430

AZC(L)-S(F)P2 Smart Power Capacitor Compensation Device

Installation instruction V1.2

Acrel Co., Ltd.

Declare

Our company Reserves the right to modify the product specifications described in this manual without prior notice. Before placing an order, please consult your local agent for new specifications of this product.

Catalog

AZC series intelligent capacitors

AZCL series intelligent capacitors

AZC series intelligent capacitor

1 Product Overview

AZC series intelligent capacitor is a new generation of reactive power compensation equipment which is applied to 0.4kV, 50Hz low voltage power distribution to save energy, reduce line loss, improve power factor and power quality. It is composed of intelligent measurement and control unit, thyristor compound switch circuit, line protection unit, two common compensation or one separate compensation low voltage power capacitor. It can replace the conventional automatic reactive power compensation device which is composed of fuse, composite switch or mechanical contactor, thermal relay, low-voltage power capacitor, indicator lamp and other loose parts in the cabinet and the cabinet surface are connected by wires. It has the characteristics of smaller volume, lower power consumption, convenient maintenance, long service life and high reliability, which can meet the higher requirements of modern power grid for reactive power compensation.

AZC series intelligent capacitors adopt LCD LCD display, which can display three-phase bus voltage, three-phase bus current, three-phase power factor, frequency, capacitor path number and switching state, active power, reactive power, total harmonic voltage distortion rate, capacitor temperature, etc. Through the internal thyristor compound switch circuit, automatically find the best input (cut) point, to achieve zero switching, with over voltage protection, phase loss protection, harmonic protection, overtemperature protection and other protection functions.

1.1 Product implementation standards

GB/T 15576-2008 Low voltage reactive power compensation device

2 Functional Features

2.1 Zero-crossing cutting

Realize voltage zero crossing input, current zero crossing excision, small switching inrush current, reduce the impact of current.

2.2 Phase separation compensation

Single phase compensation is realized separately, and any phase with large reactive power deficiency is compensated separately to achieve the optimal compensation effect.

2.3 Temperature protection

Overvoltage, overharmonic and overtemperature of the capacitor will cause the overtemperature of the capacitor and reduce the service life of the capacitor.AZC series intelligent capacitor through the built-in temperature sensor, to achieve the temperature measurement of the capacitor, when the temperature is too high, the automatic removal of the intelligent capacitor has been invested, to achieve overtemperature protection.

2.4 Phase loss protection

When three phases A, B and C are out of phase in the grid, the uninvested corresponding

intelligent capacitor bank will no longer be put into operation, and the invested corresponding intelligent capacitor bank will quit operation.

2.5 Over-voltage and under-voltage protection

When the grid voltage is higher than the set value, the corresponding intelligent capacitor bank will automatically quit operation to avoid damage caused by long-term overvoltage operation. When the grid voltage is lower than the set value, the corresponding intelligent capacitor bank will automatically quit operation to protect the equipment.

2.6 Voltage and current harmonic protection

When the harmonics of the power grid reach the set value, the intelligent capacitor bank not put in will not be put in, and the intelligent capacitor bank that has been put in will quit operation to prevent the equipment damage caused by excessive harmonics.

2.7 Building block structure

Product standardization, modularization, instead of the traditional AC contactor, SCR, thermal relay, capacitor, its functions as a whole, when the panel is installed by building blocks, when the capacitor is damaged, only monomer simple and quick replacement.

2.8 Simple wiring

Multiple capacitor bank panel installation, production hours than the traditional mode to save time, reduce cable consumption, reduce the type of primary and secondary parts, simple in the cabinet, in the use of the site fast assembly, not only reduce the production cost, but also improve the production efficiency.

2.9 Convenient capacity expansion

The product is small in volume and simple in connection. With the increase of power load of users, the number of capacitors can be increased at any time, which has changed the disadvantage that the conventional mode is not easy to expand the capacity.

2.10 Convenient maintenance

LCD screen can display protection action types, such as phase loss, overcurrent, overtemperature, three-phase imbalance, harmonics, etc. With self-diagnosis function, it can reflect the faults of electronic switches, capacitors, intelligent modules, network communication and so on on the LCD screen, which is conducive to on-site fault search. When the capacitor is damaged, only the single unit needs to be replaced quickly.

3 Model description

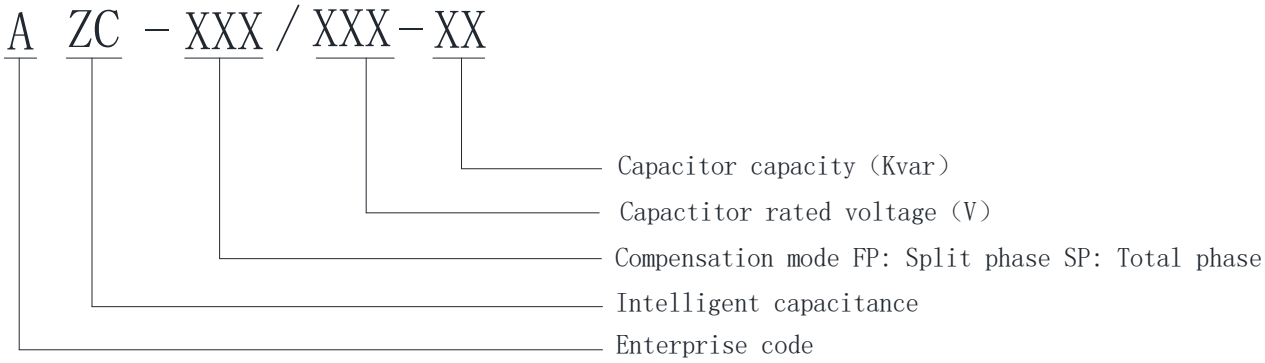


Fig. 1 Model description

AZC series intelligent capacitor selection:

Table 1 Selection description

Compensation mode	Type of cutting device	Capacity (kvar)	specifications	Overall dimension (mm)		
				length	width	highly
Three-phases Common compensation SP1	Compound switch switching	20 + 20	AZC-SP1/450-20+20	340	80	300
		20 + 15	AZC-SP1/450-20+15	340	80	300
		20 + 10	AZC-SP1/450-20+10	340	80	300
		15 + 15	AZC-SP1/450-15+15	340	80	300
		15 + 10	AZC-SP1/450-15+10	340	80	300
		10 + 10	AZC-SP1/450-10+10	340	80	250
		10 + 5	AZC-SP1/450-10+5	340	80	250
		5 + 5	AZC-SP1/450-5+5	340	80	250
		2.5 + 2.5	AZC - SP1/450-2.5 + 2.5	340	80	250
Split phase compensation FP1	Compound switch switching	30	AZC-FP1/250-30	340	80	330
		25	AZC-FP1/250-25	340	80	300
		20	AZC-FP1/250-20	340	80	270
		15	AZC-FP1/250-15	340	80	270
		10	AZC-FP1/250-10	340	80	250
		5	AZC-FP1/250-5	340	80	250

4 Main Indicators

4.1 Environmental conditions

Altitude: ≤2000 m

Ambient temperature: -10 ~ 50℃

Relative humidity: ≤95%

Atmospheric pressure: 79.5 ~ 106.0 kPa

No conductive dust and corrosive gas around the environment, no flammable and explosive medium

4.2 Power supply conditions

Rated voltage: AC380V

Allowable deviation: ±20%

Voltage waveform: sine wave, the total distortion rate is not more than 5%

Power frequency: 48.5 ~ 51.5Hz

Power consumption: <0.5W (when the capacitor is removed), <1W (when the capacitor is put in)

4.3 Safety requirements

It meets the requirements of the corresponding clauses in the technical conditions of DL/T842-2003 for low-voltage shunt capacitor devices.

4.4 Measurement error

Table 2 Measurement error

The electric voltage	Plus or minus 1.0%
Electricity flow	Plus or minus 1.0%
Active power	Plus or minus 2.5%
Reactive power	Plus or minus 2.5%
Frequency rate	Plus or minus 0.2%
The power factor	Plus or minus 1.5%

4.5 Protection error

Voltage: 1.0% or less

Current: 1.0% or less

Temperature: + / - 1 ℃

Time: + / - 0.01 s

4.6 Reactive power compensation parameters

Capacitor switching interval: >10s

Reactive power capacity: total complement single set ≤ (20+20) kvar; separate compensation single set ≤ 30Kvar

4.7 Reliability parameters

Capacitor capacity running time decay rate: ≤1%/ year

Capacitor capacity switching attenuation rate: ≤0.1%/ ten thousand times

Annual failure rate: 0.1%

5 Display content and operation method introduction

5.1 Operation interface

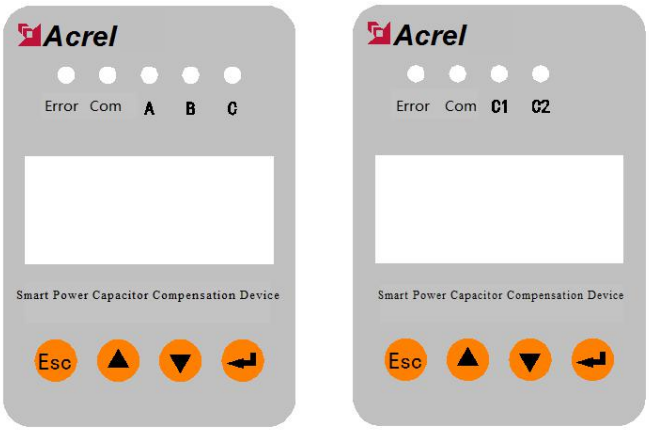


Fig. 2 Separate compensation panel (left) and common compensation panel (right)

5.2 Keys Description

5.2.1 Common compensation product key function description

Settings: Press "Settings" in automatic mode, and the cursor will blink. At this time, press "▲" or "▼" to switch to other modes, and press "OK" to confirm the selection; In any other mode, press the Settings key to exit the current state and return to automatic mode.

▲ : In automatic mode, press "▲" to switch all menus in this mode successively; When setting parameters, press "▲" key to increase the value by 1, and return to 0 when the value increases to 9.

▼ : In manual mode, press "▼" button to switch Capacitor 1 and Capacitor 2 under the menu; When setting the parameters, press the "▼" key to move the cursor from left to right. Press it once to move one to the right. When moving to the last one, the cursor jumps to the first place on the left.

2. To confirm a selection or setting made; In manual mode, press "OK" to input and remove the capacitor; When setting parameters, press "OK" to display all menus in this mode successively.

5.2.2 Button function description of separate compensation products

Settings: Press "Settings" in automatic mode, and the cursor will blink. At this time, press "▲" or "▼" to switch to other modes, and press "OK" to confirm the selection; In any other mode, press the Settings key to exit the current state and return to automatic mode.

▲ : In automatic mode, press "▲" to switch all menus in this mode successively; In manual mode, press "▲" to switch phase A, phase B and phase C under the menu; When setting parameters, press "▲" key to increase the value by 1, and return to 0 when the value increases to 9.

▼ : In automatic mode and manual mode, press "▼" button to switch phase A, phase

B and phase C under the menu; When setting the parameters, press the "▼" key to move the cursor from left to right. Press it once to move one to the right. When moving to the last one, the cursor jumps to the first place on the left.

To confirm a selection or setting made; In manual mode, press "OK" to input and remove the capacitor; When setting parameters, press "OK" to display all menus in this mode successively.

5.3 Automatic operation

After the system is powered on, the software version number will be displayed first, and then it will enter the automatic running state. LCD backlight automatically turns off in 180 seconds, press any key to activate the backlight.

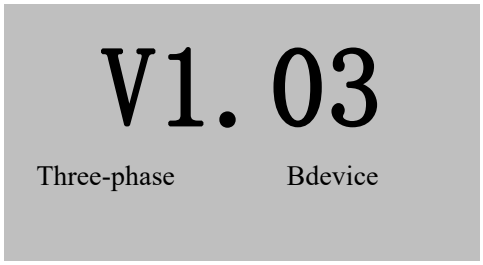


Fig.3 Software version

In the automatic mode, press the "▲" "▼" key to view the operation data of various power grids. Press the " " key to switch the data of each phase.

5.3.1 Display of common compensation capacitance data

5.3.1.1 Power factor display

Fig. 4 Power factor

If the sign bit is "-", it means capacitive; If the sign bit does not exist, it is represented as perceptual.

