INSTRUCTION MANUAL

# Power Factor Controller RVT-L

## Installation Instructions


### Contact Us

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Contents

# 1 Preamble

## 1.1 About this User's Manual

The detailed information provided in this manual is intended to help you quickly install and operate the RVT-L Power Factor Controller.

## 1.2 Cautionary

**Caution, danger warning sign.**

Read the safety precautions carefully before installing and operating the RVT-L controller. This manual is for the reference of installation, maintenance and operation personnel.

## 1.3 Safety

The RVT-L controller meets the requirements of JB/T 9663-2013.

**Beware of electrocution safety tips.**

The RVT-L controller must be installed, maintained and operated by a qualified electrical technician. Do not operate with electricity. To clean, wipe the dust with a dry cloth. Do not use abrasives, solvents or alcohol. Before cleaning, turn off the power and disconnect the voltage measurement circuit. Do not open the RVT-L controller housing to prevent electrical shock There are no user-accessible parts inside the instrument. This RVT-L controller can be connected to a current transformer. Do not unplug the current transformer until you are sure it is shorted or connected in parallel to another load with a low enough impedance, otherwise it will generate dangerous high voltages. It is recommended to use 2.5mm² specification for current sampling line and 1mm² specification for voltage sampling line, and the tightening torque of terminal screws is not more than 0.5Nm. External isolation devices (e.g. switches) and external overcurrent protection devices (e.g. 2A fuses) must be provided to protect the RVT-L controller. Do not use this product for any purpose other than the function for which it was designed.

## 1.4 electromagnetic compatibility

The controller has been tested and fully complies with the JB/T 9663-2013 EMC (Electromagnetic Compatibility) regulations for operation at 50Hz.

The following guidelines help to improve the EMC of a system:

1. Metal enclosures can generally improve electromagnetic compatibility.
2. Cables shall be routed away from the aperture of the housing.
3. Cables shall be placed close to a grounded metal structure.
4. Use multiple grounding busbars on door panels or other panel parts as needed. Avoid common ground impedance.

## 1.5 Network Security Disclaimer

The RVT-L controller is designed to connect and transfer information and data via a network interface. This network interface should be connected to a secure network. It is your responsibility to provide and continuously ensure a secure connection between the Products and your network or any other network, as the case may be, and to establish and maintain appropriate measures (such as, but not limited to, installing firewalls, applying authentication measures, encrypting data, installing anti-virus programs, etc.) to protect the RVT-L Controller Products, networks, systems and interfaces from any type of security breaches, unauthorized access, interference intrusion, leakage and/or theft of data or information. Beijing ABB Low Voltage Apparatus Co., Ltd. and its subsidiaries shall not be liable for damages and/or losses caused by such security breaches, unauthorized access, interference, intrusion, disclosure and/or theft of data or information.

While Beijing ABB Low Voltage Electric Apparatus Co., Ltd. provides functional testing for products and updates released by us, you should develop your own testing procedures for any product updates or other major system updates (including, but not limited to, code changes, configuration file changes, third-party software updates or patches, hardware replacements, etc.) to ensure that the security measures you have implemented have not been compromised and that the functionality of the systems in your environment as expected.

# 2 Introduction to Controllers

## 2.1 Overview of the contents of this chapter

This chapter gives a general description of the power factor controller RVT-L. which describes the basic structure of the controller, its main functions, and the controller's touchscreen user interface.

## 2.2 Controller Introduction

RVT-L controller adopts 32-bit ARM processor, 4.3-inch color LCD, touch screen keys, powerful functions, friendly interface, Chinese and English display, intelligent adaptive control to meet the requirements of the working conditions with the best control strategy.

The product has a powerful data recording function and forms the trend graph of various measurement data, can visualize the harmonic state of voltage and current with harmonic histogram, and can also display the waveform of system voltage and current in real time.

## 2.3 Technical characteristics

The RVT-L controller enables power factor compensation in three-phase balanced and unbalanced loads. This model is suitable for balancing three-phase or split-phase (phase-phase) load reactive power compensation. Featuring three-phase voltage and current measurements, it is a power factor controller that can realize both co-compensation and sub-compensation.

- As long as the wiring phase sequence is correct, no need to set parameters, can also realize intelligent compensation control.
- Control of physical quantities: reactive power + target power factor, avoid compensation dead zones, prevention of switching oscillations.
- Support DIDO: Support 2-channel DC24V signal input, 1-channel fan start contact and 1-channel alarm output contact.
- Rich display functions, displaying four-quadrant power, displaying various electrical parameter, waveform, harmonic histogram, temperature, operating days, monthly average power factor, etc.
- Complete protection function, over-voltage, under-voltage, voltage, current harmonic over-limit, temperature over-limit, no-load alarm, insufficient compensation capacity alarm, etc.
- Super anti-interference ability, EMC electromagnetic compatibility test: EFT group pulse anti-interference up to 4000V class A (the highest level of IEC standard).

