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

Model: JKWF Series

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

JKWF Series

Reactive Power Automatic Compensation Controller

Note: The working mode of this controller has been adjusted to power factor control mode before leaving the factory, and all parameters have been pre-set in the most reasonable way. Unless there are special requirements, users can work normally as long as the wiring is correct without any operation.

Contents

1. Overview

The JKWF series reactive power automatic compensation controller uses a high-speed and high-performance microprocessor as the core device to simultaneously sample 3-phase voltage and 3-phase current signals, and provides 6 compensation schemes for sub compensation and co compensation, as well as 12 switching coding schemes. Users can freely choose by modifying the control parameters. Once the control parameters are modified, they will be permanently saved, and the power loss compensation will be lost. The switching of the capacitor bank is controlled by a combination of fundamental power factor and fundamental reactive power, ensuring stable switching without oscillation and insensitivity to voltage, harmonic, and current harmonic interference. Used for automatic control of reactive power compensation in AC power systems below 45Hz-65Hz and 0.4KV.

2. Functional Features

1. Calculating the capacity of switching capacitors based on fundamental reactive power can avoid various forms of switching oscillations and accurately display the power factor of the power grid in the presence of harmonics.
2. High precision in power factor measurement and wide display range.
3. Real time display of total power factor (PF) and fundamental power factor (COSΦ).
4. There are 12 encoding output methods for users to choose from.
5. There are up to 6 compensation options for users to choose from.
6. Up to 16 outputs.
7. The human-machine interface is user-friendly and easy to operate.
8. All kinds of control parameters are digitally adjustable, intuitive and easy to use.
9. It has two working modes: automatic operation and manual operation.
10. It has overvoltage and undervoltage protection functions.
11. It has power failure protection function to prevent data loss.
12. The input impedance of the current signal is low ≤ 0.012.
13. The target power factor adjustment range is wide.
14. Communication function (customized).
15. It has harmonic protection function.

3. Conditions of Use

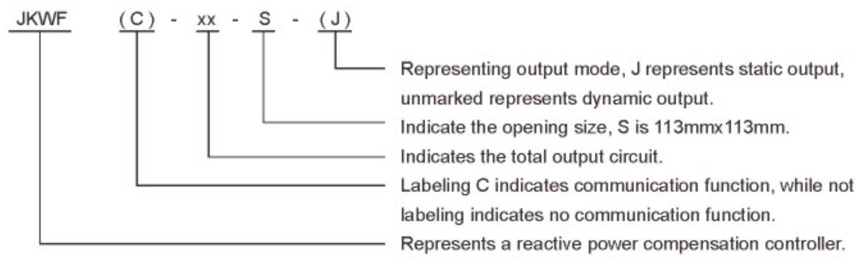
1. The altitude shall not exceed 2500 meters.
2. The ambient temperature ranges from -20℃ to+50℃.
3. The air humidity should not exceed 50% at 40℃ and 90% at 20℃.
4. The surrounding environment is free of corrosive gases, conductive dust, and flammable and explosive media.
5. There is no severe vibration at the installation location.

JKWF Series Reactive Power Automatic Compensation Controller

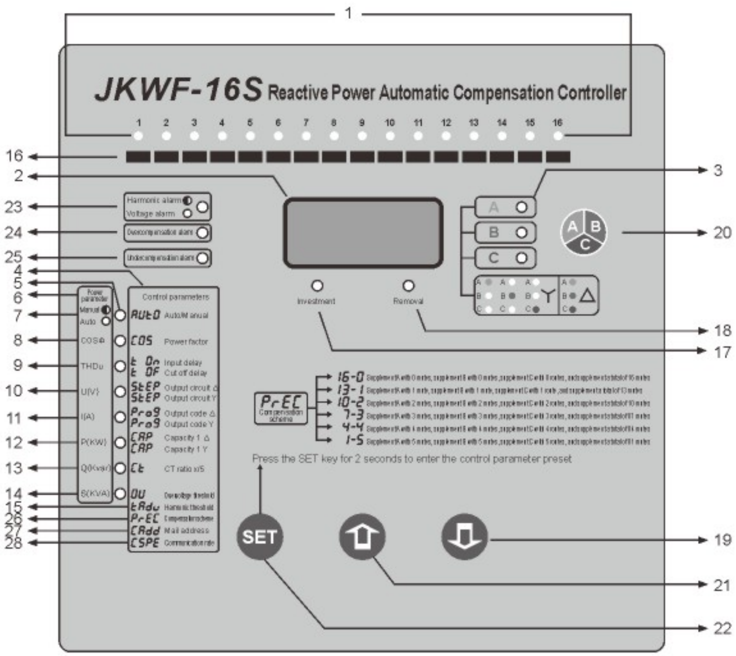
4. Technical Data

Rated working voltage: AC220V ± 20%
Rated working current: AC0-5A
Rated operating frequency: 45Hz-65Hz
Power consumption of the whole machine: 10VA
Undervoltage protection value: 170V
Sensitivity: 50mA
Display: 4-digit red digital tube
Protection level: IP40 shell
Dimensions: 122mmx122mmx99mm
Hole size: 113mmx113mm
Display power factor: lag 0.001- lead 0.01
Static output contact capacity per circuit: AC220V 7A
Dynamic output capacity per channel: -12V 10mA
Connection method: socket terminal block screw fixation
Installation method: Embedded installation with inverted teeth attachment fixed

5. Model Meaning



6. Control Panel Diagram



7. Buttons and Indicator Lights

1. 1-16 circuit capacitor bank switching indication.
2. Display of power parameters and control parameters.
3. Phase indicator light

In automatic operation mode:

-The A indicator light is on, indicating that the digital display shows the power parameters of phase A.
-The B indicator light is on, indicating that the digital display shows the power parameters of phase B.
-The C indicator light is on, indicating that the digital display shows the power parameters of phase C.
-The simultaneous illumination of ABC indicator lights indicates that the digital display shows the sum of ABC3 phase power parameters.

In manual operation mode:

-When the A indicator light is on, press the increment button to activate the A-phase compensating capacitor group; press the decrement button to deactivate the A-phase compensating capacitor group.
-When the B indicator light is on, press the increment button to activate the B-phase compensating capacitor group; press the decrement button to disconnect the B-phase compensating capacitor group.
-When the C indicator light is on, press the increment button to activate the C-phase compensating capacitor group; press the decrement button to deactivate the C-phase compensating capacitor group.
-When the ABC indicator lights are on at the same time, press the increment button to activate the shared capacitor bank; press the decrement button to deactivate the shared capacitor bank.

