



# User Manual

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Version 1.1

Arc Fault Protection Box FR-DCBS-AFC4C



Scan code to learn more

Fonrich (Shanghai) New Energy Technology Co., Ltd.

Add: 1st Floor, Building 5, No.999 Jianguyue Road, Minhang District, Shanghai

Web: [www.fonrich.com](http://www.fonrich.com)

Tel: +86 21 61679671

Email: [sales@fonrich.com](mailto:sales@fonrich.com)

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## Preface

### Instruction






This user manual describes introduction, installation, electrical connection and operation in detail for FR-DCBS-AFC4C users. Before installing and operating of the equipment, you should read and understand all the instructions and be familiar with the relevant safety in relevant paragraphs.

### Target Group

This user manual is intended for operators and end users.

### Signs

The following signs may appear in this article, and their meanings are as follows.

Signs	Instructions
	Indicates a hazardous situation which,if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which,if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which,if not avoided, could result in minor or moderate injury.
	Indicates a situation which,if not avoided, can result in property damage. It is not safety warning information, and does not involve personal, equipment and environmental damage.
	Protrudes important or critical information, best practices, tips, etc. It is not safety warning information, and does not involve personal, equipment and environmental damage.

## 1 Safety Precautions

To prevent personal injury and property damage, read this section carefully and observe all safety information at all times.

### Requirements of operators

Operators must have the following skills:

- Knowledge of how an arc fault production box works and is operated.
- Training in how to deal with the dangers and risks associated with installing, using electrical devices and installations.
- Knowledge of and compliance with this document and all safety information.

### Installation



- Disconnect the product from voltage sources and make sure it cannot be reconnected before working on the device.
- 



- Please do not touch the other parts inside in addition to the terminals during the installation process.
- 



- Please read this user manual carefully before installation. If the equipment is damaged resulting from violation of the regulations specified in this document, our company has the right not to guarantee the quality.
  - The distance between FR-DCBS-AFC4C and the object should meet the conditions.
- 

### Electrical connection



- Before electrical connection, please make sure that FR-DCBS-AFC4C is not damaged and in a safe state, otherwise it may cause electric shock or fire.
- 



- Touch the cables of the PV array on the insulation only.
  - All electrical connections must meet the electrical standards of the country or region where they are located.
  - Please use the indicated electric wire and electric cable. Using electric wire and electric cable with no sufficient capacity or with no correct connection method will lead to machine breakdown, machine fire or electric shock.
-

## Operation



- FR-DCBS-AFC4C has high voltage during operation, which may cause electric shock or death in severe cases. Please operate strictly in accordance with the safety precautions listed in this manual and other related documents.
-

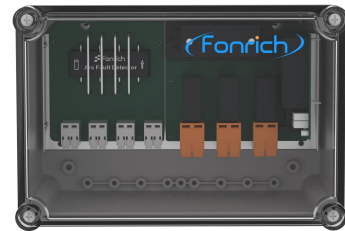
## 2 Product Overview

### 2.1 Description

FR-DCBS-AFC4C is solar AFCI (Arc Fault Circuit Interrupter), which is mainly used in small sizes of distributed PV system.

#### Functions

Its main function is to detect the arc fault of the PV strings and make the string cables in the state of no current when the arc fault occurs. In addition, users can remotely monitor the state of the product by the mobile phone APP, such as arc alarm, relay contact, current, etc.

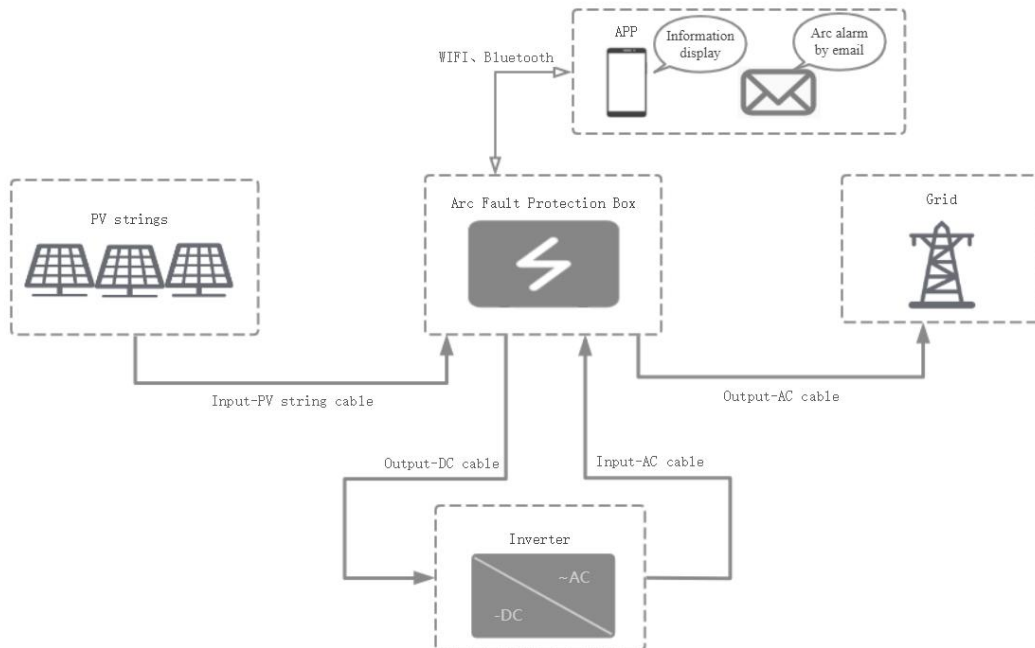


#### Features

- 1-4 PV strings each box supports
- Arc fault detecting of each PV string
- Fonrich IP technology to self-adapt with different inverters
- UL 1699B 2018 conformity
- The protection arc sensitivity is adjustable
- WiFi internet connection, email alarm notification