5.3.1.2 Voltage display

Fig.5 Voltage

5.3.1.3 Current display

Fig.6 Current

5.3.1.4 Reactive power display

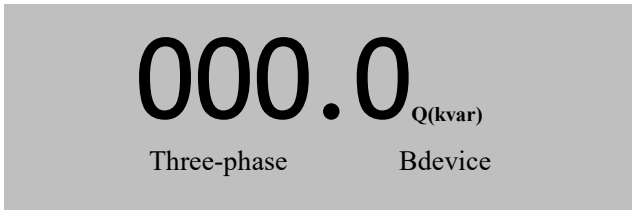


Fig.7 Reactive power

5.3.1.5 Active power display

Fig.8 Active power

5.3.1.6 Total harmonic content of voltage

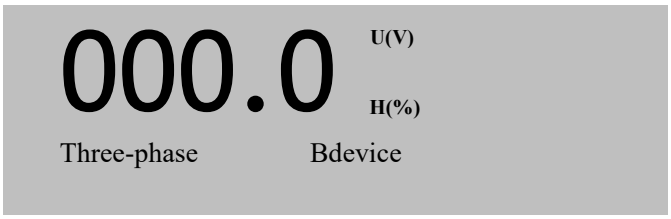


Fig.9 Total voltage harmonics

5.3.1.7 Display of current total harmonic content

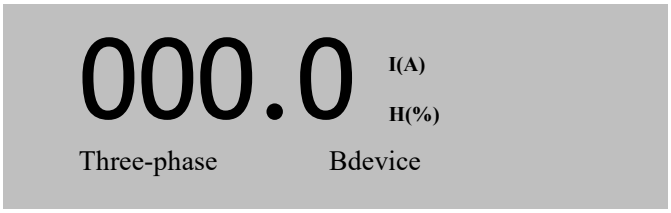


Fig.10 Total current harmonics

5.3.1.8 Address display

Fig.11 Address

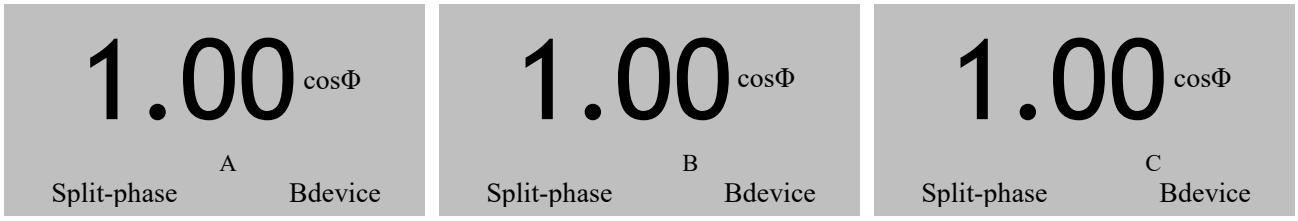
If the capacitor network is successful, the communication address will be obtained automatically. (Note: The address range of the capacitor is 03..... 32)

5.3.1.9 Temperature display

Fig.12 Temperature

5.3.2 Display of separate compensation capacitance data

5.3.2.1 Power factor display

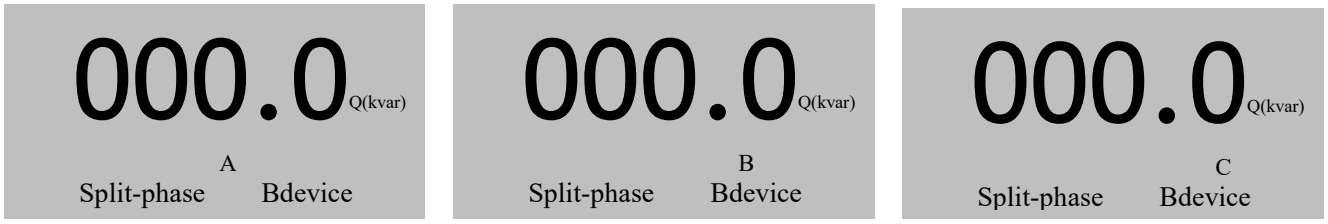


a b c

Fig.13 Power factor A: A phase; B: B phase; C: c phase

If the sign bit is "-", it means capacitive; If the sign bit does not exist, it is represented as perceptual.

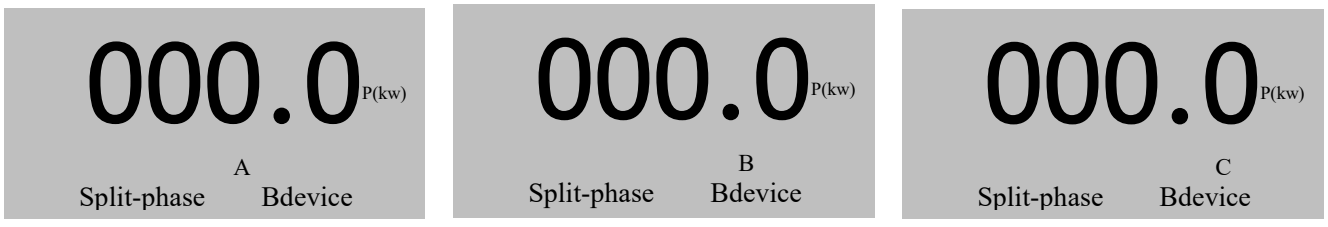
5.3.2.2 Reactive power display



a b c

Fig. 14 Reactive power a: A-phase reactive power; b: B-phase reactive power; c: C-phase reactive power

5.3.2.3 Active power display



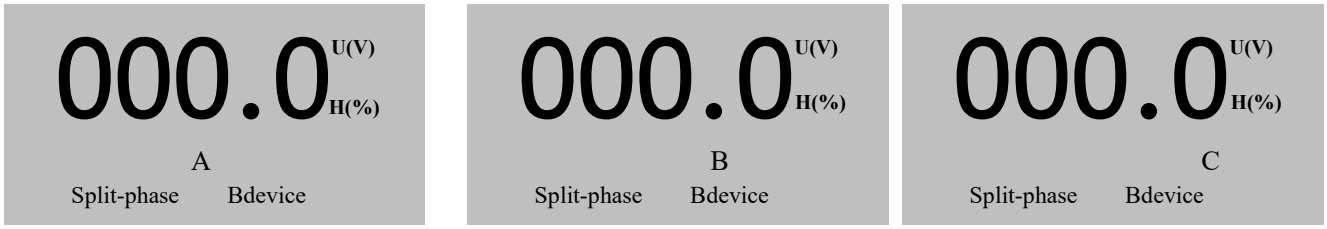
a b c

Fig. 15 Active power a: A-phase active power; b: B-phase reactive power; C: C-phase active power

5.3.2.4 Temperature display

Fig.16 Temperature

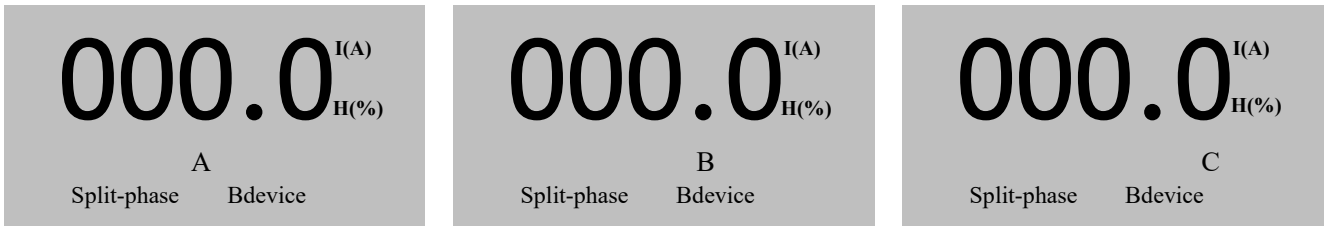
5.3.2.5 Display voltage total harmonic content



a b c

Fig. 17 Voltage harmonic content a: A-phase harmonic content; b: B-phase harmonic content; c: C-phase harmonic content

5.3.2.6 Display of current total harmonic content



a b c

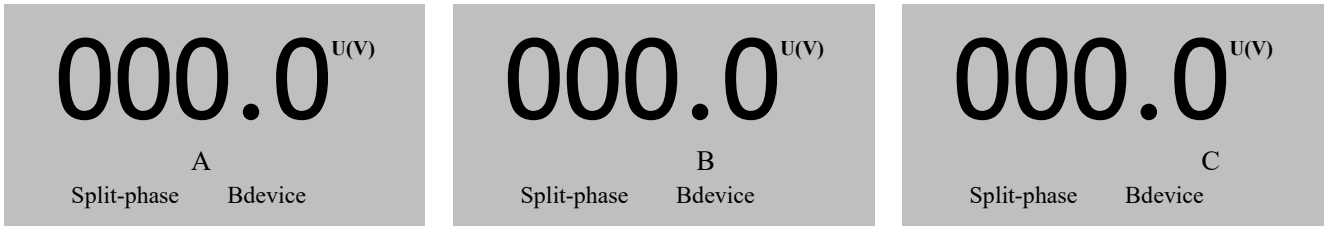
Fig. 18 Current Harmonic Content a: A-phase harmonic content; b: B-phase harmonic content; c: C-phase harmonic content

5.3.2.7 Address display

Fig.19 Address

If the capacitor network is successful, the communication address will be obtained automatically. (Note: The address range of the capacitor is 03..... 32)

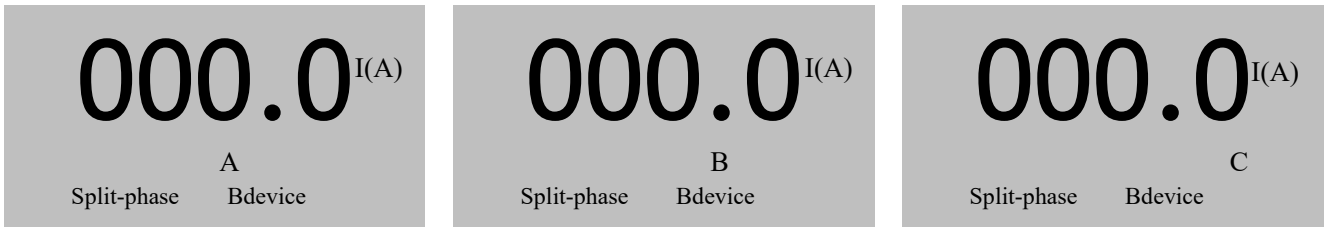
5.3.2.8 Voltage display



a b c

Fig. 20 Voltage a: A-phase voltage; b: B-phase voltage; c: C-phase voltage

5.3.2.9 Current display



a b c

Fig. 21 Current a: A-phase current; b: B-phase current; c: C-phase current

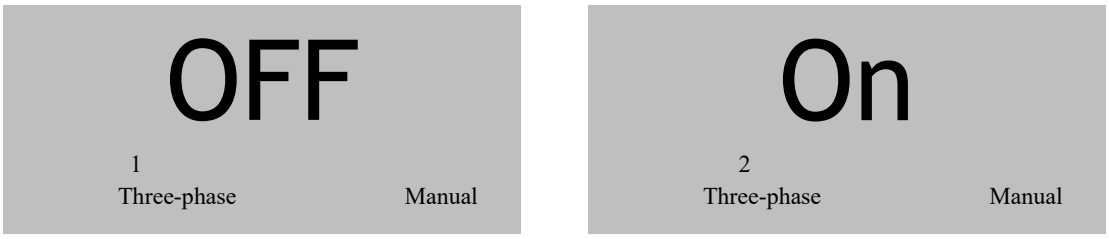
5.4 Manual control

The manual function is only used to compensate for the forced switching of the capacitor.

Press the setting key, the mode menu flashes, operate "▲" and "▼" keys to select "manual" mode, and operate "confirm" key to enter the manual state. After entering the manual state, you can press "▲" and "▼" key to select capacitor 1, capacitor 2 (common compensation products) or capacitor A phase, B phase, C phase switching control (separate compensation products).

5.4.1 Common compensation capacitance control

5.4.1.1 Manual control of capacitor 1 and capacitor 2



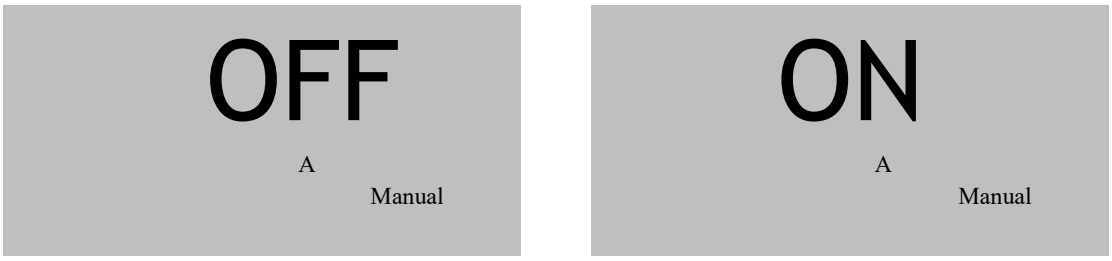
a b

Fig. 22 Manual control a: Capacitance 1; b: Capacitance 2

If it is displayed as "OFF", the capacitor is in the state of excise, while the capacitor is displayed as "ON". The capacitor is in the state of input. Press "OK" to conduct switching between switching and cutting.