## 2.4 Appearance

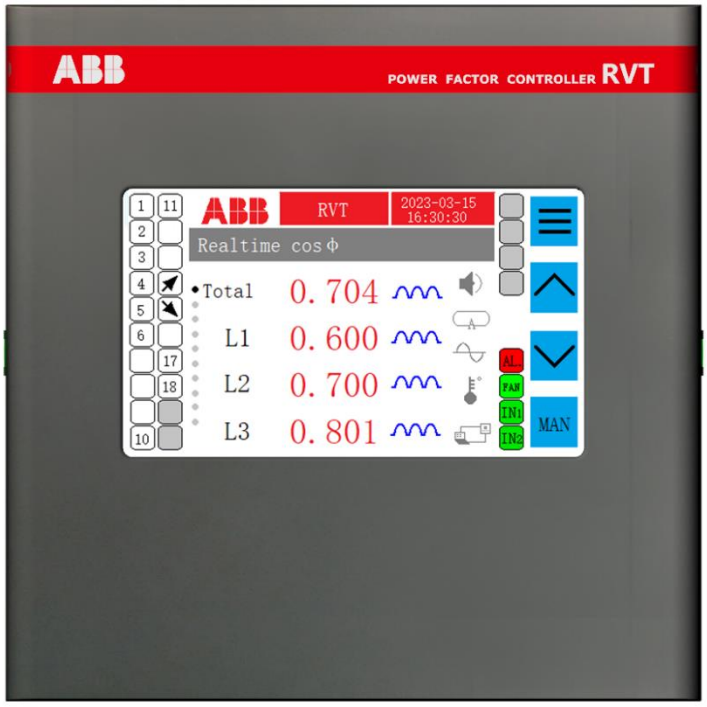



Figure 1: RVT-L Front View

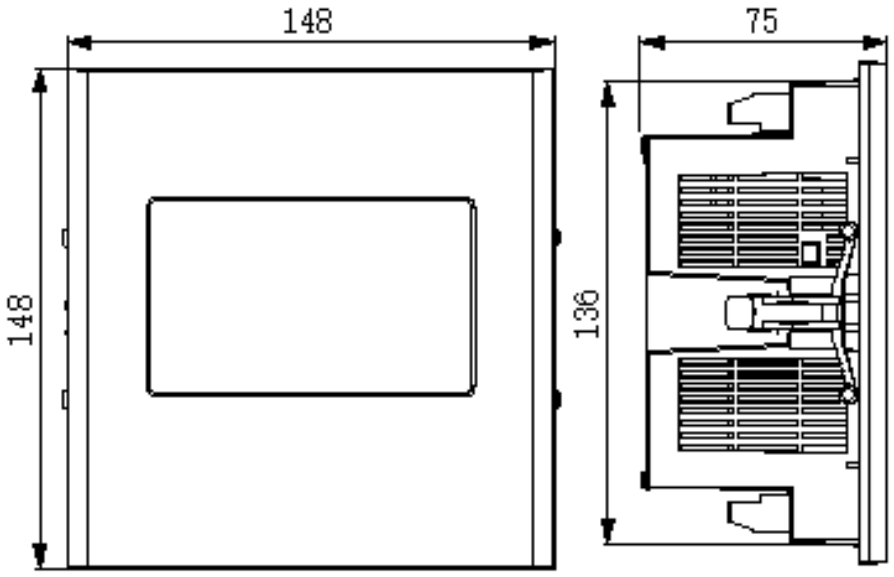
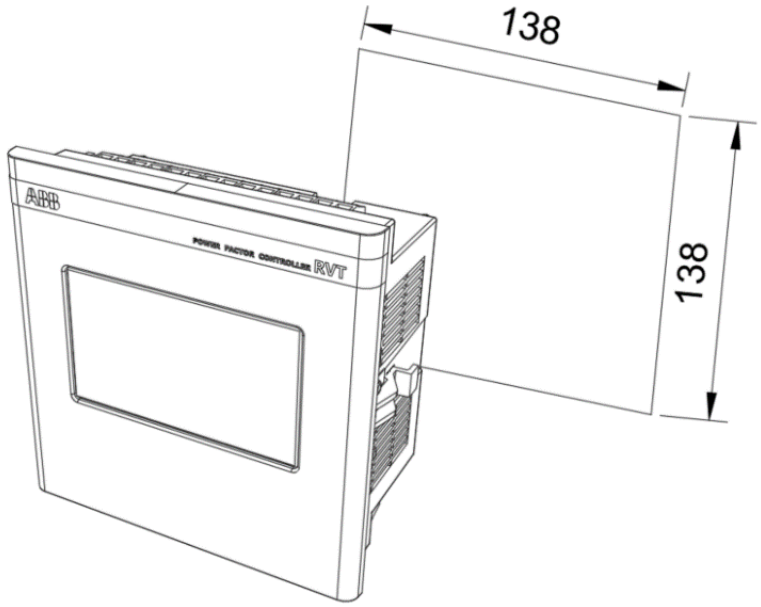



Figure 2: RVT-L External Dimensions

# 3 Installation and Wiring

## 3.1 Installation and Dimensions

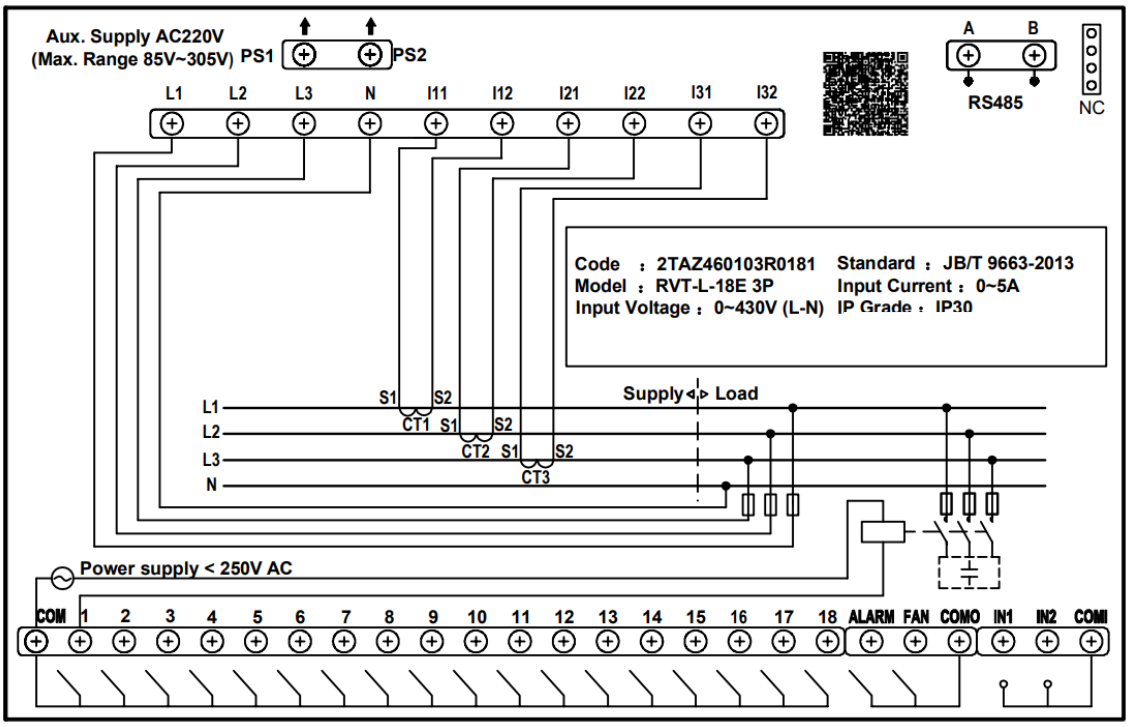
Gently push this controller into the panel of the cabinet where the holes have been cut, as shown in the figure below. The fixings are then snapped into the slots on the side.




Insert hole size is 138 x 138 mm.

## 3.2 Wiring

This wiring diagram shows how the main and control circuits are connected.




Special warning:

1.COM terminal maximum working voltage 250V, need to connect less than 250V independent power supply.

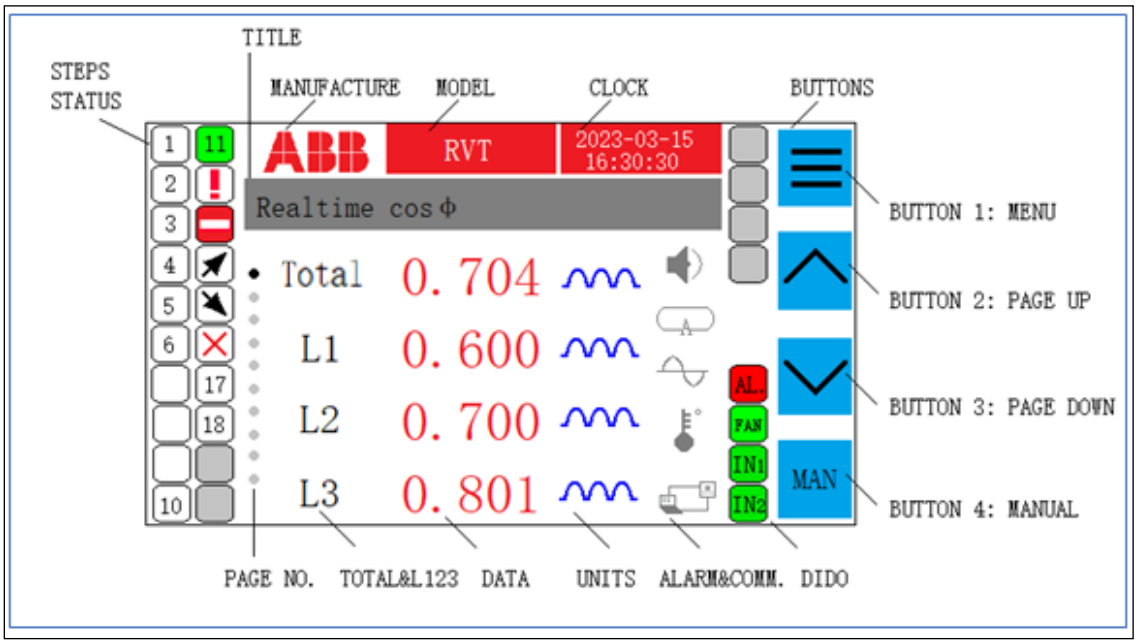
2. Do not connect the sampling voltage to the PS1, PS2 working power terminals, otherwise it will burn the controller.

3. After the capacitor bank is completely disconnected from the power supply, it still must wait for 5 minutes of discharging time before maintenance can be carried out.

| | |
|---|---|
| PS1, PS2 | Power supply port |
| L1, L2, L3, N | Voltage Measurement |
| I11, I12, I21, I22, I31, I32 | Current measurement CT connection |
| COM | Output Relay common power supply |
| 1-18 | Output Relay |
| ALARM | Alarm Output Relay |
| FAN | Fan Relay |
| COMO | Alarm Output/Fan Relay Common Power Supply |
| IN1, IN2 | Digital inputs for external signals |
| COMI | External Signal Digital Input Common Power |
| RS485I | RS485 Modbus Interface |
| RS485 II | RS485 Modbus Interface |

# 4 Operation and Setup

## 4.1 Touch Screen Icons




### 4.1.1 Alarm and communication icon annotation

| | |
|---|---|
| MAX High Voltage | MIN Low Voltage |
| MIN No Load Current | Capacity Shortage |
| COSφ Capacitive cosφ | High Temperature |
| THDi High THDi | THDu High THDu |
| RS485 Comm. | |

### 4.1.2 Annotation of output icon

Channels 1~6, 10, 17, 18: indicate normal input, split-phase compensation in the front, three phases compensation in the back

Channel 11: 11 indicates fixed inputs, which will be cut off only in manual state or shutdown state. Normal mode or fixed cut off can be set in Output Configuration menu which is

under Compensation Configuration  menu. Be careful, this function only can be used when there is no load at the scene.

