1 Introduction

HJKL5C (HJKL2C) (the dimension of mounting hole is 111mm×111mm) intelligent reactive power automatic compensating controller is a specified controller for compensating reactive power in a low-voltage power distribution system. It can be used with various types of low-voltage electrostatic capacitor cabinets.

The rated power supply voltage of HJKL5C is AC 380V. For HJKL2C, it is AC 220V. The range of frequency is between 50Hz and 60Hz. These two controllers can be applicable to three-phase / single-phase reactive power compensation, respectively.

The product adopts the micro controller unit (MCU) to control and absorb domestic and overseas advanced technologies, updating the software to add the function, improve the precision and make a reliable stability.

2 Features

2.1 With loop setting function, the number of output loops can be set according to actual requirements.

2.2 The input or cut-off threshold can exceed the power factor of 1.00, which makes our product have a wider application range.

2.3 With automatic phase-detecting function, wiring method is not fixed and it is easy for wiring. Thus it is easy for installation and debugging, which makes a wider application range.

2.4 With MCU controlling, the controller can automatically display overcompensation, undercompensation, overvoltage, undervoltage and undercurrent of the power grid and then processes the corresponding actions.

2.5 The product has double threshold protections function of overvoltage. When the working voltage exceeds the first threshold (X), the circuit will be locked and no longer put in the capacitor; when the voltage exceeds the second threshold (X+8V), the capacitor already charged will be quickly cut off.

2.6 The product has strong anti-interference ability and has (WDT) automatic reset function, which is stable and reliable.

2.7 It has the function of preventing zero-input intelligently to avoid defects of general product design.

2.8 DC output type products can be selected to realize non-impact "flexible compensation".

3 Working Condition

3.1 The rated operating voltage is AC 380V/220V and the fluctuation range is no more than 15%.

3.2 Ambient temperature: -25°C to +40°C.

3.3 Relative Humidity: not exceeding 90% at 20°C.

3.4 The surrounding environment is free from corrosive gases, conductive dust and flammable and explosive media.

3.5 No severe vibration at the installation site.

3.6 The altitude does not exceed 2000m (special requirements can be negotiated)

4 Technical Parameter

Category	Parameter value	Default Value
Sampling voltage	380V(HJKL5C)/ 220V（HJKL2C）±15%	
Sampling current	n/5A (Is≤5A)	
Frequency	50~60（Hz）	
Sensitivity	50mA	
Input threshold	lag 0.80~lead-0.82 adjustable step 0.01	0.95
Cut-off threshold	lead-0.80 ~lag0.82 adjustable step 0.01	-0.99
Loop setting	1~12 adjustable step 1	
Time setting	1s~120s adjustable step 1s	30s
Overvoltage setting	400~450V（HJKL5C）adjustable step 5V	430V
	235~260V（HJKL2C）adjustable step 5V	245V
Undervoltage protection	300V(HJKL5C) / 170V(HJKL2C)	
Undercurrent setting	0mA~500mA adjustable step 50mA	200mA (0 is for close)
COSΦ display	Lead & Lag (0.00~0.99) resolution 0.01	
Working methods	Continuous working, circular switching	
Output loops	4, 6, 8, 10, 12 loops	
Capacity of output	Each group 5A, 220V resistive / 3A, 380V resistive	
IP grade	IP30 for cover	
Weight	< 0.85kg	

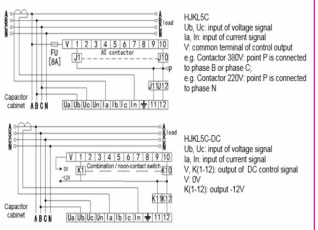
5 Installation

The controller adopts flush mounting type. A guidance channel is installed on the side of the product. When the mounting accessory is pushed into the channel, the product is fixed on the cabinet body.

The dimension of HJKL5C/HJKL2C is 140×140×100(mm). The dimension of the mounting hole is 111X111(mm). The inserting depth is 85mm.

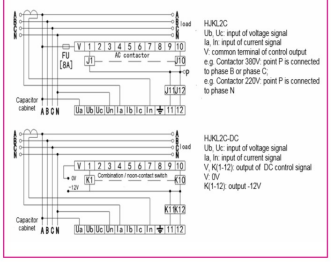
6 Wiring Diagram

6.1 HJKL5C series



Signal sampling principle: When the operating voltage is taken from phase B and phase C, the current transformer is placed on the phase A; when the operating voltage is taken from phase A and phase B, the current transformer is set on the phase C; when the operating voltage is taken from the phase, the current transformer is set on phase B. In short, the phase of the sampling current transformer should not be the same with the phase of operating voltage, and the current transformer must be placed on the buses of the main incoming cabinet, where is: sampling current = load current + capacitance current.