5.4.2 Separate compensation capacitance control

5.4.2.1 Separate compensation A phase control

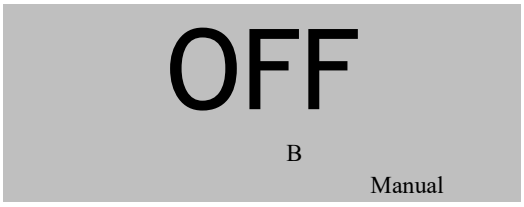


a b

Fig. 23 A Phase-controlled control a: excision; b: input

If it is displayed as "OFF", the capacitor is in the state of excise, while the capacitor is displayed as "ON". The capacitor is in the state of input. Press "OK" to conduct switching between switching and cutting.

5.4.2.2 Separate compensation B phase control



a

b

Fig. 24 B Phased control a: excision; b: input

If it is displayed as "OFF", the capacitor is in the state of excise, while the capacitor is displayed as "ON". The capacitor is in the state of input. Press "OK" to conduct switching between switching and cutting.

5.4.2.3 Separate compensation C phase control

a

b

Fig. 25 C phased control a: excision; b: input

If it is displayed as "OFF", the capacitor is in the state of excise, while the capacitor is displayed as "ON". The capacitor is in the state of input. Press "OK" to conduct switching between switching and cutting.

Note: This function should be operated with caution

5.5 Parameter configuration

Product parameters have been preset in the factory, and users can modify them according to on-site needs. All setting parameters are automatically memorized, no loss when power is off. Press "Settings" key once the cursor flashes, press "▲" or "▼" key to select "Settings" mode, and press "OK" key to enter the setting state. When modifying the parameters, press "▼" to move the cursor to the position that needs to be modified, press "▲" to modify the parameters, and press "OK" to determine after modification.

Note: If it is used for the first time, parameters such as ratio and capacitance must be reset according to actual field needs.

Press the setting key to enter the mode selection, automatic, manual, setting mode flashing, operation "▲" "▼" key to select "setting", operation "confirm" key, enter the setting state.

5.5.1 Common compensation capacitance parameter configuration

5.5.1.1 Current transformer ratio setting

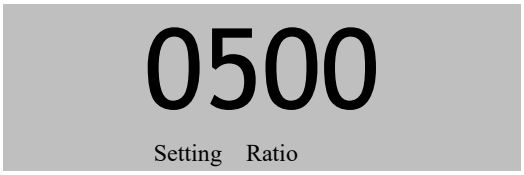


Fig. 26 Current transformer ratio setting

Factory preset: 500

Purpose: Incoming cabinet current transformer ratio, to provide measurement and control parameters.

5.5.1.2 Power factor (1) setting

Factory preset: 0.90

Purpose: When the power factor of the grid is lower than this value, the terminal will be put into the capacitor bank.

Fig. 27 Input power factor Settings

5.5.1.3 Power factor (2) setting

Factory preset: L 0.98

Purpose: When the power factor of the grid is higher than this value, the terminal will cut off the capacitor bank.

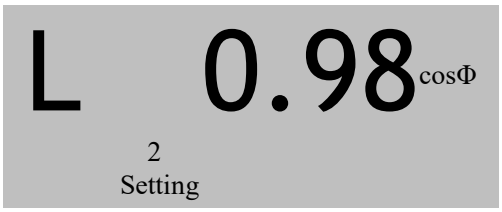


Fig. 28 Cut off power factor Settings

5.5.1.4 Switching delay (1) Set

Factory preset: 5S

Purpose: Set capacitor switching delay time

Fig. 29 Switching Delay (1) Settings

5.5.1.5 Switching delay (2) Settings

Factory preset: 20S

Purpose: Delay time of reinput after capacitor excision.

Fig. 30 Switching Delay (2) Settings

5.5.1.6 Overvoltage protection Settings

Factory preset: 110%

Purpose: excise capacitor when power grid overvoltage

Fig. 31 Overvoltage protection Settings

5.5.1.7 Undervoltage protection Settings

Factory preset: 90%

Purpose: Cutting capacitor when power network undervoltage

Fig. 32 Undervoltage protection Settings

5.5.1.8 Overcurrent protection Settings

Factory preset: 120%

Purpose: Power grid overcurrent is excised capacitor

Fig. 33 Overcurrent Protection Settings

5.5.1.9 Undercurrent protection Settings

Factory setting: 50%

Purpose: Cutting capacitor when power grid undercurrent

Fig. 34 Undercurrent protection Settings

5.5.1.10 Voltage total harmonic distortion rate over limit setting

Factory preset: 5.0%

Purpose: voltage total harmonic distortion rate over-limit protection

Fig. 35 Total voltage distortion rate over-limit setting

5.5.1.11 Over-limit setting of total harmonic distortion rate of current

Factory preset: 5.0%

Purpose: Current total harmonic distortion rate over - limit protection

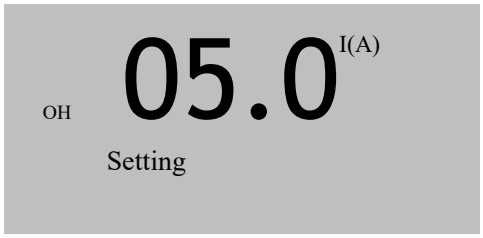


Fig. 36 Out-of-limit setting of total harmonic distortion rate of current

5.5.1.12 Temperature protection setting

Factory preset: 60℃

Purpose: when the temperature of intelligent capacitor exceeds the set value, the capacitor bank can be cut off to avoid capacitor damage.

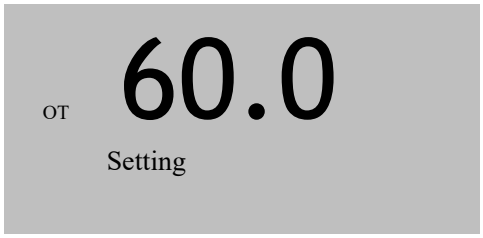


Fig. 37 Temperature protection Settings

5.5.1.13 Capacitor 1 capacity setting

Factory preset: set according to capacitance

Purpose: As the basis of reactive power compensation switching capacitor

Figure 38 Capacitor 1 capacity setting

Note: when the compensation mode of the intelligent power capacitor compensation device is three-phase, the setting value is the capacity value of a single capacitor. For example, if the three-phase capacity is 10+5Kvar, the capacity of capacitor 1 is set to 10Kvar.

5.5.1.14 Capacitor 2 capacity setting

Factory preset: set according to capacitance

Purpose: As the basis of reactive power compensation switching capacitor

Fig. 39 Capacitor 2 capacity Settings

Note: when the compensation mode of the intelligent power capacitor compensation device is three-phase, the setting value is the capacity value of a single capacitor. For example, if the three-phase capacity is 10+5Kvar, then the capacity of capacitor 2 is set to 5Kvar.

5.5.2 Parameter setting of Separate compensation capacitance

5.2.2.1 Current transformer ratio setting

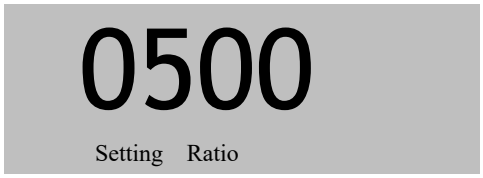


Fig. 40 Current transformer ratio setting

Factory preset: 0500

Purpose: Incoming cabinet current transformer ratio, to provide measurement and control parameters.

5.5.2.2 Power factor (1) setting

Factory preset: 0.90

Purpose: When the power factor of the grid is lower than this value, the terminal will be put into the capacitor bank.

Fig.41 Power Factor (1) Settings

5.5.2.3 Power factor (2) setting

Factory preset: L 0.98

Purpose: When the power factor of the grid is higher than this value, the terminal will cut off the capacitor bank.

Fig.42 Power Factor (2) Settings

5.5.2.4 Switching delay (1) Settings

Factory preset: 5S

Purpose: Set capacitor switching delay time

Fig. 43 Switching delay (1) Settings

5.5.2.5 Throw and cut delay (2) Set

Factory preset: 20S

Purpose: Delay time of reinput after capacitor excision.

Fig. 44 Switching Delay (2) Settings

5.5.2.6 Overvoltage protection Settings

Factory preset: 110%

Purpose: excise capacitor when power grid overvoltage

Fig. 45 Overvoltage Protection Settings

5.5.2.7 Undervoltage protection Settings

Factory preset: 90%

Purpose: Cutting capacitor when power network undervoltage

Fig. 46 Undervoltage protection Settings

5.5.2.8 Overcurrent protection Settings

Factory preset: 120%

Purpose: Power grid overcurrent is excised capacitor

Fig. 47 Overcurrent Protection Settings

5.5.2.9 Undercurrent protection Settings

Factory setting: 50%

Purpose: Cutting capacitor when power grid undercurrent

Fig. 48 Undercurrent protection Settings

5.5.2.10 Voltage total harmonic distortion rate over limit setting

Factory preset: 5.0%

Purpose: voltage total harmonic distortion rate over - limit protection

Fig. 49 Voltage total harmonic distortion rate overrun setting

5.5.2.11 Over-limit setting of total harmonic distortion rate of current

Factory preset: 5.0%

Purpose: Current total harmonic distortion rate over - limit protection

Fig. 50 Out-of-limit setting of total harmonic distortion rate of current

5.5.2.12 Temperature protection setting

Factory preset: 60℃

Purpose: when the temperature of intelligent capacitor exceeds the set value, the capacitor bank can be cut off to avoid capacitor damage.

Fig. 51 Temperature protection Settings

5.5.2.13 Capacitance setting

Factory preset: set according to capacitance.

Purpose: As the basis of reactive power compensation switching capacitor.

Fig.52 Capacitance Settings

Note: when the compensation mode of the intelligent power capacitor compensation device is phase separation, the set value is the single-phase capacity. For example, the total capacity of separate compensation is 5Kvar, then the set capacity should be 5/3=1.7Kvar.

5.6 Overrun and Fault Warning

When a fault occurs in the power grid or a parameter exceeds the limit, the state overvoltage, undervoltage, harmonic overvoltage, capacitor current overcurrent, undercurrent, etc. of a certain value will be indicated, and the warning signal will be output.

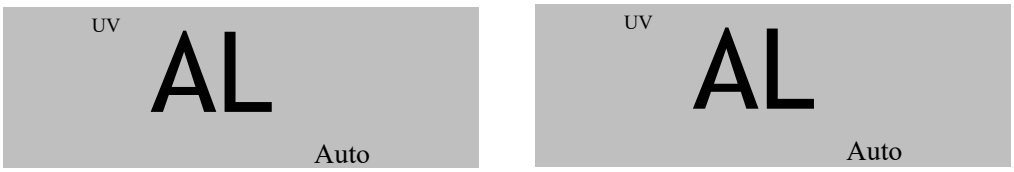
5.6.1 Overvoltage

a b

Fig. 53 Overvoltage Warning a: Common compensation capacitance; b: Separate compensation capacitance

When the voltage is detected to be greater than the overvoltage setting value, the "overvoltage" prompt is displayed.

5.6.2 Undervoltage



a b

Fig. 54 Undervoltage Warning a: Common compensation capacitance; b: Separate compensation capacitance

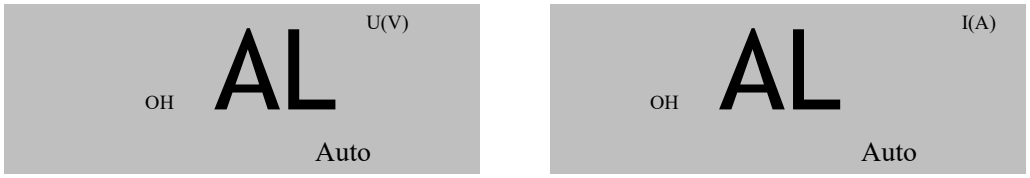
When the voltage is detected to be less than the under-voltage setting, the "under-voltage" prompt is displayed.

5.6.3 Excessive temperature

Fig. 55 Excess temperature warning

When the capacitor temperature is detected to be greater than the set value, the "over temperature" prompt will be displayed.

5.6.4 Harmonic overrun



a b

Fig. 56 Harmonic Overrun Warning A: Voltage Harmonic Overrun; B: Current harmonic overrun

When the total harmonic content of voltage is detected to be greater than the set value, the "overharmonic" prompt will be displayed.

When the total harmonic content of the current is greater than the set value, the "overharmonic" prompt will be displayed.

5.6.5 Open-phase

When open-phase is detected, the "open-phase" prompt is displayed.