Channel 12:  Indicates a fault in this channel, where a capacitor, fuse, or circuit breaker failure has been detected in this channel during operation.

Channel 13:  Indicates fixed cut off, the controller will not put in this channel.

Channel 14:  Indicates put in is ongoing.

Channel 15:  Indicates cut off is ongoing.

Channel 16:  Indicates that the capacitance is not detected, and the controller does not detect a current change after put in or cut off the channel during power-on detection.

Other channel:  indicates normal cut off

 is the contact of fan start control, and the contact is off,  means the contact is on.

 is the alarm output contact, and the contact is off,  means the contact is on.

 Indicates that the input signal of input contact 1 is valid,  indicates that the input signal of input contact 2 is valid, and  indicates that there is no input signal.

## 4.2 Page parameters

Page 1: Displays three-phase and total real-time power factor;

Page 2: Displays three-phase real-time voltage;

Page 3: Displays three-phase real-time current;

Page 4: Displays three-phase real-time active power;

Page 5: Displays three-phase real-time reactive power;

Page 6: Displays three-phase real-time apparent power;

Page 7: Monthly Average Power Factor + Days of Operation + System Frequency + Internal Temperature of the Controller, where pressing the key  , you can check the average monthly power factor values for the last 12 months;

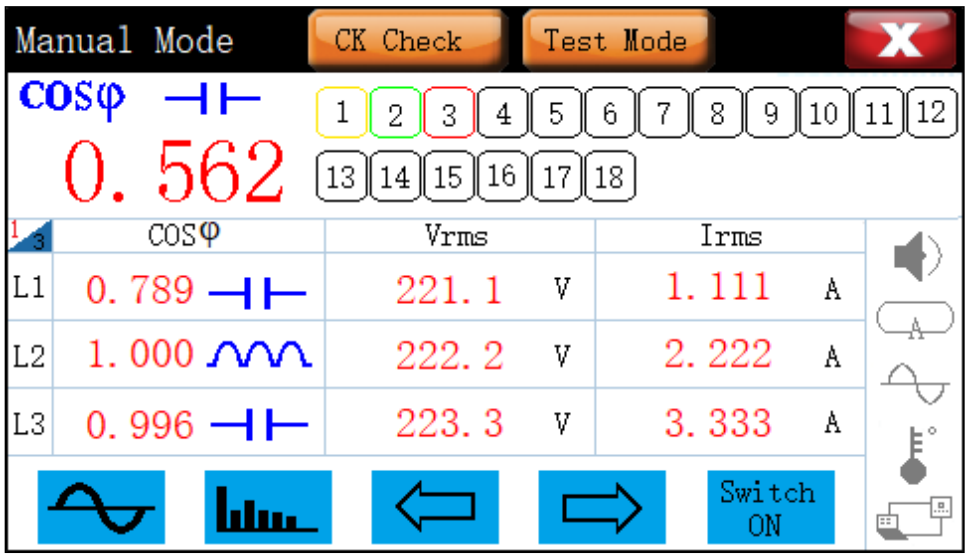
Page 8: Displays the total three-phase voltage harmonic distortion rate;

Page 9: Displays the total three-phase current harmonic distortion rate;

Page 10: Displays the three-phase reactive power value required to compensate to the target power factor value.

**Tips:** Alternately display different page every 10 seconds, you can also press key two, key three to manually change page display, after manually press, the page display will last for 60 seconds for your parameter check of this page!

## 4.3 Manual mode MAN




Manual operation has 3 functions:

1、Manually switch capacitor. Discharge delay of relay output type controller under manual mode is in action, will cause re-input failure, need to wait for the end of the capacitor discharge delay.

2, Test mode Test Mode : Circulation of automatically put in one channel and cut off one channel, this mode is used for electrical switch manufacturers to produce compensation cabinet to conduct factory test. End users should not use this mode.

3, Detect C / K value: CK Check: detect C / K value of each channel if the condition are met, this function only can be used when the device is after commissioning at the final use site. Press CK Check key, make sure there is no error according to the reminder, press OK key, start to automatically detect the C/K value of each channel, put in one channel, and cut it off, then put in the next channel, until all completed.

**Tips: This function requires operation when the capacitor bank is initially energized and commissioned!**

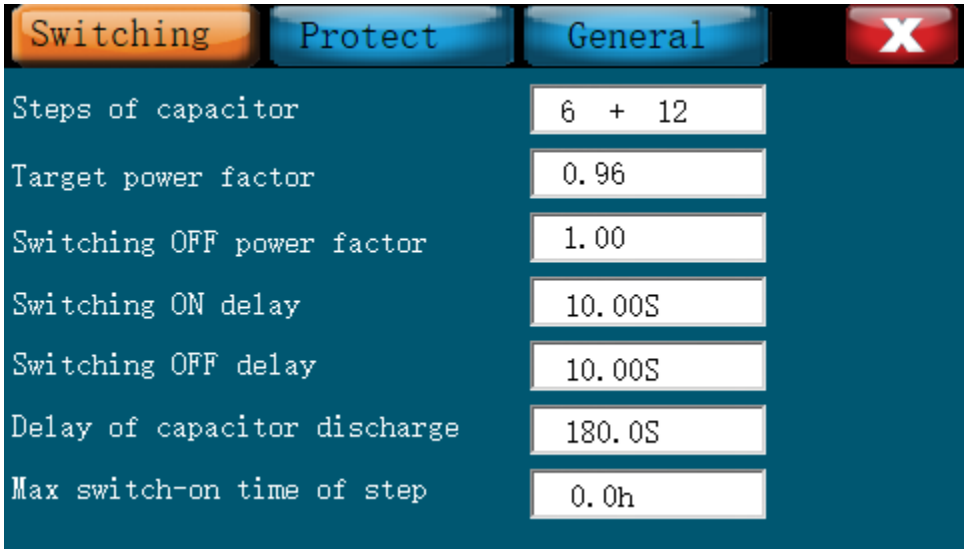
## 4.4 Setting

Click  to enter the main menu:


### 4.4.1 Control parameter

Click  to enter the control parameter setting interface.

#### 4.4.1.1 Switching Setting

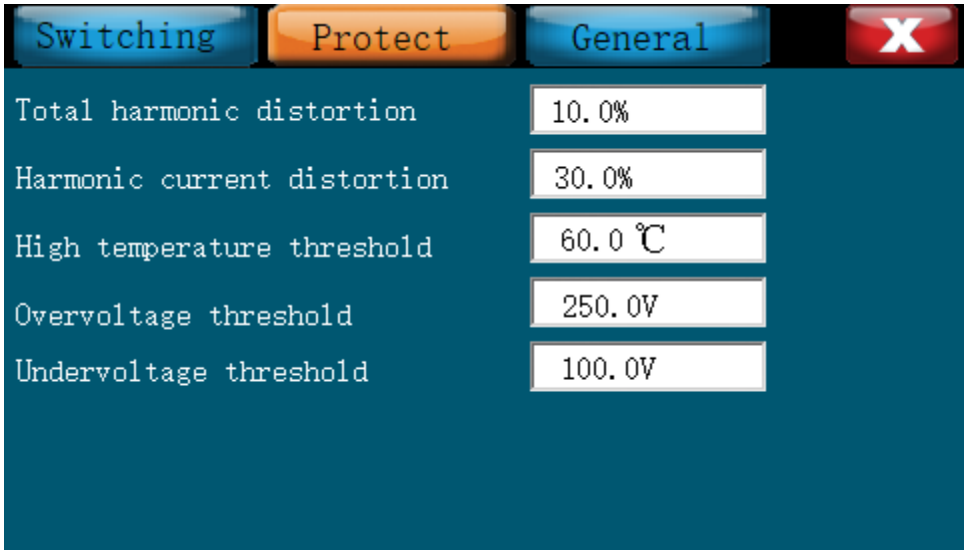



1. Output group setting, the maximum number of channels that can be displayed or set in the automatic interface, manual interface and compensation configuration interface, the maximum number of channels can be set is 18 channels. 6+12 means that 1~3

channels, 4~6 channels are split-phase compensation, and 7~18 channels are three phase co-compensation, in which the number of split-phase compensation channels can only be set as a multiple of 3 or 0. When it is set to 0, this controller becomes a three phase co-compensation controller.