In the control parameter modification state:

-The alternating illumination of ABC indicator lights indicates that the user is currently modifying the phase separation compensation control parameters.
-The simultaneous illumination of ABC indicator lights indicates that the user is currently modifying the co compensation control parameters.-The simultaneous extinction of ABC indicator lights does not indicate any meaning.

4. Control parameter menu.

5. The power parameter and control parameter indicator lights are shared by the power parameter menu and the control parameter menu because their displays do not overlap in time and space. In automatic operation mode, the digital display shows the power parameter content indicated by this indicator light. In the parameter modification state, it indicates that the digital display displays the control parameter content indicated by this indicator light.

6. Power parameter menu.

7. Automatic/Manual Operation and Automatic/Manual Parameter Indicator Light：

In the parameter preset state: When this indicator light is on, it indicates that the control parameter currently selected by the user is the automatic operation mode/manual operation mode control parameter. In non parameter preset state (automatic operation state or manual operation state): If the indicator light stays on, it Indicates that the controller is working in automatic operation state; The indicator light flashes at intervals of half a second to indicate that the controller is operating in manual mode.

8. CosΦ (fundamental power factor) and target power factor parameter indicator lights:

In manual or automatic operation mode: When this indicator light is on, it indicates that the digital display shows the fundamental power factor of the phase indicated by the phase indicator light; When a negative power factor is displayed, it indicates that the fundamental current signal leads the fundamental voltage signal; When a positive power factor is displayed, it indicates that the fundamental current signal lags behind the fundamental voltage signal.

In parameter preset state: When this indicator light is on, it indicates that the digital display is displaying the compensation target power factor control parameters.

9. THDu (total power factor) and input cut-off delay indicator light:
In automatic operation mode: (JKWF-12) When this indicator light is on, it indicates that the digital display shows the total power factor of the phase indicated by the phase indicator light. When a negative power factor is displayed, it indicates grid capacitance, and when a positive power factor is displayed, it indicates grid inductance; (JKWF-16) This indicator light is on, indicating that the digital display shows the voltage distortion rate of the phase indicated by the phase indicator light; In the parameter preset state: When this indicator light is on, it indicates that the digital display is showing the delay control parameters for input or output.

10. U (V) (sampled signal voltage value) and control parameters for the co compensation and sub compensation output circuit:
In automatic operation mode: When this indicator light is on, it indicates that the digital display is displaying the voltage value of the phase indicated by the phase indicator light. In the parameter preset state: When this indicator light is on, it indicates that the digital display is displaying the control parameters of the common compensation output circuit or the sub compensation output circuit.

11. I (Sampling signal current value) and co compensation output coding control parameters:
In automatic operation mode: When this indicator light is on, it means that the digital display shows the phase primary current value indicated by the phase indicator light. In the parameter preset state: When this indicator light is on, it indicates that the digital display is displaying the control parameter of the capacitance value encoding of the common or sub capacitor.

12. P (KW) (active power of the power grid) and capacity control parameters for the first capacitor for co or sub compensation:
In automatic operation mode: When this indicator light is on, it means that the digital display shows the active power value of the phase indicated by the phase indicator light.
In the parameter preset state: When this indicator light is on, it indicates that the digital display is displaying the first common capacitor capacity value or the first sub capacitor capacity value to control the parameter.

13. P (Kvar) (reactive power of the power grid) and total current transformer ratio control parameters:
In automatic operation mode: When this indicator light is on, it means that the digital display shows the reactive power value of the phase indicated by the phase indicator light.
In the parameter preset state: When this indicator light is on, it indicates that the digital display is displaying the total current transformer ratio control parameters.

14. S (KVA) (apparent power of the power grid) and overvoltage threshold control parameters:
In automatic operation mode: When this indicator light is on, it indicates that the digital display is displaying the apparent power value of the phase indicated by the phase indicator light.
In the parameter preset state: When this indicator light is on, it indicates that the digital display is displaying the overvoltage threshold control parameter.

15. Hz (grid rate) and compensation party control parameters
JKWF-12S model in automatic operation mode: When this indicator light is on, it indicates that the digital display shows the grid frequency value. In the parameter preset state: When this indicator light is on, it indicates that the digital display is displaying the compensation scheme control parameters. The JKWF-16 model has no LED indicator lights or grid frequency parameters for this controller. In the parameter preset state: When all parameter indicator lights are off, it indicates that the digital display is displaying compensation scheme control parameters.

16. Paste position of phase indication label for switching
Due to the phase indicated by the switching indicator LED light, it will change with the compensation scheme and output circuit parameters. When the user determines the compensation scheme and output circuit based on their designed compensation device parameters, the phase indicated by the switching indicator LED light will also be determined. The user can attach the phase label provided with the packaging to make the switching indicator more intuitive.

17. Input indicator light
When the user manually inputs the capacitor bank or automatically inputs the capacitor bank, this indicator light will light up, indicating that the control is preparing to input the capacitor bank. After a predetermined input delay time, the capacitor bank will be input.

18. Cut off the indicator light
When the user manually cuts off the capacitor bank or automatically cuts off the capacitor bank, this indicator light will light up, indicating that the controller is accurately cutting off each capacitor bank. After a predetermined cutting delay time, the capacitor bank will be cut off.

19. Decrease button
In automatic operation mode: Press this key to cycle down as shown on the control panel to select and display power parameters.
In manual operation mode: operate this key to cut off the capacitor bank of the phase indicated by the phase indicator light.
In the parameter preset state: Press this key to select the control parameter downwards or decrease the control parameter value as shown on the operation panel.

20. Phase selection button
Operate this key to cycle through the selection of the target phase.
Note: In manual operation mode, if the user finds that manual input is not possible, they should check whether the phase selection is correct.

21. Incremental button
In automatic operation mode: Press this key as shown on the control panel to cycle up and display the power parameters.
In manual operation mode: Press this button to activate the capacitor bank with phase indicator light indicating the phase.
In the parameter preset state: Operate this key as shown on the operation panel to select the control parameter upwards or increase the control parameter value.

