The product models and specifications published in this manual are for reference only, and everything is subject to the actual product and product description.

PRODUCT QUALIFICATION CERTIFICATE

Name: Reactive Power Compensation Controller (Separate Compensation)

Model: _____

This product meets the standard for crystal inspection and is allowed to leave the factory.

Inspector: Test 8

Due to product upgrades and version updates, the content described in this manual is subject to the actual product. If there are any errors, omissions, or other inappropriate aspects, we kindly ask for your understanding.

OPERATION INSTRUCTIONS

Reactive Power Compensation Controller (Separate Compensation)

Note: Thank you for choosing this product. Please read the user manual carefully before installing, using, or maintaining the product.

Contents

1. Reference Standards

DL/T 721-2000	Remote terminal of distribution network automation system
GB/T 191-2000	Packaging and Storage Diagram Identification
DL/T 743-2000	Remote Terminal of Electric Energy
DL/T 448-2000	Technical Management Regulations for Electric Energy Metering Devices
GB 12325-90	Allowable deviation of power quality supply voltage
GB 12324-90	Voltage fluctuation and flicker allowed for power quality
GB 4208	Classification of Protection Levels for Enclosures
GB/T 4208-1993	Protection level of shell (IP code)
DL/T 614-1997	Multi function watt hour meter
GB/T 13729-92	General technical specifications for remote control terminals
GB/T 17626.2-1998	Electromagnetic compatibility testing and measurement techniques - Electrostatic discharge immunity test
GB/T 17626.3-1998	Electromagnetic compatibility testing and measurement techniques - Radio frequency electromagnetic field radiation immunity test
GB/T 17626.4-1998	Electromagnetic compatibility testing and measurement techniques - Electrical fast transient burst immunity test
GB/T 17626.5-1999	Electromagnetic compatibility testing and measurement techniques - Surge (impact) immunity test
GB/T 17626.8-1998	Electromagnetic compatibility testing and measurement techniques - Power frequency magnetic field immunity test
GB/T 17626.11-1999	Electromagnetic compatibility testing and measurement techniques - Immunity tests for voltage dips, short interruptions, and voltage changes
GB/T 17626.12-1998	Electromagnetic compatibility testing and measurement techniques - Oscillatory wave immunity test
GB/T 2423.1-2001	Environmental testing for electrical and electronic products - Part 2: Test methods - Test A: Low temperature
GB/T 2423.2-2001	Environmental testing for electrical and electronic products - Part 2: Test methods - Test B: High temperature
GB/T 2423.9-2001	Environmental testing for electrical and electronic products - Part 2: Test methods - Test Cb: Constant humidity and heat for equipment
GB/T 2423.10	Environmental testing for electrical and electronic products - Part 2: Test methods - Test FC: Vibration (sinusoidal)
GB/T 5169.11	Fire hazard test methods for electrical and electronic products - Finished product hot wire test methods and guidelines
DL/T 645-1997	Communication protocol for multifunctional electricity meter

2. Product Overview

The reactive power compensation controller is a new type of distribution measurement and control equipment that integrates data acquisition, reactive power compensation, and grid parameter analysis. It is suitable for monitoring and reactive power compensation control of AC 0.4KV, 50Hz low-voltage distribution systems.

The reactive power compensation controller is based on a high-speed digital signal processor, adopts AC sampling, and has a human-machine interface of 128 × 64 dot matrix large screen LCD display. It has power distribution monitoring, reactive power compensation, harmonic analysis, adaptive frequency algorithm, and input signal varies between 45Hz and 55Hz.

3. Conditions of Use

Air temperature: The air temperature should not exceed+65℃ and should not be lower than -25℃.

Atmospheric conditions: The air humidity should not exceed 90% at 20℃, and higher relative humidity is allowed at lower temperatures.

Altitude: not exceeding 2500 meters.

Environmental conditions: There is no risk of combustion or explosion in the surrounding medium, no corrosive gases, and no conductive dust. The installation site should not experience severe vibration due to rain and snow erosion.