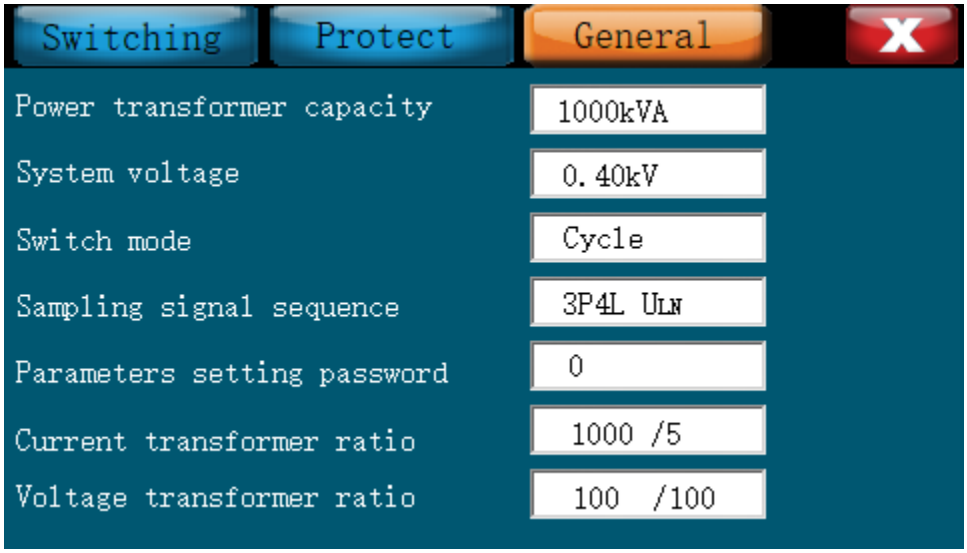
2. Target power factor setting, which can be set to a negative number, and the target power factor is capacitive, indicating that overcompensation is allowed. When this value is set to a positive number, and power factor of the system is greater than this value, the controller considers that the target power factor value has been reached, and will not continue to put in capacitors, and only when the power factor of the system is capacitive will the controller remove the capacitors that have been put in.
3. Target cut-off power factor setting, default value is 1.00.
   Tips: If the target power factor (2nd parameter) is 0.92 and the target cut-off power factor is set as 0.97:
   1. If the current system power factor is lower than 0.92, the controller will put in capacitors until the system power factor exceed 0.92.
   2. After the target cut-off power setting, if the current system power factor is greater than 0.97, controller will cut off the capacitors until the system power factor is less than 0.97.
4. Put in delay setting, the delay is the delay from the time when the channel is allowed to put in to the time when the channel is actually put in. In the automatic interface, the channel will flash the  icon, which indicates that this channel is preparing to put in and is in the put in delay; if the channel flash  icon, it indicates that this channel is in the cut-off delay. The put in delay and cut-off delay share this delay, which can be set from 1.00 to 600.00 seconds.
5. Cut off delay setting, default value is 10.00S, set to 0.00S means that the cut off delay is not turned on, it shares the same delay with the put in delay (the 4th parameter).
6. Discharge delay after capacitor cut off, this delay is the waiting time before putting in capacitor again after cutting off a capacitor. Mostly used in relay output type controllers, after the controlled AC contactor is removed, it is necessary to wait for the capacitor to discharge before the contactor can be closed again.
7. Upper limit value of running time (hour), default value is 0.0h, and this function is not activated if not change this default value. When the set value has exceeded 1.0 hour, then will start timing for each channel (excluding split-phase compensation channels) that has been put in, if running time reaches the upper limit value, will cut off the channel, so that the controller will put in other channels which is not yet put in. This function is suitable for the site with super-steady load, and the site in which, the switching state is not changed for a whole day. This function only available when controller in cyclic model.

#### 4.4.1.2 Protection Setting




1. Upper limit of total voltage harmonic distortion, when the system voltage harmonic exceeds this value, the controller will be in the voltage harmonic over-limit alarm state, will cut off all the capacitors that have been put in. When the value falls below this upper limit value, controller will back to normal state immediately.
2. Upper limit of current harmonic protection, default value is 0.0%, which indicates that the harmonic current protection function is not enabled.
3. Over-temperature protection value, when the temperature inside the controller exceeds this value, controller will be in an over-temperature alarm state, and will also quickly cut off the capacitors that have been put in. The controller returns to normal state when the internal temperature drops more than 5°C bellow the over-temperature protection value.
4. Overvoltage protection value, when the system voltage rises and is greater than this value, controller will be in overvoltage alarm state, and will quickly cut off the capacitors that have been put in. The controller will return to normal only when the system voltage drops more than 8V bellow overvoltage protection value.
5. Undervoltage protection value, when the system voltage drops and is less than this value, controller will be in undervoltage alarm state and will quickly cut off the capacitors that have been put in. Controller will return to normal when the system voltage has risen more than 8V above the undervoltage protection value.

#### 4.4.1.3 General Settings




1、 Transformer capacity setting, to make the monthly average power factor calculation more accurate, it is recommended that the user set the transformer capacity to the rated capacity value of the transformer (the capacity can be set in the range of 20~9999kVA).

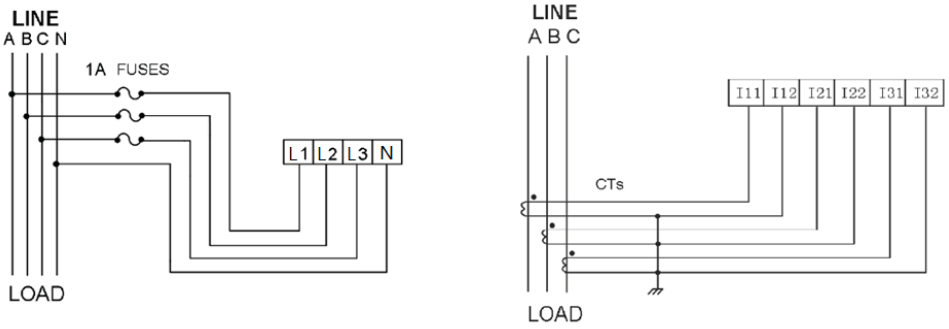
2、 System voltage setting, which is only relevant for CK value calculation, if set as 0.4kV, then the CK value calculation will convert all output capacitor CK values to the CK value under the 400V system. No matter the controller is a split-phase compensation controller or a three phase co-compensation controller, this voltage value is the line voltage ( L-L).

3、 Switching mode, there are three switching modes: cyclic, linear, and fast.
Cyclic mode: Transmit switching command based on average reactive load during switching delay period. If the capacitor capacity of each channel is equal, then controller will adopt first put in and first cut off cyclic mode; if the capacitor capacity of each channel is not the same (any two groups of capacitor capacity difference is greater than 20%), then controller will adopt intelligent cyclic switching, controller will intelligently combine the optimal switching strategy and also group cyclic switching, which will prolong the service life of the capacitor and the contactor.
Linear mode: Transmit switching command based on average reactive load during switching delay period. Adopting the linear mode of first put in and last cut off, it is

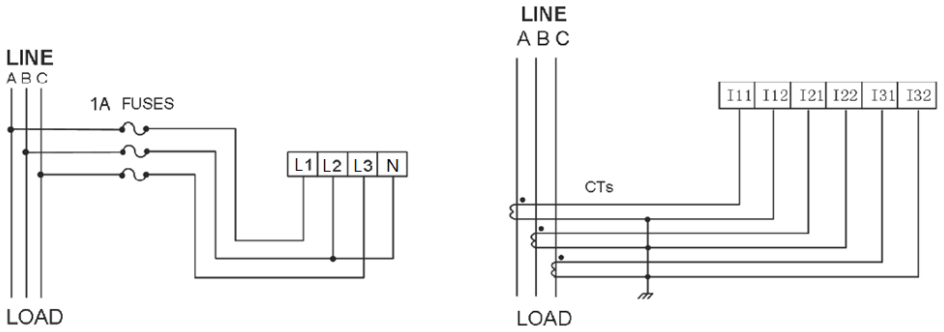
mostly used for passive filtering control (this mode is only applicable to the pure co-compensation mode).