Fig. 57 Warning of Open-phase

5.7 Networking mode

a When the display interface is a separate one, the display will be automatic; b The

display interface is connected with the controller to display the slave; c Display interface is connected to multiple intelligent capacitors, which can be set as host in the hidden menu.

a b c

Fig. 58 Networking mode

6 Installation dimension, terminal definition and connection mode

6.1 Shape diagram of intelligent capacitor

Product dimensions: length × width × height 340mm×80mm×330mm

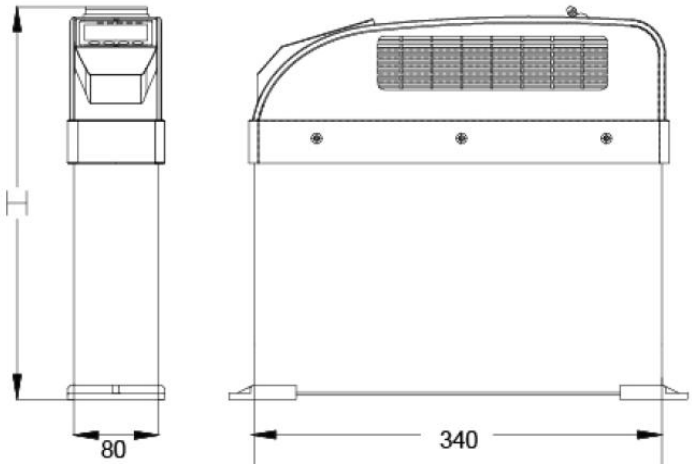


Fig. 59 Overall dimension drawing

Note: The height of the capacitance varies with the size of the capacity, but not more than 340mm

Product mounting size: length x width 362mm x 52mm

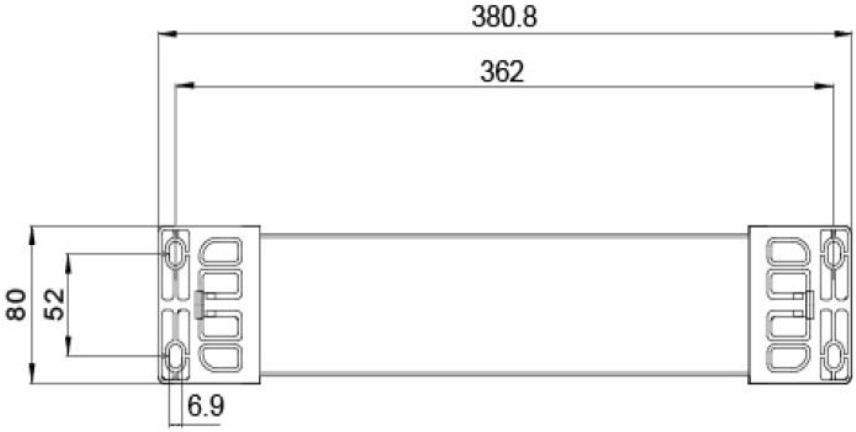
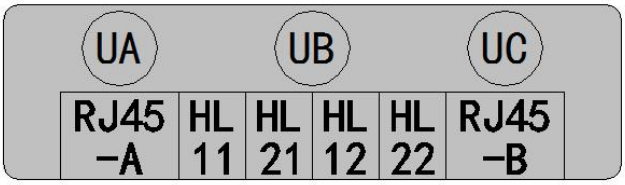
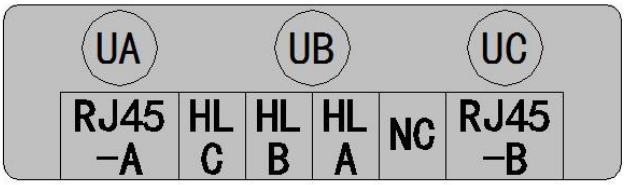


Fig. 60 Installation dimension drawing

6.2 Terminal definitions



AZC common compensation



AZC separate compensation

Fig. 61 Terminal Diagram a: Common compensation wiring; b: Separate compensation wiring

Definition of common fill terminal diagram

Table 3 Definition of common compensation terminal diagram

The serial number	Common compensation definition	instructions	
1	UA	A phase voltage terminal	
2	UB	B phase voltage terminal	
3	UC	C phase voltage terminal	
4	RJ45-A	Network line communication interface	
5	H L11	The first set puts in the indicator terminals	Connect the two terminals of the 380V indicator light
6	H L21	The second set puts in the indicator terminal	
7	H L12	The first set puts in the indicator terminals	
8	H L22	The second set puts in the indicator terminal	
9	RJ45-B	Network line communication interface	

Definition of separate compensation terminal diagram

Table 4 definition of separate compensation terminal diagram

The serial number	Separate compensation for defining	instructions
1	UA	A phase voltage terminal
2	UB	B phase voltage terminal
3	UC	C phase voltage terminal
4	RJ45-A	Network line communication interface

5	H LC	C phase into the indicator terminal	They are respectively connected to a wiring terminal of the 220V indicator light, and the other terminal of the indicator light is connected to the N line
6	H LB	B phase into the indicator terminal	
7	H LA	Phase A into the indicator terminal	
8	NC	empty	
9	RJ45-B	Network line communication interface	

6.3 Wiring mode of common compensation and separate compensation smart capacitor

6.3.1 Common compensation wiring diagram of controller without reactive power compensation

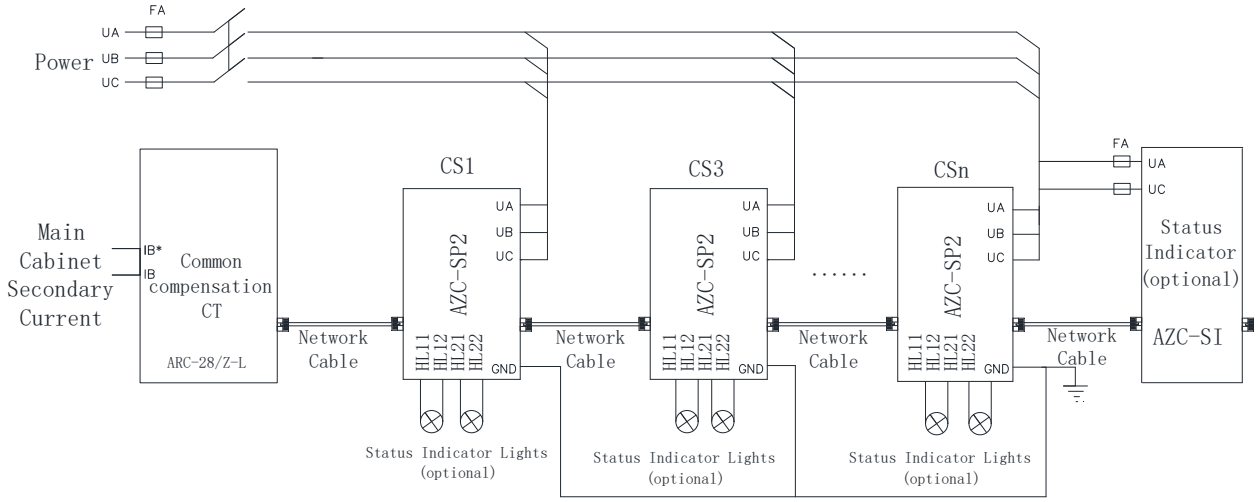


Fig. 62 Common compensation wiring without reactive power compensation controller

6.3.2 Mixed compensation wiring diagram of controller without reactive power compensation

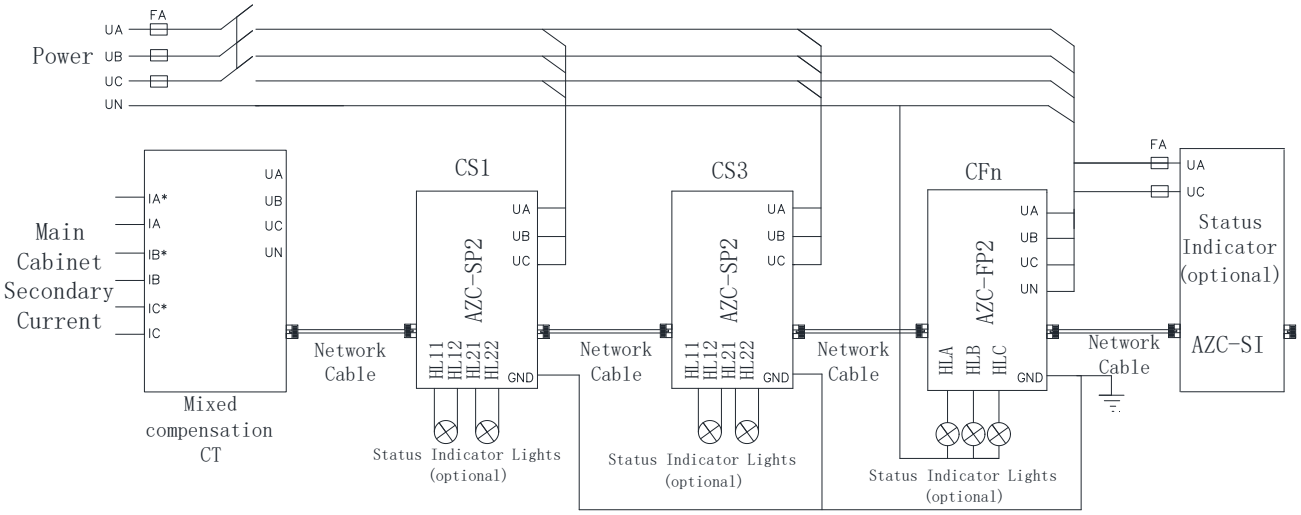


Fig. 63 Hybrid compensating wiring without reactive power compensation controller

6.3.3 Common compensation wiring diagram of controller with reactive power compensation

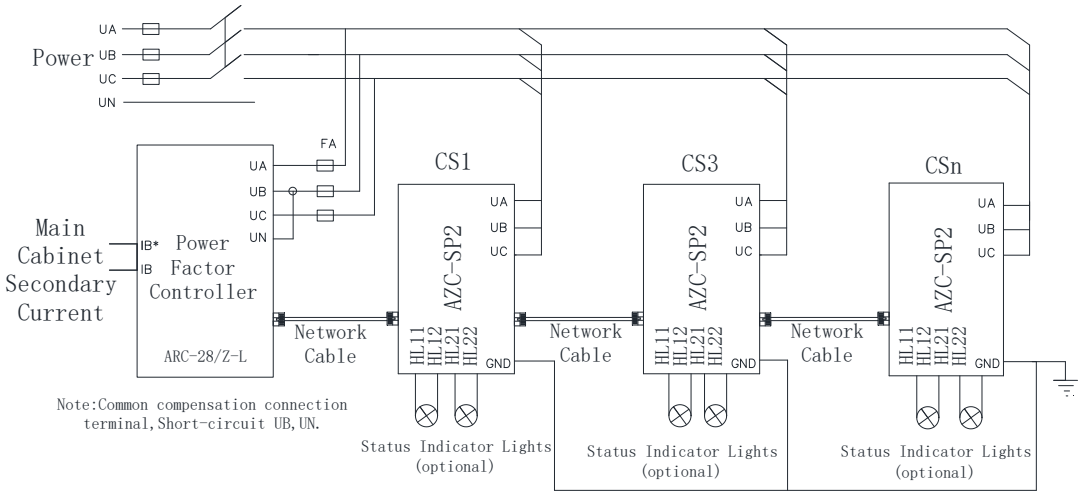


Fig. 64 Common compensation wiring with reactive power compensation controller

6.3.4 Mixed compensation wiring diagram of controller with reactive power compensation

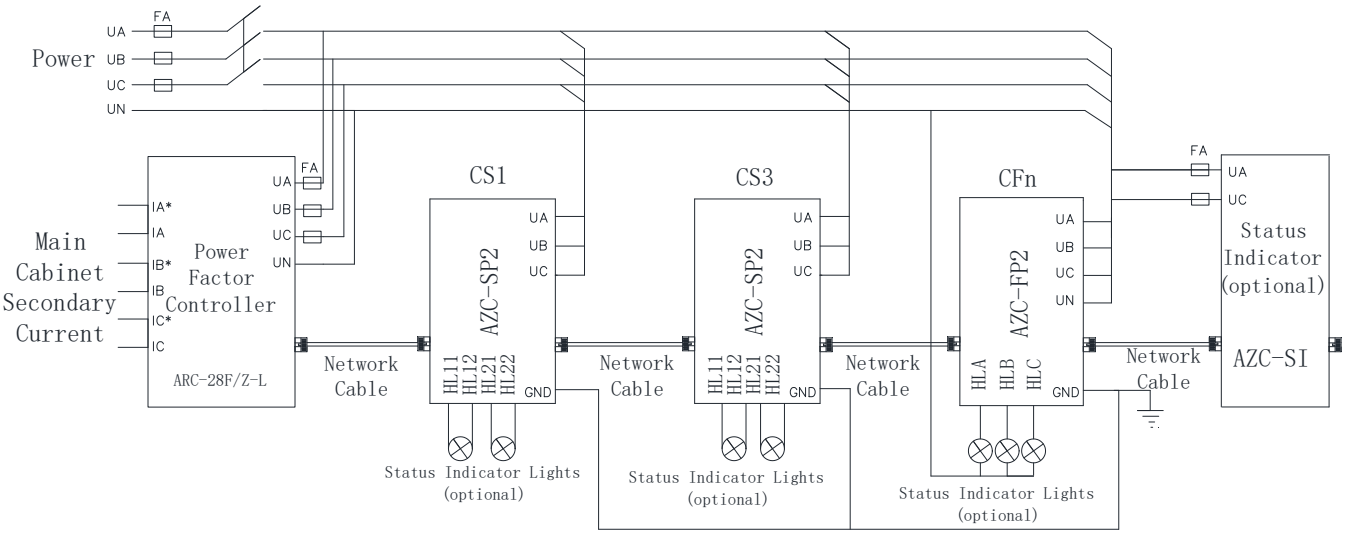
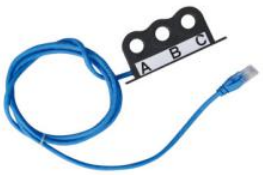


Fig. 65 Hybrid compensating wiring with reactive power compensation controller

7 attachments

Mounting bracket

Cold-pressing pieces



CT(situation without control)

Network line:0.5M

Network line:1M

Network line:3M

Fig. 66 accessories

Network line: 0.5m for the connection between two adjacent capacitors or between the controller and the indicator; 1M for the connection between the upper and lower layers of capacitors; 3M is used for wiring between indicator or compensator and intelligent capacitor.