22. Set button

In automatic or manual operation mode, pressing this button for 2 seconds will enter the parameter preset state of the controller; In the parameter preset state, pressing this button for 2 seconds will exit the controller from the parameter preset state, or clicking and pressing this button will switch the control parameter between the modified state and the selected state.

23. Harmonic alarm or voltage alarm indicator light

When this indicator light is on for a long time, it indicates that the sampling signal voltage is higher than the user's predetermined overvoltage threshold value. When flashing, it indicates that the phase voltage harmonics exceed the user's predetermined harmonic threshold value. The controller will cut off the capacitor banks that have been put into operation one by one.

24. Overcompensation alarm indicator light

When all capacitor banks have been disconnected and the power factor value of the grid is still higher than the target power factor value, it indicates overcompensation. This indicator light will light up.

25. Insufficient compensation test alarm indicator light

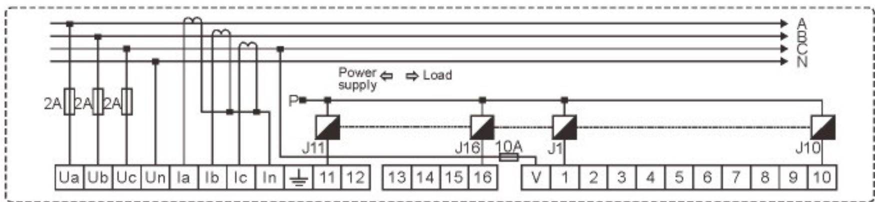
When all capacitor banks have been put into the grid and the power factor value is still lower than the target power factor value, it means that the under compensation test indicator light will be on.

26. Compensation party safety control parameters

27. Communication address control parameters

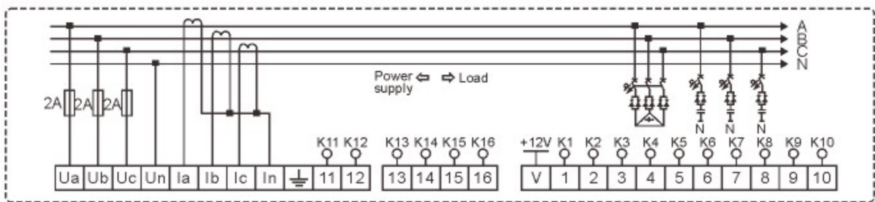
28. Communication baud rate control parameter

8. Wiring Diagram



JKWF type wiring diagram static output

When the rated working voltage of the AC contactor is 380V, point P is connected to B; when it is 220V, point N is connected.



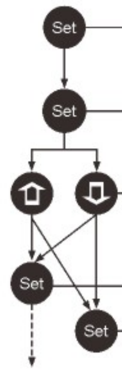
JKWF type wiring diagram dynamic output

9. Parameter Preset

All the preset operation procedures for the following control parameters start from the startup state.

9.1 Selection of automatic and manual operation modes

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller

The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).

Click the settings button

Operate the increment and decrement keys as shown on the digital display:

80n indicates that the controller is operating in automatic mode

DF indicates that the controller is operating in manual mode

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

Special reminder: The selection of manual and automatic operation functions is indirectly achieved through the selection of this control parameter. In other words, the controller has the function of memorizing the working state.

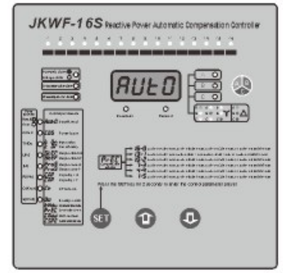
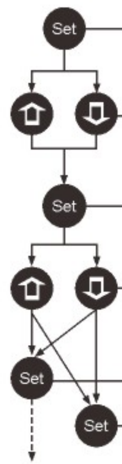


Figure 1

9.2 Pre setting of target power factor

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller

The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).

Operate the increment and decrement keys to display the "COS Power Factor" indicator light in the COS control parameter menu, as shown in Figure (2)

Click the settings button

The operation of the increment and decrement keys can adjust the target power factor between a lag of 0.70 and a lead of 0.70

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

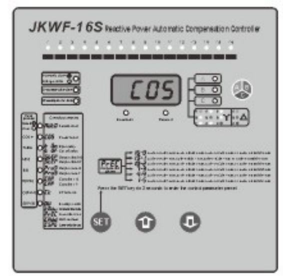
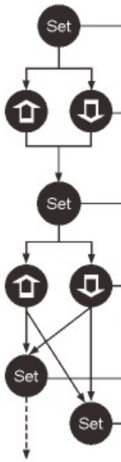


Figure 2

9.3 Pre setting of input delay

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: t On
The " t On Input Delay/ t OF Cut Off Delay" indicator light in the control parameter menu is onAs shown in Figure (3)

Click the settings button

The operation of the increment and decrement keys can adjust the delay of the capacitor bank between 2-120 seconds

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

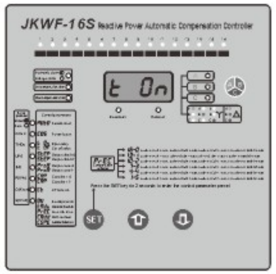
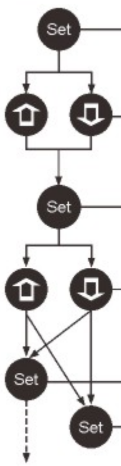


Figure 3

9.4 Pre setting of resection delay

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: t OF
The " t On Input Delay/ t OF Cut Off Delay" indicator light in the control parameter menu is onAs shown in Figure (4)

Click the settings button

The operation of the increment and decrement keys can adjust the delay of the capacitor bank between 2-120 seconds

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

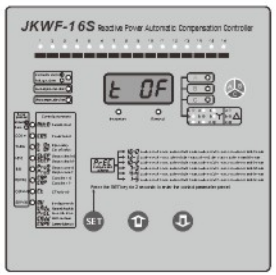
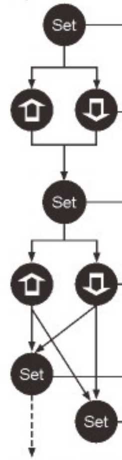


Figure 4

9.5 Pre setting of output circuit for shared capacitor bank

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: the StEP 3 phase indicator lights are on simultaneously, and the control parameter menu "StEP output circuit△/ StEP output circuit Y" indicator light is on, as shown in Figure (5).
Click the settings button

The incremental and decremental keys can be used to adjust the output circuit of the shared capacitor bank to the user's desired circuit.