**Warning: Controller that control contactor switch cannot use fast mode to prevent large impulse current during switching to damage capacitor bank.**

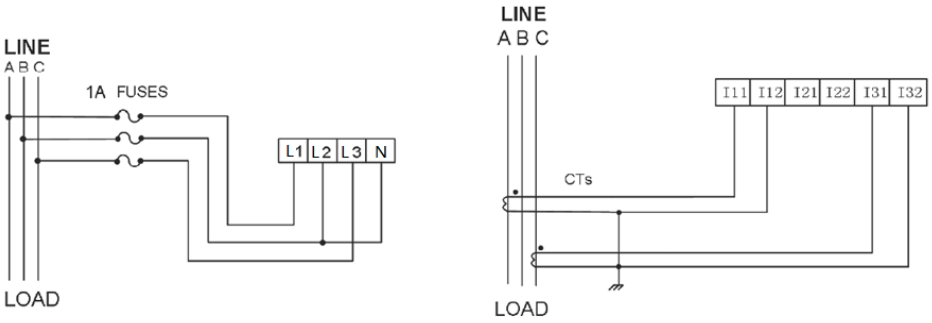
4、Sampling signal change, support four wiring modes:
0:3P4L ULN: Default mode, 3-phase 4-wire system, automatic interface voltage display phase voltage.
1:3P4L ULL: Three-phase four-wire system, automatic interface voltage display line voltage, wiring scheme as follows.




2:3P3L 3CTs: Three-phase three-wire system with three current transformers sampling, need to short the controller voltage sampling terminals L2 and N. The wiring scheme is as follows.




3:3P3L 2CTs: 3-phase 3-wire system with 2 current transformers sampling, need to short the controller voltage sampling terminals L2 and N, the wiring scheme is as follows.



5、Setting the parameter password, default value is 0000, no need password verification, when a non-zero password is set, then password verification is required to enter the control parameter page from the main menu.
Tip: customer need to remember the set password!

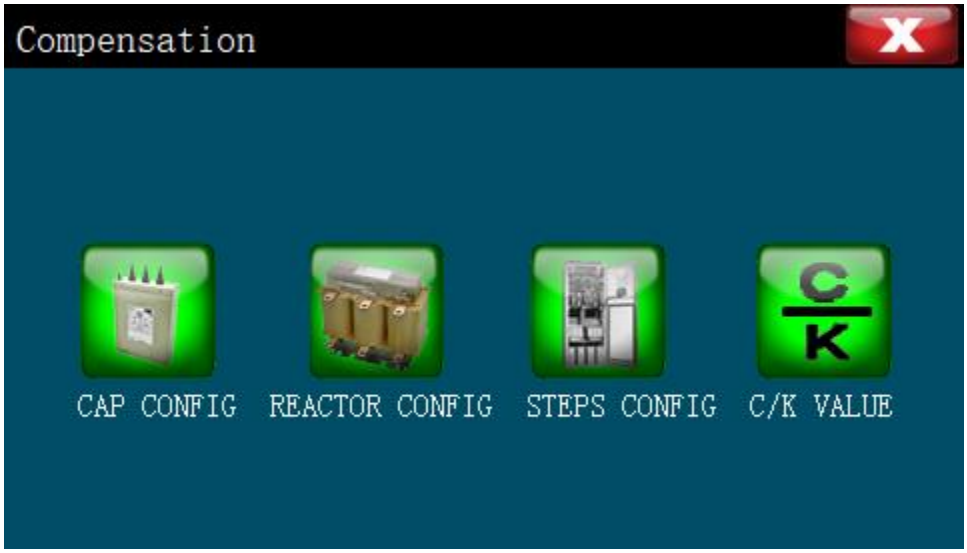
6、Current transformer ratio setting, when the ratio is set, the automatic interface can display the actual RMS value and power value of the system current. This parameter consists of a numerator and a denominator, the numerator can be set up to 10,000 and the denominator can be set to 5 or 1 (indicating that the maximum current on the secondary side of the current transformer of the system is 1A).

7、Change voltage Ratio(change scope: 100/100~999999/100) When the voltage ratio is greater than 10 times, the controller switches to high-voltage operation mode, the unit of the switching delay and discharge delay changes to minutes, the unit of the over-voltage and under-voltage settings changes to kV, and the unit of the rated voltage of the capacitor changes to kV.

Click on the white box where the parameter is located to change it, and input directly from the small keyboard:

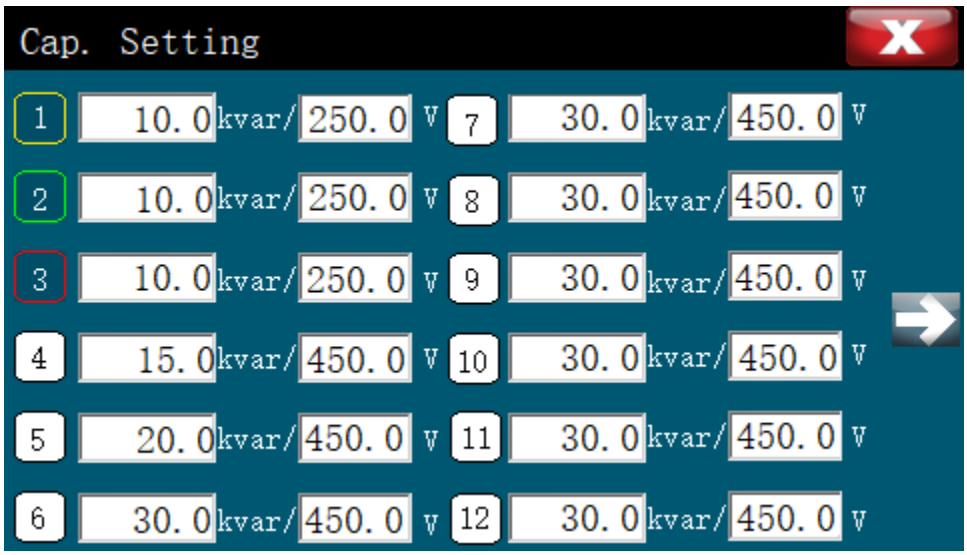

## 4.4.2 Compensation configuration

Click  to enter the Compensation Parameter Configuration Settings interface.




#### 4.4.2.1 Capacitor Configuration

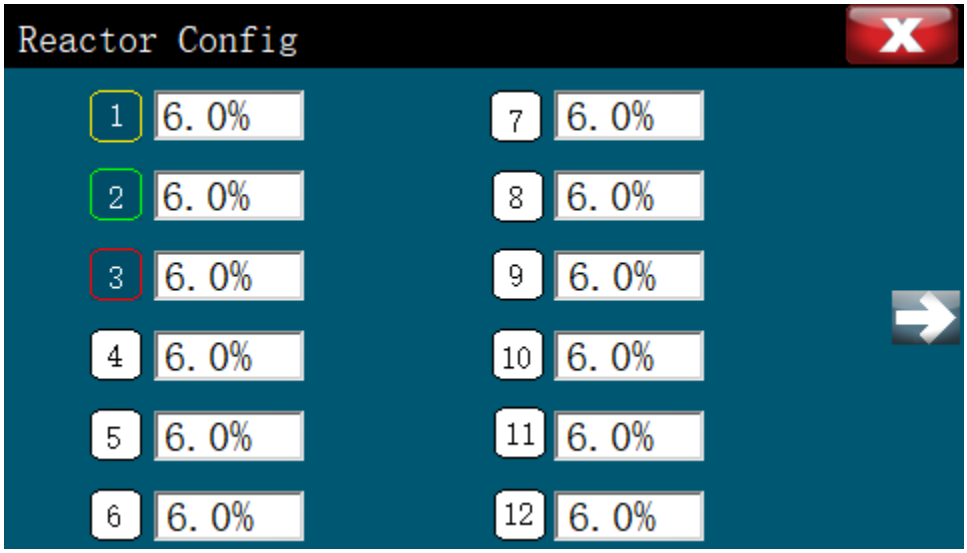
Click  to enter the capacitor configuration interface, you can set the capacitor capacity and operating voltage of each channel according to the actual configuration, and the "yellow", "green" and "red" borders indicate that the channel is set as split-phase compensation, which are phase-A, phase-B and phase-C.