#### Application

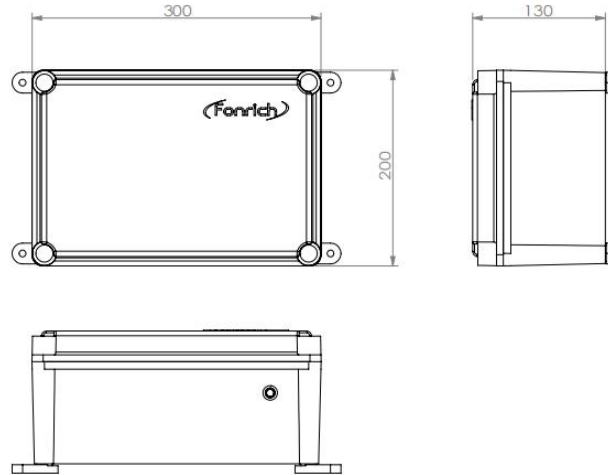
FR-DCBS-AFC4C is mainly used in small sizes of distributed PV system, such as <10KW residential solar system. The system consists of PV strings, arc fault protection box, inverter and grid, as shown in the figure below.



Typical Application of AFC4C

## 2.2 Appearance

### Dimensions(mm)

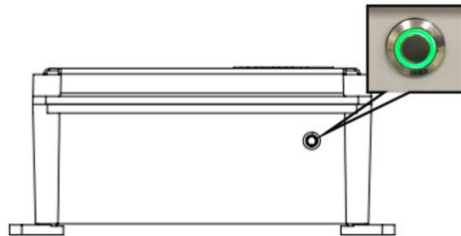


### LED Signal

There is a LED in the front of the FR-DCBS-AFC4C, which indicates the operating state of the product.

The green LED is on : The product is operating normally .

The green LED is off : The product is not operating or the arc faults occurred .



## 2.3 Principles of Design

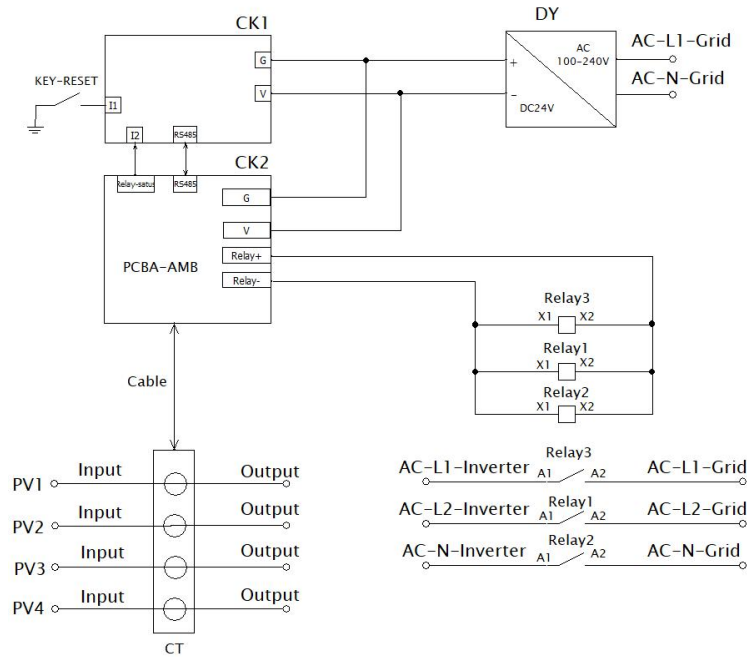
### 2.3.1 Schematic Diagram

DC side: 4 PV strings are connected to the DC input terminals of the product. After passing through the arc fault detectors, the DC output terminals of the product are connected to the input terminals of the inverter.