6.2 HJKL2C series



Signal sampling principle: when the operating voltage is taken from phase A, the current transformer is placed on phase A; when the operating voltage is taken from phase B, the current transformer is set on phase B; when the operating voltage is taken from phase C, the current transformer is set on phase C. In short, the phase of the sampling current transformer should be the same with the phase of operating voltage, and the current transformer must be placed on the buses of the main incoming cabinet, where is: sampling current = load current + capacitance current.

7 Function Key on the Panel Board

Key points for operation: press the button, release it once the content changes. If you don't release it, this action will be equivalent to press the button continuously.

Name		Content
Function keys		Option for function setting
		To increase the value when the controller is in a function setting condition, and to display the current value when running automatically
		To decrease the value when the controller is in a function setting condition, and to display the supply voltage value when running automatically

8 Debug

8.1 Settings

The controlling parameters of the machine have been set at the factory, if you want to change, you need to reset according to the following steps.

8.1.1 Press to light the input& cut-off setting indicator. It shows the original input threshold value of 0.95. Press or to reset according to your requirement.(After 15 seconds, it displays the cut-off threshold value of -.99. Mark "-"means lead. Press or to reset; Note: in order to make COSΦ have a stable working rang, the parameter setting shall meet: input threshold≤cut-off threshold of -0.02.)

8.1.2 Press again, light the time loop indicator. It displays the original delay time, which is 30 seconds. Press or to reset. (After 15 seconds, it displays the original loop setting value "LXX"."XX" means the maximum loops. Press or to reset; Note: to ensure the reliability, it is a must to turn off power supply and then restart the product when the loop is changed.)

8.1.3 Press again, light the overvoltage& undercurrent indicator. The original overvoltage setting value of HJKL5C is 430V, and HJKL2C is 245V. Press or to reset. (In order to avoid oscillation caused by the small current, the default undercurrent value is set to 200mA according to the standard at the factory. Do not adjust this value randomly. If it is necessary to adjust, set the position under the overcurrent and undercurrent conditions. After 15 seconds, the original undercurrent setting value "A20" will be displayed. The letter "A" indicates the undercurrent settings, and the "20" indicates the value is 200 mA. Press or to restart.)

8.1.4 Press again, light the changing ratio reactive power indicator. It displays the original value 000, which means the reactive power mode is closed. Press or to restart(range 0-1000). According to the actual CT changing ratio, the user can start reactive mode. (After 15 seconds, it displays original reactive power value "F00". Letter "F" means reactive power settings. "00" means the value is 0 Kvar. Press or to restart(range 0-50)

Note: Press , it will be in one of the four conditions: switch settings, loop settings, undercurrent settings and reactive settings. Stop pressing the button and wait for 15 seconds, the controller will be back in the automatic operating condition.

8.1.5 Press again, but the setting indicator is not working on. It displays "UXX". This means the controller is in debugging condition. Please don't operate it.

8.1.6 Press again, manual operation indicator lights up. It displays COSΦ value of the power grid. Press or to switch manually.

8.1.7 Press again to recover automatic operating condition and display COSΦ value of the power grid.

8.1.8 Press to display current sampling value (Ampere) for about 2 seconds under the automatic operating condition. Press to display voltage value of power supply for 2 seconds.

8.2 Manual operation

8.2.1 Press to light up the manual operation indicator if the user wants to operate it manually to show the COSΦ value of power grid.

8.2.2 Press to switch to input gradually. Press to cut-off gradually.

8.2.3 Press to go back to automatic operation.

8.2.4 Setting sheet of CT ratio

CT ratio	display	remark
0:5	0	close
50:5	10	
100:5	20	
150:5	30	
200:5	40	
……..	……	
4900:5	980	
4950:5	990	
5000:5	99A	

8.3 Power grid debugging

8.3.1 Use multimeter to check the wiring before energizing the low-voltage capacitor compensation cabinet. Ensure there are no short circuits in terminals 1-12 of reactive compensator and J end of AC contractor (see the wiring diagram for details). The fuse shall be inspected to protect the output loop.

8.3.2 Debug under required load condition. Sampling current Is≥ 200mA(under current setting value). If Is=0, then LED displays 000, which means no current. If Is<200mA, the product will be in standby condition without input and LED will display C-0 and COSΦ value alternately(at this moment, the user can measure Is to see the value).