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

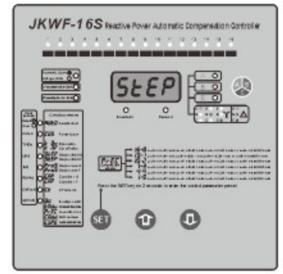
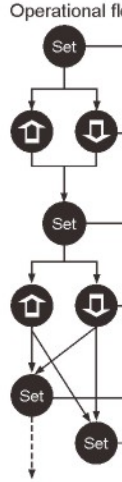


Figure 5

Note: Before modifying this parameter, the compensation scheme should be pre-set with a number. The maximum output circuit of the shared capacitor bank is related to the selection of the compensation schemeIf the user is unable to adjust the output circuit to the normal value, the compensation scheme should be checked for correctness.
Regarding the relationship between the maximum value of the output circuit of the shared capacitor and the compensation scheme, please refer to Section 10 (Instructions for the use of compensation parameters)

9.6 Pre setting of the output circuit for the capacitor group

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: the StEP 3 phase indicator lights are on simultaneously, and the control parameter menu "StEP output circuit△/ StEP output circuit Y" indicator light is on, as shown in Figure (6).
Click the settings button

The incremental and decremental keys can be used to adjust the output circuit of the capacitor bank to the user's desired circuit.

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

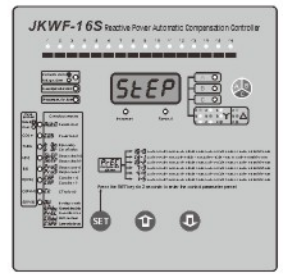
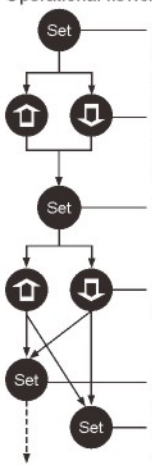


Figure 6

Note: Before modifying this parameter, the compensation scheme should be pre-set. The maximum output circuit of the capacitor group is related to the selection of the compensation scheme. If the user is unable to adjust the output circuit to the normal value, the selection of the compensation scheme should be checked for correctness.
Please refer to Section 10 (Instructions for Using Compensation Parameters) for the relationship between the maximum value of the output circuit of the compensating capacitor and the compensation scheme

9.7 Pre setting of output code for shared capacitor bank

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display the three phase indicator lights of Prog and the " Prog Output Encoding△/ Prog Output Encoding Y" indicator light in the control parameter menu simultaneously, as shown in Figure (7).

Click the settings button

The increment and decrement keys can be used to select the output code of the shared capacitor bank from Pr-1 to Pr12.

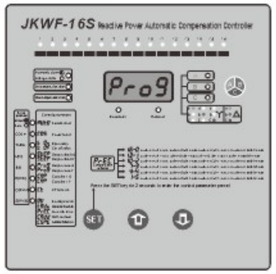
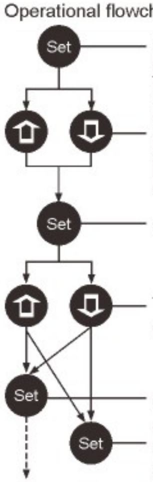


Figure 7

Click the settings button to continue presetting other control parameters
Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program
Please refer to Section 10 (Instructions for Using Compensation Parameters) for an explanation of the output encoding of capacitor banks

9.8 Pre setting of output coding for capacitor banks

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display the three phase indicator lights of Prog and the " Prog Output Encoding△/ Prog Output Encoding Y" indicator light in the control parameter menu simultaneously, as shown in Figure (8).

Click the settings button

The increment and decrement keys can be used to select the output code of the shared capacitor bank from Pr-1 to Pr12.

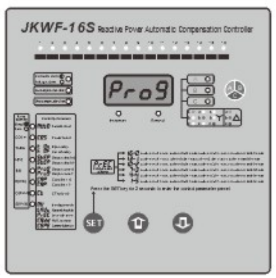
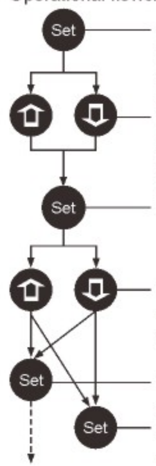


Figure 8

Click the settings button to continue presetting other control parameters
Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program
Please refer to Section 10 (Instructions for Using Compensation Parameters) for an explanation of the output encoding of capacitor banks

9.9 The preset capacity of the first shared capacitor bank

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: the CAP 3 phase indicator lights are on simultaneously, and the control parameter menu " CAP Capacity 1 △ / CAP Capacity 1 Y" indicator light is on, as shown in Figure (9).
Click the settings button

The increment and decrement keys can be used to adjust the capacity value of the first shared capacitor bank from 0.1Kvar to 200.0Kvar.

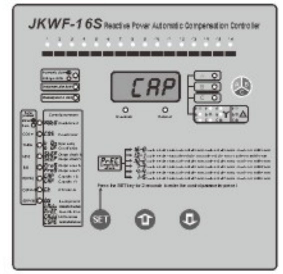
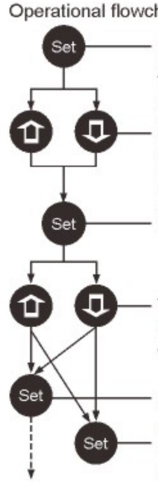


Figure 9

Click the settings button to continue presetting other control parameters
Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

9.10 The preset capacity of the first supplementary capacitor group

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: the CAP 3 phase indicator lights are on simultaneously, and the control parameter menu " CAP Capacity 1 △ / CAP Capacity 1 Y" indicator light is on, as shown in Figure (10).
Click the settings button

The increment and decrement keys can be used to adjust the capacity value of the first shared capacitor bank from 0.1Kvar to 200.0Kvar.

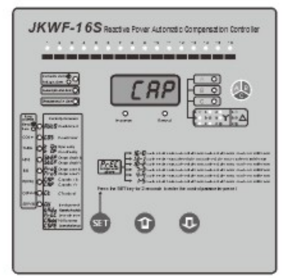
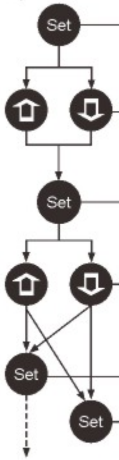


Figure 10

Click the settings button to continue presetting other control parameters
Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

9.11 Pre setting of total current transformer ratio

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display the "CT Ratio x/5" indicator light in the Ct control parameter menu, as shown in Figure (11).