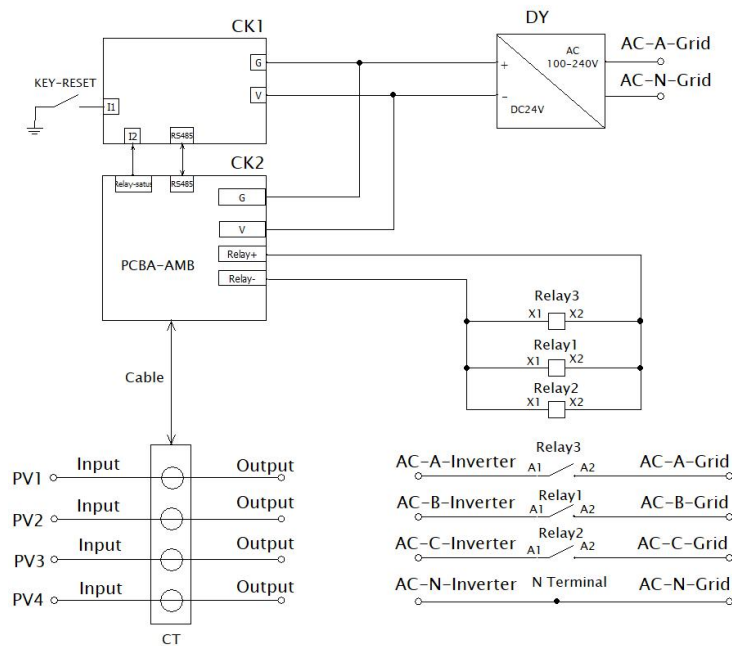
AC side: The output terminals of the inverter are connected to the AC input terminals of the product, and after passing through the AC relay, the AC output terminals of the product are connected to the input terminals of the grid.



### Single-phase three-wire



### Three-phase four-wire



#### 2.3.2 Work principle

If the arc fault is detected, the product will issue an alarm signal by the indicator and Email. At the same time, the AC relay will be driven to break off the AC circuit between the inverter and the grid. So that the inverter will stop working to ensure that the DC circuit is in the state of no current. After 2 minutes, the AC relay will be driven to turn on the AC circuit and then the entire circuit resumes normal operation.

## 2.4 Arc alarm strategy

### 2.4.1 Arc mode

We divide the arcs into Instantaneous Arc and Continuous Arc.

#### Instantaneous Arc

The arc duration does not exceed the Instantaneous Arc Time (IAT), and there is no arc occurring again within the Continuous Arc Time (CAT).

#### Continuous Arc

The arc duration exceeds the IAT, or the arc duration does not exceed the IAT, but the arc occurs again within the CAT.

### 2.4.2 Arc alarm strategy

#### 1. Instantaneous arc alarm

If the arc intensity of any channel exceeds the channel alarm threshold, an arc alarm will be generated.

#### 2. Continuous arc alarm

The product does not alarm when instantaneous arc is detected, but only when continuous arc is detected.

### 2.4.3 Arc alarm time

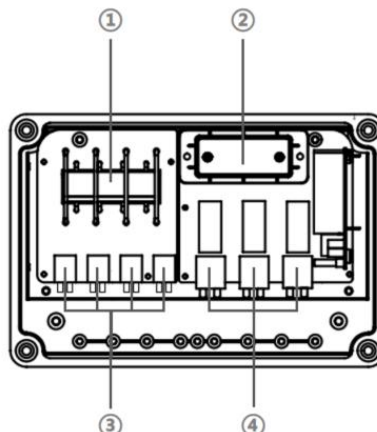
The calculation method of the arc alarm times of the channel: When an arc alarm occurs in any channel, the number of arc alarm times increases by 1. When arc faults occur in several channels at the same time, the number of arc alarm times only increases by 1. The product will automatically restart after 2 minutes.

However, when the arc alarm times is up to the value of the arc alarm time, the device must be restarted manually.

## 2.5 Inside Components

### Description

- ① Arc Fault Detector : Detect real-time the arc in the PV strings.
- ② Main Control : Control the state of the product.
- ③ DC Terminals : PV strings input and output terminals.
- ④ AC Terminals : Inverter input and output terminals.

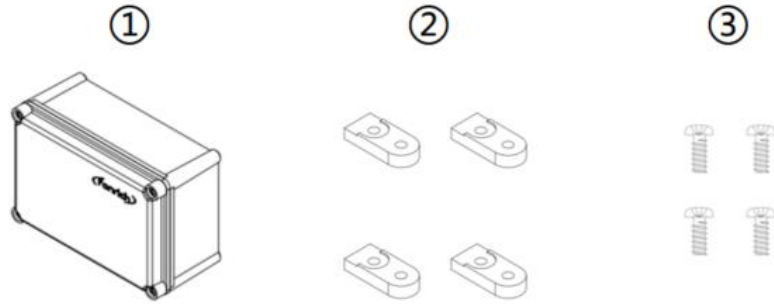


### 3 Installation

#### 3.1 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage before installation. Contact your distributor if the scope of delivery is incomplete or damaged.

##### Product and accessories



Position	Quantity	Designation
①	1	Arc Fault Protection Box
②	4	Fixture
③	4	Cylindrical screw

#### 3.2 Requirements for Installation



- Do not install the product in areas containing highly flammable material or grass.
- Do not install the product in potentially explosive atmospheres.
- Disconnect the product from voltage sources and make sure it cannot be reconnected before working on the device.



- Do not install the product in the area where can be touched unintentionally.