8 Precautions for use

8.1 When choosing to use this terminal, you must read the instructions carefully, connect the lines as required, and input all the control parameters as required.

8.2 Input control parameter values, should be checked without error before putting into operation.

8.3 If any device display error or control abnormality is found, the manufacturer shall be informed in time to deal with it.

8.4 If the controller number is needed, it can be obtained from the device number on the controller certificate.

9 Ordering Instructions

9.1 Please specify the model name and quantity of the product.

9.2 Supply address and time.

9.3 When the secondary side current of the CT is less than 0.5A, it should be informed, otherwise the measurement accuracy will not be guaranteed.

9.4 Special requirements, please explain in advance.

AZCL series intelligent capacitor

1 Product Overview

AZCL series intelligent capacitor is a new generation of reactive power compensation equipment which is applied to 0.4kV, 50Hz low voltage power distribution to save energy, reduce line loss, improve power factor and power quality. It is composed of intelligent measurement and control unit, thyristor compound switch circuit, line protection unit, two common compensation or one separate compensation low voltage power capacitor. It can replace the conventional automatic reactive power compensation device which is composed of fuse, composite switch or mechanical contactor, thermal relay, low-voltage power capacitor, indicator lamp and other loose parts in the cabinet and the cabinet surface are connected by wires. It has the characteristics of smaller volume, lower power consumption, convenient maintenance, long service life and high reliability, which can meet the higher requirements of modern power grid for reactive power compensation.

AZCL series intelligent capacitors adopt customized segment LCD LCD display, which can display three-phase bus voltage, three-phase bus current, three-phase power factor, frequency, capacitor path number and switching state, active power, reactive power, harmonic voltage total distortion rate, capacitor temperature, etc. Through the internal thyristor compound switch circuit, automatically find the best input (cut) point, to achieve zero switching, with over voltage protection, phase loss protection, harmonic protection, overtemperature protection and other protection functions.

1.1 Product implementation standards

GB/T 15576-2008 Low voltage reactive power compensation device

2. Functional Features

2.1 Zero-crossing cutting

Realize voltage zero crossing input, current zero crossing excision, small switching inrush current, reduce the impact of current.

2.2 Phase separation compensation

Single phase compensation is realized separately, and any phase with large reactive power deficiency is compensated separately to achieve the optimal compensation effect.

2.3 Temperature protection

Overvoltage, overharmonic and overtemperature of the capacitor will cause the overtemperature of the capacitor and reduce the service life of the capacitor. AZCL series of intelligent capacitors through the built-in temperature sensor, to achieve the temperature measurement of the capacitor, the temperature is too high, the automatic removal of the intelligent capacitor has been invested, to achieve overtemperature protection.

2.4 Phase loss protection

When three phases A, B and C in the power grid are missing, the uninvested corresponding

intelligent capacitor banks will no longer be put in, and the invested corresponding intelligent capacitor banks will quit operation to achieve the purpose of protecting the equipment.

2.5 Over-voltage and under-voltage protection

When the power grid voltage is higher than the set value, the corresponding intelligent capacitor will automatically quit operation to avoid the risk of explosion caused by long-term overvoltage operation of the capacitor and achieve the purpose of protecting the equipment. When the grid voltage is lower than the set value, the corresponding intelligent capacitor bank will automatically quit operation to protect the equipment.

2.6 Voltage and current harmonic protection

When the harmonics of the power grid reach the set value, the intelligent capacitor bank not put in will not be put in, and the intelligent capacitor bank that has been put in will quit operation to prevent the equipment damage caused by excessive harmonics.

2.7 Building block structure

Product standardization, modularization, instead of the traditional AC contactor, SCR, thermal relay, capacitor, its functions as a whole, when the panel is installed by building blocks, when the capacitor is damaged, only monomer simple and quick replacement.

2.8 Simple wiring

Multiple capacitor bank panel installation, production hours than the traditional mode to save time, reduce cable consumption, reduce the type of primary and secondary parts, simple in the cabinet, in the use of the site fast assembly, not only reduce the production cost, but also improve the production efficiency.

2.9 Convenient capacity expansion

The product is small in volume and simple in connection. With the increase of power load of users, the number of capacitors can be increased at any time, which has changed the disadvantage that the conventional mode is not easy to expand the capacity.

2.10 Convenient maintenance

LCD screen can display protection action types, such as phase loss, overcurrent, overtemperature, three-phase imbalance, harmonics, etc. With self-diagnosis function, it can reflect the faults of electronic switches, capacitors, intelligent modules, network communication and so on on the LCD screen, which is conducive to on-site fault search. When the capacitor is damaged, only the single unit needs to be replaced quickly.

3 Model description

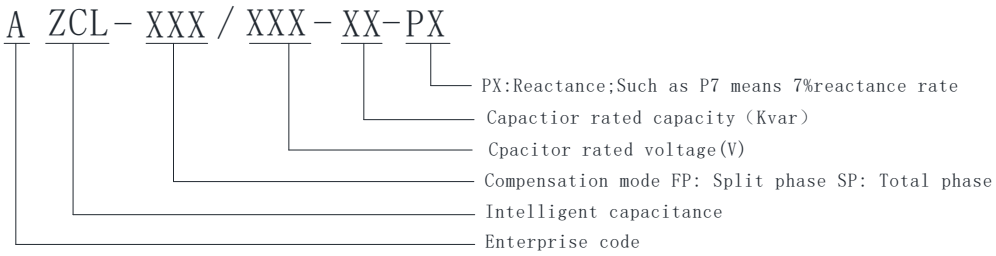


Fig. 67 Model description

AZCL series intelligent capacitor selection:

Table 5 Description of AZCL series intelligent capacitor selection

Compensation mode	Reactor class	Capacity (kvar)	specifications	Overall dimension (mm)		
				length	width	highly
Three-phases Common compensation SP1	Series 7% reactance reactor, reactance material is copper or aluminum	40	AZCL-SP1/480-40-P7	480	185	380
		35	AZCL-SP1/480-35-P7	480	185	380
		30	AZCL-SP1/480-30-P7	480	185	380
		25	AZCL-SP1/480-25-P7	480	185	380
		20	AZCL-SP1/480-20-P7	480	185	380
		15	AZCL-SP1/480-15-P7	480	185	380
		10	AZCL-SP1/480-10-P7	480	185	380
		5	AZCL-SP1/480-5-P7	480	185	380
	Series 14% reactance reactor, reactance material is copper or aluminum	25	AZCL-SP1/525-25-P14	480	185	380
		20	AZCL-SP1/525-20-P14	480	185	380
		15	AZCL-SP1/525-15-P14	480	185	380
		10	AZCL-SP1/525-10-P14	480	185	380
		5	AZCL-SP1/525-5-P14	480	185	380
Split phase compensation FP1	Series 7% reactance reactor, reactance material is copper or aluminum	30	AZCL-FP1/280-30-P7	480	185	380
		25	AZCL-FP1/280-25-P7	480	185	380
		20	AZCL-FP1/280-20-P7	480	185	380
		15	AZCL-FP1/280-15-P7	480	185	380
		10	AZCL-FP1/280-10-P7	480	185	380
		5	AZCL-FP1/280-5-P7	480	185	380
	Series 14% reactance reactor,reactance material is copper or aluminum	20	AZCL-FP1/300-20-P14	480	185	380
		15	AZCL-FP1/300-15-P14	480	185	380
		10	AZCL-FP1/300-10-P14	480	185	380
		5	AZCL-FP1/300-5-P14	480	185	380

4 Main Indicators

4.1 Environmental conditions

Altitude: ≤2000 m

Ambient temperature: -10 ~ 50℃

Relative humidity: ≤95%

Atmospheric pressure: 79.5 ~ 106.0 kPa

No conductive dust and corrosive gas around the environment, no flammable and explosive medium

4.2 Power supply conditions

Rated voltage: AC220V/AC380V

Allowable deviation: ±20%

Voltage waveform: sine wave, the total distortion rate is not more than 5%

Power frequency: 48.5 ~ 51.5Hz

Power consumption: <0.5W (when the capacitor is removed), <1W (when the capacitor is put in)

4.3 Safety requirements

It meets the requirements of the corresponding clauses in the technical conditions of DL/T842-2003 for low-voltage shunt capacitor devices.

4.4 Measurement error

Table 6 Measurement error

Voltage	Plus or minus 1.0%
Current	Plus or minus 1.0%
Active power	Plus or minus 2.5%
Reactive power	Plus or minus 2.5%
Frequency	Plus or minus 0.2%
Power factor	Plus or minus 1.5%

4.5 Protection error

Voltage: 1.0% or less

Current: 1.0% or less

Temperature: + / - 1 ℃

Time: + / - 0.01 s

4.6 Reactive power compensation parameters

Capacitor switching interval: >10s

Reactive power capacity: Common compensation single ≤50kvar; Separate compensation ≤ 30Kvar

4.7 Reliability parameters

Control accuracy: 100%

Capacitor capacity running time decay rate: ≤1%/ year

Capacitor capacity switching attenuation rate: ≤0.1%/ ten thousand times

Annual failure rate: 0.1%

5 Display content and operation method introduction

5.1 Operation interface

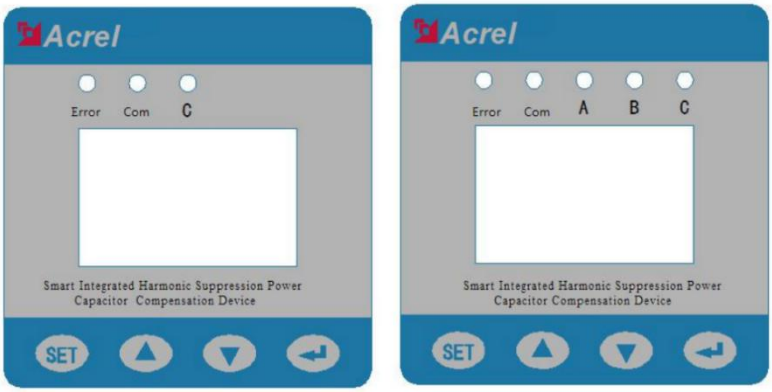


Fig. 68 Operation Panel a: Common compensation Panel; b: Separate compensation panel

5.2 Keys Description

5.2.1 Common compensation keys

Settings: Press the "Settings" key in automatic mode, the cursor will blink. At this time, press the ▲ or ▼ key to switch to other modes; In any other mode, press the "Set" key to exit the current state and return to the automatic mode.

▲ : In automatic mode, press ▲ key to order all menus in this mode; When setting parameters, press ▲ key to increase the value by 1, and return to 0 when the value increases to 9;

▼ : When setting parameters, press the CURSOR BUTTON to move from left to right. Press the CURSOR BUTTON to move one bit to the right every time. When moving to the last bit, the CURSOR jumps to the first place on the left.

2. To confirm a selection or setting made; In manual mode, press "OK" to input and remove the capacitor; When setting parameters, press "OK" to display all menus in this mode successively.