Click the settings button

The increment and decrement keys can be used to select the total current transformer transformation ratio from 5 to 9000.

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

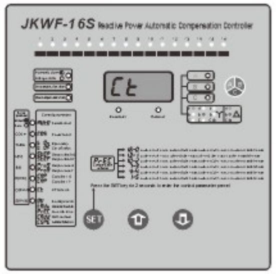
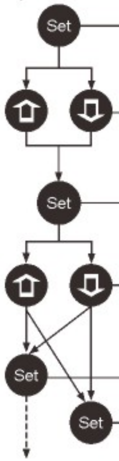


Figure 11

9.12 Pre setting of overvoltage threshold

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display the " OU Overvoltage Threshold" indicator light in the OU control parameter menu on the digital display, as shown in Figure (12).

Click the settings button

The increment and decrement keys can be used to select the overvoltage threshold value between 220V and 260V.

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

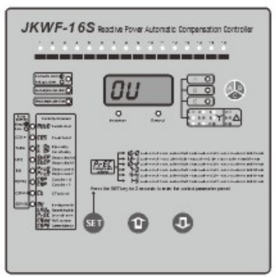
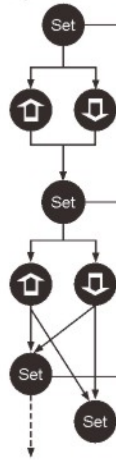


Figure 12

JKWF Series Reactive Power Automatic Compensation Controller

9.13 Pre setting of voltage harmonic threshold

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display the " tAdu Harmonic Threshold" indicator light in the tAdu control parameter menu on the digital display, as shown in Figure (13).

Click the settings button

The increment and decrement keys can be used to select the harmonic threshold value between 1.0 and 50.

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

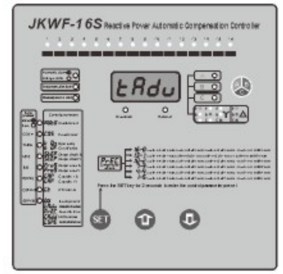
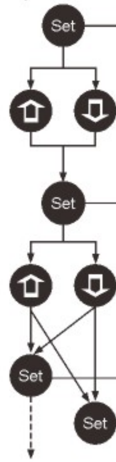


Figure 13

9.14 Pre setting of compensation plan

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display the " PrEC Compensation Scheme" indicator light in the PrEC control parameter menu, as shown in Figure (14).

Click the settings button

Operate the increment and decrement keys to select the compensation scheme that suits you

16-8　7-3
19-1　4-4
18-2　1-5

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

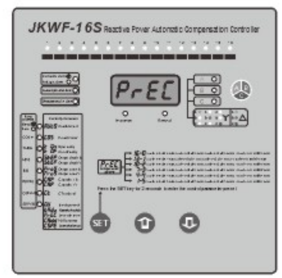
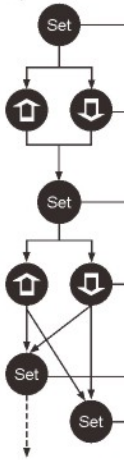


Figure 14

The meaning of the compensation scheme code: The digital display format of the compensation scheme is 88-8 . The first two digits of the digital tube display represent the total number of output circuits in the co compensation circuit. If it is zero, it indicates that there is no output in the co compensation circuit; The third digit displays the isolation symbol "-" with no other meaning; The last digit displayed on the digital tube represents the number of output circuits for each phase's compensation. If it is zero, it indicates that there is no output from the compensation circuit.

9.15 Preset communication address

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: CAdd is shown in Figure (15).

Click the settings button to display the preset communication address value on the digital display.

The operation setting key can use the increment and decrement keys to select the communication address from 0 to 247, where 0 is the broadcast address.

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

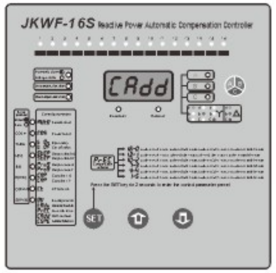
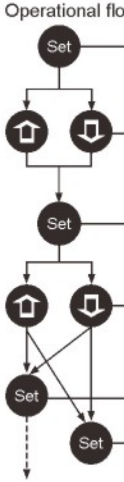


Figure 15

9.16 Preset communication speed

Operational flowchart



Press and hold the settings button for 2 seconds to enter the parameter preset program on the controller
The digital display shows that the "AUtO Automatic / Manual" indicator light in the AUtO control parameter menu is on, as shown in Figure (1).
Operate the increment and decrement keys to display on the digital display: CSPE is shown in Figure (16).

The preset communication rate value of the operation setting key is displayed on the digital display.

The operation setting key can use the increment and decrement keys to select the communication rate between 4800, 9600, 19200, 38400, and 115200.

Click the settings button to continue presetting other control parameters

Press and hold the settings button for 2 seconds to automatically save and modify parameters. The controller exits the parameter preset program

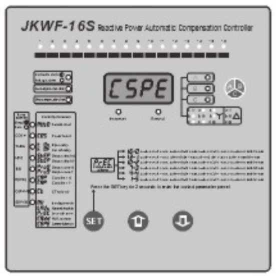


Figure 16

Note: Actual communication rate=displayed value x 100; If the displayed value is 96, the actual communication rate is 96 × 100 =9600, and the communication protocols MODBUS-RTU and RS485 are detailed in the test program help.

10. Instructions for Using Compensation Parameters

10.1 Compensation plan

The concept of compensation scheme in this manual refers to the number of channels for the controller to output the common compensation and each phase partial compensation drive signals.

1. Before using this controller, users should first establish the total compensation capacity based on the characteristics of the power parameters at the work site of the compensation device, and then establish the total co compensation capacity and the total sub compensation capacity.

2. The number of shared capacitors can be determined based on the total shared capacity.

3. The number of capacitors distributed in each phase can be determined based on the total capacity of the distribution.

Due to hardware limitations, the total number of output circuits for the JKWP-12S controller must not exceed 12; The total output circuit of the JKWP-16 controller shall not exceed 16; Otherwise, users should re plan the capacity of each capacitor to ensure that the total number of output channels is within the allowable range.