Take wall-mounted installation as an example to introduce:

- A solid support surface must be available.
- The ambient temperature range is -30°C ~ +60°C.
- The protection level of FR-DCBS-AFC4C is IP65, and it can be used in both indoor and outdoor environments.
- The product should be installed such that the LED signal can be read off

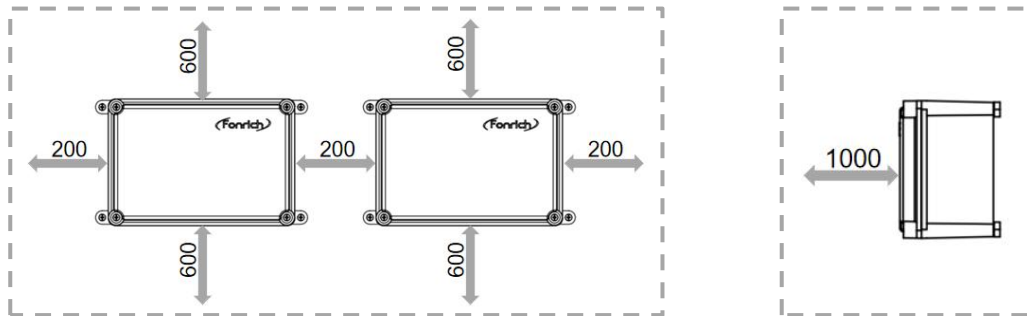
without difficulty.

### Recommended installation clearances

If you maintain the recommended clearances,adequate heat dissipation will be ensured. Thus,you will prevent power reduction due to excessive temperature.

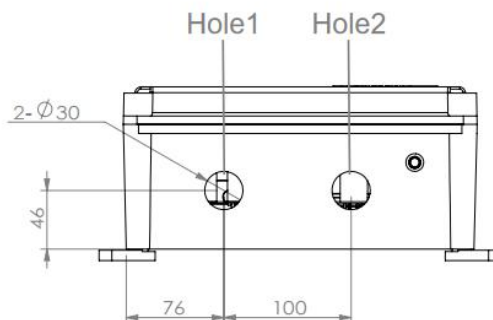
- Maintain the recommended clearances to walls as well as to other products or objects.

(Dimensions in mm)



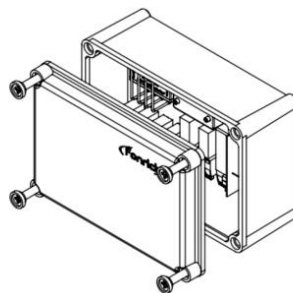
### 3.3 Drilling Diagram

Users can drill the bore holes according to their own needs.The size diagram of the holes is as follows.

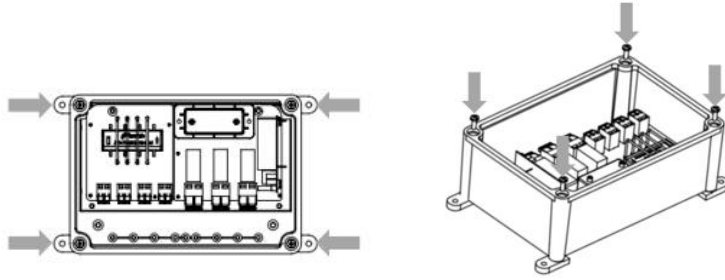


### 3.4 Procedure

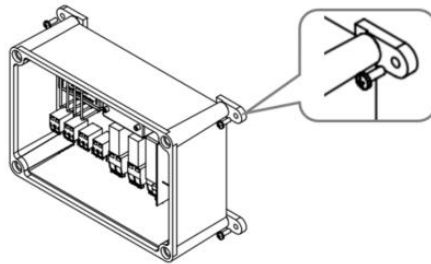
- 1) Remove the four screws on the product cover using a flat-blade screwdriver, and then remove the front panel.




- 2) Place the four fixtures under the four corners of the product bottom, put the screws into the holes.And then screw the four fixtures to the product using the screwdriver.



- 3) Place the product vertically on the wall and use the screws to attach the four fixtures of the product to the wall.



 Note : Install the front panel after completing the electrical connections in the fourth chapter.

## 4 Electrical Connection



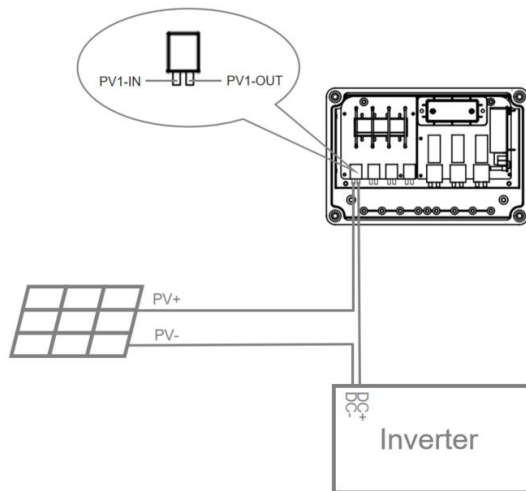
- Before electrical connection, please make sure that FR-DCBS-AFC4C is not damaged and in a safe state, otherwise it may cause electric shock or fire.



- Touch the cables of the PV array on the insulation only.
- All electrical connections must meet the electrical standards of the country or region where they are located.
- Please use the indicated electric wire and electric cable. Using electric wire and electric cable with no sufficient capacity or with no correct connection method will lead to machine breakdown, machine fire or electric shock.

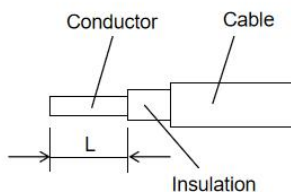
### 4.1 DC Terminals

Connect the product, inverter and PV strings through the DC terminals as shown in the figure below.



