Operating Instruction for Power Quality and Energy Analyzer

Please read this manual before switching the unit on.
Important safety information inside.

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1.Product Introduction

- The Three-Phase Power Quality Analyzer provides the best power quality analysis function.
- It can measure and analyze voltage, current, frequency, power, electric energy, flicker, transient, harmonic, interharmonic, oscilloscope waveform and phasor, voltage sag and surge, three-phase imbalance, etc.
- It is helpful to locate, predict, prevent and investigate the power quality problems in three-phase and single-phase distribution systems, and it is convenient for users to judge the power grid performance or detect the power grid related performance in advance.

2.Product Features

- Using 64-bit quad-core Cortex-A53 CPU architecture Android, with high-definition 8-inch IPS TFT display (1024 (RGB) x 768Pixels) and touch screen, better operation and user experience than similar products on the market.
- Built-in GPS+BD module, can provide global real-time time.
- Instrument built-in 16G NAND FLASH (About 10GB remaining capacity available capacity).
- Support WiFi functions, make it convenient for users to upgrade online, and keep the instrument with excellent function all the time.
- The measuring end and the system show that each interface has 3000V isolation protection.
- Support the maximum 256GB SD card, this machine is equipped with a 64GB SD card, which can store a lot of data.
- Support for Type-C USB communication.
- Meet the following criteria:
  - » IEC 61000-4-30 Class A power quality measurement.
  - » IEC 61000-4-15 flicker measurement
  - » IEC 61000-4-7 harmonic measurement
  - » EN 50160 International standard for power quality
  - » EN 61326 (2005-12) electro magnetic compatibility
  - » UKCA Marking
  - » CE Marking
  - » UL and cUL certification
  - » ANSI C12.1-Specification for watt-hour meters
  - » ANSI C12.20 (Class 0.2) and IEC 62053-22 (Class 0.2S) accuracy

3.Security Information (Please Read First)

3-1.Environmental Conditions for Use

Operating Temperature	-10 to 40°C/14 to 104°F; 40 to 50°C/104 to 122°F (Battery operation only)
Storage Temperature	-20 to 60°C/-4 to 140°F
Humidity	10 to 30°C/50 to 86°F: 95% Relative humidity, no condensation. 30 to 40°C/86 to 104°F: 75% Relative humidity, no condensation. 40 to 50°C/104 to 122°F: 45% Relative humidity, no condensation.
Maximum Working Altitude	CAT IV 600V, CAT III 1000V, up to 2000m (6,666 ft) above sea level; CAT III 600V, CAT II 1000V, up to 3000m (10,000 feet) above sea level; Maximum storage height is 12,000m (40,000 ft).
EMC	Comply with EN 61326 (2005-12) radiation and anti-interference standards

3-2.Power Supply

- City electricity: AC100~240V adapter (with country-specific plug).
- Power adapter input voltage: 12~15V DC (DC).
- Safety requirements for electrical equipment for measurement, control and laboratory use, part 1: General requirements, rating: 600V (CAT IV) 1000V Class III (CAT III) pollution level 2.
- Use the analyzer and its accessories as specified in the user's manual, otherwise, the protection provided by the analyzer and its accessories may be compromised.

3-3.International Symbols

WARNING The word warning refers to a situation or behavior that poses a danger to the user.

ATTENTION The word attention describes the conditions and actions that may cause damage to the analyzer.

⚠	See the instructions in the manua
⏚	Grounding Communication
~	AC
⎓	DC
MH25771	Safety Certification
c SP us	Safety Certification
CE	European Compliance
	Current Clamp
⧈	Double Insulation (Protection Grade)
Li-ion	Recycling Information
N10140	Comply with Relevant Australian Standards
	Do not use it directly on a dangerously charged conductor.

	RoHS
	Waste disposal information
	Do not dispose of this product as unsorted municipal waste.

3-4.WARNING

⚠To avoid electric shock or fire:

- Please read the whole manual before using the analyzer and its accessories.
- Please read all the instructions carefully.
- Don't work alone.
- Do not use this product in the vicinity of explosive gas or steam or in a humid environment.
- Use this product as specified, otherwise the protection provided by the product may be compromised.
- Can only be provided with the analyzer or described for Insulated current probe, test wire and adapter of the analyzer.
- Please hold your finger behind the probe finger guard.
- Before use, check the analyzer, voltage probe, test wires and accessories for organic damage, if there is any damage, it should be replaced immediately.
- Check to see if there is any damage or lack of plastic parts, paying special attention to the insulation near the connector.
- Verify the operation of the analyzer by measuring a known voltage.
- Remove all probes, test wires and parts that are not in use.
- Connect the power adapter to the AC outlet before connecting it to the analyzer.
- Do not touch high voltage: Voltage > AC RMS (RMS) 30V, AC peak 42V or DC 60V.
- The grounding input can only be used as the grounding of the analyzer and no voltage can be applied at this end.
- The applied voltage shall not exceed the rating indicated on the voltage probe or current clamp meter.
- Measure using only the correct measurement standard category (CAT), voltage and current rating probes, test wires, and adapters.
- Do not exceed the minimum rated single component measurement standard category (CAT) for products, probes or accessories.
- Comply with local and national security regulations, in an environment where dangerous live wires are exposed, personal protective equipment (approved rubber gloves, facial protection, flame retardant clothing) must be used to prevent electric shock and arc discharge.
- The battery door must be closed and locked before you operate the product.
- Do not operate the product when the lid is removed or the housing is opened, may be injured by a dangerous voltage.
- Special care should be taken when installing and removing flexible current probes, disconnect the power of the equipment under test or wear appropriate protective clothing.
- Do not use exposed metal BNC or banana plug connectors.
- Do not insert metal objects into the connector.

- Only the Analyzer power supply (power adapter) can be used.
- Before using, please check whether the selected voltage range indicated on the Analyzer conforms to the local city voltage and frequency.
- For the Analyzer power adapters, only AC line adapters or AC power cords that comply with local safety regulations can be used.
- Disconnect the input signal before cleaning the product.

3-5. ⚠ Current Voltage Banana Connector Input to Ground Input Voltage

Input ports A (L1), B (L2), C (L3), N to ground: 1000V third type (CAT III), 600V fourth type (CAT IV).

3-6. ⚠ Maximum Voltage of the Current Bnc Input Port (See Mark)

- Enter ports A (L1), B (L2), C (L3), N to ground: 42V peak.
- The voltage rating shall be used as the "Working Voltage".
- Application of AC sinusoidal wave as VAC rms (50-60Hz).
- For direct current applications, it is pronounced Vdc.
- The fourth type of (CAT IV) of measurement standard refers to the installation service of public utilities of high-altitude lines or underground lines.
- The third category (CAT III) refers to the distribution level in the building and the circuit in the fixed device.
- When security measures fail.
- If the analyzer is not used in accordance with the manufacturer's instructions, the protection provided by the analyzer may not be effective.
- Before use, please check the test wire for mechanical damage and replace the damaged test wire.
- If the analyzer or its accessories fail or do not work properly, please do not use it and send it for repair.

3-7.Safe Use of Lithium Ion Battery Pack

3-7-1.Recommendations for Safe Storage of Battery Packs

- Do not store the battery pack near a source of heat or fire, don't store it in the sun.
- Do not remove the battery pack from its original package before you need to use it.
- When not in use, try to remove the battery pack from the device.
- When storing the battery for a long time, the battery pack should be fully charged to avoid battery failure.
- After storing the battery for a long time, the battery pack may need to be recharged and discharged several times to obtain the best performance.
- Put the battery pack out of reach of children and animals
- If you swallow the battery or part of it, you should see a doctor immediately.

3-7-2.Recommendations for Safe Use of Battery Packs

- The battery pack needs to be recharged before use, you can only use a power adapter approved.
- Refer to safety instructions and user's manual for correct charging method.
- Do not charge the battery for a long time when not in use.
- The battery pack has the best performance at normal room temperature 20°C±5°C (68°F±9°F).

- Do not put the battery pack near the source of heat or fire, don't put it in the sun.
- Don't let the battery pack suffer a severe impact, such as a mechanical shock.
- Keep the battery pack clean and dry, clean dirty joints with a dry, clean cloth.
- Be sure to use the charger specially equipped with this equipment to charge.
- Do not use batteries that are not designed for recommended for use in the product.
- When putting the battery into the product or external battery charger, you should pay attention to the correct placement of the battery.
- Don't short circuit the battery pack, do not put the battery pack on its terminal which may be short-circuited by a metal object, place (for example, coins, paper clips, pens or other items).
- Do not use battery packs or chargers that have been obviously damaged.
- Batteries contain dangerous chemicals that may cause combustion or explosion, if you are exposed to chemistry, Product, wash with water and see a doctor, if the battery leaks, the product should be repaired before use.
- Retrofit the battery pack: if the battery pack does not seem to be working properly or has been damaged, please do not, attempt to open, modify, modify, or repair the battery pack.
- Do not disassemble or squeeze the battery pack.
- The battery can only be used for the specified purpose.
- Take good care of the original product data for future reference.

3-7-3.Recommendations for Safe Transportation of Battery Packs

- The battery pack must be fully protected against short circuit or damage in transit.
- Refer to the provisions of the international air transport agreement (IATA) on the safe transport of lithium-ion batteries.
- Refer to domestic/local regulations applicable to the transportation of batteries by mail or other means of transportation.
- Up to 3 batteries can be transported by mail, the package must be marked as follows: the package contains lithium. Ion battery (excluding lithium metal).

3-7-4.Recommendations for Safe Disposal of Battery Packs

- Battery packs that have failed should be properly disposed of in accordance with local laws and regulations.
- Proper disposal: Do not dispose of batteries as unclassified municipal waste.
- Before handling, discharge the battery and cover the battery terminal with electrical tape.

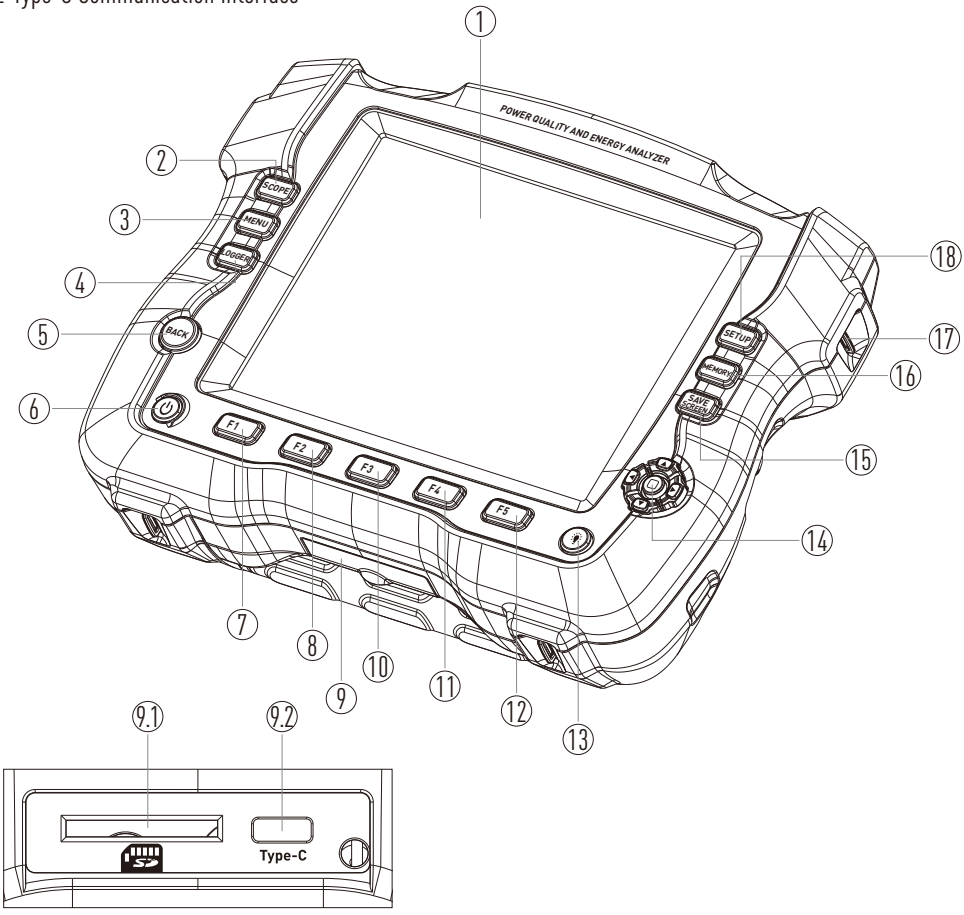
4.Measuring Functions

- Oscilloscope (Waveform and Phasor)
- Voltage/Current/Frequency
- Power and Electric Energy
- Harmonic Wave and Interharmonic
- Unbalance
- Inrush Current
- Flicker
- Transient State
- Sudden Drop and Sudden Rise
- Record (Logger) and View
- Screenshot
- Wave Recording

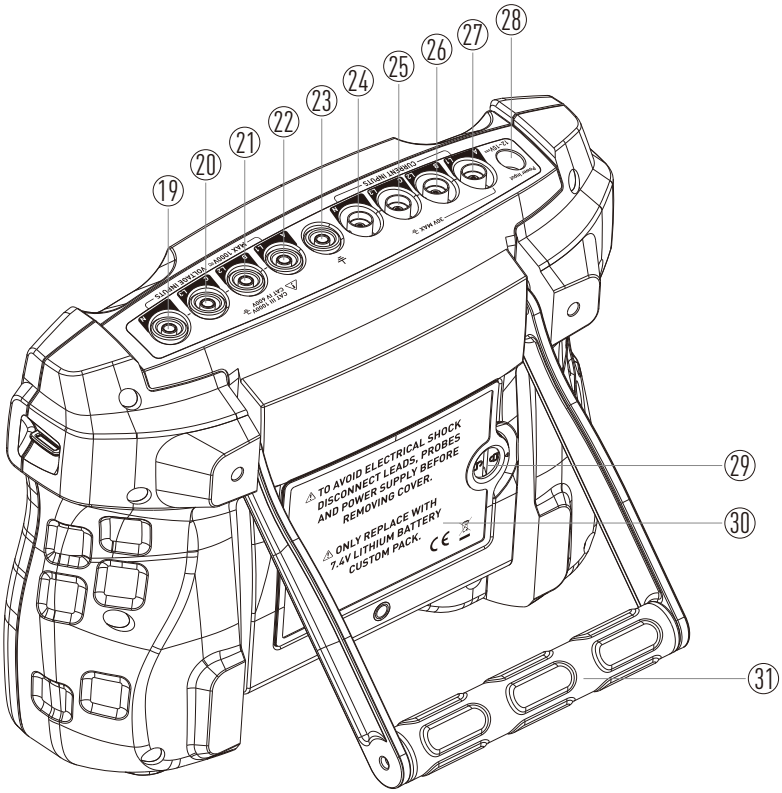
5.Description

5-1.Panel Description

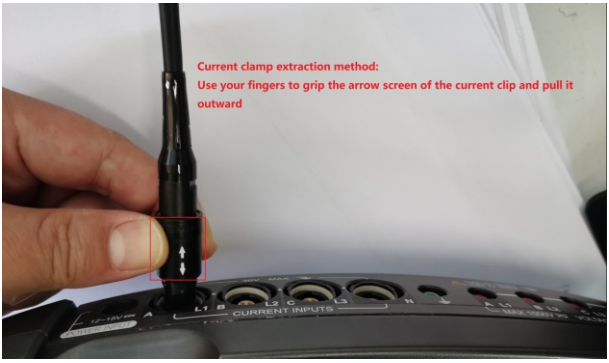
1-TFT Display
2-Oscilloscope Waveform Button
3-Menu Button
4-Logger Button
5-Return Button
6-Power Button
7-F1 Function Button
8-F2 Function Button
9-Interface and Cover
 9.1-SD Card Slot
 9.2-Type-C Communication Interface
10-F3 Function Button
11-F4 Function Button
12-F5 Function Button
13-Backlight Button
14-Direction & Confirm Button
15-Save Screen Button
16-Menory Button
17-Lanyard Hole
18-Setup Button



19-Voltage Measurement Input Port: N
20-Voltage Measurement Input Port: C
21-Voltage Measurement Input Port: B
22-Voltage Measurement Input Port: A
23-Voltage Measurement Input Port: GND
24-Current Clamp N Measurement Input Interface
25-Current Clamp C Measurement Input Interface
26-Current Clamp B Measurement Input Interface
27-Current Clamp A Measurement Input Interface
28-DC12~15V, 2.4A Charger Jack
29-Battery Slot Switch
30-Battery Cover
31-Tilt Stand



5-2.Current clamp connection instrument and disconnection method operation guide



6.Wiring Combination Description

1Ø+NEUTRAL	Single-phase band neutral line
1Ø SPLIT PHASE	Split-phase
1Ø IT NO NEUTRAL	Single phase, with two phase voltage, no neutral line
3Ø WYE	Three phase four wire system, Y shape
3Ø DELTA	Three-phase three-wire triangular (Delta)
3Ø IT	Three-phase Y-shaped, no neutral line
3Ø HIGH LEG	Four-wire three-phase triangular (Delta), with center tap high pressure phase foot
3Ø OPEN LEG	Open triangle (Delta) three-wire with two transformer windings
2-ELEMENT	Three-phase three-wire system, L2 / B phase sensorless (2 watt power meter method)
2½-ELEMENT	Three-phase four-wire system, L2 / B phase without voltage sensor

7.Measurement Mode Description

Scope	4 groups of voltage waveforms, 4 groups of current waveforms, RMS voltage (Vrms), fundamental voltage (Vfund). Effective current (Arms), fundamental current (A fund), cursor voltage (V @ cursor), cursor current (A @ cursor), phase angle.
Volts/Amps/Hertz	Interphase RMS voltage (Vrms), Phase to neutral line RMS voltage (Vrms), Peak voltage (Vpeak), Voltage peak coefficient, RMS current (Arms), Peak current (Apeak), Current peak coefficient, Frequency (Hz).
Dips and Swells	Half-cycle RMS Vrms (Vrms1/2), Half-cycle RMS current (Arms1/2), Programmable threshold level Pinst for event detection.
Harmonics DC, 1...50	Harmonic voltage, Total harmonic distortion (THD), Harmonic current, K coefficient current, Power harmonics, Power total harmonic distortion, Power K coefficient, Inter-harmonic wave voltage, Inter-harmonic wave current, Effective value voltage (Vrms), Effective value current (Arms) (Relative to fundamental or total effective value).
Power and Energy	RMS voltage (Vrms), RMS current (Arms), Full power (Wfull), Fundamental power (Wfund), Complete VA, Fundamental VA, Harmonics VA, Unbalanced VA, Var, Power factor (PF), DPF, CosQ, Efficiency factor, kWh forward, kWh reverse.
Unbalance	Negative voltage percentage (Vneg%), Zero voltage percentage (Vzero%), Negative current percentage (Aneg%), Zero current percentage (Azero%), Fundamental voltage (Vfund), Fundamental current (Afund), Voltage phase angle, Current phase angle.
Inrush	Inrush current, Inrush duration, Half cycle RMS current (ARMS1/2), Half cycle RMS voltage (Vrms1/2).
Flicker	Pst (1-minute), Pst, Plt, Pinst, Half-cycle RMS voltage (Vrms 1/2), Half-cycle RMS current (Arms 1/2), Frequency (Hz).
Transients	Transient waveform 4x voltage, 4x current, Flip-flop: Half-cycle RMS voltage (Vrms1/2), Half-cycle RMS current (Arms1/2), Pinst.
Logger	Custom selection of up to 150 sets of power quality parameters for simultaneous four-phase measurement.
Wave Recording	Record the 4 x Voltage waveform and 4 x Current waveform for a maximum duration of 3 minutes.