4. With the number of shared capacitors and the number of phase specific capacitors, the compensation scheme can be determined.

Example 1: A user's compensation device requires the installation of 10 shared capacitor banks, but due to the extremely balanced 3-phase load, no separate capacitors were used. So this user should choose a 12-0 compensation scheme, with a total compensation output circuit of 10 and a partial compensation output circuit of 0. See 9.14 for details

Example 2: A compensation device for a certain user requires the installation of 8 shared capacitor banks. Due to slight imbalance in the 3-phase load, 1 separate capacitor is used for each phase. So this user should choose the 9-1 compensation scheme, with a total compensation output circuit of 8 and a partial compensation output circuit of 1. See 9.14 for details

Example 3: A user's compensation device requires the installation of three shared capacitor banks. Due to moderate imbalance in the three-phase load, three separate capacitors are used for each phase. So this user should choose a 3-3 compensation scheme, with a total compensation output circuit of 3 and a partial compensation output circuit of 3. See 9.14 for details

Example 4: A user's 3-phase load is very unbalanced, with 4 separate capacitors used for each phase, while the shared capacitors are not used. So this user should choose a 0-4 compensation scheme, with a total compensation output circuit of 0 and a partial compensation output circuit of 4. See 9.14 for details

10.2 Output encoding

The concept of output encoding in this manual refers to the way in which the controller outputs the capacitor bank switching control signal, and the output method is directly related to the matching of the capacitor bank capacity.

Generally, traditional controllers only have one encoding method, which is equal capacity (1:1:1...:1) cyclic switching. The value of the capacitive reactive power to be compensated by the power grid is often continuous and not graded. Due to hardware limitations, the capacitive reactive power provided by the compensation device is usually limited to a few levels. This is a supply-demand contradiction, which is most prominent when the system load is relatively small. Here is an example: For example, a user has a 315KVA transformer with a total compensation capacity of 100Kvar and a total of 5 20Kvar capacitor banks. The controller uses the commonly used JKG type controller on the market. The control physical quantity of this controller is power factor, and the target power factor is the power factor. The input threshold is a lag of 0.92, and the cutoff threshold is a lag of 0.99. At some point in the evening, it was discovered that the system power factor was lagging by 0.60, with an apparent power of 12.5KVA and an inductive reactive power of 10Kvar. The controller continuously performed switching actions. The reason for this is that the capacity of a single capacitor group (20Kvar) is much larger than the required compensation capacity of the system (10Kvar). When the controller does not input the capacitor group, the power factor of the system is 0.60. According to the control principle of the positive G-type controller, if the power factor of the system is lower than the target power factor, the controller must input the capacitor group. After the capacitor group is input, due to the additional compensation of 10Kvar of capacitive reactive power, the compensated power factor changes from inductive 0.60 to capacitive 0.60. Due to the lag of 0.98 in the cut-off power factor threshold of the positive JKG type controller, the controller needs to cut off the capacitor group that has just been input, which repeatedly works back and forth. This is called switching oscillation in professional terminology. There are two drawbacks to this: firstly, frequent and meaningless switching actions greatly shorten the service life of capacitor banks and AC contactors; secondly, although compensation devices are installed in the power system, the expected compensation effect cannot be achieved. Most users will encounter the above phenomena, but the difference is that the situation varies from mild to severe. This is an unavoidable problem for every user. To solve the above problems, we believe that three points can be achieved: firstly, the physical quantity of the controller's switching control must take reactive power; The second capacitor bank cannot be of equal capacity and should be matched in size. The third controller should have the ability to automatically select the appropriate capacitor capacity. And the positive JKWF controller has these three points. The practice of matching capacitor capacity to adapt to changes in grid load size is referred to as output coding in this manual. Since it is coding, the size of the capacitor capacity cannot be arbitrarily given, and it should comply with certain rules. This controller provides 11 capacitor capacity ratio size matching schemes, which are:

Pr-1=> 1: 1: 1: 1: 1: ...: 1	Pr-2=> 1: 2: 2: 2: 2: ...: 2
Pr-3=> 1: 2: 4: 4: 4: ...: 4	Pr-4=> 1: 2: 4: 8: 8: ...: 8
Pr-5=> 1: 1: 2: 2: 2: ...: 2	Pr-6=> 1: 1: 2: 4: 4: ...: 4
Pr-7=> 1: 1: 2: 4: 8: ...: 8	Pr-8=> 1: 2: 3: 3: 3: ...: 3
Pr-9=> 1 : 2: 3: 6: 6: ...: 6	Pr-10=> 1 : 1: 2: 3: 3: ...: 3
Pr-11=> 1: 1: 2: 3: 6: ...: 6	Pr-12=> Cut in order

We use the JKWF controller to solve the problem in the above example

Based on the characteristics of the example power grid parameters, we chose the Pr-3 coding scheme. According to the proportional relationship between the total compensation capacity and the capacity of the Pr-3 coding scheme, the first circuit takes 5Kvar, the second circuit takes 10Kvar, the third circuit takes 20Kvar, the fourth circuit takes 20Kvar, the fifth circuit takes 20Kvar, and the sixth circuit takes 20Kvar. There are a total of six capacitor banks. When the power grid requires 10Kvar, the controller only needs to activate the second circuit. When 15Kvar is required, only the first and second circuits need to be activated. When 20Kvar is required, only the third circuit needs to be activated. The selection of input capacity JKWF can be automatically completed. Due to the use of reactive power control for capacitor bank switching in JKWF, there is no issue of switching oscillation.

JKWF Series Reactive Power Automatic Compensation Controller

10.3 Capacity of the first capacitor

The JKWF controller uses reactive power as the control physical quantity for switching capacitor banks. It must know the capacity of each circuit capacitor it drives. Due to the controller's use of output coding control parameters, this parameter establishes the capacity ratio relationship between each group of capacitors. Therefore, as long as the user inputs the capacity and output coding of the first circuit shared and supplemented capacitor bank, the controller can automatically calculate the remaining capacity of the circuit capacitor bank based on these two parameters. When in use, the user must input the capacity of the shared and supplemented first circuit capacitors.