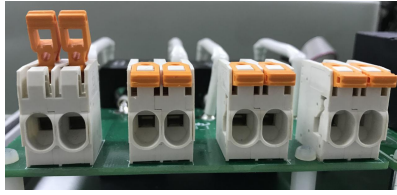
#### Procedure

- 1) Strip the insulation of PV string cables.

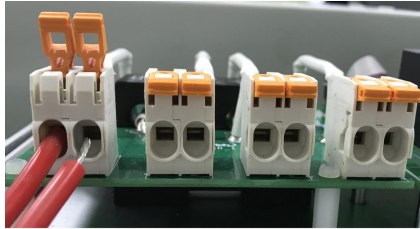


L is the reference value of the exposed length of the conductor of the **DC** cables. The length of L is recommended to be 8-10mm.

- 2) Pull up the handle of the DC terminals.



3) Insert the stripped conductor section into the connection port.

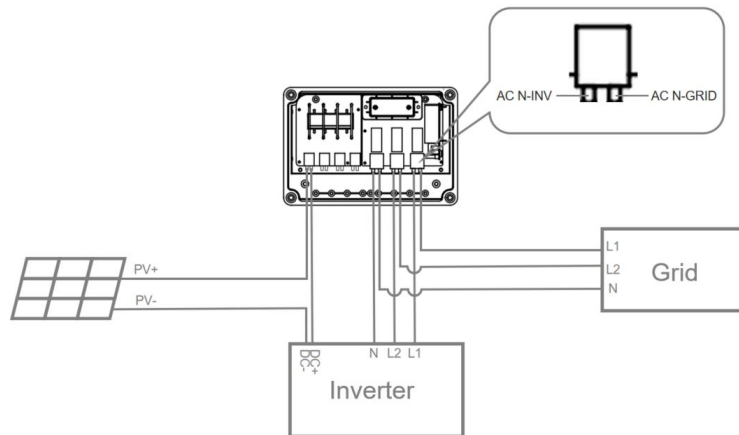


4) Press down the handle of the DC terminals.



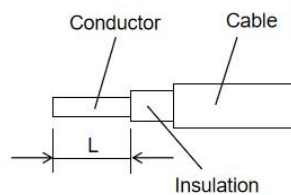
## 4.2 AC Terminals(Single-phase three-wire connection)

Connect the product, inverter and grid through the AC terminals as shown in the figure below.



### Procedure

1) Strip the insulation of the cables.



L is the reference value of the exposed length of the conductor of the AC cables. The length of L is recommended to be 9-11mm.

2) Pull up the handle of the AC terminals.

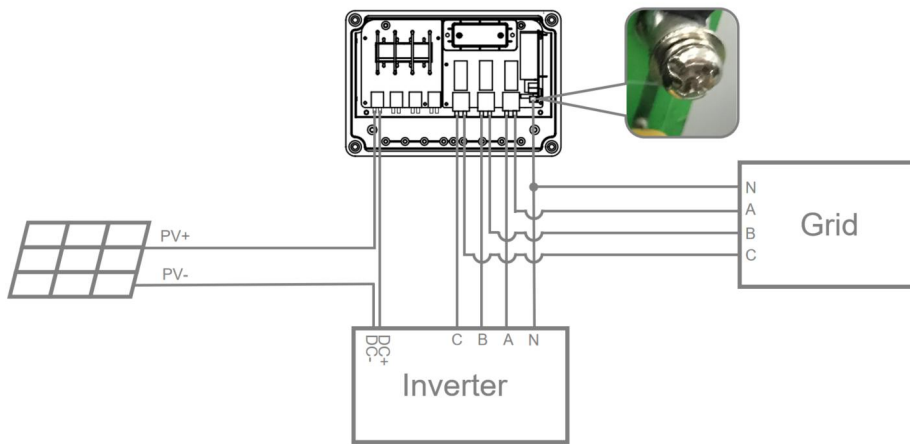
- 3) Insert the stripped conductor section into the corresponding connection port.
- 4) Press down the handle of the AC terminals.

### 4.3 AC Terminals(Three-phase four-wire connection)

**NOTICE**

- When wiring three-phase four-wire, the silkscreen mark of the AC terminals is not applicable, please follow the instructions for wiring.

Connect the product, inverter and grid through the AC terminals and N terminal as shown in the figure below.



#### Procedure

- 1) Strip the insulation of the cables.
- 2) Pull up the handle of the AC terminals.
- 3) Insert the stripped conductor section of the cables into the corresponding connection port.
- 4) Press down the handle of the AC terminals.
- 5) Insert the stripped conductor section of the cables into the OT terminal or U-shaped terminal, and then connect it to the N terminal.



-----THE END

Note: Cover the front panel of the product and fix it firmly with screws.



## **5 Operation**

### **5.1 Checking before Operation**

In order to ensure the normal operation of the arc safety protection box, a pre-operation inspection is required.

- The product must be correctly installed.
- All cables must be correctly connected.

### **5.2 Operation**

Perform power-on operation to turn on the FR-DCBS-AFC4C.

The green indicator is on, and the product is in normal operation.