8.3.3 Connect the power supply and current signal correctly according to the wiring diagram. About one minute after the LED displaying 8.88, the power factor of power grid is shown. If COS Φ value ≤ "input threshold setting value", the input indicator lights. After reaching the delay time set, it will automatically switch to a group of capacitor and one more indicator will light, making the COSΦ value increase. If COS Φ value ≥ "cut-off threshold setting value ", the indicator will turn off. After reaching the delay time, it will automatically cut-off a group of capacitor and turn off one indicator, making the COSΦ value decrease. When grid COS Φ value is between input and cut-off threshold values, the product will be in a stabile state without switching operation.

8.3.4 When grid voltage > "overvoltage set value", the overvoltage indicator lights, and voltage value and COSΦ value are displayed alternately. After 4 seconds, the controller will cut off the input compensation capacitor step by step immediately.

When grid voltage≤ 300V (170V for JKL2C), the undervoltage indicator lights, and ***ddd*** and COSΦ value are shown alternately. After 4 seconds, the controller will cut off the input compensation capacitor step by step immediately.

If the product works under the manual operating condition, the controller will have the same protection function.

9 System Troubleshooting

During the process of installation, unnoted wiring errors may occur, which will lead to abnormal operation in the entire system. So the common fault phenomena and solutions are described below.

9.1 When the controller displays COSΦ value below lead -.50 or lag 0.5, or the value has a big difference with the actual grid power factor (the standard COSΦ table indicator index), it means abnormal. Please turn off the power supply and check the connection of wiring, phase sequence and current transformer.

For HJKL5C, the common error is that the current sampling signal and voltage sampling signal are in the same phase. Solution: change one line of the two phases with a third phase line. At this moment, the COSΦ value will change accordingly and then there will be 3 different COSΦ values. Only one value is correct and thus the voltage wiring method accordingly is correct.(Note: the product has automatic phase detection function, and exchange the two phase voltage lines or Is line will make no change to COSΦ value.)

For HJKL2C, the common error is that the current sampling signal and voltage sampling signal are not in the same phase. Solution: change the Ua of phase voltage line with another phase line. At this moment, the COSΦ value will change accordingly and then there will be 3 different COSΦ values. Only one value is correct and thus the voltage wiring method accordingly is correct.(Note: the product has automatic phase detection function, and exchange the two phase voltage lines or Is line will not affect the COSΦ value.)

9.2 If it happens that the COSΦ indication almost has no change when compensation capacitor is gradually input, the user shall install the sampling current transformer to bus bar of the distribution cabinet, closing to the power transformer.(see the wiring diagram)

9.3 If the input indicator lights but the contactor has no input, the user shall check the power bus of the external contractor, or check whether the input of the power bus is in the same phase with the J point of coil of the contactor.

9.4 If the COSΦ value of the grid is close to 0.20 load, or below 0.20, (COSΦ＜0.33, the controller will display -.11, and it will not input capacitor and remove the input capacitor.) far less than the scope of the national usage standard, it will result in poor compensation or failure of the capacitance compensation cabinet. The user shall adopt the solution of combination of on-site compensation for low COS Φ loads and centralized compensation for capacitance compensation cabinets.

9.5 Under the condition of no load changing, switching oscillation may happen. The reason is that the input capacitance does not match the reactive value of the load, and the kVar number of one or two group capacitors can be changed to make them match. In addition, the user can increase cut-off threshold of COS Φ or lower the input threshold of COS Φ appropriately to widen the range of steady state and eliminate the oscillation phenomenon.

9.6 If it is inconvenient to determine the place of error, the user can change one and try again. If the same fault occurs, please must check the external circuit according to the above instructions.

10 Corporate Commitment

Please refer to this user manual directly. Read carefully before use

Appendix: Selection reference for compensation capacity (from "Electrical Practical Manual")

$$Q=P(\operatorname{tg}\Phi_1-\operatorname{tg}\Phi_2) \quad 或 \quad Q=P\left(\sqrt{\frac{1}{\cos^2\Phi_1}-1}-\sqrt{\frac{1}{\cos^2\Phi_2}-1}\right)$$

Where: Q: the required compensation capacity, Kvar;

P: average active load, kilowatts;

Φ1: phase angle between voltage and current before compensation;

Φ2: The phase angle between voltage and current that is required after compensation.

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HJKL5C/HJKL2C series Intelligent Reactive Power Compensation Controller

User Manual

Standard: IEC 61000-6-2:2016,1.4.4.5

□ please carefully read the User Manual before the installation and use of the products. Keep it properly as backup.

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The Right Choice!