The capacitor configuration parameters are the rated capacity and rated voltage on the capacitor nameplate, and the capacitors for split-phase compensation should be configured as split-phase capacity per channel.

#### 4.4.2.2 Reactor Configuration :

Click  to enter the capacitor configuration interface, you can configure the reactor reactance according to the actual demand.




#### 4.4.2.3 Output Configuration

Click  to enter the control output configuration interface.


1. NORMAL: Normal

2. FIXED-ON: Fixed put in (use with caution)

3. FIXED-OFF: Fixed cut off

7, FAN CTRL: fan contact, when the controller output has an independent fan and alarm contact, this function can be ignored!

8, ALARM CTRL alarm contact, when the controller output has an independent fan and alarm contact, this function can be ignored!

Among them, Fixed put in, can be used for small load site or transformer no-load site to do fixed compensation for one circuit, to prevent penalty from utility due to low power factor during transformer no-load operation.

Fixed cut off, which can be used when the channel needs to stop operation due to failure of fuses, switching switches, reactors or capacitors, and other reasons.

Fan contact (FAN CTRL), used to control start and stop of compensation cabinet cooling AC fan, controlled by temperature alarm only, when the controller over-temperature alarm (fan start temperature is less than the over-temperature value of 20 ℃, such as default over-temperature value is 60 ℃, controller will start the fan when temperature exceeds 40 ℃, and stop the fan when temperature is less than 35 ℃), relay-type controllers will be connected to this channel and COM terminal (D-type controller output DC12V, can also be customized into a dry contact, need to occupy the last 2 output terminals);

When alarm contact (ALARM CTRL) connected, overvoltage, undervoltage, voltage harmonic overrun, overtemperature, capacitive load, no load, insufficient compensation capacity control will turn on.

**Tip:** If the 16th channel is set as temperature control contact output, then the number of controller group settings can only be 16 channels, and if not all the other 15 channels are connected with capacitors, customer need to set capacitance reactance parameter as 0 for those channels without capacitors, meanwhile the output configuration of those channels need to set as 3.FIXED-OFF.

#### 4.4.2.4 C/K value

Click  to enter CK value setting interface, CK value is the parameter of this product as reactive power compensation control switching.

This parameter cannot be set and is only used to check the C/K automatically configured by the controller with a minimum CK value of 0.015.

Each channel has 2 CK values, the left one is the set value (SET value) and the right one is the measured value (REAL value).

When both sets of CK values are 0, the controller will automatically measure to get the REAL value each time when it is power-on (CK Check button will flash), and will stop automatic measurements until all the CK values of all channels have been measured.

If the SET CK value has been set for all channels, controller no longer performs automatic measurement after power-on, but if the REAL value is not cleared, controller will uses the REAL value for reactive power compensation switching judgment.

The SET value is derived from the results of calculations with the setted CT value, capacitor parameters, and reactor parameters.

For example, if CT = 500/5, capacitor 30kvar/450V and reactor 6%, then C/K in a 400V power system is calculated as:

$$\frac{400\times400}{450\times450}\times\frac{30\times1000}{\sqrt{3}\times400\times100\times(1-6\%)}=0.364$$

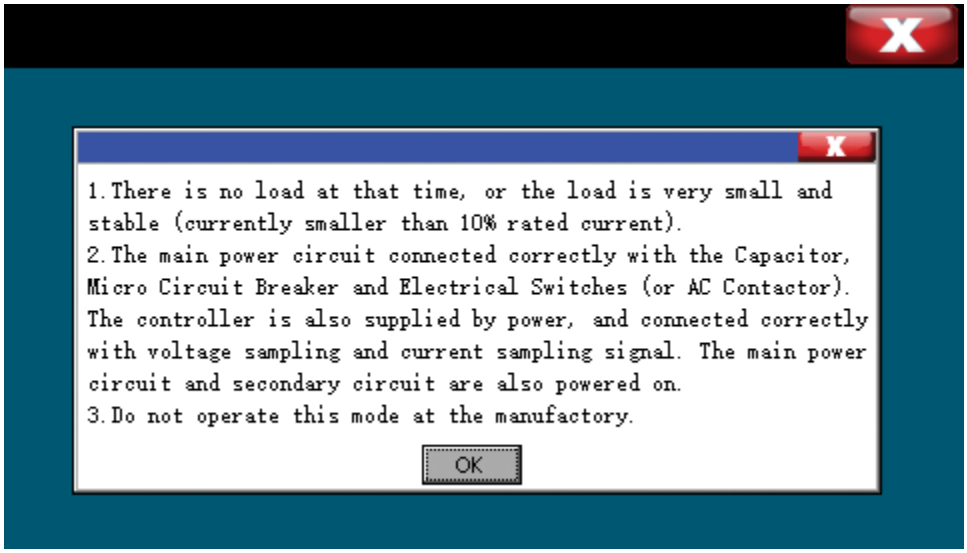
For a single-phase capacitor of 10kvar/250V, the C/K value is calculated as:

$$\frac{230\times230}{250\times250}\times\frac{10\times1000}{230\times100\times(1-6\%)}=0.391$$

Where 230 is the phase voltage, which is obtained by dividing the system voltage 400 by √3.

Click to 

enter the program for checking the C/K value. The procedure is the same as the CK Check performed in manual mode.




Click 

to clear the detected C/K value (REAL value). If the SET value is required for switching judgment, the REAL value needs to be cleared.

Click  to see the formula for calculating the CK value:

Three-phase network

$$C/K=\frac{U^2}{U_e^2}\times\frac{Q\times1000}{\sqrt{3}\times U\times K\times(1-X)}$$

Single-phase network

$$C/K=\frac{U^2}{U_e^2}\times\frac{Q\times1000}{U\times K\times(1-X)}$$

Q: Single step of capacitor capacity
U: Line voltage L-L(V)(Single-phase L-N)
Ue: rated voltage of capacitor (V)
K: Sampling current transformer ratio
X: series reactor reactance rate (%)

## 4.5 Communication settings

Click  to enter Communication Settings interface

### 4.5.1 Communication parameter setting


Parameter No. 1: RS485 I communication port, communication address for Modbus RTU protocol.

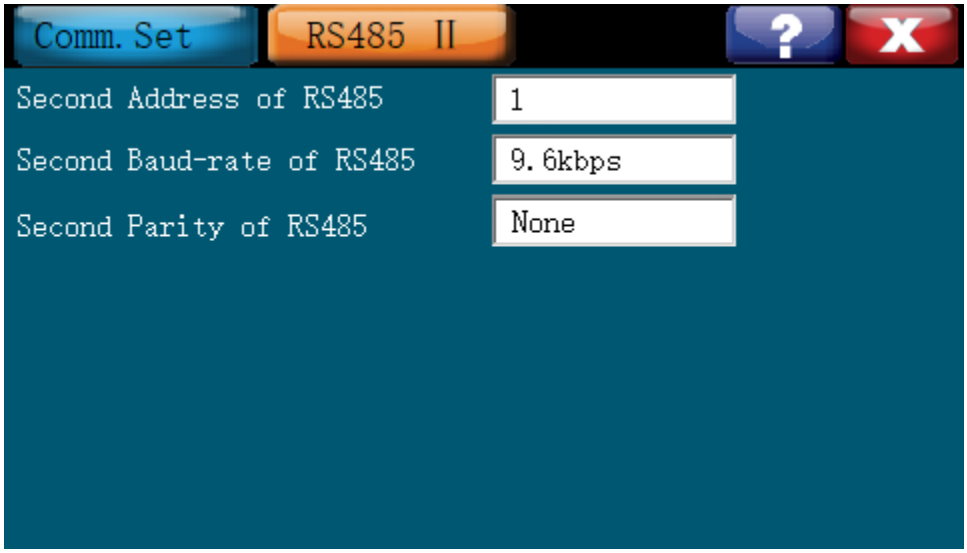
Parameter No.2: RS485 I communication port, Modbus RTU protocol communication baud rate, can be set to 4.8 kbps, 9.6 kbps, 19.2 kbps, 38.4 kbps, 57.6 kbps, 115.2 kbps , and it is recommended to set it to 9.6 kbps.