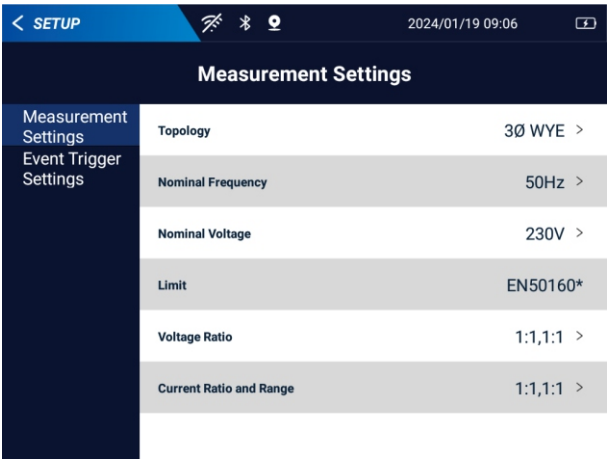
8.Connection Instructions Before Instrument Measurement

8-1.The following points need to be checked or modified before each measurement

- Define calculation parameters.
- Select the type of power grid (from single-phase to three-phase four-wire) and the access method (Two-wattmeter, standard).
- The current sensor ratio is selected according to the type of current sensor connected.
- Choose voltage ratio and current ratio.
- Define the trigger level (Transient mode).
- Define the values that need to be recorded (Trend pattern).
- Define the alarm threshold.

8-2.For a three-phase system, please connect as shown in the following figure

- Click on "**SETUP**", "**Measurement Settings**", "**Topology**" on the main interface, and select the corresponding wiring method, as shown in the following figure.



- First, place the current clamp on the conductor of phase A (L1), B (L2), C (L3) and N (neutral line), the clamp is marked with an arrow to indicate the correct signal polarity.
- Next, complete the voltage connection: start with the grounded (Ground) connection, and then connect N, A (L1), B (L2) and C (L3) in turn.
- To get correct measurement results, always remember to connect the ground wire input port and check whether the connection is correct.
- Make sure the current clamp is firm and completely clamped around the conductor.
- For single-phase measurements, use current input port A (L1) and ground wire, N (neutral wire) and phase A (L1) voltage input port.
- A (L1) is the reference phase for all measurements.
- Before starting any measurement, set up the analyzer for the line voltage, frequency, and wiring configuration of the power system you want to measure, specific information is described in the general settings in the following section.

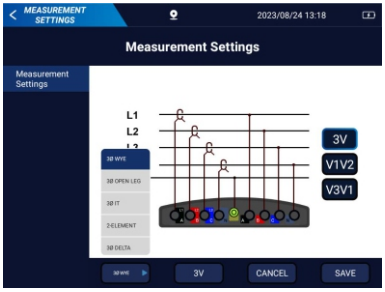
- The oscilloscope waveform and phasor display can be used to check whether the voltage wire and current clamp are connected correctly.
- In the vector diagram, when the example shown in the following figure is viewed clockwise, the phase voltage and current A (L1), B (L2) and C (L3) should appear in turn.
- "SCOPE" Click "[ ]" enter the oscilloscope loss diagram, as shown below.

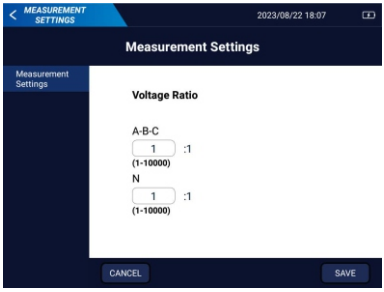
- To complete a measurement, the user needs to define at least:

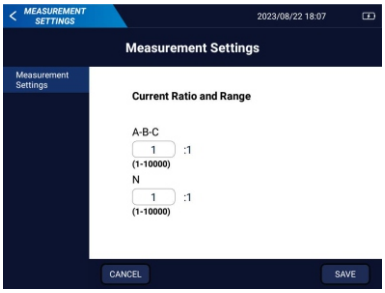
1.Select the mode of electrical connection, as shown in figure 1 below.

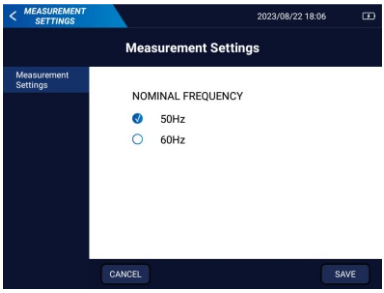
2.And the ratio of the sensor, Select frequency (See figure below).

3.Click on the main interface "**Setup**", "**Measurement Settings**" to enter, as shown in the following figure.





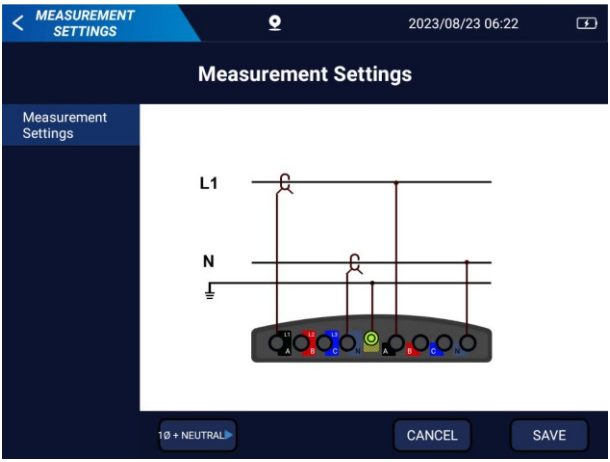




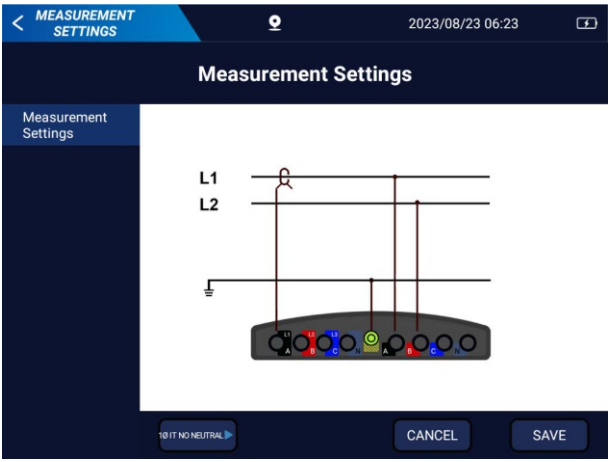
8-3.The selection of the electrical connection mode can be changed to correspond to the tested object.

Select "**SETUP\ Measurement \Settings Topology**" in the main interface, as shown in the following figure:

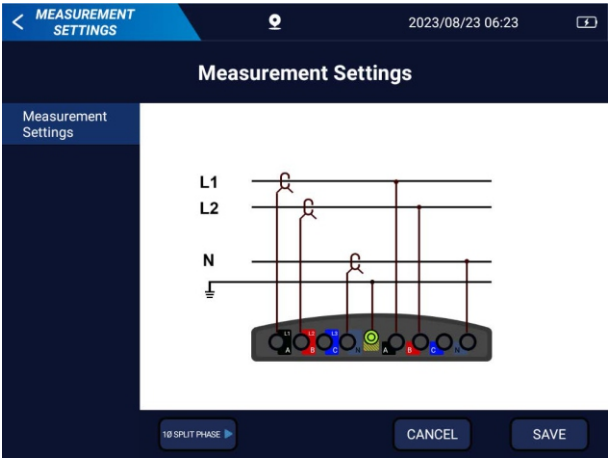
1.1Ø+NEUTRAL (Single phase with neutral lines).



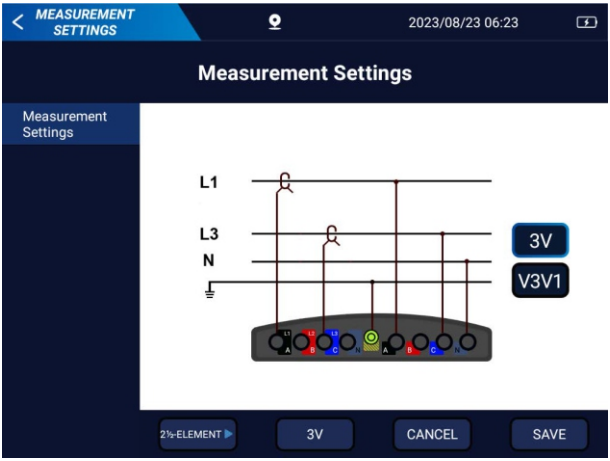
2.1Ø IT NO NEUTRAL (Single phase, with two phase voltage, no neutral line).



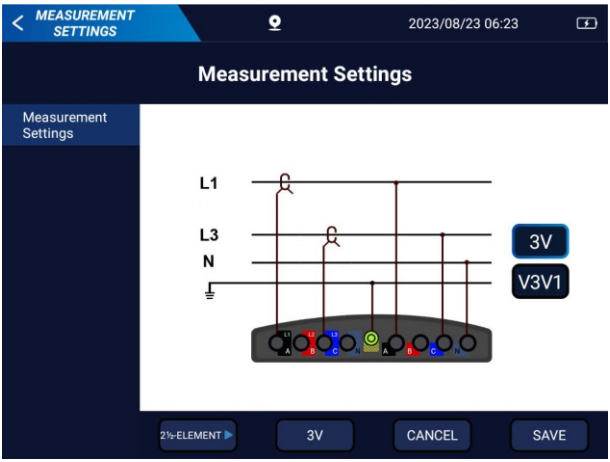
3.1Ø SPLIT PHASE.



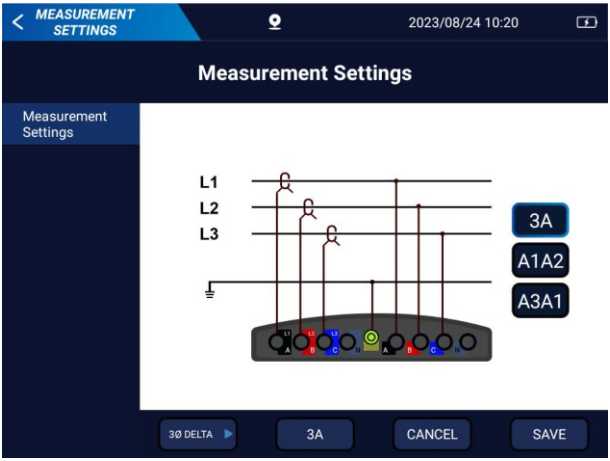
4.2½-ELEMENT (Three phase four wire system,L2 B phase no voltage sensor).



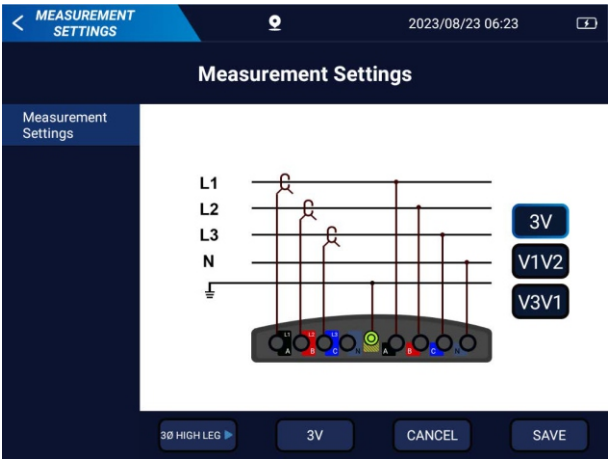
5.2-ELEMENT (Three-phase, three-wire,L2 B phase current sensor (2-watt power meter method)).



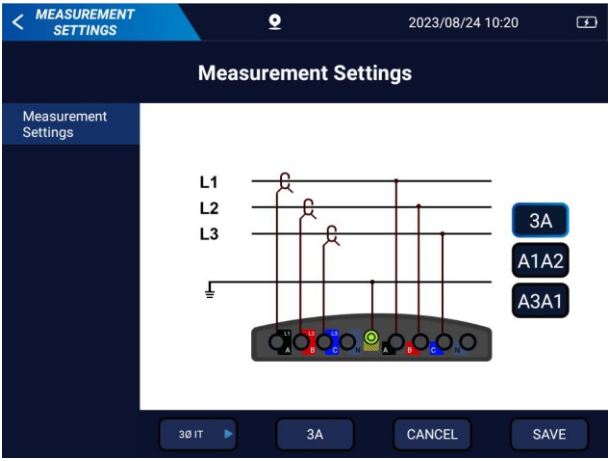
6.3Ø DELTA (Three phase three wire Delta).



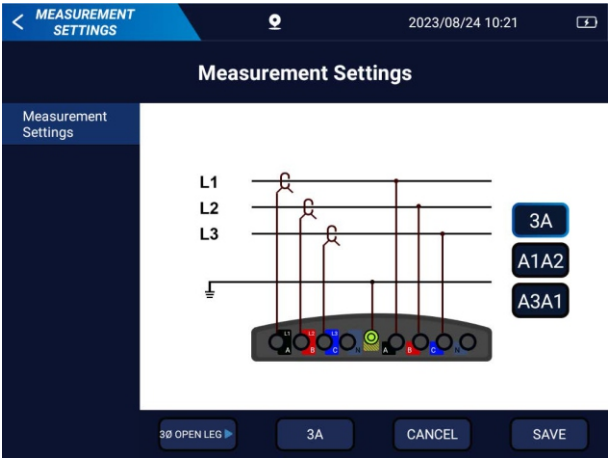
7.3Ø HIGH LEG (Four wire system, three phase Delta, with center tap high pressure phase pin).



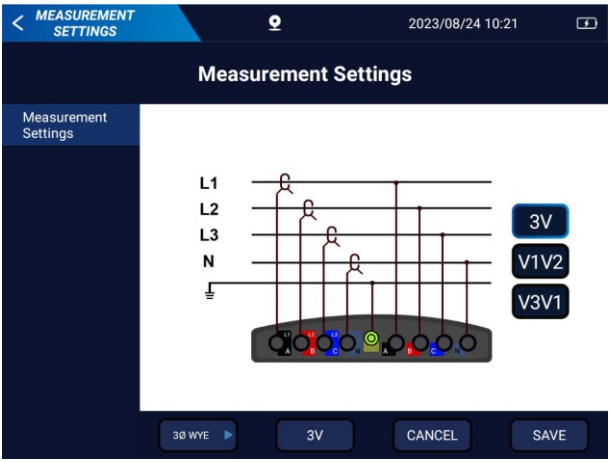
8.3Ø IT (Three-phase Y shape, no neutral line).



9.3Ø OPEN LEG (Three-wire open Delta system with two transformer windings).



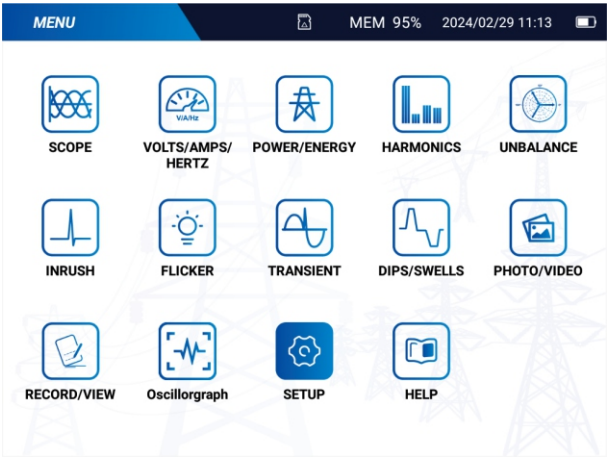
10.3Ø WYE (Three phase four wire system, Y shape).



9.Operation Guidance

9-1.Starting Up

- Pressing power about 3 seconds will start the boot, and the instrument loads the company interface.
- After entering the instrument animation interface, you will enter the current instrument measurement main page, as shown in the following figure.



- Touching the corresponding measurement icon on the screen in the main interface above will enter the corresponding measurement interface.

9-2.Oscilloscope Measurement

9-2-1.Brief introduction of Oscilloscope Waveform and Phasor

- Oscilloscope (Scope) mode displays the voltage and current of the tested power system in the form of waveform or vector graph.
- In addition the values of phase voltage (Effective value RMS), fundamental value, display value at cursor, phase current (Effective value RMS), fundamental value, display value at cursor, frequency, phase angle between voltage and current are also displayed.

- Description of the content of the interface.

1-It is the mode option of oscilloscope waveform, there are three modes, namely RMS (True effective value), THD (Total harmonic distortion), CF (Crest factor).

2-It is the instantaneous value cursor, you can press the "left and right"buttons of the panel to move the cursor.

3-Switch back to the phasor interface.

4-It is the instantaneous value at the intersection of the cursor and the curve.

5-It is the set voltage range value, the limit of this Scope can be set in the settings interface, if the alarm and record selection are turned on, the limit will be recorded when the limit is exceeded.

6-MENU

7-It is the true effective value of RMS and the RMS of the interface above is the true effective value of voltage.

8-Click this icon to exit the main interface with a pop-up prompt.

9-Return to the previous level interface.

10-Sliding the screen to the right will pop up the operation options bar, and at the same time Sliding left will retract the options bar.

- Introduction

1.Oscilloscope Waveform screen quickly updates the display of voltage and or current waveforms in the style of an oscilloscope.