4. Terminal Function

4.1 Real time data monitoring

Voltage, current, and power factor of phases A、B and C

Switching status of distribution container groups in phases A、B and C

Active power and reactive power of phases A、B and C

Total harmonic distortion rate of voltage and current in phases A、B and C, system frequency

Content of 3rd, 5th, 7th, 9th, 11th, and 13th harmonic voltages in phases A、B and C

Content of 3rd, 5th, 7th, 9th, 11th, and 13th harmonic currents in phases A、B and C

4.2 Reactive power compensation

The sampled physical quantity is reactive power without switching oscillation.

Y-shaped compensation method

△ type compensation method

Y+△ comprehensive compensation method

5. Technical Parameter

5.1 Basic parameters

Supply voltage	AC220V+20%
Sampling voltage	AC220V+20%
Power frequency	50Hz+5%
Sampling current	0~5A
Maximum power consumption of the whole machine	14W (depending on the power of the controlled switching switch)
Control output contacts	24 channels, each DC12V × 30mA

5.2 Measurement accuracy

Voltage	±0.5%
Electric current	±0.5%
Active power	±1.0%
Reactive power	±1.0%
Frequency	±0.5%
Power factor	±1.0%

5.3 Control parameters

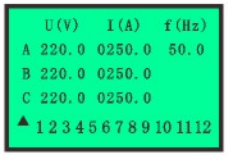
Control sensitivity	30mA
Target COSΦ (1)	0.85~1.00 Step Size 0.01 Factory preset 1.00
Target COSΦ (2)	0.00~0.60 Step size 0.01 Factory preset 1.00
Threshold coefficient	0.5~1.2 Step size 0.1 Factory preset 1.00
Switching delay (1)	00s~600s Step size 1/0.02 Factory preset 0s
Switching delay (2)	00s~300s Step 1 Factory preset 8s
Overvoltage protection	230V~280V Step size 1V Factory preset 240V
under voltage protection	210V~180V Step size 1V Factory preset 190V
Harmonic voltage exceeds the limit	00.0%~25.0% Step size 0.5% Factory preset 00.0%
Harmonic current exceeds the limit	00.0%~100.0% Step size 0.5% Factory preset 00.0%

6. Display and Operation

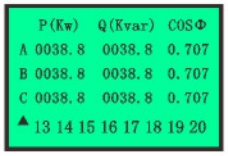
6.1 Automatic control

After the system is powered on, it automatically enters the main menu (displayed in both Chinese and English, as shown in the figure below) after 3 seconds, and enters the automatic running state after a delay of about 180 seconds. The LCD backlight will automatically turn off after 180 seconds. Press any key to activate the backlight.

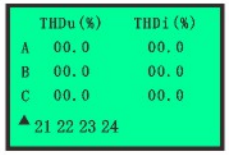
There are 5 screens in automatic operation mode, and operating the up or down button can cyclically display various power grid operation data (the display varies depending on the number of control output channels). The first screen displays real-time voltage, current, grid frequency, and capacitor switching status.



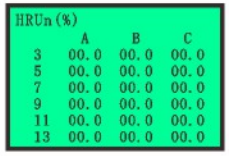
"▲▼" is the switching indicator. When a capacitor is to be switched in or out, ▲ or ▼ flashes, indicating the action to be performed. 1-24 are output states. If a certain channel number is displayed in reverse, it indicates that the channel has been put into operation. Otherwise, it means it has not been invested.
The second screen displays active power, reactive power, power factor, and capacitor switching status.



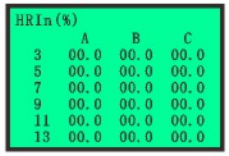
The third screen displays the total harmonic distortion rate of each phase voltage and current, as well as the switching status of capacitors.



The fourth screen displays the 3rd, 5th, 7th, 9th, 11th, and 13th harmonic distortion rates.