5.2.2 Separate compensation keys:

Settings: Press the "Settings" key in automatic mode, the cursor will blink. At this time, press the ▲ or ▼ key to switch to other modes; In any other mode, press the "Set" key to exit the current state and return to the automatic mode.

▲ : In automatic mode, press ▲ key to order all menus in this mode; In manual mode, press ▲ key to switch phase A, phase B and phase C under the menu; When setting parameters, press ▲ key to increase the value by 1, and return to 0 when the value increases to 9;

▼ : In automatic mode and manual mode, press the ▼ button to switch phase A, phase B and phase C under the menu; When setting parameters, press the CURSOR BUTTON to move from

left to right. Press the CURSOR BUTTON to move one bit to the right every time. When moving to the last bit, the CURSOR jumps to the first place on the left.

2. To confirm a selection or setting made; In manual mode, press "OK" to input and remove the capacitor; When setting parameters, press "OK" to display all menus in this mode successively.

5.3 Operation method

5.3.1 Common compensation operation method

5.3.1.1 Automatic operation

After the system is powered on, the software version number will be displayed first, and then it will enter the automatic running state. LCD backlight automatically turns off in 180 seconds, press any key to activate the backlight.

Fig. 69 Software version

In automatic mode, press the ▲ key to switch the menus in this mode successively.

5.3.1.2 Power factor display

Fig. 70 Power factor

If the sign bit is "-", it means capacitive;If the sign bit does not exist, it is represented as perceptual.

5.3.1.3 Voltage display

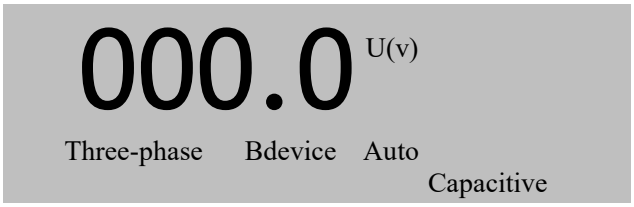


Fig. 71 voltage

5.3.1.4 Current display

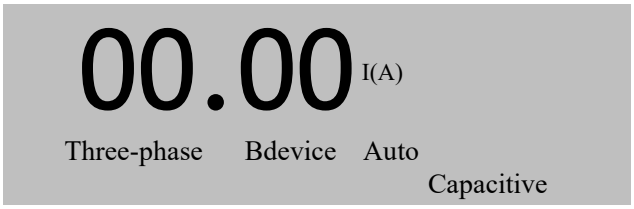


Fig. 72 current

5.3.1.5 Reactive power display

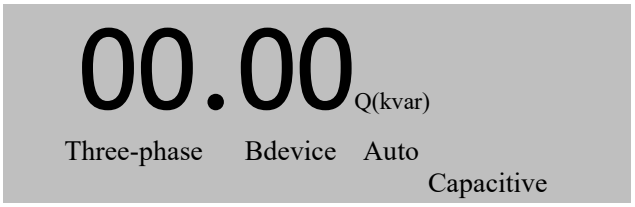


Fig. 73 Reactive power

5.3.1.6 Active power display

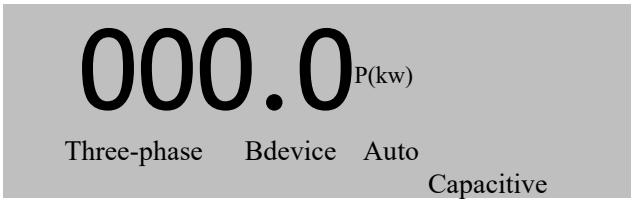


Fig. 74 Active power

5.3.1.7 Display voltage total harmonic content

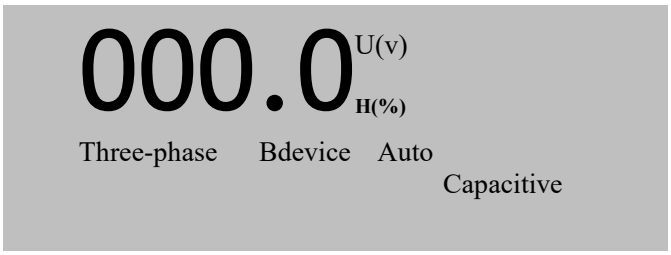


Fig. 75 Total harmonic content of voltage

5.3.1.8 Display of current total harmonic content

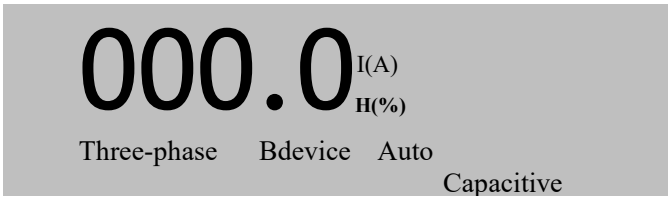


Fig. 76 Total harmonic content of current

5.3.1.9 Address display

Fig. 77 address

5.3.1.10 Temperature display

Fig.78 temperature

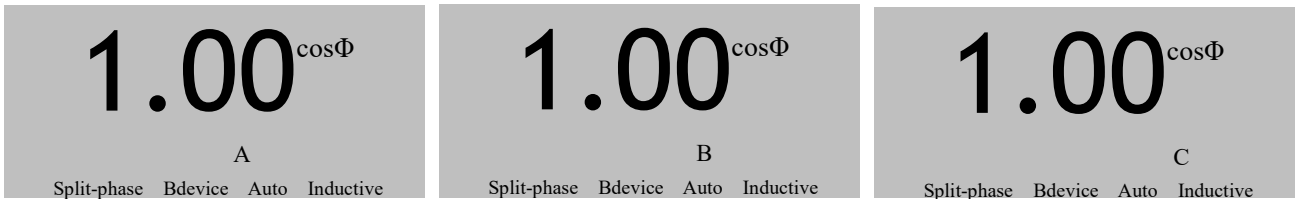
5.3.2 Operation method of separate compensation

5.3.2.1 Automatic operation

After the system is powered on, it enters the automatic running state. LCD backlight automatically turns off in 180 seconds, press any key to activate the backlight.

In the automatic mode, press the ▲ key to switch the menus in this mode successively. Press the ▼ key to switch the A, B and C phases under the menu.

5.3.2.2 Power factor display

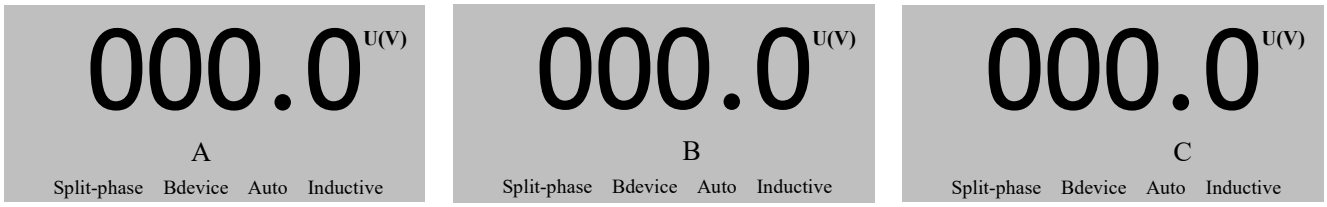


a b c

Fig. 79 Power factor a: A phase power factor; b: B phase power factor; c: C phase power factor

If the sign bit is "-", it means capacitive;If the sign bit does not exist, it is represented as perceptual.

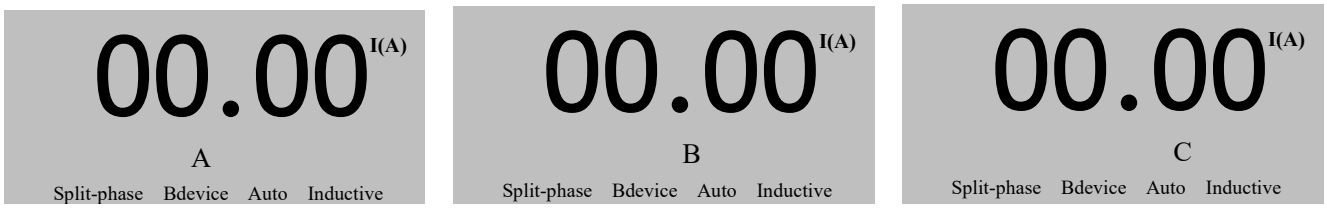
5.3.2.3 Voltage display



a b c

Fig. 80 Voltage a: A-phase voltage; b: B-phase voltage; c: C-phase voltage

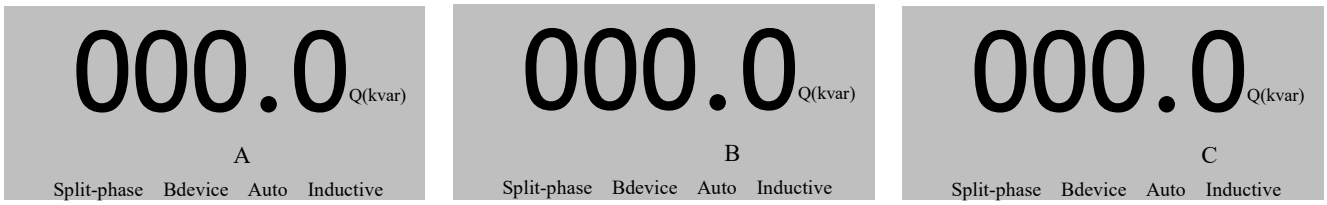
5.3.2.4 Current display



a b c

Fig. 81 Current a: A-phase current; b: B-phase current; c: C-phase current

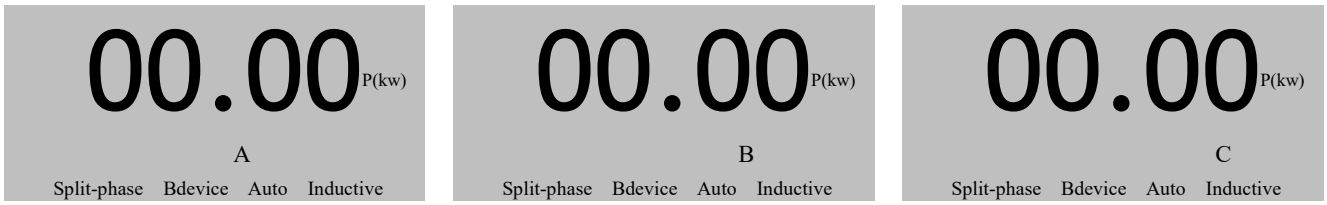
5.3.2.5 Reactive power display



a b c

Fig. 82 Reactive power a: A-phase reactive power; b: B-phase reactive power; c: C-phase reactive power

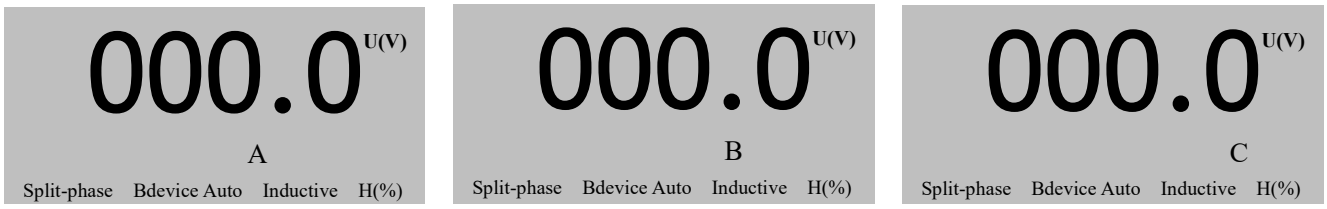
5.3.2.6 Active power display



a b c

Fig. 83 Active power a: A-phase active power; b: active power of B phase; c: C phase active power

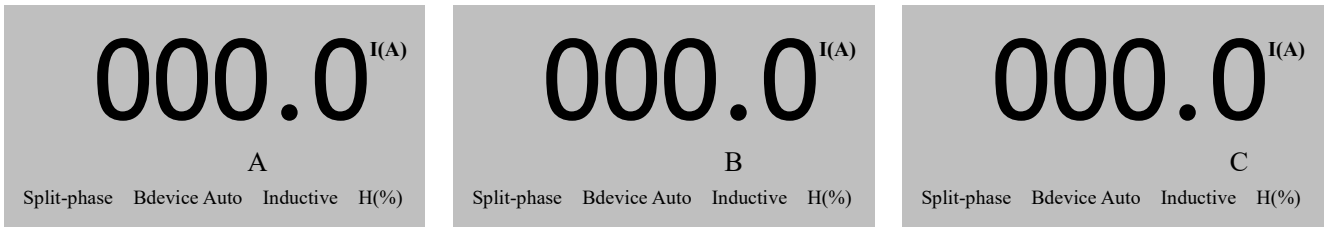
5.3.2.7 Display voltage total harmonic content



a b c

Fig. 84 Total voltage harmonic content a: A harmonic content; b: B phase harmonic content; c: C phase harmonic content

5.3.2.8 Display of current total harmonic content



a b c

Fig. 85 Current Total Harmonic Content a: Phase A Harmonic Content; b: B phase harmonic content; c: C phase harmonic content

5.3.2.9 Address display

Fig.86 address

5.3.2.10 Temperature display

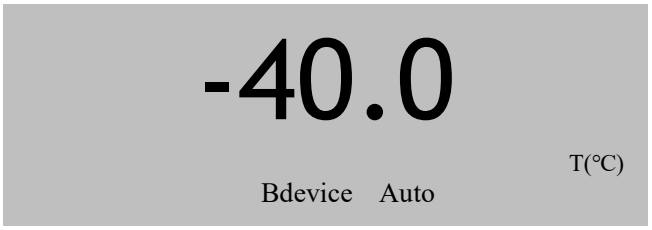


Fig.87 temperature

5.3.2.11 Frequency display

Fig.88 frequency

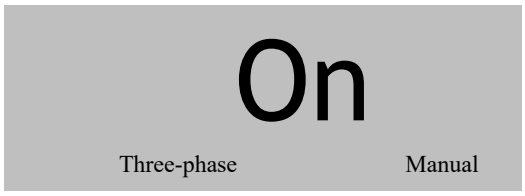
5.4 Manual control

5.4.1 Common compensation control

The manual function is only used to compensate for the forced switching of the capacitor.