Parameter No.3: RS485 I communication port, Modbus RTU protocol communication parity bit, can be set to 3 modes: None-no parity, Odd-odd parity, Even-even parity, it is recommended to set it to None-no parity.

Parameter No.4: host or auxiliary controller settings, can be set to 0 ~ 4 or 11 ~ 14, 0 means normal mode controller, no host and auxiliary function; 1 means the controller is the host controller, and with an auxiliary device, 2 means the host controller with two auxiliary controllers; 11 means the controller is an auxiliary controller, and it is No.1 auxiliary controller, 12 means the controller is an auxiliary controller, and it is No.2 auxiliary controller, auxiliary controller will not measure voltage and current, the displayed value and the status of capacitor switching are transmitted from the host controller through RS485 communication, but the number of channels displayed in automatic mode and manual mode are set by the auxiliary controller itself.

Tip: The controller with single communication port can only choose host and auxiliary communication or Modbus communication, and the controller with double communication port can have both Modbus communication and host and auxiliary communication, in which the RS485 I port is used for Modbus communication, and the RS485 II port is used for host and auxiliary communication.

### 4.5.2 Parameter setting for the second communication port




Parameter No. 1: RS485 II communication port, communication address.

The 2nd parameter: RS485 II communication port, communication baud rate, can be set to 4.8 kbps, 9.6 kbps, 19.2 kbps, 38.4 kbps, 57.6 kbps, 115.2 kbps, and it is recommended to set it to 9.6 kbps.

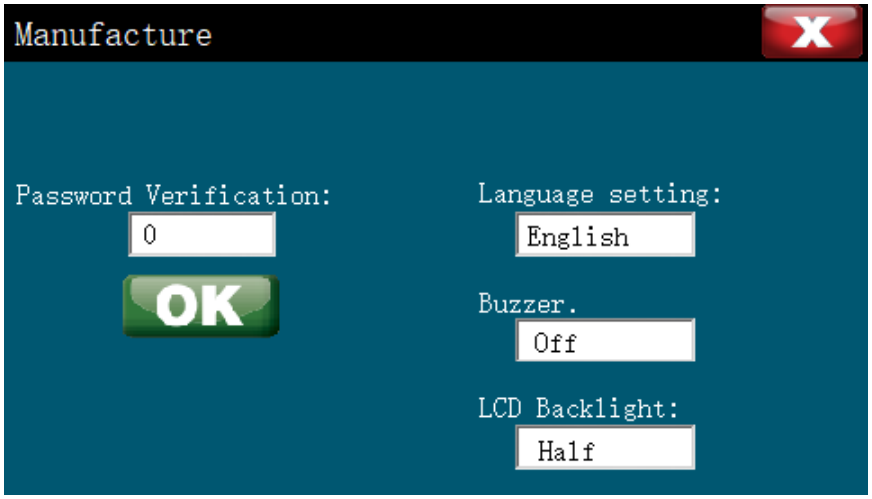
The third parameter: RS485 II communication port, communication parity bit, can be set to three modes: None-no parity, Odd-odd parity, Even-even parity, it is recommended to set to None-no parity.

Note: RS485 || is a reserved function and has no actual interface.

## 4.6 Manufacturer's parameters

Click  to enter manufacturer's parameter configuration interface, this setting requires factory privileges, only for the manufacturer's debugging use, customer does not need to set.

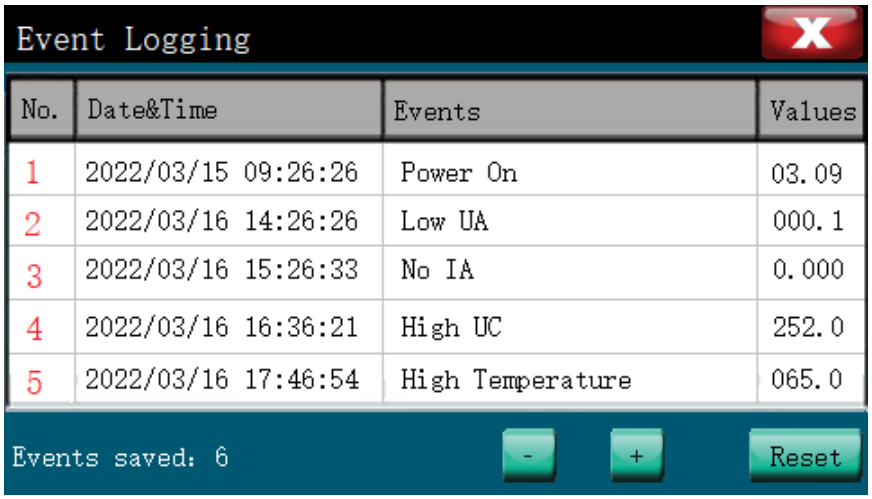
Under this page, you can set the display language of the controller (Language Setting), which can be set to display in 2 languages: Simplified Chinese and English, and you can also turn on or turn off the touch sound of the touch screen. The backlight brightness of the LCD can be adjusted. After 24h without touch, it can be set to: off (which can increase the display life of the LCD screen), half-bright (factory default), full bright (not recommended for long-term use).




## 4.7 Event Records

Click  to enter Event Logging screen:

Record the time and value of various alarm events with 160 entries.




## 4.8 Real-time waveforms

Click  to enter real-time waveform monitoring interface, you can check the real-time voltage and current waveform of the compensation circuit.

Voltage: voltage waveform, displayed by the yellow waveform, customer can zoom X-axis and Y-axis, as well as up and down panning of the waveform.

Current: current waveform, shown by the red waveform, this waveform is the current waveform of L2 phase

: Indicates that the displayed waveform is phase L1

L2: Indicates that the displayed waveform is phase L2

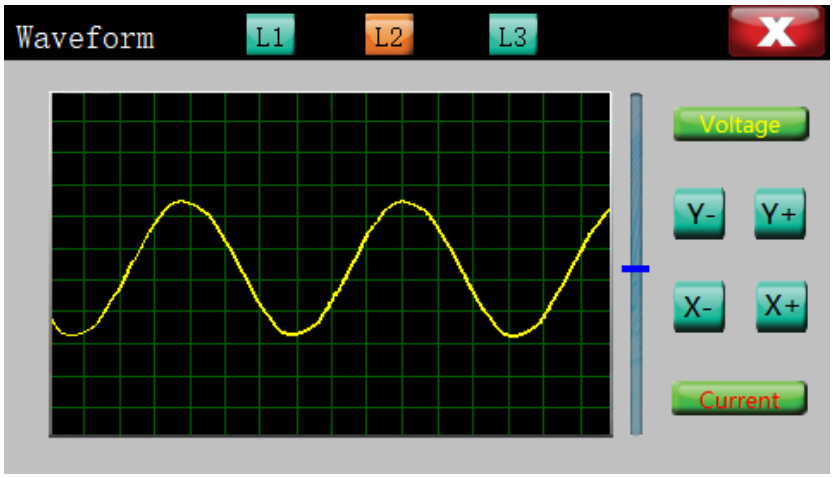
L3: Indicates that the displayed waveform is phase L3

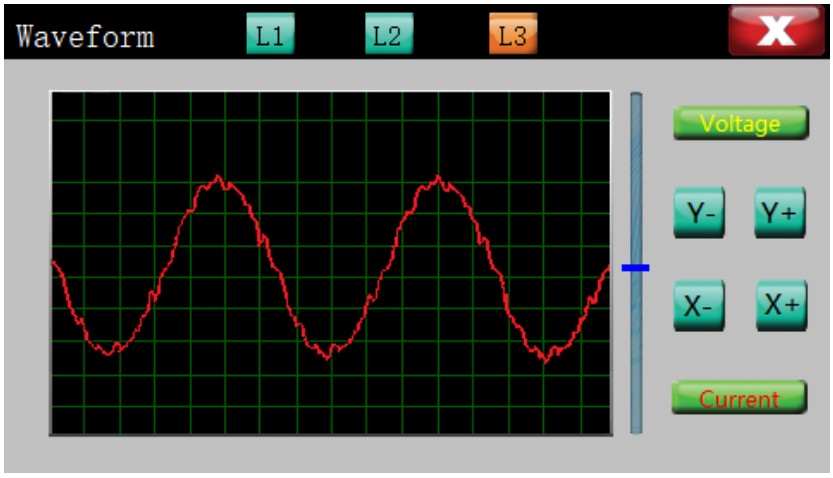
Voltage: Switch to voltage waveform display

Current: Switch to current waveform display

Y+ Y-: You can zoom in and out in the Y direction of the waveform.

