chart categorizes and screens numerous electrical parameters, selecting important ones for monitoring. The monitored parameters include amplitude, harmonics, imbalance, flicker, and power. At the

same time, a ruler function is provided to display the numerical values of each point on the trend chart. The trend chart page is shown in Figures8-14.



Figure8-14Trend diagram

Press[F1] to display trend charts of amplitude, harmonics, imbalance, power, and flicker, as shown in Figures8-15.



Figure8-15Trend Diagram -1

When selecting the content of the F1key menu, the corresponding content in the F2key menu options will also change accordingly. The parameters corresponding to different content trend graphs are shown in Table 8-1.

F1key trend name	F2key parameter content range
amplitude	Freqfrequency, U-Rmsvoltage RMS, I-Rms current RMS.
harmonic	U-Harm1~U-Harm101st to 10thvoltage harmonics; I-Harm1~I-Harm101st to 10thharmonic currents.
Imbalance	U+正序电压、U-负序电压、U0 零序电压、Un-负序不平衡、Un0 零序不平衡； I+正序电流、I-负序电流、I0 零序电流、In-负序不平衡、In0 零序不平衡。
power	Pactive power,Qreactive power,Sapparent power.
Flicker	Short flicker of PSTandlong flicker of PLT.

Press[] to switch between cursor and zoom functions,press[] to reset all data for reanalysis,press[] to switch between hold and run states. If in hold state, the trend chart will pause refreshing and fix the current trend chart for analysis. When in operation, the trend chart is updated in real-time.

Chapter 9 file management

File management is an endpoint provided by THE DEVICE for users to operate device files, which can be accessed by selecting from the main menu to access the file management homepage. File management is divided into three types of files, namely statistical files, recording files, and screenshot files. The page is shown in Figure 9-1.



Figure9-1File Management

9.1 Statisticalfiles

The statistical file is used as the original file for storing statistical records. The statistical file is classified by date, stored in different folders for different dates, and corresponding file information can be viewed. Press the [▶] key to enter the file statistics and select the time and file, as shown in Figure 9-2.



Figure9-2Statistical Files

Press the [F4] key to clear all files within the corresponding date, and press [F3] to delete the selected files one by one.

Press the [F5]key to view the statistical information, transient events, and limit crossing events generated by the statistical file, as shown in Figure9-3.



Figure9-3Statistical Files-File Information

9.2 Recording file

The recording file is used as the original file for storing recording records. The recording file is classified according to the date, stored in different folders for different dates, and corresponding file information can be viewed. The interface is shown in Figure9-4.



Figure9-4 Recordingfile

Press the [F4] [F3]key to clear all files within the corresponding date, and press [F3]to delete the selected files one by one.

Press the []key to view the information of the recording statistics file, as shown in Figure9-5.



The screenshot shows a software window titled '录波文件' (Recording File). The top status bar displays '三相四线 220V/5A/50Hz 2018-12-05 09:57:58'. On the left, a sidebar has '录波信息' (Recording Information) selected. The main area shows a list of file details:

File Name	094645_034
File Size	663.0Kb
Measurement Location	
Start Time	2018-12-05 09:46:45.034
End Time	2018-12-05 09:46:49.453
Wave Points	128

Figure9-5 RecordingFile - File Information

Chapter 10 Storage and Maintenance

10.1 Maintenance of monitoring devices

Wipe the monitoring device and its accessories with a damp cloth and mild soap. Do not use corrosive agents, solvents, or alcohol. They may damage the text on the monitoring device. In addition, it is also recommended to open the jaws of the current clamp and wipe the magnetic pole pieces with a slightly oiled cloth. This is to prevent rust from forming at the magnetic poles.

10.2 Troubleshooting

10.2.1 Monitoring device operation unresponsive

The device system may crash, please restart.

10.2.2 Network unable to connect

Re plug and unplug the network cable, and try the relevant operation again.