### **5.3 Clearing the Arc Alarm**

When the green indicator is off, it proves that arc fault has occurred.

Press the indicator to clear the arc alarm. Then the green indicator will light again and the product will work .

## 6 APP Connection

FR-DCBS-AFC4C has a matching mobile phone APP(FR-DCBS-AFC4x). Users can connect the FR-DCBS-AFC4C to APP by Bluetooth.

### 6.1 Download

- IOS users can download the APP(FR-DCBS-AFC4x) in the APP Store
- Users can scan the following QR code to download the matching APP or download it on the FONRICH website (www.fonrich.com).



### 6.2 Connection

Take the product coded 021012910020 as an example.

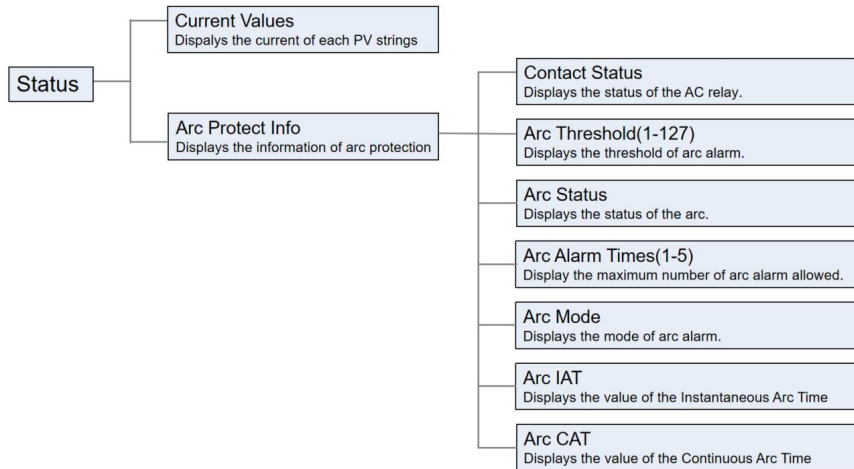
#### Procedure

1. Find the 021012910032 on the label of the main control.
2. Turn on the Bluetooth and the APP of the mobile phone, and select the serial number 021012910032 to be connected.  
If the product is not retrieved, you can click [**Not listed above, scan again**].
3. When the APP is successfully connected to the product, it will enter the Status Interface.



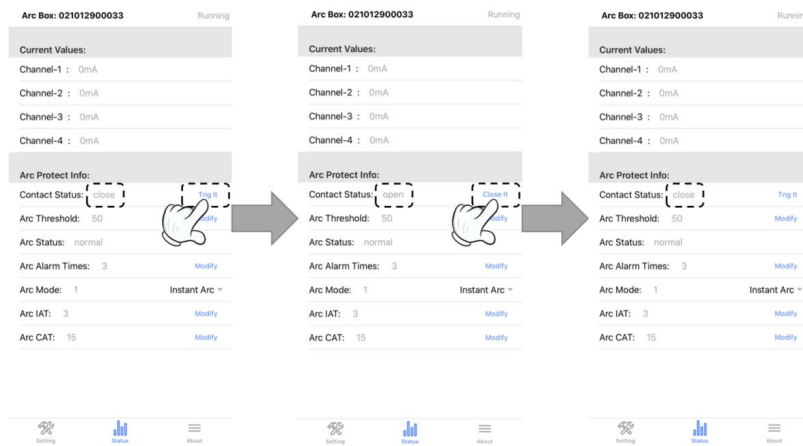
## 6.3 Status Interface

### 6.3.1 Design of the status interface



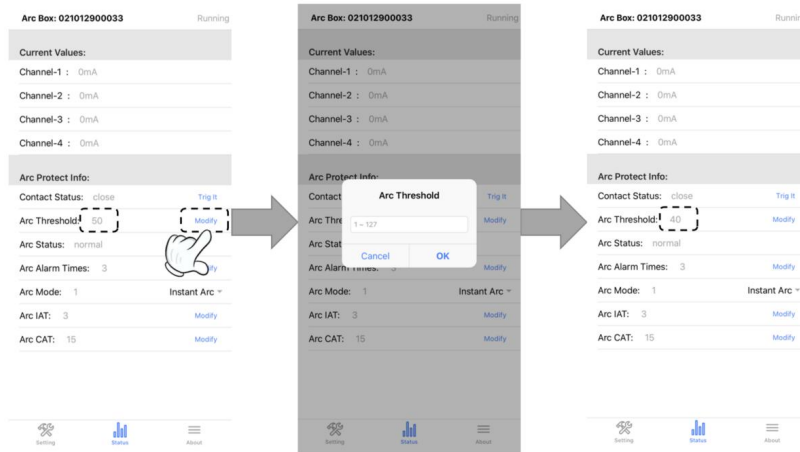
### 6.3.2 Contact Status

- 1) Click on **[Trig it]** when the contact status is **[close]**.
- 2) The product makes a clicking sound at this moment, and the contact status is changed to **[open]**.
- 3) Click on **[Close it]** when the contact status is **[open]**.
- 4) The product will make a clicking sound at this moment, and the contact status is changed to **[close]**.