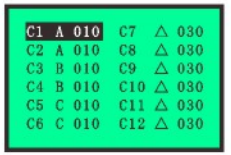
The fifth screen displays the 3rd, 5th, 7th, 9th, 11th, and 13th harmonic distortion rates of the current.

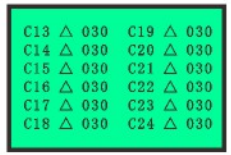


6.2 Manual control

The manual function only applies to the forced switching of compensating capacitors. Press the menu key to enter the main menu, use the ▲▼ keys to select "Manual Control", and use the "OK" key to enter manual mode.

If the capacitance value of a certain circuit is reversed, it indicates that it has been put into operation; otherwise, it indicates that it has not been put into operation.





If the capacity of a certain route is set to "00", the route cannot be put into operation. On the operation, use the ▲▼ keys to select the circuit number to be put into operation, and use the "OK" key to perform the action of putting or cutting off the capacitor in that circuit.

6.3 Parameter settings

The parameters related to the product have been pre-set at the factory, and users can modify them according to their on-site needs.

All setting parameters are automatically memorized and not lost in case of power failure.

When a certain parameter is displayed in reverse, if it needs to be modified, you can directly operate the ▲▼ keys to modify the parameter.

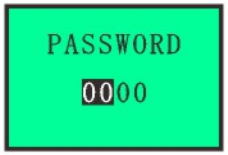
If a certain parameter is displayed in reverse and does not need to be modified, you can directly operate the "OK" button to select other parameters.

Attention: If used for the first time, parameters such as transformation ratio and capacitance must be reset according to actual on-site needs.

Press the menu key to enter the main menu, use the ▲▼ keys to select "Parameter Configuration", and use the "OK" key to enter the setting mode.

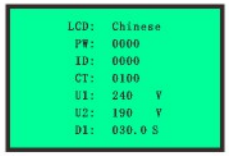
6.3.1 Password confirmation (displayed in both Chinese and English)

Press the "OK" button to enter and enter the password.



6.3.2 Parameter selection (displayed in both Chinese and English)
Press the "OK" button to enter and select the parameter item to be set, such as "Operating parameters".

6.3.3 Set operating parameters
Press the "OK" button to enter and select the parameter item to be set.



First screen

6.3.3.1 Display Settings
Identification: LCD
Factory preset: Chinese
Purpose: Switching between Chinese and English displays
Scope: Chinese English

6.3.3.2 Password Setting
Identification: PW
Factory preset: 0000
Purpose: Determine parameter modification permissions for settings
Scope: 0000-9999

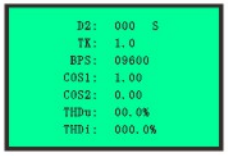
6.3.3.3 Communication Address
Identification: ID
Factory preset: 0000
Purpose: Communication device address
Scope: 0000-0255

6.3.3.4 Current Transformer Ratio Setting
Identification: CT
Factory preset: 0100 (500/5)
Purpose: To provide measurement and control parameters for the current transformer ratio in the incoming cabinet

6.3.3.5 Overvoltage protection settings
Identification: U1
Factory preset: 240V
Range: 230V-280V
Step size: 1V
Purpose: To cut off capacitors when the power grid is overvoltage

6.3.3.6 Undervoltage protection setting
Identification: U2
Factory preset: 190V
Range: 210V-180V
Step size: 1V
Purpose: To remove capacitors when the power grid is under voltage

6.3.3.7 Switching Delay (1) Setting
Identification: D1
Factory preset: 030.0S
Scope: 000-600S
Purpose: Set capacitor switching delay time



Second screen

6.3.3.8 Switching protection delay (2) setting
Identification: D2
Factory preset: 000S
Scope: 00-300S
Purpose: Capacitor discharge time.