Press the "Settings" key, the mode menu flashes, the operation ▲ or ▼ key to select the "Manual" mode, and the operation "Confirm" key to enter the manual state.

a



b

Fig. 89 Common compensation manual control a: excision; b: input

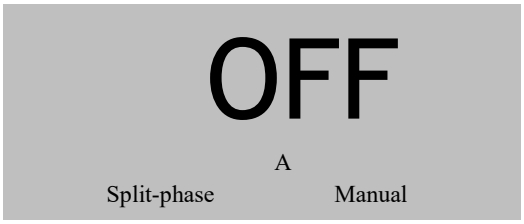
If it is displayed as "OFF", the capacitor is in the excised state; Display as "ON", this capacitor is in the input state; Press "OK" to perform the cast/cut conversion.

5.4.2 Separate compensation manual control

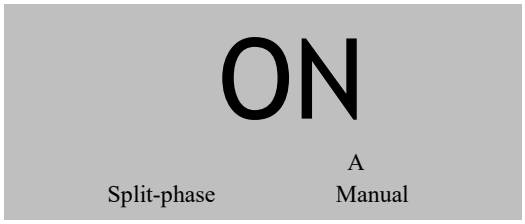
The manual function is only used to compensate for the forced switching of the capacitor.

Press the "Settings" key, the mode menu flashes, operate ▲ or ▼ key to select the "Manual" mode, and the operation "Confirm" key to enter the manual state. After entering the manual state, you can press ▲ or ▼ key to select capacitor A phase, B phase, C phase switching control.

5.4.2.1 Manual control of A phase



a

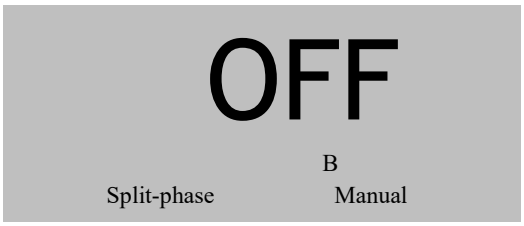


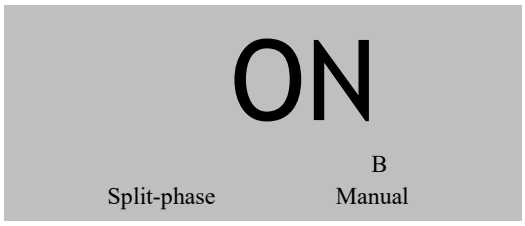
b

Fig. 90 Manual control of phase A a: excision;b: input

If it is displayed as "OFF", the capacitor is in the excised state; Display as "ON", this capacitor is in the input state; Press "OK" to perform the cast/cut conversion.

5.4.2.2 Manual control of B-phase



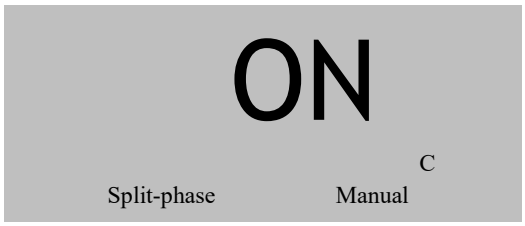


a b

Fig. 91 Manual control of phase B a: excision;b: input

If it is displayed as "OFF", the capacitor is in the excised state; Display as "ON", this capacitor is in the input state; Press "OK" to perform the cast/cut conversion.

5.4.2.3 Manual control of C-phase



a b

Fig. 92 Manual control of phase C a: excision; b: input

If it is displayed as "OFF", the capacitor is in the excised state; Display as "ON", this capacitor is in the input state; Press "OK" to perform the cast/cut conversion.

5.5 Parameter Setting

Product related parameters have been preset in the factory, and users can modify them according to on-site needs. All setting parameters are automatically memorized, no loss when power is off.

Press the "Set" key to blink the cursor twice, press the "▲" or "▼" key to select the "Set" mode, and press the "OK" key to enter the setting state. To modify the parameters, press ▼ to move the cursor to the position that needs to be modified, press ▲ to modify the parameters, and press "OK" to determine after modification.

Note: If it is used for the first time, parameters such as ratio and capacitance must be reset according to actual field needs.

5.5.1 Change ratio setting of CT

Factory preset: 0001(500/500)

Purpose: Incoming cabinet current transformer ratio, to provide measurement and control parameters.

Fig. 93 Current transformer ratio setting

5.5.2 Input power factor setting

Factory preset: 0.90

Purpose: below this value, power grid input capacitor.

Fig. 94 Input power factor Settings

5.5.3 Setting of excised power factor

Factory setting: L0.98

Purpose: Above this value, power grid cutting capacitor.

Fig. 95 Cutting power factor Settings

5.5.4 Delay Settings

Factory preset: 5S

Purpose: Set input delay time.

Fig. 96 Delay Settings

5.5.5 Settings of excision delay time

Factory preset: 20S

Purpose: To set the delay time of capacitor excision.

Fig. 97 Settings of excision delay

5.5.6 Overvoltage protection Settings

Factory preset: 110%

Purpose: excise capacitor when power grid overvoltage.

Fig. 98 Overvoltage protection Settings

5.5.7 Undervoltage protection Settings

Factory preset: 90%

Purpose: Cutting capacitor when power network undervoltage.

Figure 99 Undervoltage Protection Settings

5.5.8 Overcurrent protection Settings

Factory preset: 120%

Purpose: excise capacitor when power grid overcurrent.

Fig. 100 Overcurrent Protection Settings

5.5.9 Undercurrent protection Settings

Factory preset: 50%

Purpose: Cutting capacitor when power grid undercurrent.

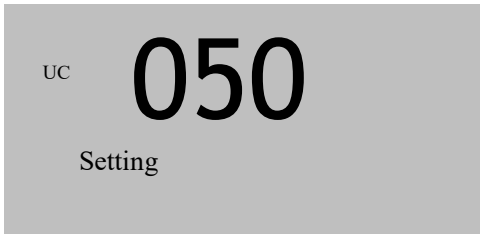


Figure 101 Undercurrent Protection Settings

5.5.10 Voltage total harmonic distortion rate over limit setting

Factory preset: 10.0%

Purpose: voltage total harmonic distortion rate over-limit protection.

Fig. 102 Voltage total harmonic distortion rate overrun setting

5.5.11 Over-limit setting of total harmonic distortion rate of current

Factory setting: 10.0%

Purpose: Current total harmonic distortion rate over - limit protection.

Fig. 103 Excessive protection of total harmonic distortion rate of current

5.5.12 Temperature protection setting

Factory preset: 60℃

Purpose: when the temperature of intelligent capacitor exceeds the set value, the capacitor bank can be cut off to avoid capacitor damage.

Fig. 104 Temperature protection Settings

5.5.13 Capacitance setting

Factory preset: different Settings according to different capacity

Purpose: As the basis of reactive power compensation switching capacitor.

Fig. 105 Capacitance Settings

5.6 Self- inspection

Press the "Set" key to blink the cursor twice. Press the "▲" or "▼" key to select the "Self-check" mode. Press the "OK" key to enter the self-check state. Exit automatically after self-check and return to automatic mode.

Fig. 106 self-inspection

5.7 Over-limit and Fault Warning

When a fault occurs in the power grid or a parameter exceeds the limit, the state of overvoltage, undervoltage, over-current, under-current, harmonic overlimit and over-temperature of a certain value will be indicated, and warning signals will be output.

5.7.1 Overvoltage

Fig. 107 Overpressure Warning

When the voltage is detected to be greater than the overvoltage setting value, the "overvoltage" prompt is displayed.

5.7.2 Undervoltage

Fig. 108 Undervoltage Warning

When the voltage is detected to be less than the under-voltage setting, the "under-voltage" prompt is displayed.

5.7.3 Overcurrent

When the current is greater than the overcurrent setting value, the "overcurrent" prompt is displayed.

Fig. 109 Overcurrent Warning

5.7.4 Undercurrent

When the current is detected to be less than the undercurrent setting, the "undercurrent" prompt is displayed.

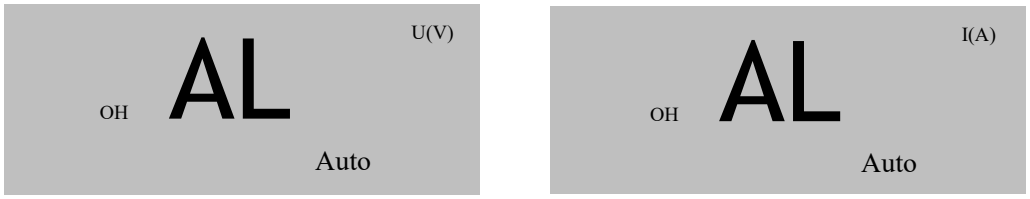
Fig. 110 Undercurrent warning

5.7.5 Excessive temperature

Figure 111 Warning for Excessive Temperature

When the capacitor temperature is detected to be greater than the set value, the "over temperature" prompt will be displayed.

5.7.6 Harmonic over-limit



a b

Fig. 112 Harmonic over-limit Warning a: Voltage Harmonics; b: Current harmonics

When the total harmonic content of voltage is detected to be greater than the set value, the "overharmonic" prompt will be displayed.

When the total harmonic content of the current is greater than the set value, the "overharmonic" prompt will be displayed.

5.7.7 Open- phase

Fig. 113 Warning of open-phase

When phase break is detected, the "phase break" prompt is displayed.

5.8 Networking mode

a When the display interface is a separate one, the display will be automatic; b The display interface is connected with the controller, and the display is automatic; c Display interface is connected to multiple intelligent capacitors, which can be set as host in the hidden menu.

a b c

Fig. 114 Network mode

6 Mounting Dimension

The installation size is as follows (unit mm) :

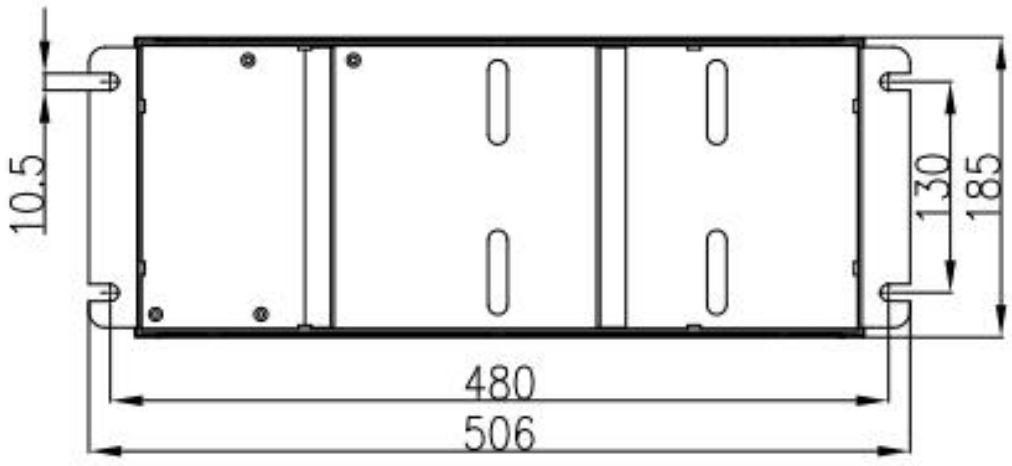


Fig. 115 Mounting dimension drawing

The overall dimensions are as follows (unit mm) :