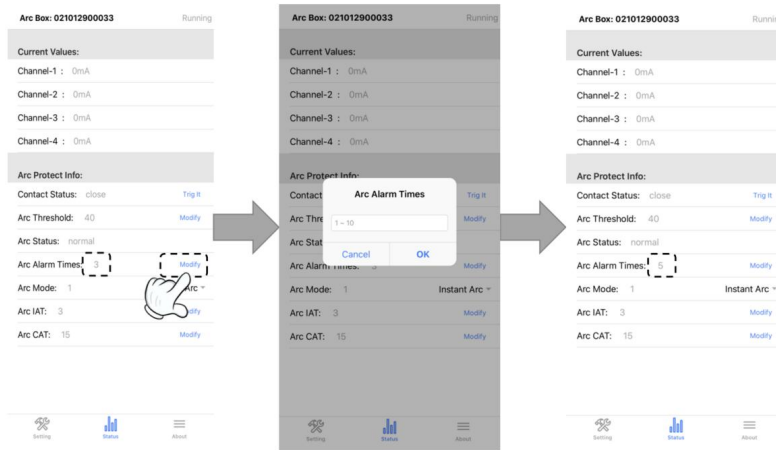
### 6.3.3 Arc Threshold (Range 1-127)

- 1) Click on **[Modify]**.
- 2) Enter the desired parameter **[40]** and select **[OK]** (Take 40 as an example).
- 3) This parameter is modified to **[40]**.



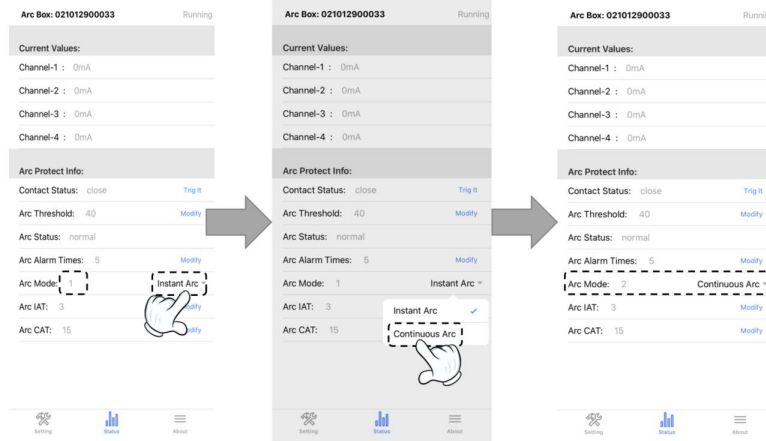
### 6.3.4 Arc Alarm Times (Range 1-10)

- 1) Click on [Modify].
- 2) Enter the desired parameter [5] and select [OK] (Take 5 as an example).
- 3) This parameter is modified to [5].



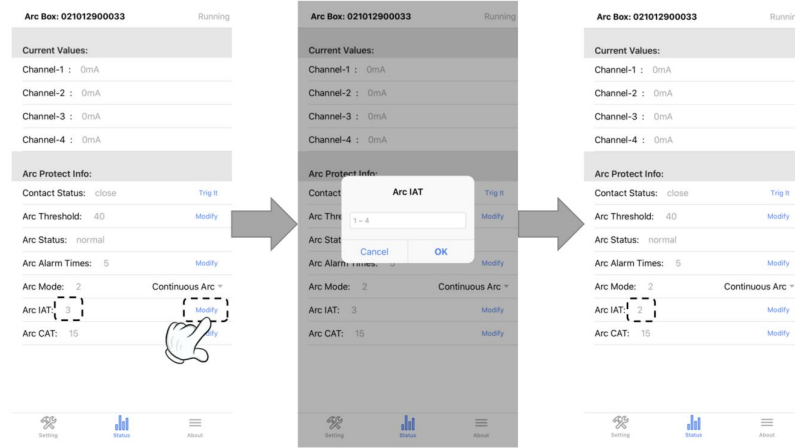
### 6.3.5 Arc Mode

- 1) Click on [▼].
- 2) Select the desired arc alarm mode.



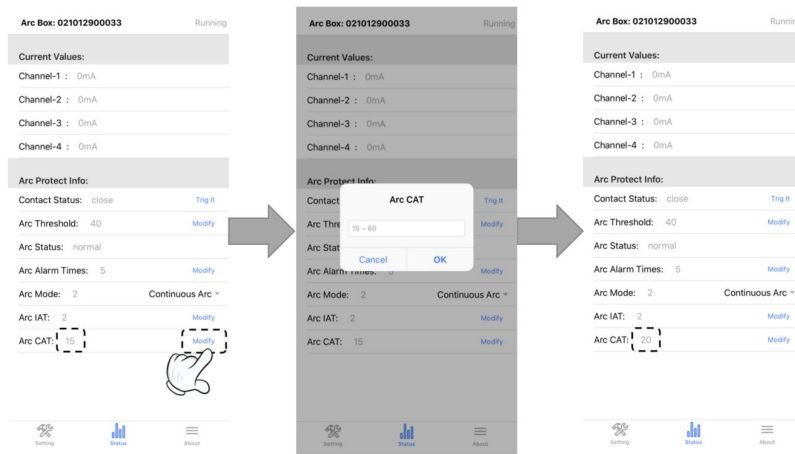
### 6.3.6 Arc IAT (Range1-4)

- 1) Click on **[Modify]**.
- 2) Enter the desired parameter **[2]** and select **[OK]** (Take 2 as an example).
- 3) This parameter is modified to **[2]**.