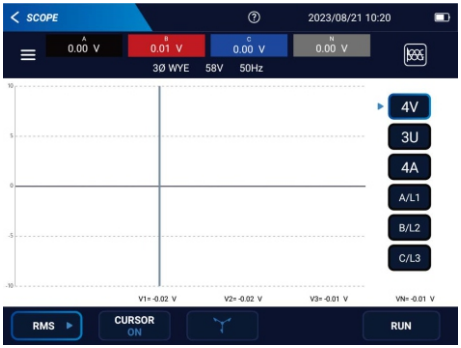
2.The head of the screen displays the relevant RMS Voltage/Current values (RMS of 10 to 12 cycles or RMS of 150 to 180 cycles) showing four waveform cycles, Channel A (L1) is the reference channel.

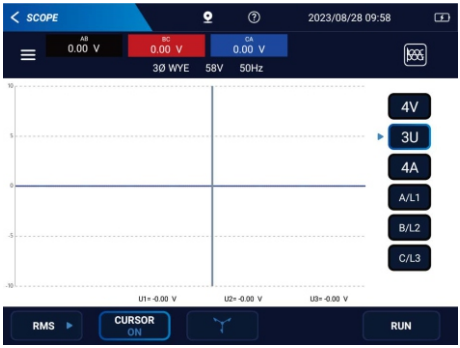
3.When the cursor starts, the wavy value at the cursor is displayed in the header of the screen.

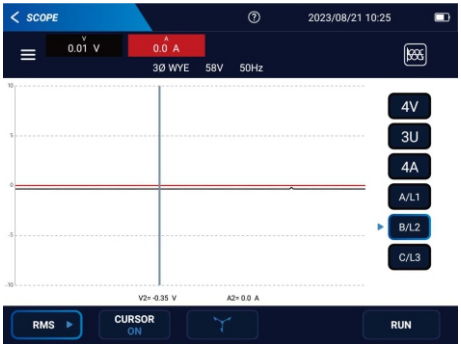
4.In order to achieve a good display effect in most cases, the range of the waveform has been adjusted in advance, this is based on the nominal voltage (Vnom) and the current range (A range).

9-2-2.Oscilloscope Waveform

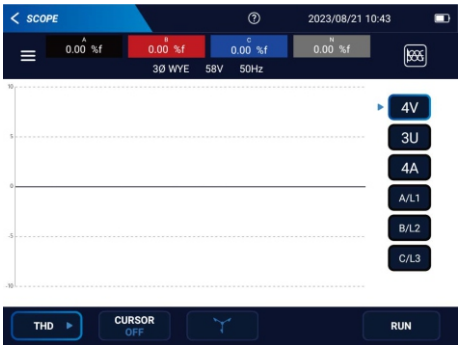
1.3Ø WYE Wiring mode-oscilloscope RMS mode

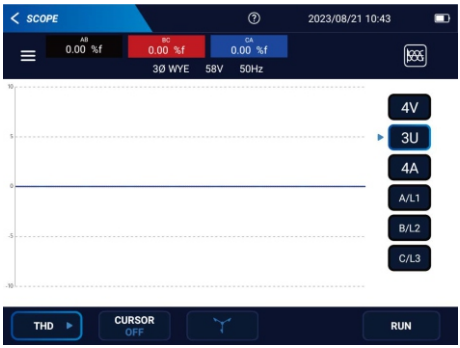


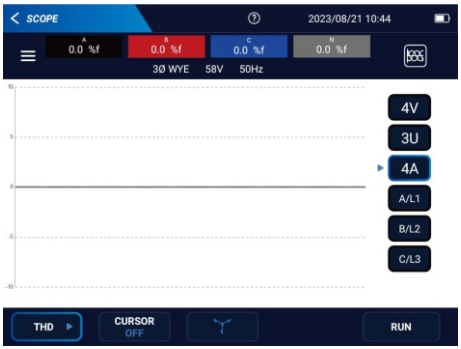


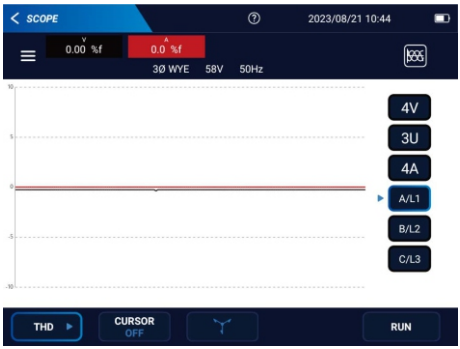


2.3Ø WYE Connection mode-oscilloscope THD mode

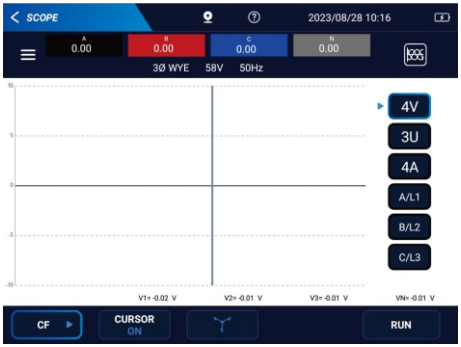


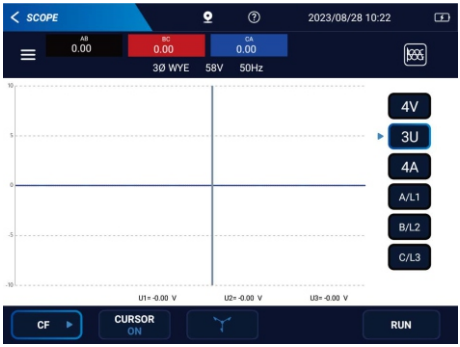






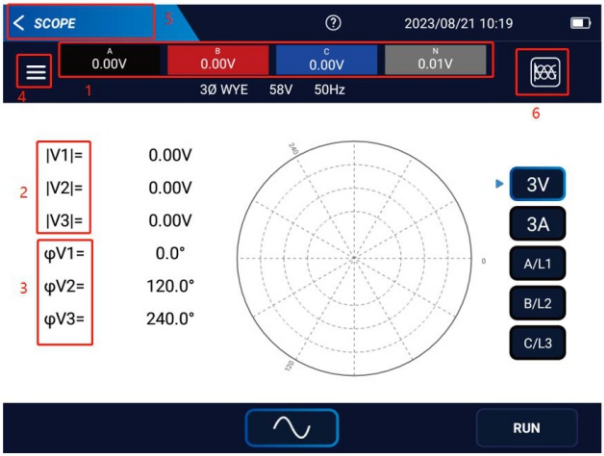
3.3Ø WYE Wiring mode-oscilloscope CF mode





9-2-3.Oscilloscope Phasor Diagram

• Phasor interface, as shown below:



• Interface specification:

A.The phasor screen shows the phase relationship between voltage and current in the vector diagram, the vector of the reference channel A (L1) points in a horizontal positive direction, other values include fundamental phase voltage and or current, frequency and phase angle, the head of the screen displays the effective value (RMS) voltage and or current value.

1-Figure 1 above shows the RMS voltage value of each phase line.

2-Figure 2 above, | V1 |, | V2 |, | V3 |: fundamental voltage modulus.

3-Figure 3 above, is the phase angle, ahead or behind.

4-As shown in Figure 4, clicking here will bring up the MENU.

5-Return to the previous level interface.

6-Click this icon to exit the main interface with a pop-up prompt.

B.3Ø WYE Connection mode-oscilloscope phasor mode, the measurement interface is as follows:

9-3.Voltage/Current/Frequency Measurement

- Phase effective voltage (Vrms), to neutral line effective voltage (Vrms), peak voltage (Vpeak), voltage peak coefficient CF V, effective value current (Arms), peak current (Apeak), current peak coefficient CF A, frequency (Hz).
- Selecting "Voltage/Current/Frequency" in the main measurement interface will enter the corresponding measurement interface, the following figure:

9-3-1.Interface Description

1-After entering the interface, the left side will default to the corresponding parameter values of the voltage measurement, and a row of vertical bar submenus on the right can change the measurement mode (Such as the label 1 in the figure above).

- After selecting the corresponding measurement sub-menu the parameter values displayed on the left side will be changed accordingly, move the cursor/select the corresponding measurement sub-menu by pressing the "Up, Down, Left and Right" buttons of the meter.
- Click the Run icon or press F5 in the panel, and the current data will be displayed in real time (as shown in the figure above).
- Clicking the Hold icon or pressing F5 on the panel will pause the data (like label 5 in the image above).

2-The left side of the image is the measurement function.(such as the label 3 in the figure above).

- RMS represents the true effective value of AC/DC.
- DC is DC voltage.
- Peak+(V) is the peak of voltage.
- CF is the crest coefficient (Indicating the degree of distortion).

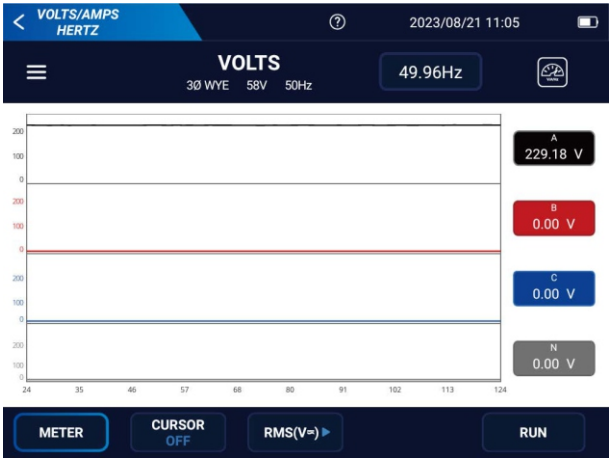
3-Click on the icon in Figure 6 to return to the main interface and a prompt box will pop up.

4-Frequency value (For example, label 7 in the above figure).

5-Click on position 8 above to pop up the MENU.

6-Click on position 9 above to return to the previous level interface.

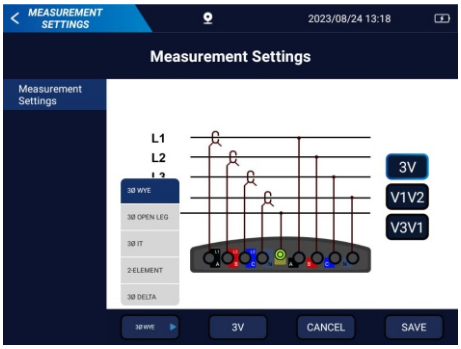
3.Click the "Trend" icon and press the F1 button of the panel in the "Voltage\ current\ Frequency" interface above to enter the trend chart interface (such as the label 4 in the figure above), as shown in the following figure:



- In the above interface, click Meter and you will return to the metering interface.
- In the above interface, click the "RMS(V=)" menu and relevant measurement options will pop up, you can choose the proper measurement functions, such as VRMS, CF, etc.
- Press Run to display the trend chart data in real time.
- On the above screen, press Hold to pause the trend chart.

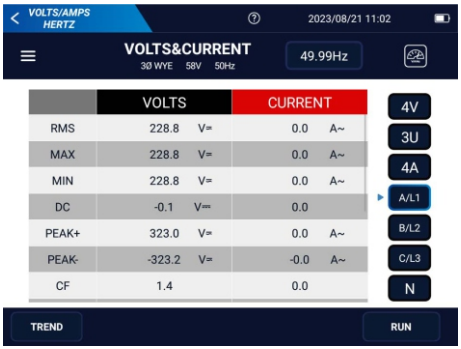
9-3-2.3Ø WYE Connection Mode, Voltage, Current, Frequency

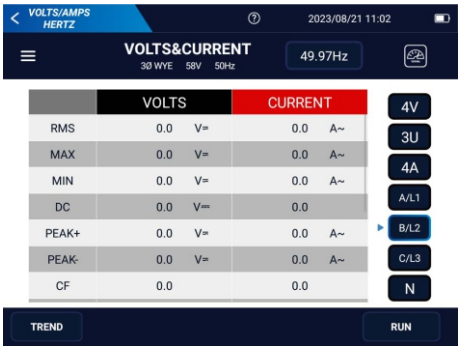
The options on the right side of the measurement screen are as follows:

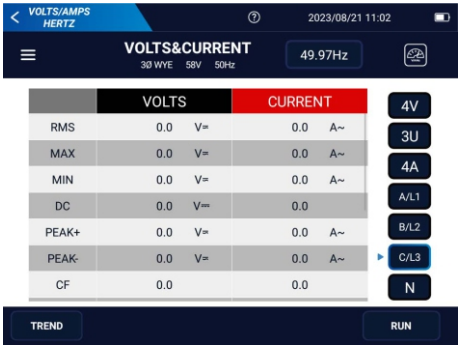


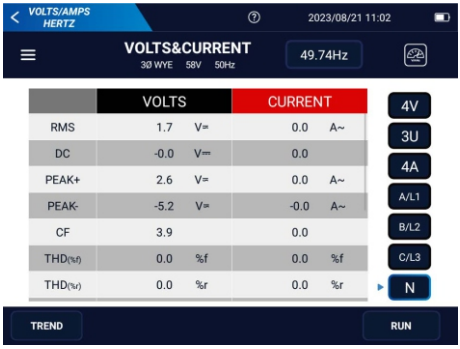

VOLTS/AMPS
HERTZ
2023/08/21 11:01
VOLTS
3Ø WYE 58V 50Hz
49.96Hz
AB BC CA
RMS(V~) 0.00 0.00 0.00
MAX(V~) 0.00 0.00 0.00
MIN(V~) 0.00 0.00 0.00
DC(V⎓) 0.00 0.00 0.00
PEAK+(V~) 0.00 0.00 0.00
PEAK-(V~) -0.00 -0.00 -0.00
CF 0.00 0.00 0.00
4V
3U
4A
A/L1
B/L2
C/L3
N
TREND
RUN

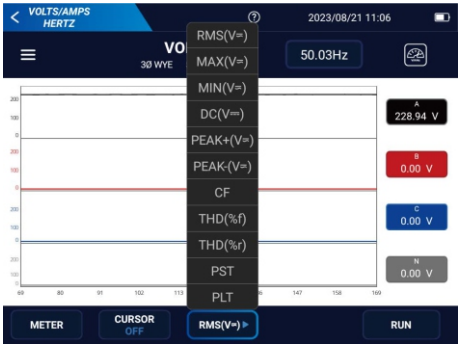

VOLTS/AMPS
HERTZ
2023/08/21 11:01
CURRENT
3Ø WYE 58V 50Hz
49.98Hz
A B C N
RMS(A~) 0.0 0.0 0.0 0.0
MAX(A~) 0.0 0.0 0.0 0.0
MIN(A~) 0.0 0.0 0.0 0.0
PEAK+(A~) 0.0 0.0 0.0 0.0
PEAK-(A~) 0.0 0.0 0.0 -0.0
CF 0.00 0.00 0.00 0.00
THD(%f) 0 0 0 0.0
4V
3U
4A
A/L1
B/L2
C/L3
N
TREND
RUN

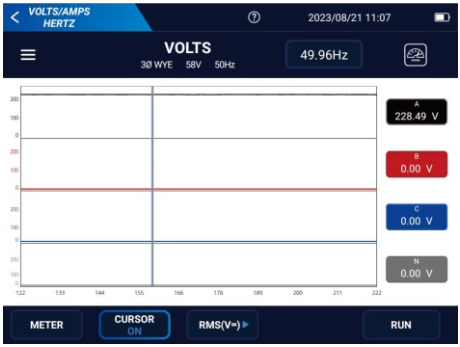

VOLTS/AMPS
HERTZ
2023/08/21 11:02
VOLTS&CURRENT
3Ø WYE 58V 50Hz
49.99Hz
VOLTS CURRENT
RMS 228.8 V= 0.0 A~
MAX 228.8 V= 0.0 A~
MIN 228.8 V= 0.0 A~
DC -0.1 V⎓ 0.0
PEAK+ 323.0 V= 0.0 A~
PEAK- -323.2 V= -0.0 A~
CF 1.4 0.0
4V
3U
4A
A/L1
B/L2
C/L3
N
TREND
RUN


VOLTS/AMPS
HERTZ
2023/08/21 11:02
VOLTS&CURRENT
3Ø WYE 58V 50Hz
49.97Hz
VOLTS CURRENT
RMS 0.0 V= 0.0 A~
MAX 0.0 V= 0.0 A~
MIN 0.0 V= 0.0 A~
DC 0.0 V⎓ 0.0
PEAK+ 0.0 V= 0.0 A~
PEAK- 0.0 V= 0.0 A~
CF 0.0 0.0
4V
3U
4A
A/L1
B/L2
C/L3
N
TREND
RUN


VOLTS/AMPS
HERTZ
2023/08/21 11:02
VOLTS&CURRENT
3Ø WYE 58V 50Hz
49.97Hz
VOLTS CURRENT
RMS 0.0 V= 0.0 A~
MAX 0.0 V= 0.0 A~
MIN 0.0 V= 0.0 A~
DC 0.0 V⎓ 0.0
PEAK+ 0.0 V= 0.0 A~
PEAK- 0.0 V= 0.0 A~
CF 0.0 0.0
4V
3U
4A
A/L1
B/L2
C/L3
N
TREND
RUN


VOLTS/AMPS
HERTZ
2023/08/21 11:02
VOLTS&CURRENT
3Ø WYE 58V 50Hz
49.74Hz
VOLTS CURRENT
RMS 1.7 V= 0.0 A~
DC -0.0 V⎓ 0.0
PEAK+ 2.6 V= 0.0 A~
PEAK- -5.2 V= -0.0 A~
CF 3.9 0.0
THD(%f) 0.0 %f 0.0 %f
THD(%r) 0.0 %r 0.0 %r
4V
3U
4A
A/L1
B/L2
C/L3
N
TREND
RUN





9-4.Power & Electrical Energy Measurement

9-4-1.Measurement Content Introduction

Power and energy, can measure RMS voltage (Vrms), RMS current (Arms), Full power (Wfull), Fundamental power (Wfund), Complete VA, Fundamental VA, Harmonics VA, Unbalanced VA, Var, Power factor (PF), DPF, CosQ, Efficiency factor, kWh for ward, kWh reverse.

9-4-2.The Analyzer Also Shows Energy Usage

- For power calculation, you can choose the fundamental frequency or full.
- The fundamental frequency power calculation takes into account only the voltage and current at the fundamental frequency (at 60Hz, 50Hz), while the full uses the entire frequency range (True RMS voltage and current).