11. Definition of the Function of Each Output Terminal Under Different Compensation Schemes and Output Circuits

The JKWF controller has a total of 16 outputs numbered 1, 2, 3,..., 16. Under different compensation schemes and output circuits, JKWF will compensate for the first circuit, second circuit,... according to phase A; B-phase compensation for the first circuit, second circuit; The first circuit, second circuit, and so on of the C-phase compensation system; The arrangement order of the first circuit, second circuit,... has been allocated to output control terminals.

Example 1: If the compensation scheme selected by a user is 10-2, it means that the maximum number of capacitor groups driven by co compensation is 10, and the maximum number of capacitor groups driven by each phase by sub compensation is 2. Selecting the co compensation output circuit as 8 means that although there are 10 available circuits for co compensation, the user only uses 8 circuits. Selecting the sub compensation output circuit as 2, the corresponding relationship between phase and output terminals is controlled according to the rules as shown in the table below.

Output terminal number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Control phase	A1	A2	B1	B2	C1	C2	G1	G2	G3	G4	G5	G6	G7	G8	Empty	Empty

Example 2: If the compensation scheme selected by a user is 10-2, it means that the maximum number of capacitor groups driven by the shared compensation is 10, and the maximum number of capacitor groups driven by each phase is 2. Selecting the shared compensation output circuit as 8 means that although there are 10 available circuits for the shared compensation, the user only uses 8 circuits. Selecting the shared compensation output circuit as 1 means that although there are 2 available circuits for each phase, the user only uses 1 circuit. According to the rules, the corresponding relationship between the phase and the output terminal is controlled as shown in the table below.

Output terminal number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Control phase	A1	B1	C1	G1	G2	G3	G4	G5	G6	G7	G8	Empty	Empty	Empty	Empty	Empty

Example 3: If the compensation scheme selected by a user is 01-5, it means that the maximum number of capacitor groups driven by co compensation is 1, and the maximum number of capacitor groups driven by each phase is 5. Selecting the co compensation output circuit as 0 means that although there is 1 available co compensation circuit, the user does not use it. Selecting the sub compensation output circuit as 5, according to the rules, controls the correspondence between the phase and the output terminals as shown in the table below.

Output terminal number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Control phase	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	Empty

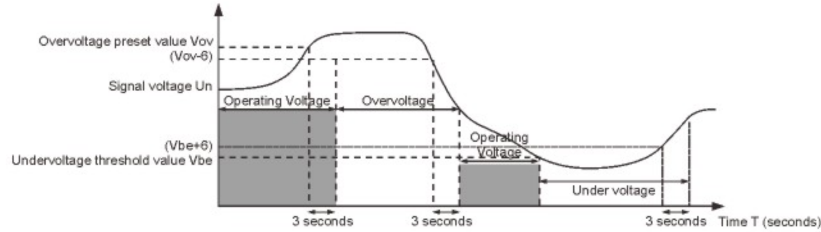
Note: In the above list,
"A1" represents the first circuit of phase A "A2" represents the second circuit of phase A ......
"B1" represents the first circuit of phase B "B2" represents the second circuit of phase B ......
"C1" represents the first circuit of phase C "C2" represents the second circuit of phase C ......
"G1" means to jointly supplement the first circuit "G2" means to jointly supplement the second circuit ......

12. Working Principle of JKWF Controller

JKWF uses two control parameters, power factor and reactive power, to control the switching of capacitor banks. When the power factor of the power grid is lower than the target power factor, JKWF calculates the reactive power that needs to be compensated to increase the current power factor of the power grid to the target power factor. When the required reactive power is greater than 0.65 times the minimum capacity of a single capacitor bank, the controller decides to switch the capacitor bank. After a user-defined delay time, if the switching condition is met, the controller immediately switches to the panic sub signal; When the required reactive power is much greater than the minimum capacitor capacity, the controller may invest multiple capacitor banks at once. In order to meet the requirements of electromagnetic compatibility, the total capacity of multiple value capacitor banks invested at once is not greater than the maximum single capacitor capacity of the compensation system. One time compensation in place avoids unnecessary switching links and improves the service life of contactors and capacitors; When the compensated reactive power is less than 0.65 times the minimum value of a single capacitor group, JKWF will refuse to put it into operation.
In order to cope with situations where the power grid load changes rapidly, JKWF uses the average reactive power within the delay time as the basis for reactive power when switching capacitor banks.

13. Reason for Alarm

13.1 Overvoltage and undervoltage alarm
When the voltage of any signal exceeds the user preset protection voltage value (Vov) for more than 3 seconds, the overvoltage alarm indicator light will turn on. In the overvoltage state, when the signal voltage is lower than or equal to (Vov-6) for more than 3 seconds, the overvoltage state will disappear. When the signal voltage is lower than the undervoltage threshold, the undervoltage alarm indicator light will turn on. In the undervoltage state, when the signal voltage is higher than VBe+6 for more than 3 seconds, the undervoltage state will disappear. Under overvoltage or undervoltage conditions, JKWF will disconnect the already connected capacitor banks with a delay of 1 second per step. When the signal voltage is higher than 260V or lower than 170V, JKWF will cut off all capacitor banks within 1 second.



13.2 Overcompensation alarm
When the AC contactor gets stuck or the contacts sinter, causing the JKWF control signal to lose its control function, or in a power grid system with lighting as the main load, it is possible that the power factor of the system is higher than the target power due to grid capacitance. At this time, the overcompensation alarm indicator light will light up.
13.3 Undercompensation alarm
The capacity of the capacitor decreases with the increase of usage time or the high breaking fuse falls off, causing the system power factor to still not reach the target power factor value even after the capacitor bank input signal is sent out. At this time, the undercompensation alarm indicator light is on.
13.4 Harmonic Alarm
When any phase voltage harmonic exceeds the user preset threshold value, a harmonic alarm will be triggered. In the harmonic alarm state, when the maximum phase voltage harmonic is less than the user preset threshold value minus 1.0 (action hysteresis), JKWF will exit the harmonic alarm state.