X+ X-: You can zoom in and out in the X direction of the waveform.




## 4.9 harmonic histogram

Click  to enter Harmonic bar graph monitoring interface.

THDu Voltage Harmonics Histogram, THDu % Total Voltage Harmonics Distortion Rate, No.1 displays fundamental wave, ratio is fixed at 100%, No.2 to 31 display 2nd to 31st voltage harmonic content.

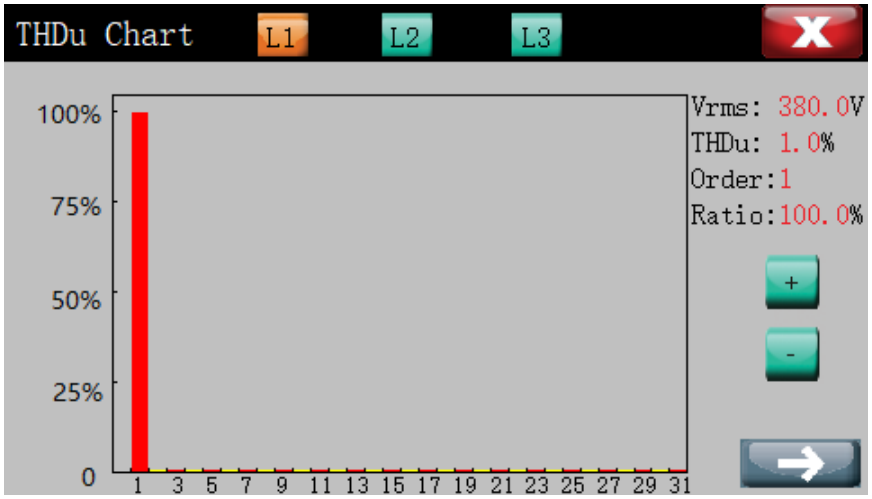
: Indicates that the displayed bar graph is phase L1

: indicates that the displayed histogram is for the phase L2

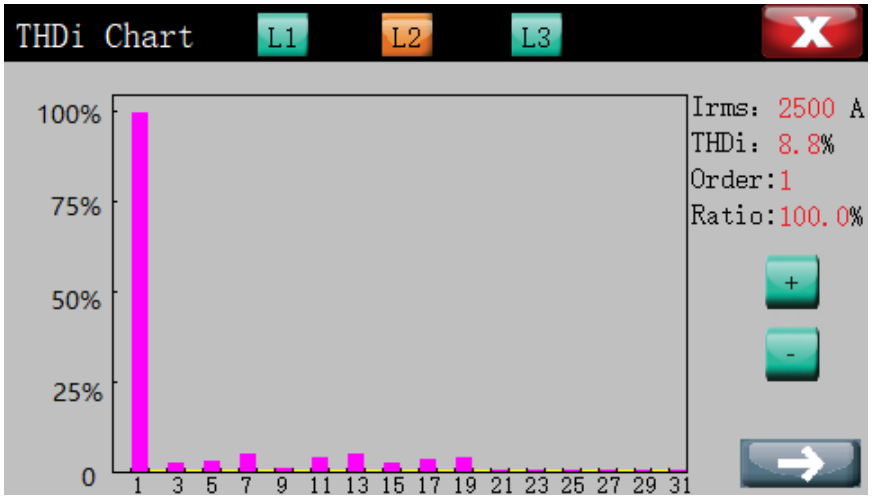
: indicates that the displayed histogram is for the phase L3

: you can check the content of each harmonic.


: Display current harmonic diagram




THDi Current Harmonics Histogram, THDi % Total Current Harmonics Aberration Rate, No.1 displays fundamental wave, ratio is fixed at 100%, No.2 to 31 display 2nd to 31st current harmonic content.




## 4.10 Operational Trend Graph

Click  to enter Trend Profile Monitor screen.

This page records the daily running trend of various electrical parameters, the 24-hour running curves for the current day and the previous 15 days for a total of 16 days, with a recording interval of 5 minutes.

: indicates that the trend graph recorded at this point is phase L1

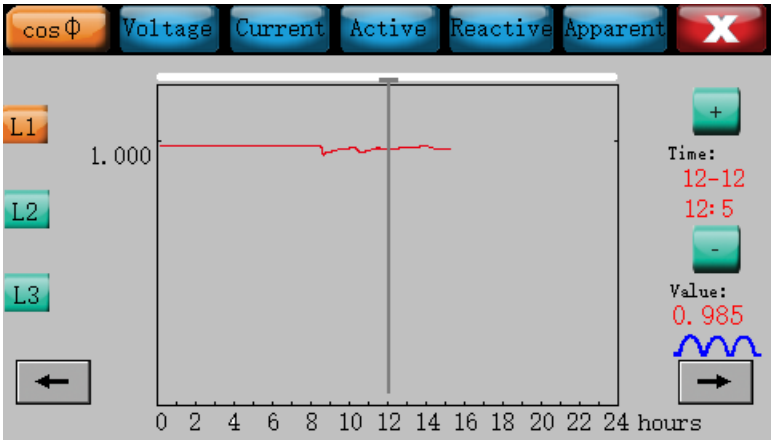
: Indicates that the trend graph recorded at this point is for the phase L2

: Indicates that the trend graph recorded at this point is for the phase L3

: View data recorded on the previous day and the next day.


: View data recorded in the next 5 minutes.


: View data recorded in the previous 5 minutes.




Value: All data are for the secondary side value; voltage is not multiplied by the voltage ratio and current is not multiplied by the current ratio.

# 5 Technical Parameters

## 5.1 Basic parameters

- Implementation standard: JB/T 9663-2013.
- Operating voltage: AC 85V ~305V, independent power supply.
- Sampling voltage input: AC 100V ~ 430V (L-N), 50Hz/60Hz frequency adaptive.
- Sampling current input: AC 0 to 5A , or 0 to 1A.
- Control physical quantity: reactive power value taking into account the power factor.
- Controller Output: Static type - Contact type - Maximum continuous load AC250V/2A.
- Control object: AC contactor.
- Dynamic response time: ≤ 1 sec (DC12V output type ≤ 20 ms)
- Sensitivity: ≥20mA, measurable CT secondary side minimum current.
- Input current impedance: <0.1Ohm.
- Communication protocol: Modbus-RTU, supportable baud rate: 4.8 kbps, 9.6 kbps, 19.2 kbps, 38.4 kbps, 57.6 kbps, 115.2 kbps, parity: odd, even, no parity.
- Delay time: put in and cut off delay time maximum 600.00 seconds, discharge delay time 6000.0 seconds.
- Switching mode: cyclic mode, linear mode, unequal capacity intelligent switching mode.
- Parameter saving: All programmed parameters and modes are saved in a power-down non-volatile memory.
- Power Failure Protection: All capacitor circuits are automatically disconnected when power failure exceeds 20ms (50Hz) or more.
- Measurement accuracy: voltage: ±1%; current: ±1%; power factor: ±1.5%; active power: ±2.5%; reactive power: ±2.5%. Temperature: ±0.5 degrees.

- Power consumption of the device: ≤15VA
- External dimensions: 148 ×148 ×75mm
- Mounting opening size: 138 ×138mm
- Installation: panel mounted vertically

## 5.2 Conditions of use

- Temperature: Operating temperature: -20℃ ~ +55℃; Storage temperature: -25℃ ~ 70℃
- Altitude: ≤2000M
- Atmospheric conditions: air humidity not exceeding 90%
- Environmental conditions: medium without conductive dust