6.3.3.9 Threshold coefficient setting
Identification: TK
Factory preset: 1.0
Range: 0.5-1.2
Step size: 0.1
Purpose: Adjust the threshold for capacitor input
Note: The value of "switching threshold" refers to the "input threshold coefficient", and its sum with the "cutoff threshold coefficient" is 1.2.
When TK is set to 1:
In the lagging state, if the reactive power of the power grid is greater than the input threshold x the capacitance value of the pre input capacitor, then the capacitor is put into the leading state. If the reactive power of the power grid is greater than the cut-off threshold x the capacitance value of the already input capacitor, then the capacitor is cut off. When it is necessary to improve the compensation effect, the threshold coefficient can be reduced. If it is necessary to increase the switching stability range, the threshold coefficient can be increased.

6.3.3.10 Communication speed
Identification: BPS
Factory preset: 9600
Scope: 4800 \9600 \19200 \38400
Purpose: Communication speed

6.3.3.11 Target power factor setting (1)
Identification: COS1
Factory preset: 1.00
Range: 0.85-1.00
Step size: 0.01
Purpose: Power factor target management
Attention: Keep the power factor at the target setting value, and reduce the target power factor setting when the power factor does not need to be too high.

6.3.3.12 Target Power Factor Setting (2)
Identification: COS2
Factory preset: 0.00
Range: 0.00-0.60
Step size: 0.01
Purpose: To remove capacitors in special occasions

6.3.3.13 Voltage total harmonic distortion rate over limit setting
Identification: THDu
Factory preset: 00.0%
Range: 00.0% -25.0%
Step size: 0.5%
Purpose: Voltage total harmonic distortion rate over limit protection

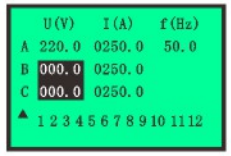
6.3.3.14 Current total harmonic distortion rate exceeding limit setting
Identification: THDi
Factory preset: 00.0%
Range: 00.0% -100.0%
Step size: 0.5%
Purpose: Current total harmonic distortion rate over limit protection

6.3.4 Setting capacitance parameters
Press the "OK" button to enter and select the parameter item to be set.

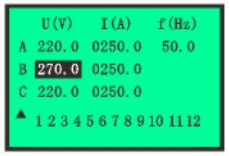
C1-C24:24 capacitors (display corresponding capacitor parameters based on the number of output channels);
Each compensation method and capacity can be set as needed.
Note: A, B, C: Phase separation capacitor setting (supplementary);
△: Three phase capacitor setting (shared compensation);
010, 030: Capacitor capacitance value setting. If set to 00.0, the capacitor cannot be switched on or off;

6.4 Overlimit and fault warning
When there is a fault in the power grid or a certain parameter exceeds the limit, the corresponding parameter will display the status of overvoltage, undervoltage, phase loss, and a certain parameter exceeding the limit.

6.4.1 Phase deficiency in B and C



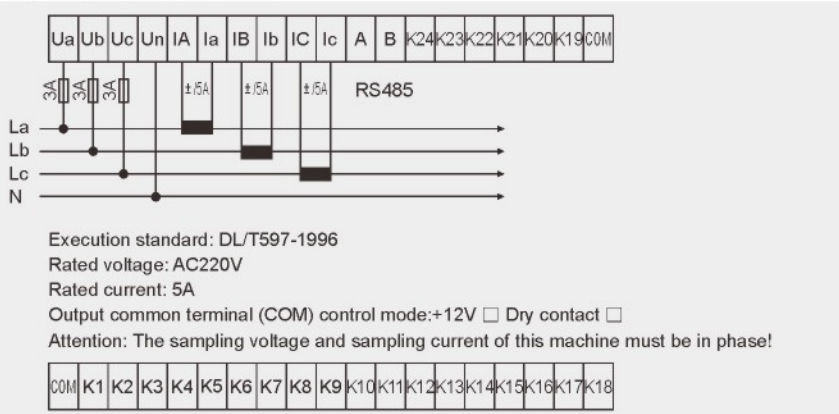
6.4.2 Phase B



7. Installation and Testing

7.1 Inspection and wiring diagram before installation
Before opening the packaging of this machine for installation, carefully check for any signs of damage and ensure that the accessories and instructions are complete. If any problems are found, please contact the supplier in a timely manner.
Connect the power supply, power on to check if the operation function and display are normal.