9-4-3.Measurement Methods

- The power can be measured according to the unified method (Unified) and the classical method (Classic).
- These two methods can be selected in the function parameter selection (Function pref) menu.

1.Unified Method

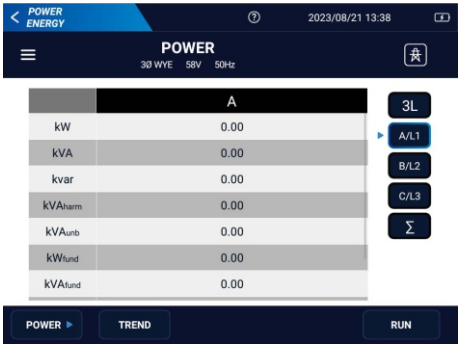
- The algorithm used is a unified method developed by the Polytechnic University of Valencia and conforms to the IEEE 1149 standard.
- This method can measure Effective power (kW), Apparent power (kVA), Reactive power (kvar), Harmonic power component (kVA Harm) and Unbalanced power (kVA Unb).

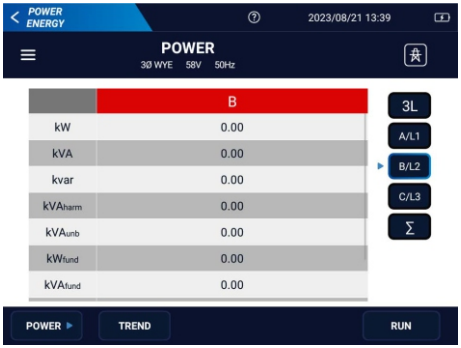
2.Classic Approach

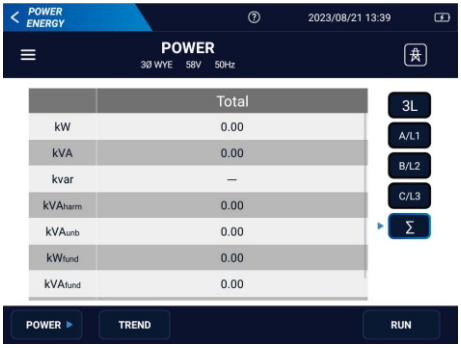
- That is, the system power is measured according to the calculation method described in the IEEE 1459 standard, the measurement method can be changed by selecting the (Function Preference) menu with functional parameters.
- In order to show more clearly that the classical system uses the arithmetic summation method to calculate the system power, a "Σ" (Sigma) symbol is usually added after the power parameter, for example, VAΣ.

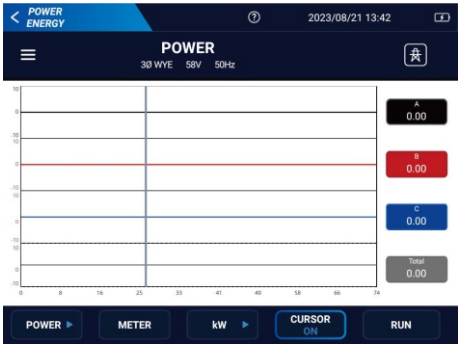
9-4-4.The Power Measurements are as Follows

- Effective power (W, kW): Usually measured by an energy meter, full range of use.
- Apparent power (VA,kVA): Full range use.
- Reactive power (var,kvar): Use fundamental frequency.
- Harmonic power (VA or kVA Harm): Non-fundamental frequency power.
- Unbalanced power (the unbalanced part of the effective power of VA or kVA Unb).
- Fundamental effective power (W or kW fund): uses fundamental frequency.
- Fundamental apparent power (VA, kVA fund): uses fundamental frequency.
- Displacement power factor Cos Ø or DPF: Cos Ø is the phase angle between fundamental voltage and current.
- DPF is fundamental effective power (W fund)/fundamental apparent power (VA fund).
- The difference between the power factor Cos Ø and PF is as follows:
  - » PF is the ratio of active power P to apparent power S, PF=P/S.
  - » Cos Ø is the ratio of the active power P1 of the fundamental wave to the apparent power S1 of the fundamental wave, Cos Ø=P1/ S1.
- 3Ø WYE: Three-phase four-wire system, Y-shaped, power measurement interface is as follows:





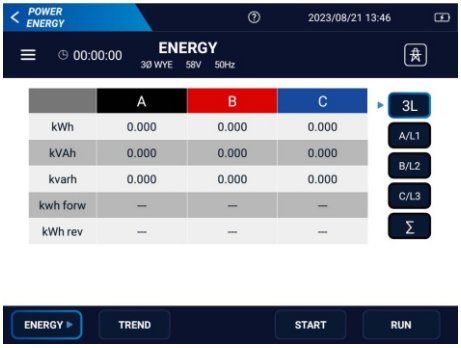


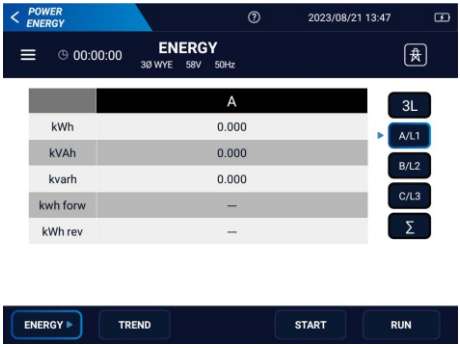


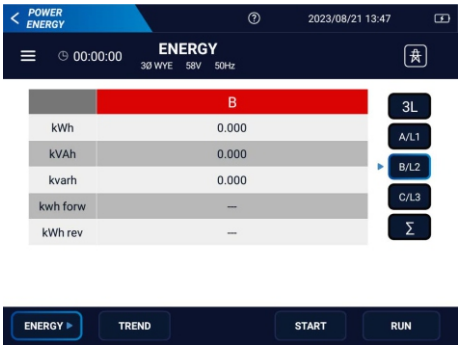
9-4-5.Energy Measurements Include

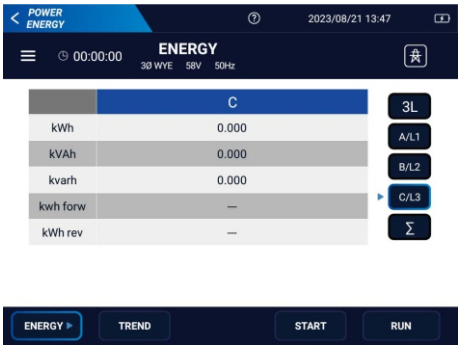
- Active energy (Wh, kWh).
- Apparent energy (VAh, kVAh).
- Reactive energy (varh, kvarh).
- Positive energy (Wh, kWh forw): Energy consumption.
- Reverse energy (Wh, kWh rev): Energy transfer).
- 3Ø WYE three-phase four-wire system, Y-shaped, the energy measurement interface is as follows:

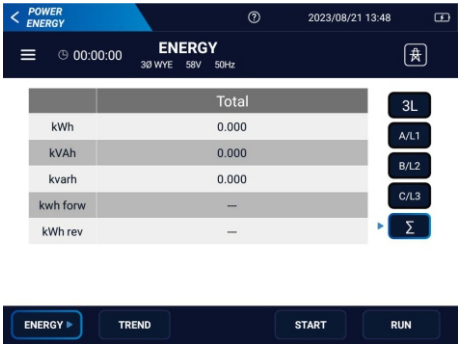
When the RUN button is pressed, the measurement timing will be started, and the time in the upper left corner will start, as shown in the following figure.











9-5.Record & View

9-5-1.Brief Introduction of Recorder (Logger)

- The Logger function can save multiple readings with high resolution.
- The readings are observed at adjustable intervals, at the end of the interval, the minimum, maximum and average values of all readings are saved and the next observation interval begins.
- This process continues throughout the observation period.

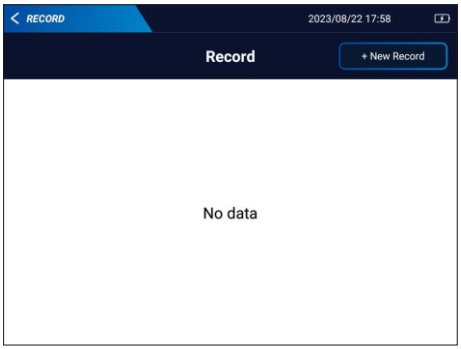
9-5-2.How to Access the Recorder (Logger)

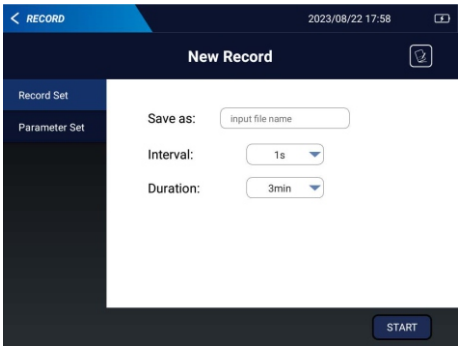
1.Select "Record View" on the main screen interface and click "+New Record" in the upper right corner to create a new record.

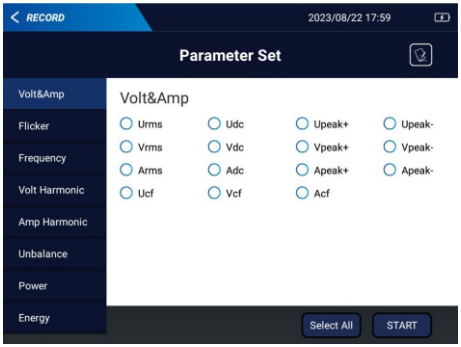
2.Click on the "Record Set" on the left to enter the file name, interval duration, and recording duration.

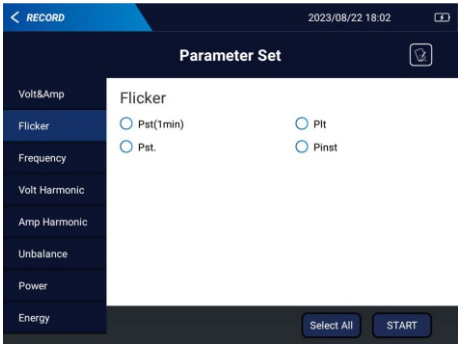
3.Click on the "Parameter Set" on the left to select the recorded parameters for different measurement items, such as selecting Urms, Vrms, etc. for "Volt & Amp" in voltage and current mode.

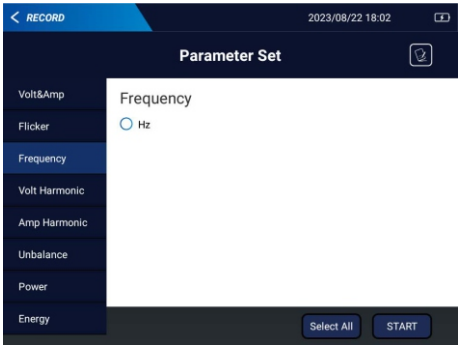
4.When several parameter items are selected, this instrument only records the parameter items of the last functional module.

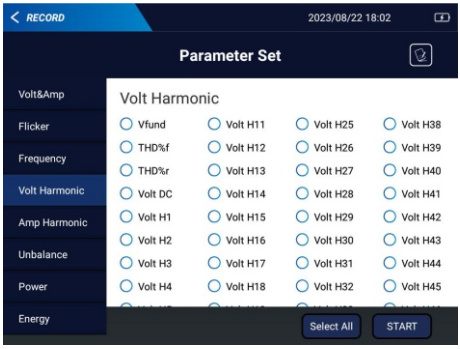


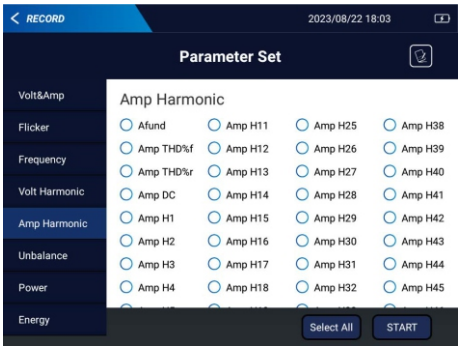


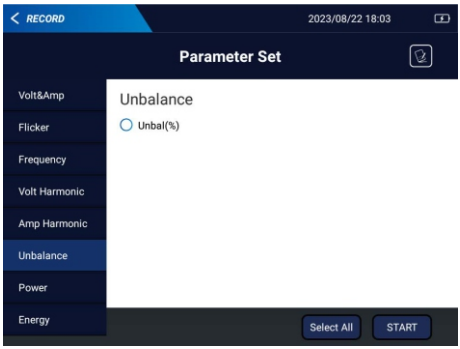

RECORD
2023/08/22 17:59
Parameter Set
Volt&Amp
Flicker
Frequency
Volt Harmonic
Amp Harmonic
Unbalance
Power
Energy
Volt&Amp
Urms
Udc
Upeak+
Upeak-
Vrms
Vdc
Vpeak+
Vpeak-
Arms
Adc
Apeak+
Apeak-
Ucf
Vcf
Acf
Select All
START

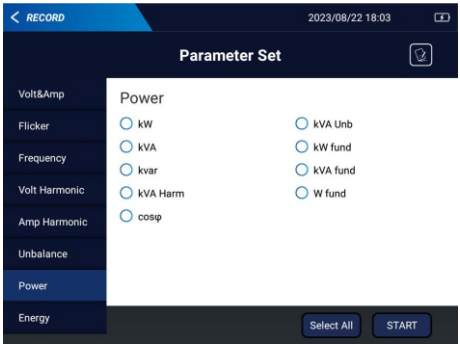

RECORD
2023/08/22 18:02
Parameter Set
Volt&Amp
Flicker
Frequency
Volt Harmonic
Amp Harmonic
Unbalance
Power
Energy
Flicker
Pst(1min)
Plt
Pst.
Pinst
Select All
START

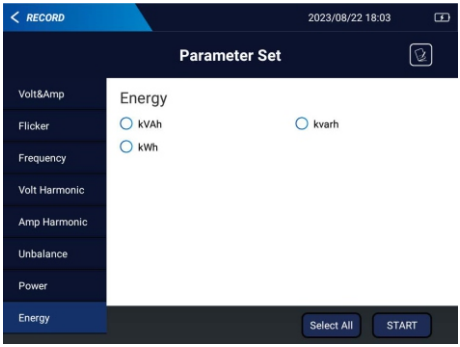

RECORD
2023/08/22 18:02
Parameter Set
Volt&Amp
Flicker
Frequency
Volt Harmonic
Amp Harmonic
Unbalance
Power
Energy
Frequency
Hz
Select All
START


RECORD
2023/08/22 18:02
Parameter Set
Volt&Amp
Flicker
Frequency
Volt Harmonic
Amp Harmonic
Unbalance
Power
Energy
Volt Harmonic
Vfund
Volt H11
Volt H25
Volt H38
THD%f
Volt H12
Volt H26
Volt H39
THD%r
Volt H13
Volt H27
Volt H40
Volt DC
Volt H14
Volt H28
Volt H41
Volt H1
Volt H15
Volt H29
Volt H42
Volt H2
Volt H16
Volt H30
Volt H43
Volt H3
Volt H17
Volt H31
Volt H44
Volt H4
Volt H18
Volt H32
Volt H45
Select All
START


RECORD
2023/08/22 18:03
Parameter Set
Volt&Amp
Flicker
Frequency
Volt Harmonic
Amp Harmonic
Unbalance
Power
Energy
Amp Harmonic
Afund
Amp H11
Amp H25
Amp H38
Amp THD%f
Amp H12
Amp H26
Amp H39
Amp THD%r
Amp H13
Amp H27
Amp H40
Amp DC
Amp H14
Amp H28
Amp H41
Amp H1
Amp H15
Amp H29
Amp H42
Amp H2
Amp H16
Amp H30
Amp H43
Amp H3
Amp H17
Amp H31
Amp H44
Amp H4
Amp H18
Amp H32
Amp H45
Select All
START


RECORD
2023/08/22 18:03
Parameter Set
Volt&Amp
Flicker
Frequency
Volt Harmonic
Amp Harmonic
Unbalance
Power
Energy
Unbalance
Unbal(%)
Select All
START





5.After selecting the corresponding settings, click on the "START" button in the bottom right corner to start recording.

6.After recording the time, you can click on the "RECORD" icon in the upper left corner to go back to the previous time, and click on the corresponding record file name to view the recorded data.

7.Swipe your finger from right to left on the record file and "Delete" will pop up, click "Delete" to delete the current file.

9-6.Harmonic Measurement

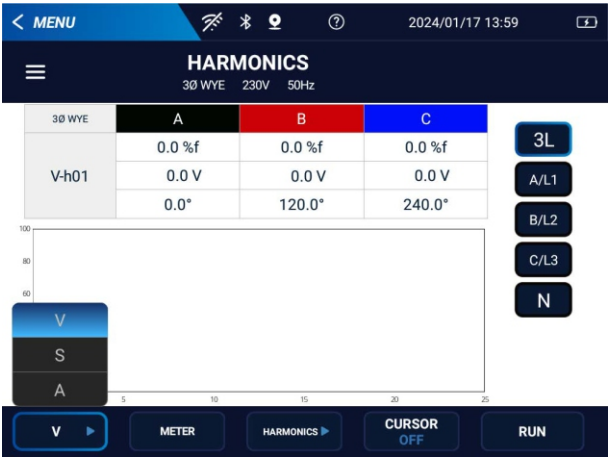
9-6-1.Harmonic Description

- Harmonic mode is used to display the effective value of harmonic voltage (Vrms), effective value current (Arms) (Relative to fundamental or total effective value) and power harmonics, total harmonic distortion, total harmonic distortion (THD), K coefficient current.
- Used to determine the harmonic current generated by non-linear load and to analyze the problems caused by various order harmonics (Neutral line, conductor, motor overheating and other cases).

9-6-2.Brief introduction of Harmonics

- Harmonics can be measured and recorded up to 50 harmonics and inter-waves, the related data, such as DC component, total harmonic distortion (THD) and K coefficient, are measured.
- Harmonics are the periodic distortion of the sine wave of voltage, current or power, waveforms can be regarded as combinations of various sine waves with different frequencies and amplitudes, the effect of these components on the whole signal is also measured.
- The readings can be expressed as a percentage of the fundamental, the percentage of all harmonics combined (RMS) or the RMS (RMS).
- The resulting values can be viewed in a bar chart, metering screen, or trend chart display.
- Harmonics are often caused by nonlinear loads, such as computer switching power supplies, televisions and drives of speed-regulating motors. Harmonics can cause transformers, conductors and motors to overheat.