14. Characteristics of Dynamic and Static Outputs

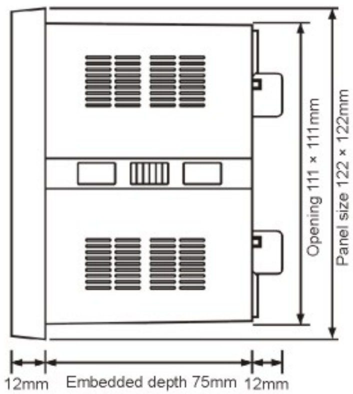
Static control output is a normally open passive contact switch signal output.
When the contact is closed, it indicates that the output is valid.
When the contacts separate, it indicates that the output is prohibited.
The dynamic control output is an active DC voltage signal output.
The output actuator is a DC voltage output. If the user uses the DC voltage range of a multimeter to measure the presence or absence of its output control signal, the load must be connected, otherwise the measurement result will be correct.
When the output DC voltage is between -10V and -16V, it indicates that the output is valid. When the output DC voltage is 0V, it indicates that the output is prohibited.

15. Factory Parameters

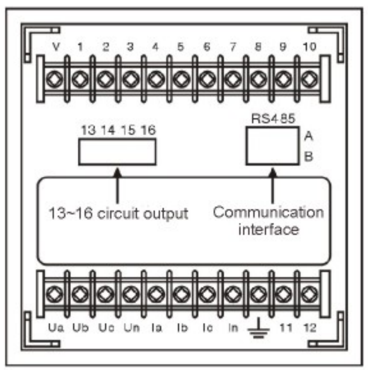
1. Automatic/Manual operation: Automatic
2. Power factor: 1.00
3. Delay time input: 10 seconds
4. Cut off delay: 5 seconds
5. Complementary output circuit: 10
6. Split compensation output circuit: 2 channels per phase
7. Co complementary output code: Pr-1
8. Complementary output code: Pr-1
9. Capacity of the first circuit capacitor to be supplemented: 10.0Kvar
10. Supplement the first circuit capacitor capacity: 5.0Kvar
11. Total current transformer ratio: 500
12. Overvoltage threshold: 240V
13. Harmonic threshold: 5.0%
14. Compensation Plan: 10-2
15. Mailing address: 1
16. Communication baud rate: 9600

16. JKWF-16-X Dimensions and Installation Method

Side view



Back view



JKWF Series Reactive Power Automatic Compensation Controller

17. Communication Interface

The JKWF model provides an optically isolated RS-485 communication interface, using the standard communication protocol (MODBUS-RTU) to facilitate third-party users' secondary development. Please refer to the corresponding communication protocol manual for specific protocol content. The RS-485 interface supports network connection, and this instrument can support 32 devices to be connected in one network. Within one network, each device has a unique device address and the same communication baud rate and protocol. In order to prevent signal reflection from affecting communication quality during on-site use, a 120 ohm resistor should generally be connected at the end of the RS-485 network for signal matching, as shown in the wiring terminal location diagram.

18. Troubleshooting

Why can't manual input be used?

1. Check if the controller is in manual operation mode externally.

If the automatic and manual operation indicator lights do not flash, it can be determined that it is caused by the operation mode setting. Users can change the operation mode to manual, as detailed in section 9.1.

2. Check if the manual phase is correct.

If the user wants to manually input the C-phase capacitor bank and the phase indicator light B is on, there will be a phenomenon that the C-phase capacitor bank cannot be input. The user only needs to operate the phase selection key to make the C-phase indicator light on, as detailed in section 7.3.

3. Check whether the compensation scheme and the parameter settings of the shared compensation output circuit are correct.

For example, if the user pre-set the shared compensation output circuit parameters to 0, the shared compensation capacitor group cannot be manually or automatically activated. If the user pre-set the shared compensation output circuit parameters to 0, any shared compensation capacitor group cannot be manually or automatically activated.

Why does the power factor display 1.00 and cannot be automatically activated?

1. When the current signal is less than 50mA, the power factor of the corresponding phase will display 1.000, indicating that the current signal is less than the minimum detection value of the controller. When the signal current exceeds this threshold value, the controller will immediately start working automatically.

Why is the power factor of the controller negative (leading) without investing a set of capacitors?

1. Check if the sampling phase of the voltage and current signals is correct.

If the terminal that should be connected to the A-phase current signal is actually connected to the B-phase current signal; The terminal connected to the C-phase voltage signal is connected to the A-phase voltage signal.Such situations can easily cause abnormal power factor display.

2. If the sampling of voltage and current signals is correct, the S1 and S2 terminals of the current transformer can be connected by wire exchange.

3. If the first and second methods are used to solve the problem and the power factor decreases with the input of the capacitor bank, it is possible that the power grid itself exhibits capacitive behavior. This situation usually only occurs in lighting based power grid systems and does not require compensation for capacitive loads.

Why is the system power factor lower than the target power factor controller but the capacitor bank is not put into operation?

1. Check if the overvoltage indicator light is on. When the voltage value of any phase exceeds the user-defined overvoltage threshold, the controller prohibits the capacitor bank from being put into operation.
2. Change the target power factor value to 1.00 and observe whether the controller is connected to the capacitor bank. If the capacitor bank can be connected, it indicates that the preset target power factor value is too low. Users can solve the problem by increasing the target power factor value. If it still cannot be automatically connected, users can check the reactive power of the corresponding phase. If the value is less than 0.65 times the minimum capacity of the single capacitor bank, users can replace the small capacity capacitor bank or continue to increase the target power factor parameter to solve the problem.

Why is the system power factor higher than the target power factor controller but the capacitor bank is not cut off?

When the system power factor is higher than the target power factor, the power grid is in an overcompensation state relative to the user-defined target power factor value. Due to the fact that the control physical quantity of this controller is reactive power, when the overcompensated reactive power is less than 0.65 times the minimum single capacitor capacity, the controller will refuse to cut off.

Why does the power factor displayed on the control display not change much after investing several capacitor banks?

1. Check the installation position of the signal current transformer, as shown in the wiring diagram in Section 8. This controller requires the signal current transformer to be installed at the common connection between the capacitor cabinet and the load cabinet, such as the main cabinet. If the user installs the signal current transformer on the load bus side, this phenomenon will occur.

Why is there such a large discrepancy between the reactive power value displayed by the controller and the actual value?

1. As this controller displays the fundamental reactive power value, when there are a large number of harmonics in the usage environment and there may be significant errors, this is a normal phenomenon and will not affect the automatic switching of the capacitor bank.
2. Check if the preset transformation ratio of the electric Han transformer is correct, see Section 9.11 for details.

The solutions to the above faults are only applicable to the actual usage environment. If the user uses them in a simulated state (pre factory debugging), they may not be suitable.