The 24 way wiring diagram is as follows:



Execution standard: DL/T597-1996
Rated voltage: AC220V
Rated current: 5A
Output common terminal (COM) control mode:+12V □ Dry contact □
Attention: The sampling voltage and sampling current of this machine must be in phase!

7.2 Installation dimensions

Dimensions: 144 * 144 * 95mm
Opening size: 138 * 138mm
Embedding depth: 110mm

7.3 Wiring Instructions

When considering installation plans, the principles of easy installation, convenient observation and collection, and favorable wiring for signal power and grounding should be followed.

7.3.1 Working power supply

The working power supply of this machine is multiplexed with the A-phase voltage sampling channel, with AC220V ± 20%

7.3.2 Voltage signal line

The voltage signal line also serves as the power input for this machine, and a 1.5mm^2 single stranded copper wire should be selected. It should be kept as far away as possible from high-voltage and high current carriers to reduce electromagnetic effects.

7.3.3 Current signal line

In order not to affect the measurement accuracy, 2.5mm^2 single stranded copper wire should be selected for the current signal line, and the wire should be kept as short as possible.

7.3.4 Contact/switch output

The contact output capacity is 5A/AC220V, and the level output capacity is DC12V/40mA. When connecting, try to stay away from the input circuit, high voltage, and high current carriers as much as possible.

8. Unpacking Inspection

Open the outer packaging and check if the appearance of the controller is intact, and if the accessories and instructions are complete. If you find any damage to the controller casing or incomplete accessories and instructions, please contact the supplier in a timely manner.

9. Safety Operation Warning

1. Before powering on this machine, carefully check whether the device is reliably grounded;
2. Only professional technicians familiar with the operation manual of the machine are allowed to install, operate or maintain the machine;
3. The installation of this machine must comply with all relevant safety operating procedures, and the safety of operation, reliability of operation, and accuracy of measurement must be ensured through correct wiring and wire size.
4. Both the power input and CT secondary side can generate high voltage that poses a threat to personal safety. Caution should be exercised during operation and strict adherence to electrical safety operating procedures should be followed.
5. When repairing, installing, and replacing this machine, it is necessary to ensure that the power supply is disconnected and the CT secondary circuit is short circuited.
6. When collecting and setting data with electricity, do not touch the live parts under any circumstances.

10. Simple Troubleshooting

1. Do not display
   Please check if the power cord is properly connected;
2. There is no data available for a certain phase
   Please check if the phase connection is secure;
3. The COS Φ value remains unchanged with the switching of the capacitor
   Please check if the position of the sampling current transformer is correct (sampling current=load current+ capacitor current).
4. Error in COS Φ value
   Please check if the sampled voltage signal and the sampled current signal are in the corresponding phase, and they cannot be in phase.
5. The current is displayed as "0.0A"
   Please check if the current transformer and controller current signal terminal circuit are open or not loaded.
6. Current display error
   Please check if the value configured in the "CT ratio" parameter setting item is consistent with the ratio of the sampling current transformer.
7. Forced removal of capacitors
   Please check if a certain indicator of the power grid exceeds the set protection range, and the controller will have a corresponding alarm indication.
8. Poor compensation effect (small COS Φ value)
   Firstly, it can be achieved by reconfiguring several parameter settings to increase the value of the "target COS Φ" or decrease the value of the "switching threshold". Our recommended values are 1.00 and 1.0, respectively, with each set of capacitance values set to be the same as the actual physical values.
   Secondly, the capacity of capacitors should be reasonably configured according to the on-site situation. If it is graded compensation, the difference in capacitance between each level of capacitor should be minimized as much as possible.
9. If the above checks cannot eliminate the fault, please replace the controller and make a judgment again, or directly contact the dealer for assistance.