9-6-3.Harmonic Bar Chart Description

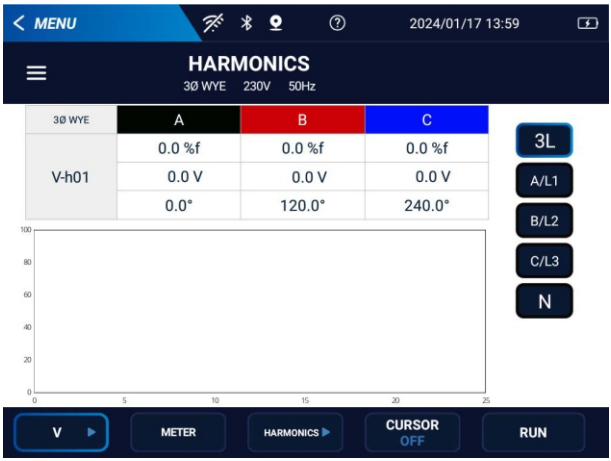


- The bar chart displays the percentage of the influence of each component related to the full signal on the full signal.
- The undistorted signal should show that the first harmonic (=fundamental) is at 100% and the other signals are at zero: This will not happen in practice, because there is always a certain amount of distortion resulting in higher harmonics.

- When a higher frequency component is added, the pure sine wave will also be distorted, distortion is expressed as a percentage of total harmonic distortion (THD).
- The percentage of DC component and K coefficient can also be displayed in the bar chart screen.
- The K coefficient is used to measure current and power and is displayed on the meter head of the screen.
- The K coefficient is a number that quantifies the potential loss of the transformer due to harmonic current, the influence of higher-order harmonics on K-coefficient is greater than that of lower-order harmonics.

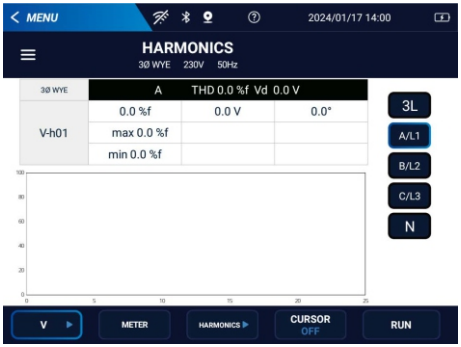
9-6-4.Bar Graph Interface of Harmonics

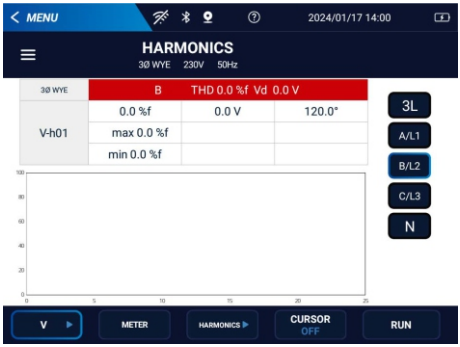
1.3Ø WYE harmonic bar chart

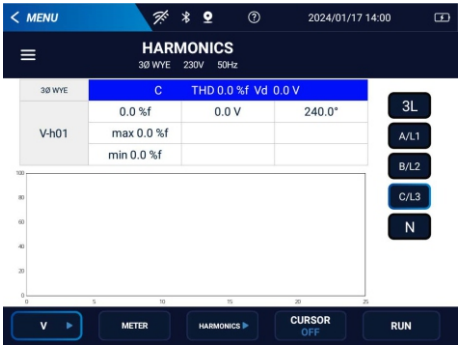


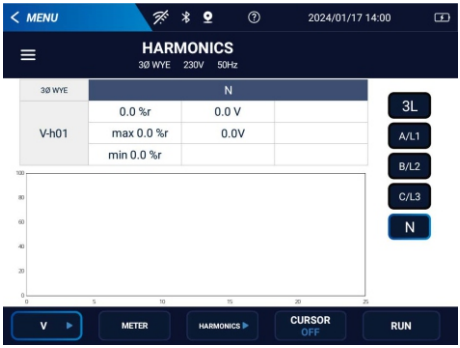
Description:

V-h01	Harmonic serial number
%f	Harmonic level, reference is fundamental RMS value
%r	Harmonic level, reference is the total RMS value
V	The RMS phase voltage corresponding to the harmonic
----°	Voltage phase angle
Max-Min	Corresponding to the maximum and minimum level of harmonics, when the harmonic sequence number changes or the user presses the confirmation key, the maximum and minimum values are reset.
THD	Total harmonic distortion
Vd	Distortion voltage RMS value

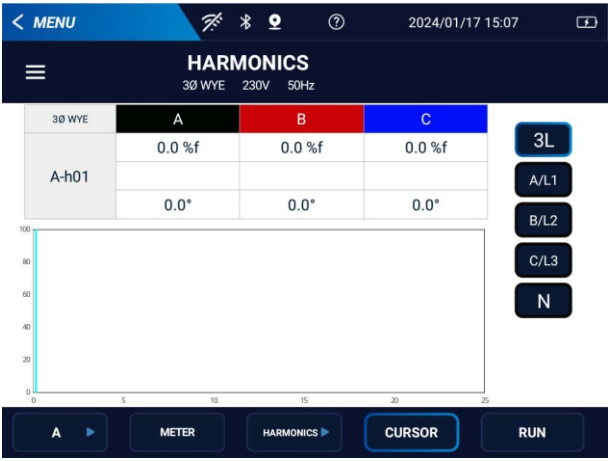






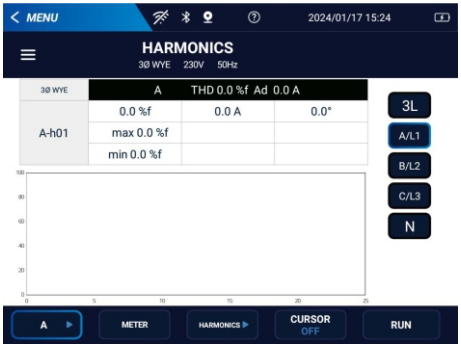


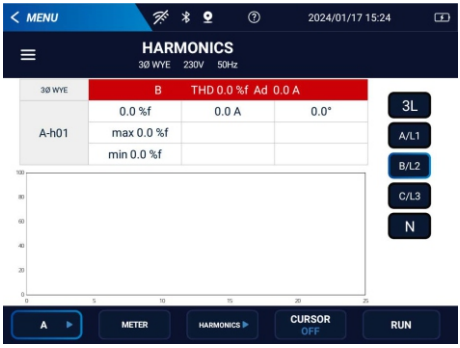
2.3Ø WYE-A (Current) harmonic bar chart

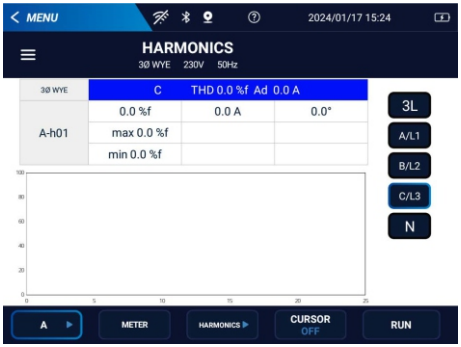


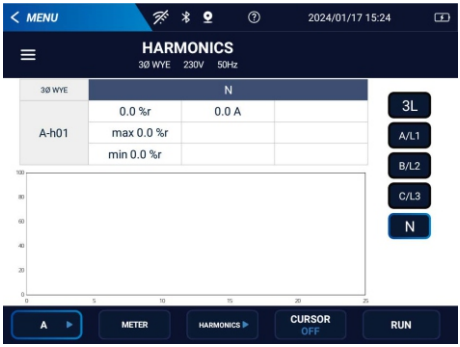
Description:

A-h01	Harmonic serial number
%f	Harmonic level, reference is fundamental RMS value
%r	Harmonic level, reference is total RMS value
A	RMS value corresponding to harmonic current
----°	Current phase angle
Max-Min	Corresponding to the maximum and minimum level of harmonics, when the harmonic sequence number changes or the user presses the confirmation key, the maximum and minimum values are reset
THD	Total harmonic distortion
Ad	Distortion current RMS value
A	The current RMS value corresponding to the harmonic
K	K coefficient, which is used to measure current and power, is a number that quantifies the potential loss of transformer due to harmonic current

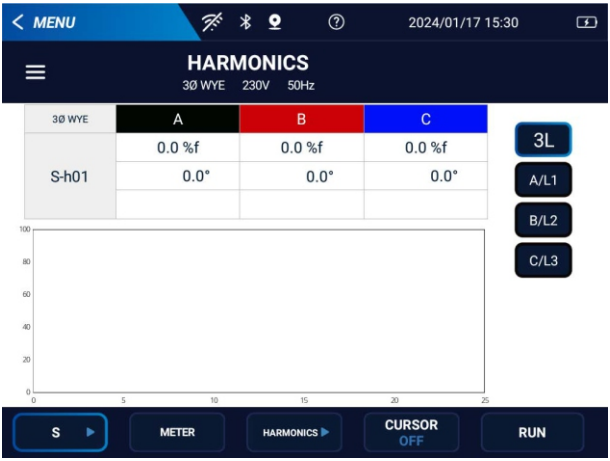






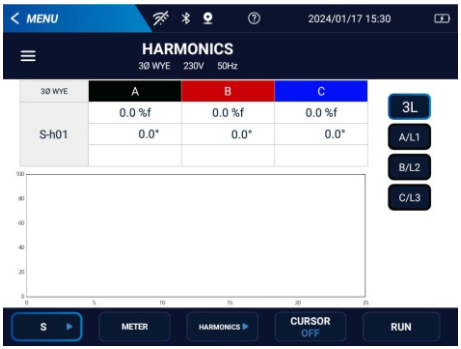


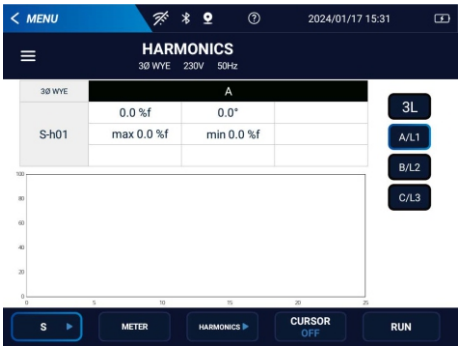
3.3Ø WYE -S(apparent power) harmonic bar chart

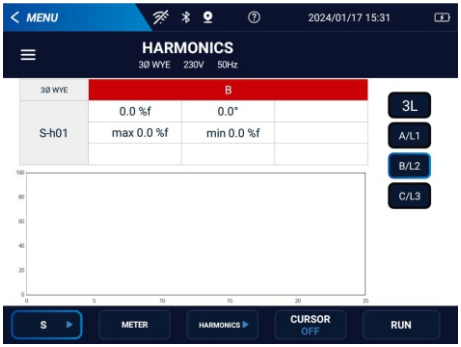


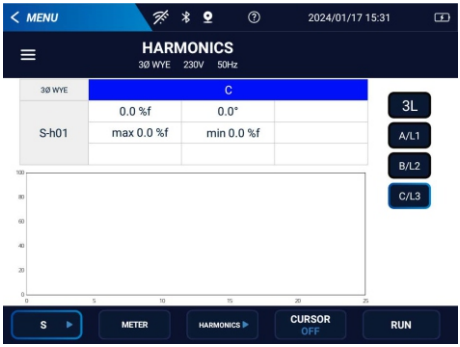
Description:

S-h01	Harmonic serial number
%f	Harmonic level, reference is fundamental RMS value
%r	Harmonic level, reference is the total RMS value
----°	The phase shift of voltage harmonics relative to the corresponding order current harmonics.
Max-Min	Corresponding to the maximum and minimum level of harmonics, when the harmonic sequence number changes or the user presses the confirmation key, the maximum and minimum values are reset



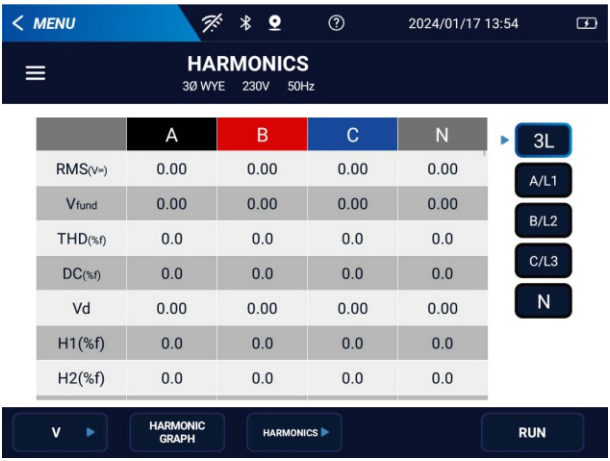






4.3Ø WYE Harmonic Meter List-Voltage Mode

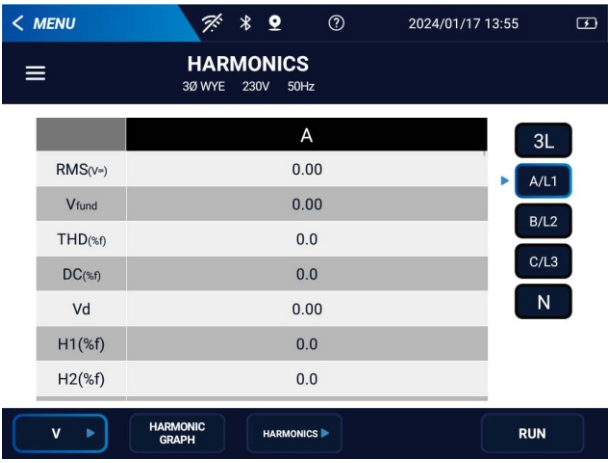
• 3Ø WYE Voltage meter measurement interface-3L mode (total 50th harmonics):



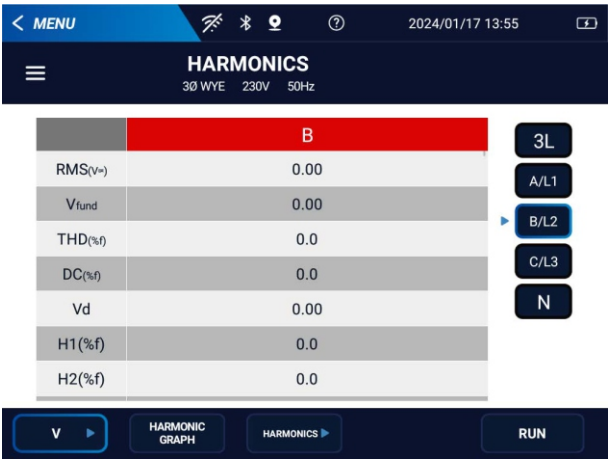
Description:

RMS	Corresponds to the phase voltage RMS value of harmonics
Vfund	Fundamental voltage
+000 °	The phase shift relative to the fundamental wave
THD	Total harmonic distortion
% f	Harmonic level, reference is fundamental RMS value
% r	Harmonic level, reference is the total RMS value.
H1 (% f)	Where 1 represents the first harmonic
DC	DC component

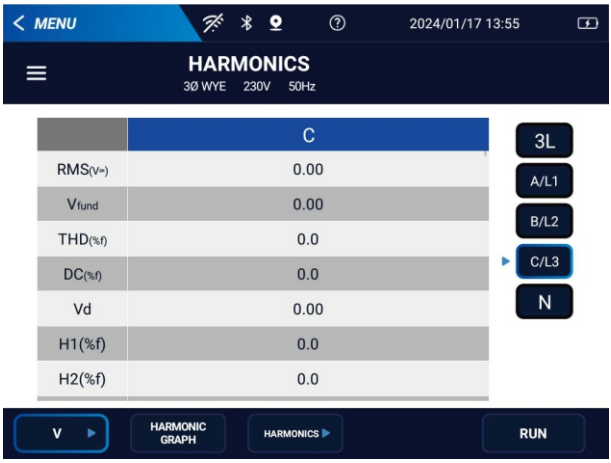
• 3Ø WYE Voltage meter Measurement Interface-L1 Mode



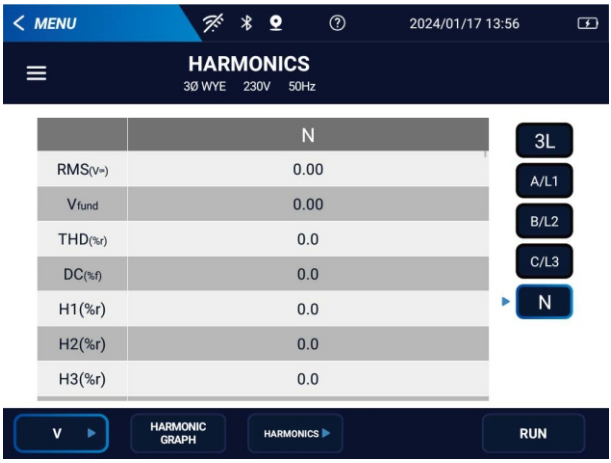
• 3Ø WYE Voltage meter Measurement Interface-L2 Mode



• 3Ø WYE Voltage meter Measurement Interface-L3 Mode

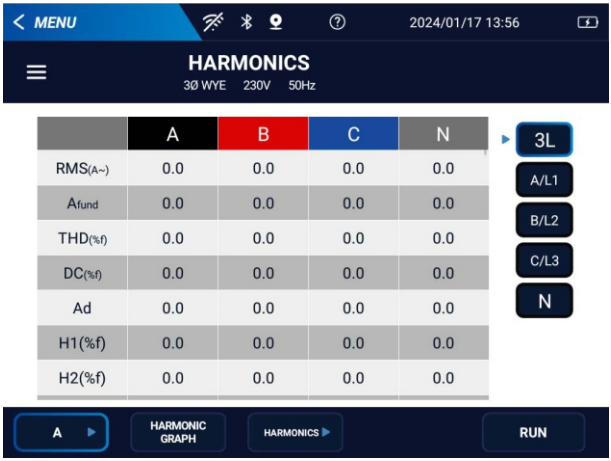


• 3Ø WYE Voltage meter Measurement Interface-N Mode

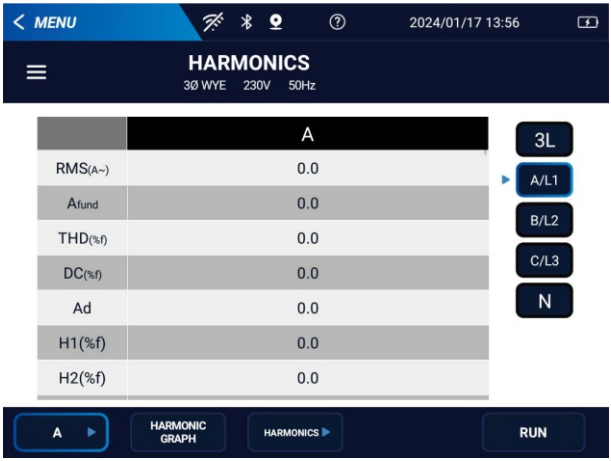


5.3Ø WYE harmonic metering list diagram-current mode

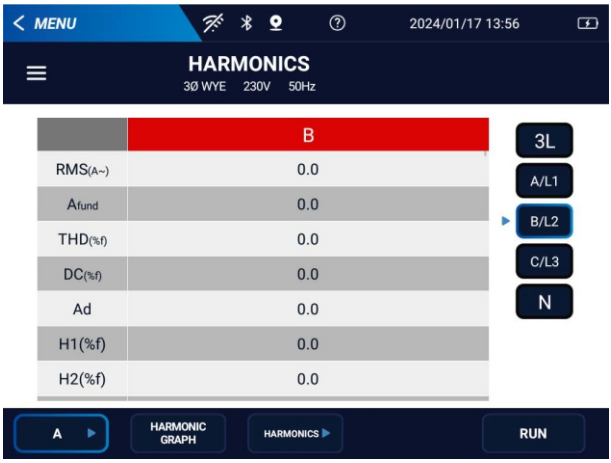
• 3Ø WYE Current meter measurement interface-3L mode