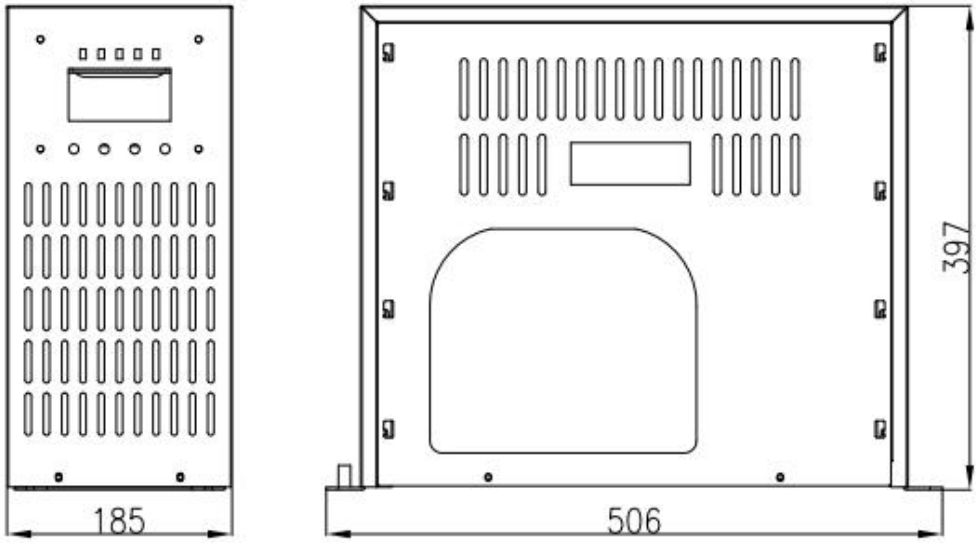
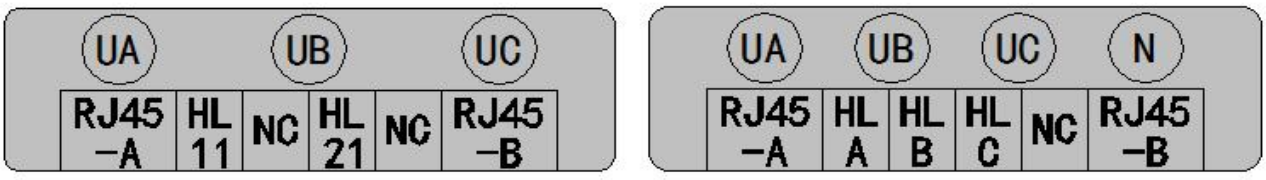


Fig. 116 Overall dimension drawing

7 Terminal definition and wiring mode

7.1 Terminal definitions



AZC common compensation AZC separate compensation

Fig. 117 Connecting terminal diagram a: Common compensation; b: Separate compensation

7.2 Definition of wiring mode terminal

Definition of common compensation terminal diagram

Table 7 Definition of common compensation terminal diagram

The serial	Common compensation	instructions

number	definition		
1	UA	A phase voltage terminal	
2	UB	B phase voltage terminal	
3	UC	C phase voltage terminal	
4	RJ45-A	Network line communication interface	
5	H L11	The first set puts in the indicator terminals	Connect the two terminals of the 380V indicator light
6	NC	empty	
7	H L12	The first set puts in the indicator terminal	
8	NC	empty	
9	RJ45-B	Network line communication interface	

Definition of separate compensation terminal diagram

Table 8 Definition of separate compensation terminal diagram

Serial number	Separate compensation for defining	instructions	
1	UA	A phase voltage terminal	
2	UB	B phase voltage terminal	
3	UC	C phase voltage terminal	
4	RJ45-A	Network line communication interface	
5	H LA	Phase A into the indicator terminal	They are respectively connected to a wiring terminal of the 220V indicator light, and the other terminal of the indicator light is connected to the N line
6	H LB	B phase into the indicator terminal	
7	H LC	C phase into the indicator terminal	
8	NC	empty	
9	RJ45-B	Network line communication interface	

7.3 Wiring mode of harmonic suppression power and quantity compensation device

7.3.1 Common compensation wiring diagram of controller without reactive power compensation

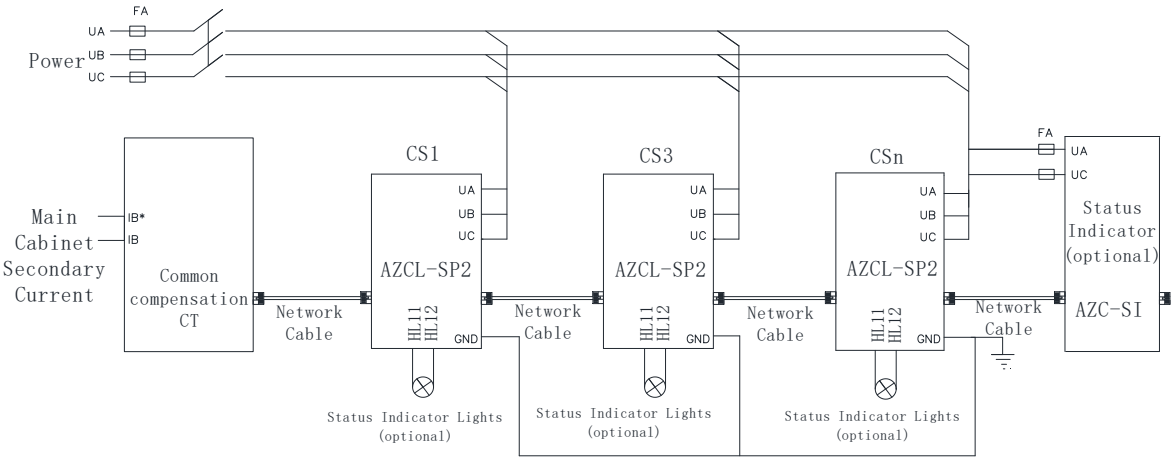


Fig. 118 Common compensation wiring without reactive power compensation controller

7.3.2 Mixed compensation wiring diagram of controller without reactive power compensation

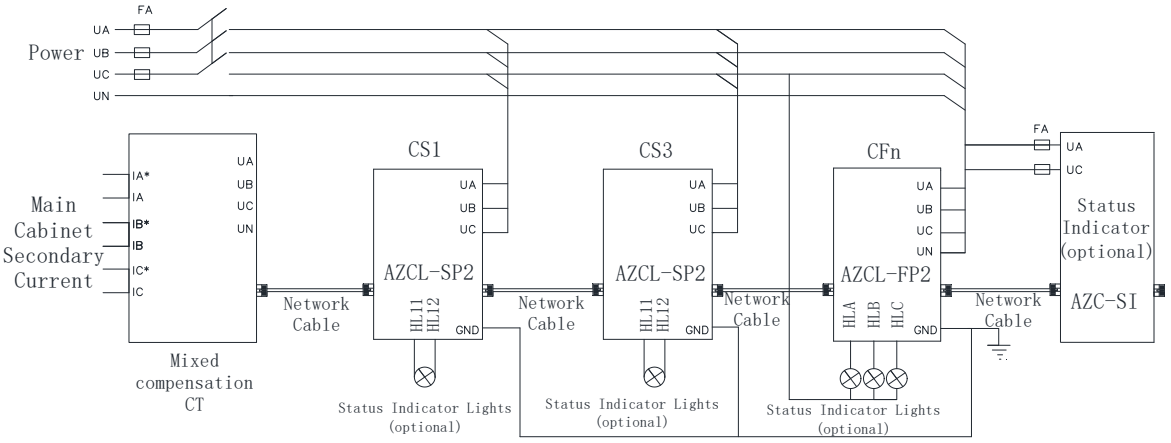


Fig. 119 Mixed compensating wiring diagram of controller without reactive power compensation

7.3.3 Common compensation wiring diagram of controller with reactive power compensation

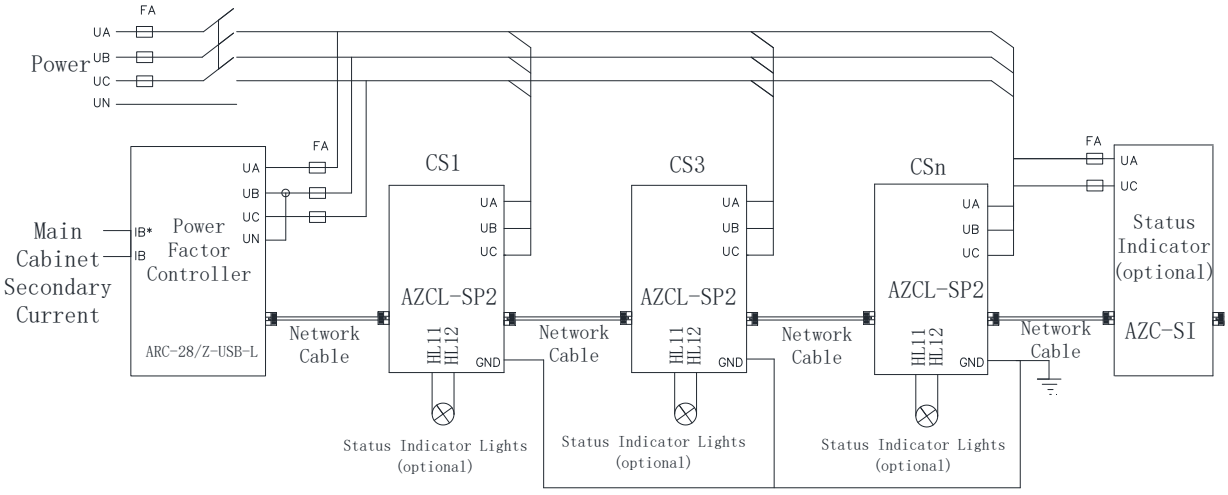


Fig. 120 Common compensation wiring diagram of controller with reactive power compensation

7.3.4 Mixed compensation wiring diagram of controller with reactive power compensation

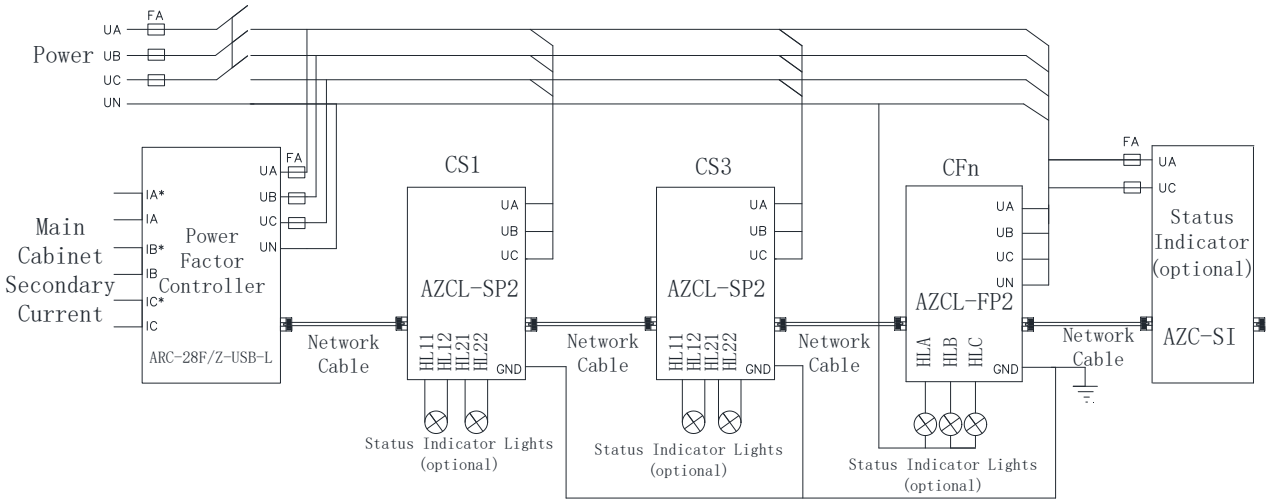


Fig. 121 Mixed compensation wiring diagram of controller with reactive power compensation

8 the attachment

Network line Cold-pressing pieces CT(situation without control)

Figure 122 accessories

9 Precautions for use

9.1 When choosing to use the capacitor, read the instruction carefully, connect the circuit as required, and input the control parameters as required.

9.2 If any device display error or control abnormality is found, the manufacturer shall be informed to deal with it in time.

10 Ordering instructions

10.1 Please specify the product model name and quantity.

10.2 Delivery address and time.

10.3 When the secondary side current of the CT is less than 0.5A, it should be informed, otherwise the measurement accuracy will not be guaranteed.

10.4 Special requirements, please state in advance.

Manual revision record:

V1.0→V1.1	Model SP1、FP1 is modified to SP2、FP2	2022.3.15
V1.1→V1.2	Modify installation dimension	2022.9.14

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