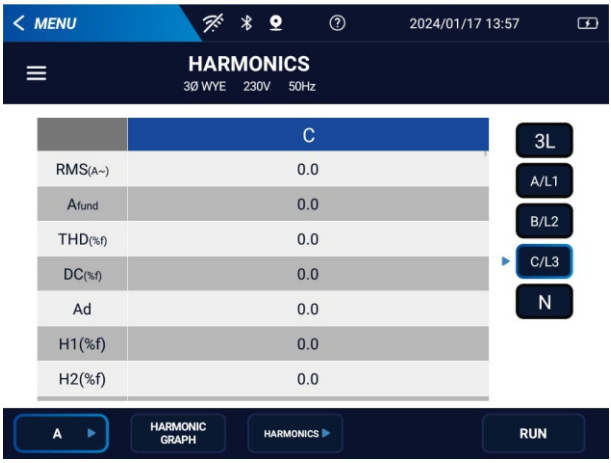
• 3Ø WYE Current meter measurement interface-L1 mode



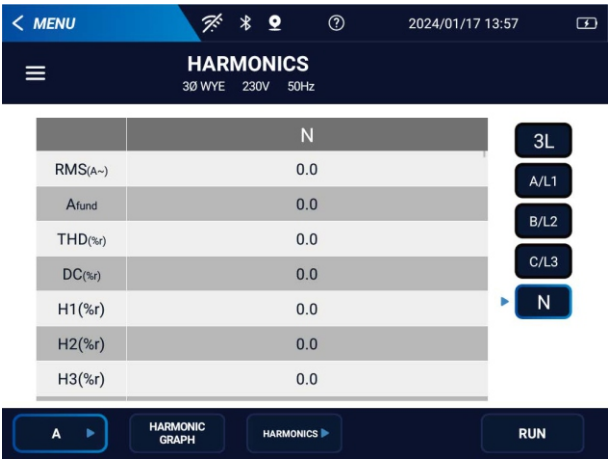
- 3Ø WYE current meter measurement interface-L2 mode



- 3Ø WYE Current meter measurement interface-L3 mode



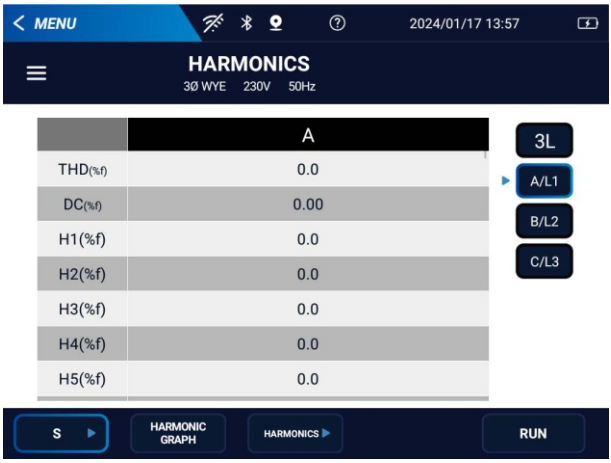
• 3Ø WYE Current meter measurement interface-N mode



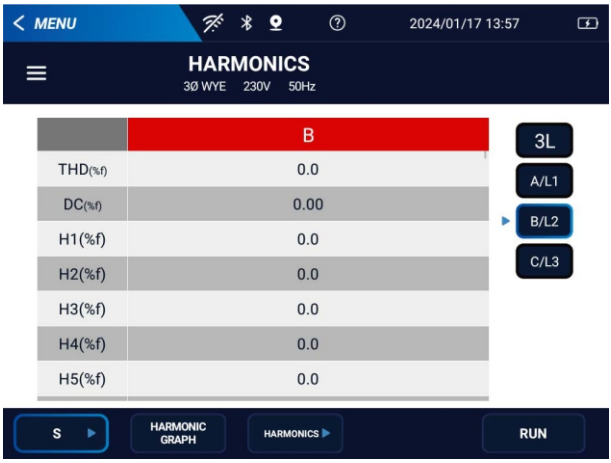
6.Table diagram of 3Ø WYE harmonic metering-apparent power S mode

• 3Ø WYE Apparent power-meter measurement interface-3L mode

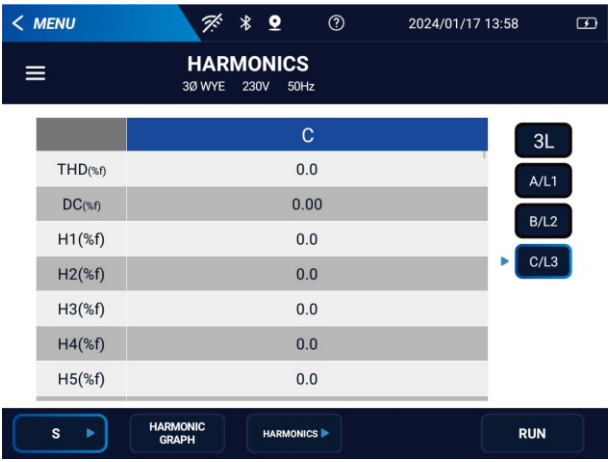
- 3Ø WYE Apparent power-meter measurement interface-L1 mode



- 3Ø WYE Apparent power-meter measurement interface-L2 mode



- 3Ø WYE Apparent power-meter measurement interface-L3 mode

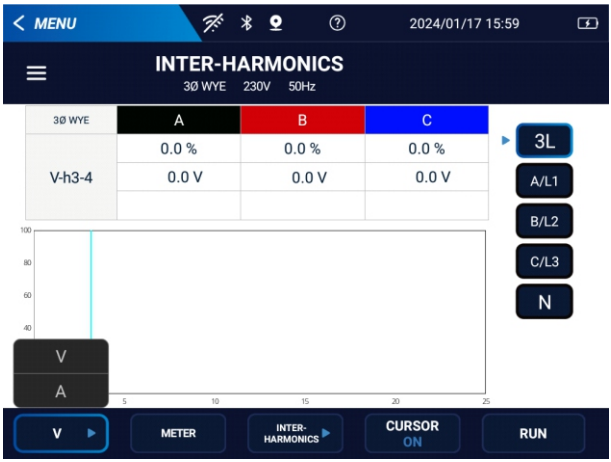


9-7.Interharmonic

9-7-1.Introduction

- With the widespread application of nonlinear devices such as power electronic components in the power system, the resulting harmonics have become increasingly serious in polluting the power grid, the issue of harmonics has attracted widespread attention, the usual harmonics generally refer to components whose frequency is an integer multiple of the power frequency (fundamental frequency), while components whose frequency is not an integer multiple of the fundamental frequency are called interharmonics.
- Interharmonics are often caused by large voltage fluctuations or impulsive nonlinear loads, all nonlinear fluctuating loads, such as arc welding, welding machines, various variable frequency speed control devices, synchronous series speed control devices, and induction motors, are sources of interharmonics, Power carrier signals are also a type of interharmonics.
- The characteristic of harmonic sources is to amplify voltage flicker and interference, affecting the TV screen, causing vibration and abnormalities of induction motors, for passive filter circuits composed of capacitors, inductors, and resistors, interharmonics may be amplified, and in severe cases, the filter may not function properly due to harmonic overload, and even cause damage, the impact and harm of interharmonics are equivalent to the impact and harm of integer harmonic voltages.

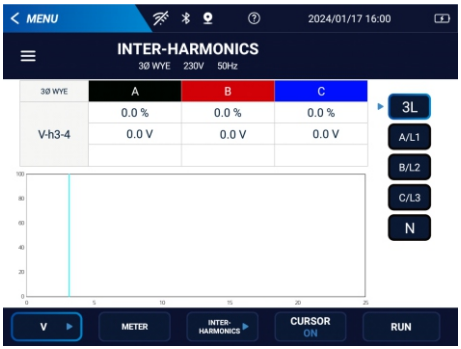
9-7-2.Interharmonic Voltage Bar Graph Interface

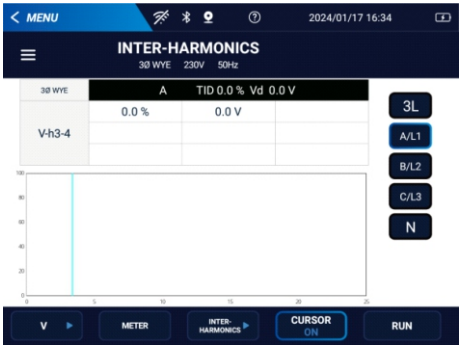


Description:

V-h3-4	The serial number of interharmonics represents the frequency of interharmonics between 3 and 4 times the fundamental frequency, for example, when the fundamental frequency is 50Hz, it represents the frequency of interharmonics within the range of 150Hz to 200Hz
%	Represents the ratio of the value of interharmonics to the fundamental voltage
V	The voltage value representing interharmonics

3QWYE-V Interharmonic voltage bar graph interface.



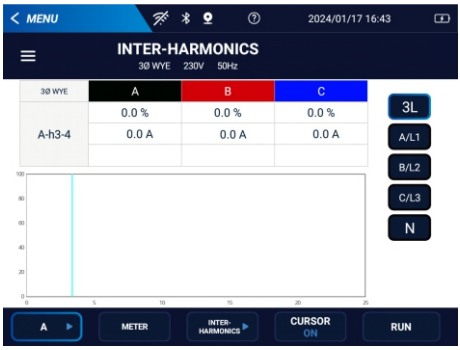


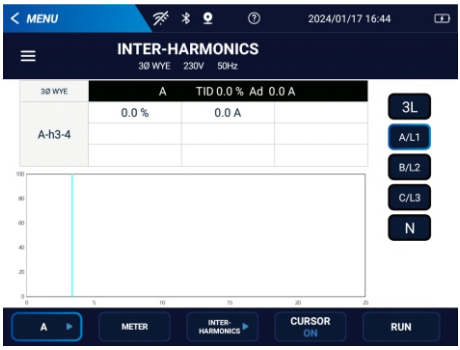
9-7-3.Inter-Harmonic Current Bar Graph Interface

Description:

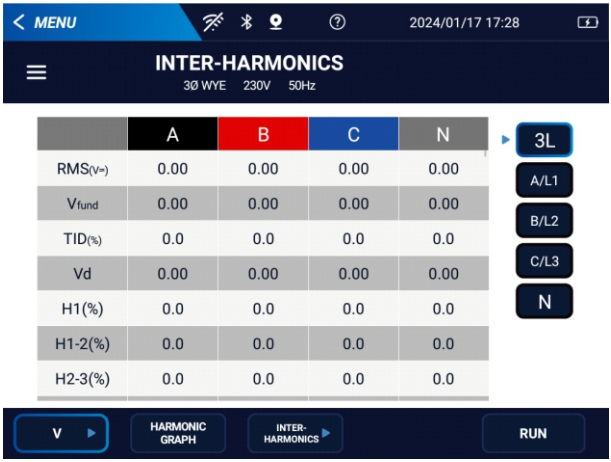
A-h3-4	The serial number of interharmonics represents the frequency of interharmonics between 3 and 4 times the fundamental frequency, for example, when the fundamental frequency is 50Hz, it represents the frequency of interharmonics within the range of 150Hz to 200Hz
%	The ratio of the value of interharmonic to the fundamental current represents the percentage value of interharmonic current at the cursor position when the cursor is opened
A	The representative is the current value of the interharmonics, and when the cursor is opened, it is the current value of the interharmonics at the cursor position

3QWYE-A Inter-harmonic current bar graph interface.



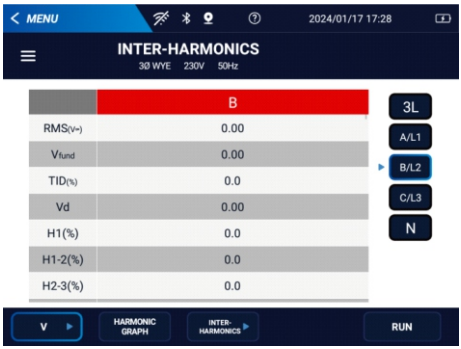


9-7-4.Interharmonic Voltage Table Graph Interface

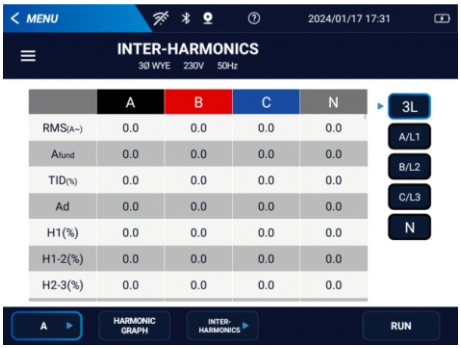


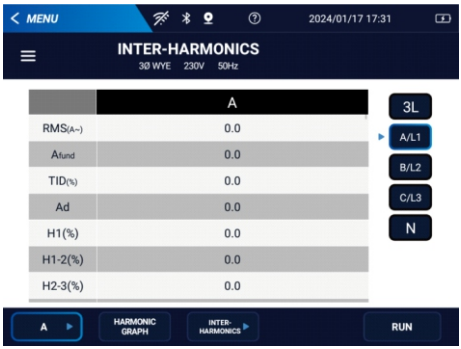
Description:

RMS	The true effectiveness of voltage
Vfund	Fundamental voltage value
TID (%)	The percentage ratio of interharmonics to fundamental waves (total interharmonic percentage ratio)
H1-2 (%)	The percentage ratio of the interharmonic sequence number between 1 and 2 times the fundamental frequency, for example, when the fundamental frequency is 50Hz, it represents that the interharmonic frequency is within the range of 50Hz to 100Hz
%	The ratio of the value of interharmonics to the fundamental voltage represents the current value of interharmonics at the cursor position when the cursor is opened
V	Represents the voltage value of interharmonics, which is the voltage value of interharmonics at the cursor position when the cursor is opened



9-7-5.Inter Harmonic Current Table Diagram





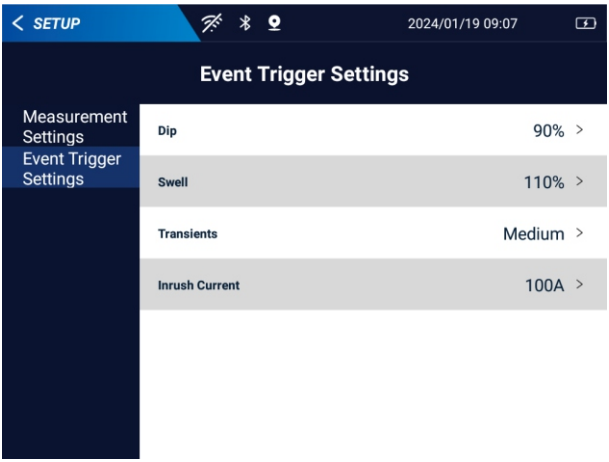
9-8.Inrush Current

9-8-1.Brief Introduction

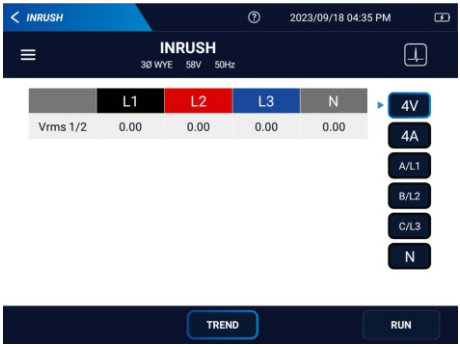
- The analyzer can capture the Inrush Currents, the inrush current is the impulse current that occurs when there is a high load or low impedance load on the line.
- Generally speaking, when the load reaches normal working conditions, the current will stabilize over a period of time, for example, the starting current of the induction motor can be as high as ten times the normal working current.
- Inrush current is a "single" mode in which current and voltage trends are recorded when a current event (Trigger condition) occurs.
- When the current waveform exceeds the adjustable limit, a inrush event occurs.
- The inrush trend chart gradually forms on the right side of the screen.
- Pre-trigger messages allow you to see what is happening before a inrush occurs.

1.Settings before inrush current measurement

- Use the arrow keys in the start menu to adjust the trigger limit: Expected inrush time, Nominal current, Threshold and Lag.
- The maximum current determines the vertical height of the current display window.
- The threshold is the current value captured by the trigger trend chart.
- The screen header displays the valid values for all valid values (RMS) during the inrush time.
- If the Cursor starts, the (RMS) measurement of the valid value of the cursor position can be displayed.
- The metering (Meter) screen displays the half-cycle RMS Vrms (RMS) and the half-cycle RMS current (RMS½) of the half-cycle RMS voltage (RMS½) and half-cycle RMS current (RMS).
- The time value set is higher than the expected inrush duration to ensure that the entire event process can be captured, the duration can be set between 1 and 45 minutes.
- The inrush current is triggered when the half-cycle RMS current (Arm½) of one of the phases is higher than the threshold.
- The inrush current ends when the half-cycle effective value current (Arms½) of the phase is below the threshold minus the lag.
- The trend chart (Trend) screen uses markers to show the duration of the inrush and displays time readings.
- The inrush value is the valid value (RMS), between markers and is measured synchronously at each phase.

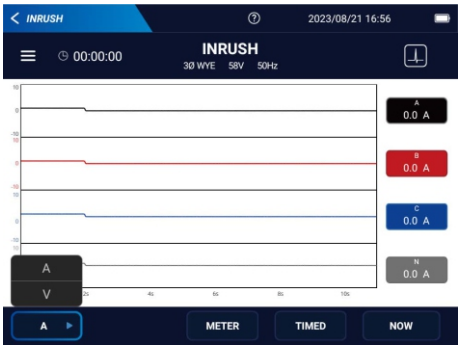


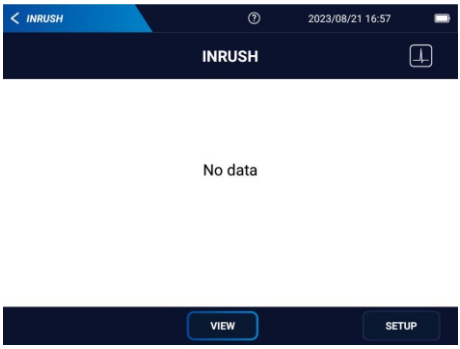
2.The meter list of 3-phase 5-wire inrush current is as follows:



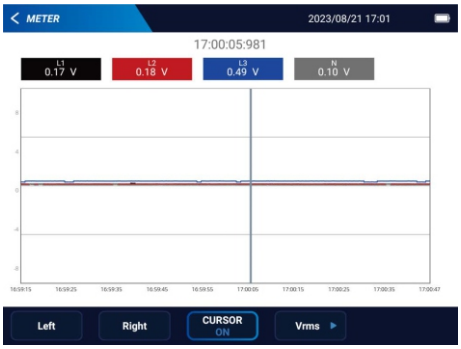
3.3QWYE wiring mode, inrush current waveform mode:

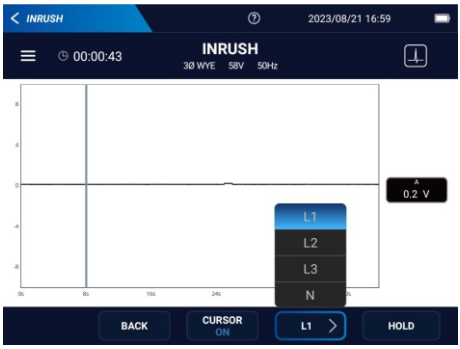
• Inrush current mode





• Inrush voltage mode



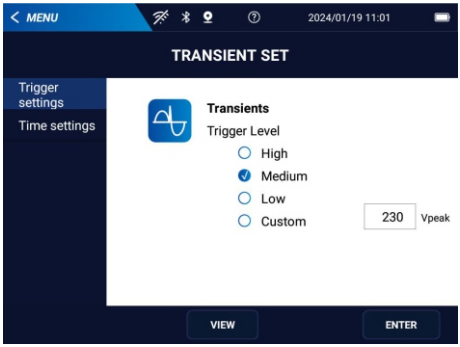


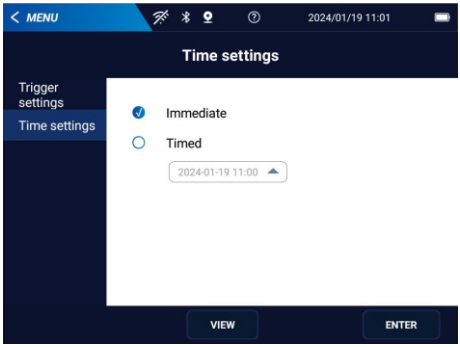
9-9.Transient

9-9-1.Brief Introduction of Transient

- The analyzer can capture waveforms with high resolution under various interference conditions.
- The analyzer can provide transient diagrams of voltage and current waveforms at the exact point in time at which the interference occurs, this allows you to view the waveforms in the event of a sudden drop, inrush, interruption, current inrush and transient.
- In transient (Transients) mode, the analyzer uses the special settings of its input circuit to capture signals with amplitudes up to 6 kilovolts.
- A transient is a fast peak signal on a voltage (or current) waveform, because the transient has very high energy, it can affect or even damage sensitive electronic equipment.
- The transient (Transients) screen looks similar to the oscilloscope waveform, but its vertical span is amplified so that the voltage peak signal superimposed on the 60 or 50 Hz sine wave can be observed.
- Whenever the voltage (or RMS current) exceeds the adjustable limit, the analyzer captures a waveform, maximum of 9999 events can be captured, the sampling rate of transient detection is 200kS/s.
- The Transients also has a metering mode that displays Half-cycle RMS voltage, Half-cycle RMS current (Arms ½) and Frequency, there is also a list of events.

9-9-2.The transient settings are as follows:



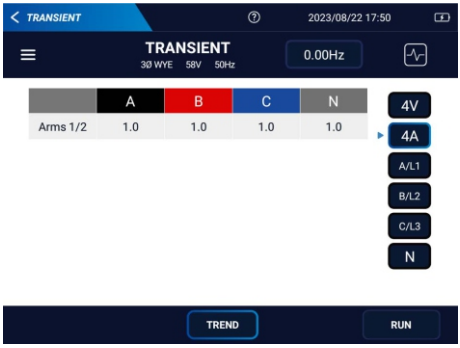


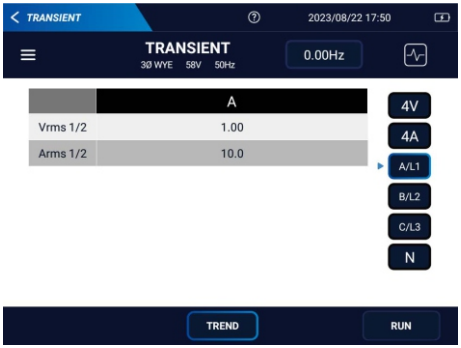
9-9-3.The Transient Waveform Shows

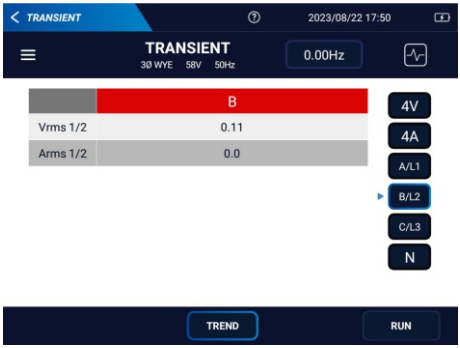
- Transient voltage mode

• Transient current mode

• Transient meter display







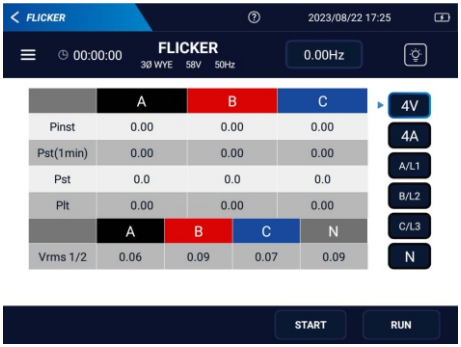
9-10.Flicker

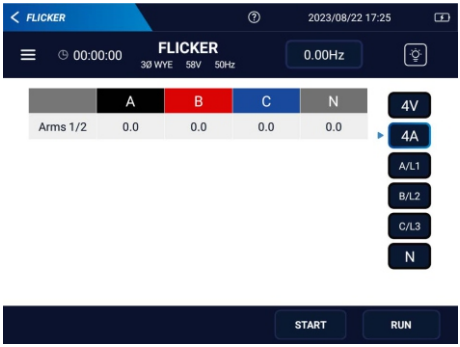
9-10-1.Brief Introduction

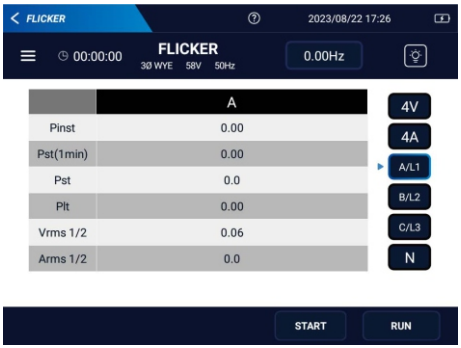
- It quantifies the fluctuation of lamp brightness caused by the change of power supply voltage, the algorithm used for the measurement conforms to the EN61000-4-15 standard and is based on the perceptual model of the naked eye/brain sensory system.
- The analyzer converts the duration and amplitude of the voltage change into the "discomfort factor" caused by the flicker of a 60W bulb, the larger the flicker reading, it means that most people will find the brightness change unpleasant.
- The voltage change is much smaller, the measurements are optimized on bulbs powered by 120V/60Hz or 230V/50Hz.
- Flicker is characterized by phase by the parameters shown on the metering screen.
- The relevant trend chart screen shows changes in all measurements in the metering (Meter) screen.

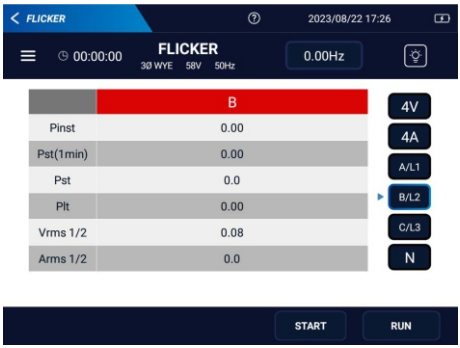
9-10-2. Flicker features include instantaneous flicker Pinst, short-term severity Pst (tested within 1 minute for fast feedback), short-term severity Pst (tested within 10 minutes) and long-term severity Plt (tested within 2 hours). The relevant data measured also include half-cycle RMS Vrms (RMS½), half-cycle RMS current (Arms½), and frequency.

9-10-3.3Q WYE meter list mode







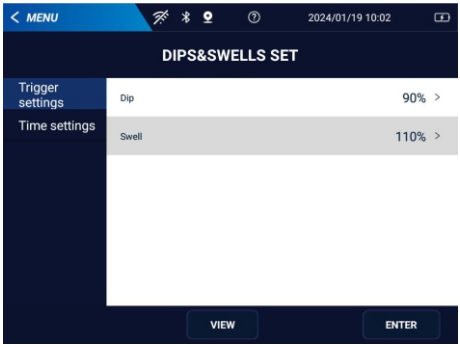


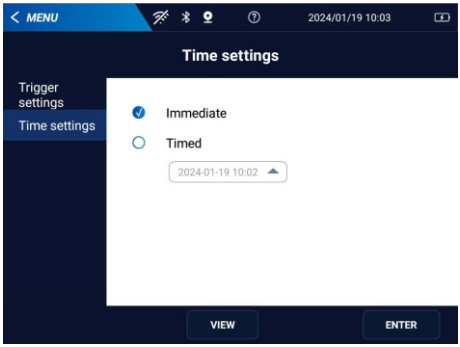
9-11.Dips and Swells

9-11-1.Brief Introduction

- Dips & Swells records sags, disturbances, rapid voltage changes and spikes.
- Dips & Swells are rapid changes in the normal voltage, the range of variation can be as high as 10 to 100 times the voltage, as defined by EN61000-4-30, its duration ranges from half a cycle to several seconds.
- The analyzer allows you to select a nominal or adjustable reference voltage, the adjustable reference voltage uses filtered measurements with an one-minute time constant.
- The voltage drops in the process of sag and rises in the process of sudden rise.
- In a three-phase system, the sag begins when the voltage of one or more phases falls to the sag threshold, and stops when the voltage of all phases is equal to or greater than the sag threshold plus lag.
- The trigger conditions of sudden drop and sudden rise are threshold and lag, sudden drops and sharp rises are characterized by duration, amplitude and occurrence time.

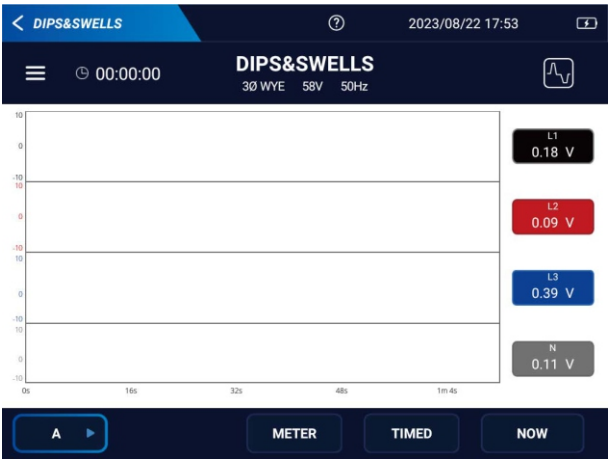
9-11-2.Waveform Settings





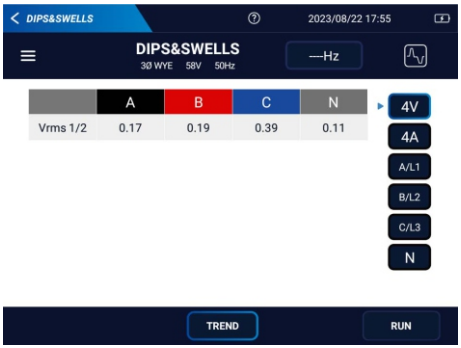
1.Waveform:

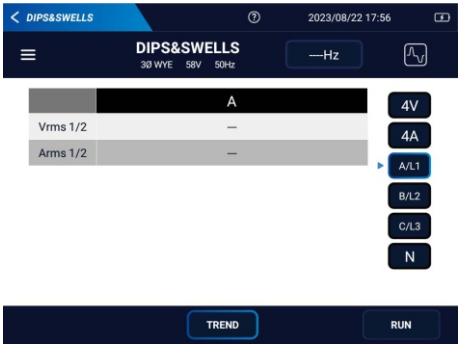
- Dips & Swells current mode:

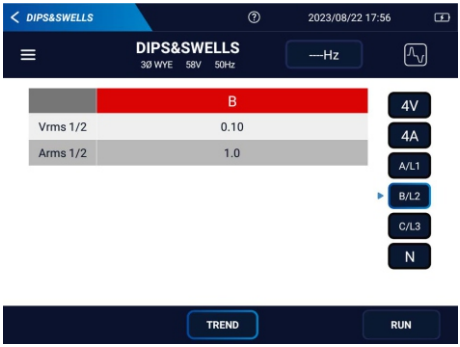


• Dips & Swells voltage mode:

2.Dips & Swells Meter list:







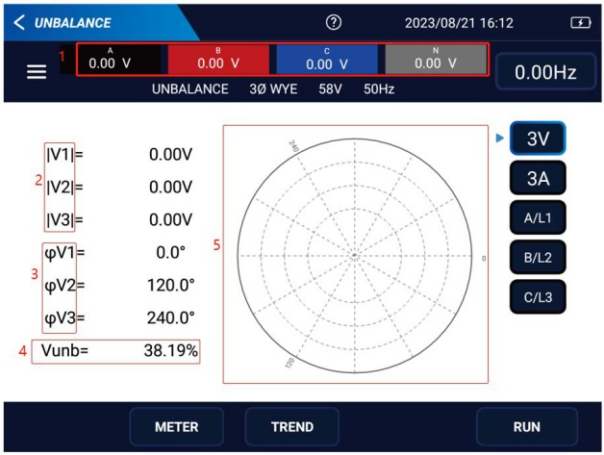
9-12.Unbalanced

9-12-1.Brief Introduction

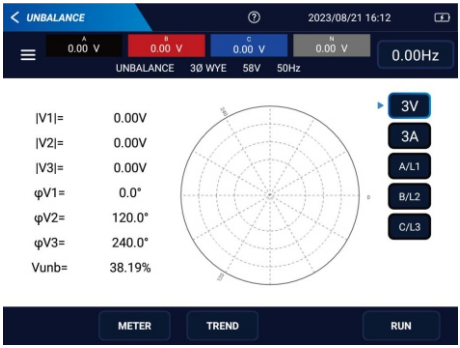
- Unbalanced shows the phase relationship between voltage and current, the measurement results are based on the fundamental frequency component of the symmetrical component method.
- In a three-phase power system, the phase shift between voltage and current should be close to 120°.
- The unbalanced mode provides a metering screen, related trend chart display and phasor display, as shown below:

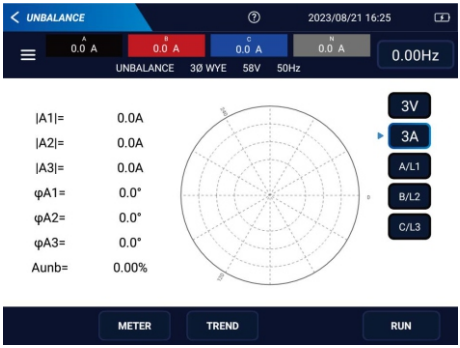
Description:

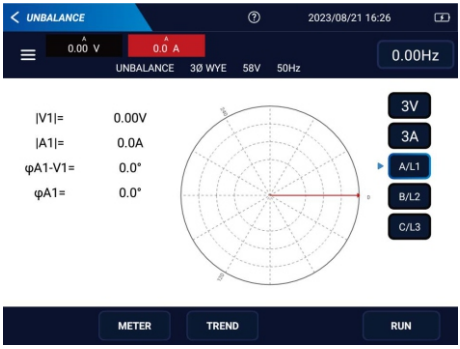
1-RMS Effective Value Vrms
2-Fundamental Voltage Vfund
3-The phase of the Voltage of L1~L3
4-Unbalanced Value
5-Phase Diagram

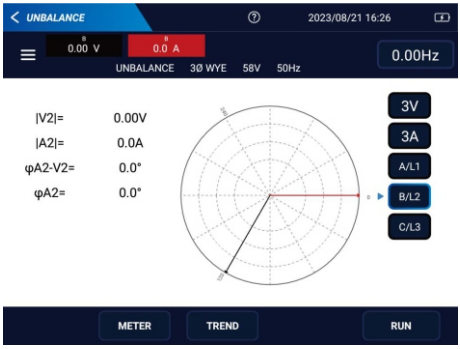


9-12-2.3Ø WYE Vector Graph

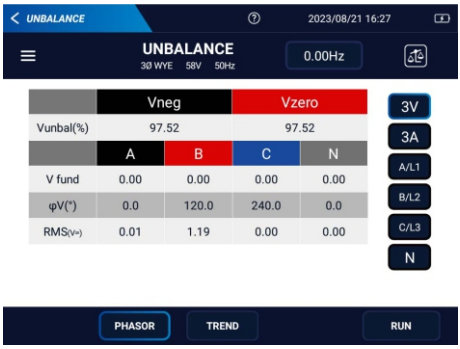


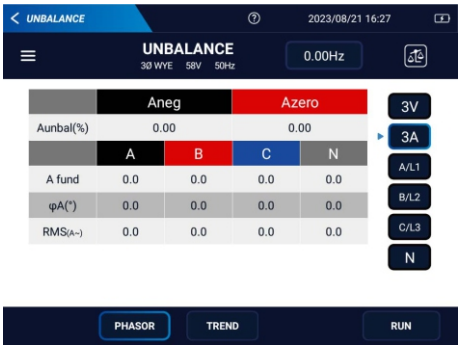


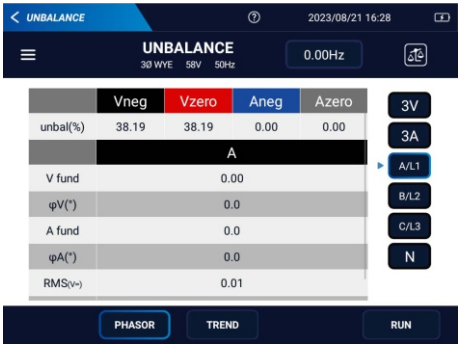


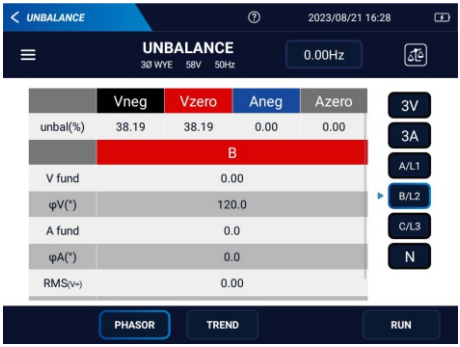


9-12-3.3Ø WYE Meter List of Figure









9-13.Gallery

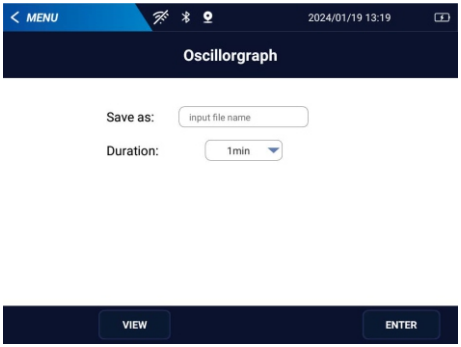
- Press the "SAVE SCREEN" button of the instrument to save the picture of the current screen to the memory card and the picture after screenshot can be viewed in the "Gallery".
- It can well allow users to analyze the performance of the power grid.

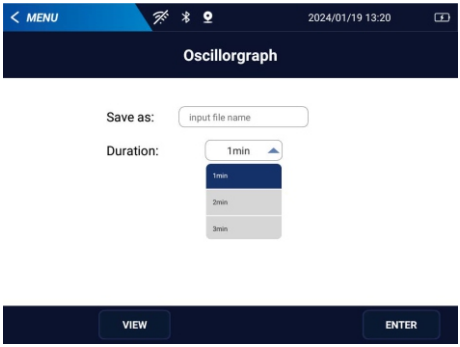
9-14.Wave Recording

Introduction: Record abnormal waveforms in the power grid, which can record voltage and current waveforms, facilitating user diagnosis and post accident data analysis.

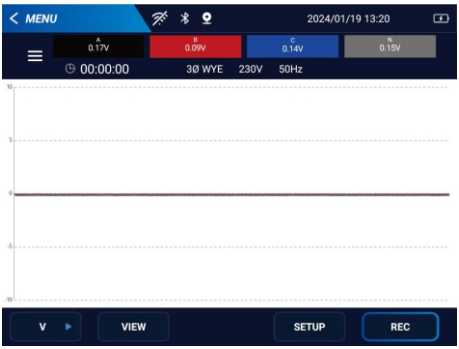
9-14-1.Recording Settings

Set the name and duration of the record, as shown in the following figure:

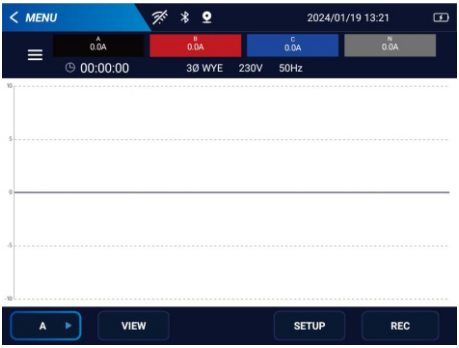




9-14-2.Recording Voltage

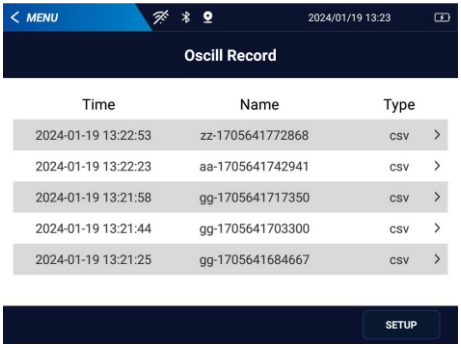


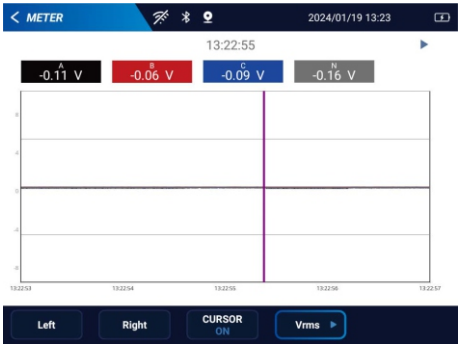
9-14-3.Recording Current



9-14-4.View Waveform Recording

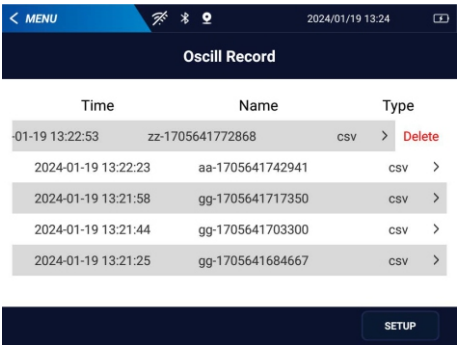
Clicking on the record file to be viewed in "**Wave Recording**" will open it, as shown in the following figure:



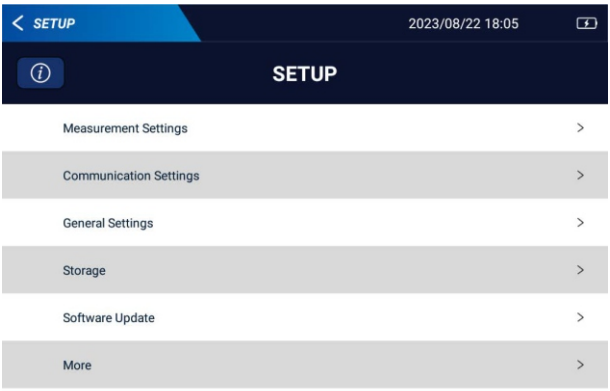


9-14-5.Delete Recorded Waveforms

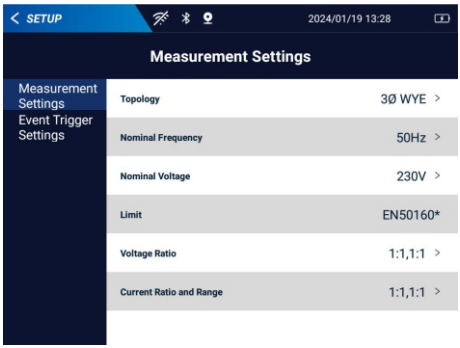
Align the recording file to be deleted and swipe your finger from right to left, the interface will display the "**Delete**" text, click on the "**Delete**" text to delete it.

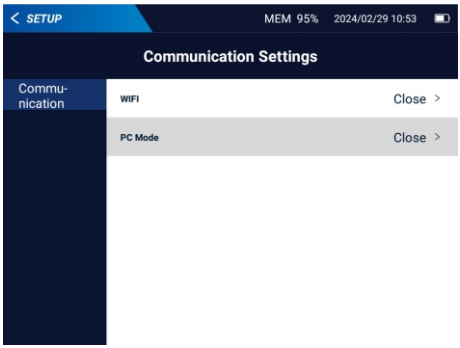


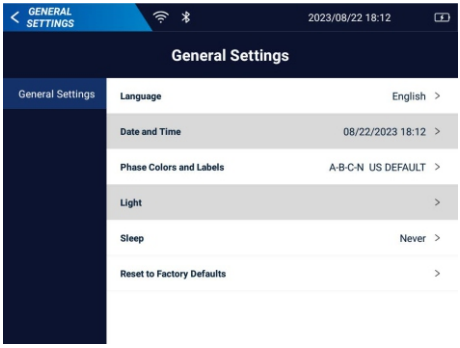
9-15.User Settings

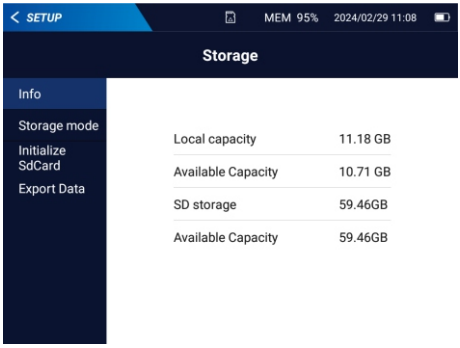


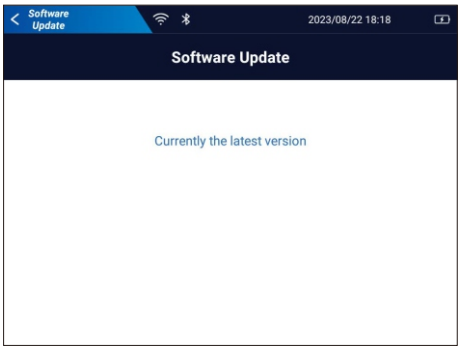
In the user settings interface, users can set the relevant operations in the following figure.










Software Update
2023/08/22 18:18
Software Update
Currently the latest version


SETUP
2023/08/22 18:19
MORE
Mobile phone APP
Scan the QR code to download the
CEM Smart Power APP
PC Software
Scan the QR code to download the
Power quality analysis software

10.Maintenance and Maintenance

- During the use of this product, if there are some abnormalities, please do not disassemble the instrument privately if there is high pressure in the instrument.
- Please contact our after-sales service point.

11.Accessories

- Trolley case
- Lithium battery, battery cell 18650 Lithium battery 2 series 2 in parallel 7.4V 5200mAH x 2pcs
- Pen type test probe engraved CAT III 1000V x 5pcs
- Crocodile clip CAT III 1000V x 5pcs
- Voltage input test line, flat cable of 4 plugs (CAT III 1000V)
- Voltage input test line, single (CAT III 1000V)
- Magnetic Absorption Test Head * Green 1 (346U) * Black 1 * Red 3
- Hanging tape
- Instruction manual
- USB cable, 3FT Type-C
- Packaging accessories, SD card (64G), class10
- Power adapter 15V/2.4A DC plug US/EU/UK/AU replaceable plug
- Flexible coil (3000A) , perimeter 535mm, inner diameter 150mm, 3000A x 4pcs

Optional Accessories

- Flexible coil (6000A) , perimeter 880mm, inner diameter 250mm, 6000A x 4pcs
- Flexible coil (10000A) , perimeter 880mm, inner diameter 250mm, 10000A x 4pcs

12.Product Performance Index

Function			Measuring Range	Resolution	Precision
Voltage/ Current/ Frequency	RMS Voltage (Vrms) (AC+DC)		1...1000V phase to neutral	0.1V	±0.1% of nominal voltage (1)
	Peak Voltage (Vpk)		1...1400Vpk	1V	5% of nominal voltage
	Half Cycle RMS Voltage (Vrms½)		1...1000V Phase to neutral line	0.1V	±0.2% of nominal voltage
	Fundamental Voltage (Vfund)		1...1000V Phase to neutral line	0.1V	±0.1% of nominal voltage
	Voltage Peak Coefficient (CF)		1.0... >2.8	0.01	± 5%
	Effective Current (Arms) (AC only)	ZRC150	5...3000A (AC only)	0.1A	±0.5% ±5 counts (2)
		SRC250	10...6000A (AC only)	1A	
		SRC250-50mV	20...10000A (AC only)	1A	
	Peak Current (Apk)	ZRC150	4200 Apk	1 Arms	± 5%
		SRC250	8400 Apk		
		SRC250-50mV	14000 Apk		
	Current Peak Coefficient (CF)		1...10	0.01	± 5%
	Arms½	ZRC150	5...3000A (AC only)	0.1A	± 1% ± 10 counts
		SRC250	10...6000A (AC only)	1A	
		SRC250-50mV	20...10000A (AC only)	1A	
	Fundamental Current (Afund)	ZRC150	5...3000A (AC only)	0.1A	±0.5% ±5 counts
		SRC250	10...6000A (AC only)	1A	
		SRC250-50mV	20...10000A (AC only)	1A	
	Frequency (Hz)		42.5 to 57.5Hz/51 to 69Hz	0.001Hz	±0.01Hz

(1) The nominal voltage is in the range of 100V to 690V; Also known as Udin.

(2) ±0.5% ±5 counts: Accuracy of the flexible coil near the center.

Function			Measuring Range	Resolution	Precision
Power	Power (VA, Var)	ZRC150	Max 600MW	0.01kW	±1% ±10 counts
		SRC250	Max 1200MW		
		SRC250-50mV	Max 2000MW		
	The Power Factor (Cos Ø/DPF)		0...1	0.001	±0.1% at nominal load condition
Electricity	Power (VA, Var)		Depends on clamp scaling and nominal voltage		±1% ±10 counts
	Energy Loss		Depends on clamp scaling and nominal voltage		±1% ±10 counts, Excluding line resistance accuracy
Harmonic	Harmonic order (n)		DC, 1..50 grouping: Harmonics are grouped according to IEC61000-4-7		
	Voltage %f		0.0...100.0%	0.1%	±0.1% ±n x 0.1%
	Voltage %r		0.0...100.0%	0.1%	±0.1% ±n x 0.4%
	Absolute Voltage		0.0...1000V	0.1V	±5% (4)
	Total Harmonic Distortion of Voltage (THD)		0.0...100.0%	0.1%	±2.5%
	Current %f		0.0...100.0%	0.1%	±0.1% ±n x 0.1%
	Current %r		0.0...100.0%	0.1%	±0.1% ±n x 0.4%
	Absolute Current		3.0 ... 3000A	0.1A	±5% ±5 counts
	Total Harmonic Distortion of Current (THD)		0.0 ... 100.0%	0.1%	±2.5%
	Power %f or %r		0.0 ... 100.0%	0.1%	±n x 2%
	The Absolute Power		Depends on clamp scaling and nominal voltage		±5% ±n x 2% ±10 counts
	Total Harmonic Distortion of Power (THD)		0.0 ... 100.0%	0.1%	±5%
	Phase		-360°...0°	1°	±n x 1°

(4) The nominal voltage is in the range of 100V to 690V; Also known as Udin.

Function		Measuring Range	Resolution	Precision
Inter-Harmonic order	Inter-Harmonic order (n)	1...50 Grouping: Interharmonic subgroups according to IEC 61000-4-7		
	Voltage	100%/1000V	0.1%/0.1mV	>1% nominal voltage[2]: of reading ±2.5% <1% nominal voltage[1]: ±0.025 nominal voltage[2]
	Current	100%	0.1A (ZRC150, AC Only)	>3% nominal Current: of reading ±2.5%
			1A (SRC250\ SRC250- 50mV, AC Only)	<3% nominal Current: Nominal Current ±0.15%

(1) AC voltage resolution reaches 0.01V, DC voltage reaches 0.1V.

(2) The nominal voltage is in the range of 100V to 690V; Also known as Udin.

(3) ±0.5% ±5 counts: Accuracy of the flexible coil near the center.

Function		Measuring Range	Resolution	Precision
Flicker	Plt, Pst, Pst (1 minute), Pinst	0.00...20.00	0.01	±5%

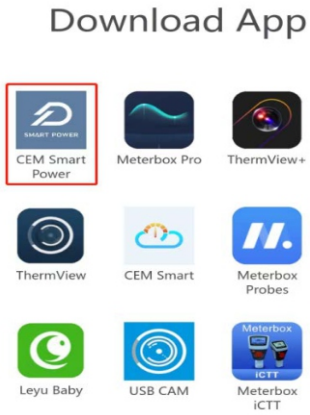
Unbalanced	Voltage %	0.0...20.0%	0.1%	±0.1%
	Current %	0.0...20.0%	0.1%	±1%

Function		Measuring Range
Trend Chart Record	Methods	Automatically record the minimum, maximum and average values relative to time for all three phase and neutral line readings displayed simultaneously.
	Sampling	Continuous sampling of 5 readings per second per channel, up to 100/120 readings per second per channel for half cycle values and PINST.
	Recording Time	1 hour up to a maximum of 1 year, user optional (default setting is 7 days).
	The Average Time	1 second to 2 hours, user selectable (Default is 1 second), 10 minutes when using monitoring mode.
	Memory	Data storage on SD card (built-in 64GB, maximum expandable to 256GB).
	The Event	Listed in the event list, including 50/60 wave cycles and 7.5 second half-cycle voltage RMS and current trend charts.

13.PC Soft and USB Driver Download

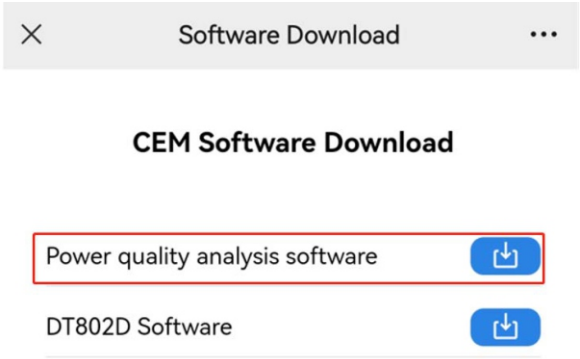
13-1.Mobile Phone APP

- Scan the QR code "Mobile App" above to download the CEM Smart Power APP.
- Choose "CEM Smart Power" to install this app software.



13-2.PC Software

- Scan the QR code "PC Software" above to download power quality analysis software.
- Click on the download icon on the right side of "Power quality analysis software" starts downloading, as shown in the following figure.



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