### 6.3.7 Arc CAT (Range15-60)

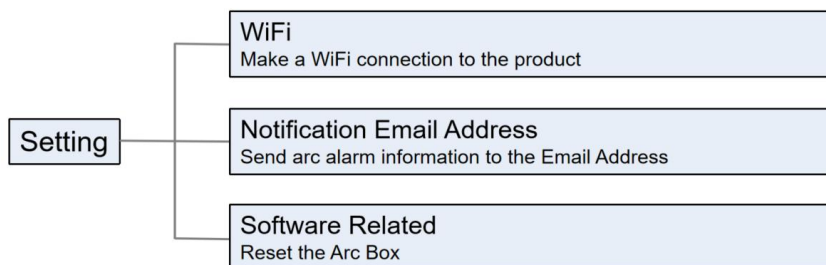
- 1) Click on **[Modify]**.
- 2) Enter the desired parameter **[20]** and select **[OK]** (Take 20 as an example).
- 3) This parameter is modified to **[20]**.



## 6.4 Setting Interface

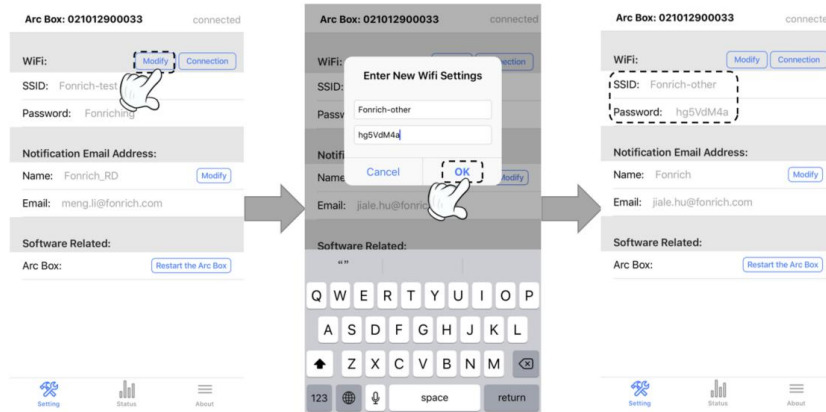
Click on **[Setting]** at the bottom to switch to the setting interface.

### 6.4.1 Design of the setting interface



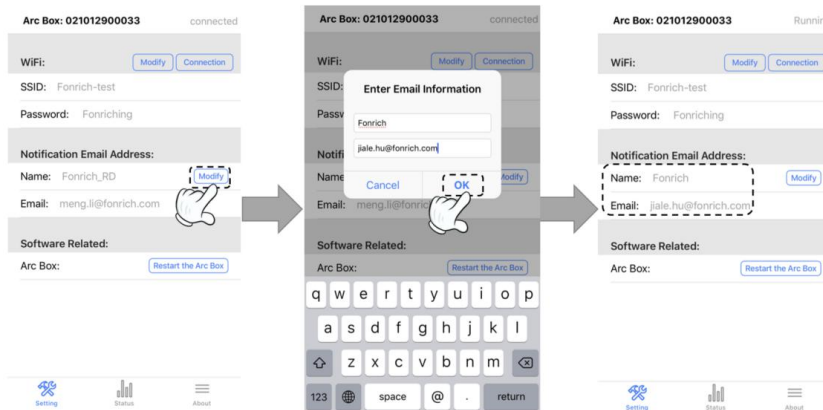
### 6.4.2 WIFI

- 1) Click on [Modify].
- 2) Enter the name and password of the WiFi and select [OK].
- 3) The WiFi is modified.



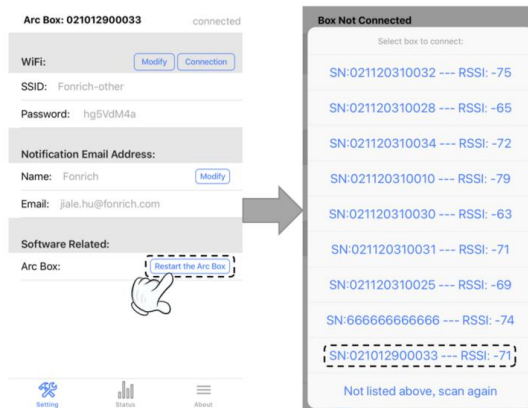
### 6.4.3 Notification Email Address

- 1) Click on [Modify].
- 2) Enter the name and Email of the user and select [OK].
- 3) The Email address are added.(Email will take effect after 2 minutes)



### 6.4.4 Software Related

- 1) Click on [Reset Device].
- 2) Select [OK].



## 7 Appendix

### 7.1 Revision Log

Version	Change content	Revision date
1.0	First edition	2021.04.26
1.1	Updated certain content of 2.4 Arc alarm strategy. Updated certain content of 4 Electrical Connection. Updated certain content of 6.3 Status Interface.	2021.7.28

### 7.2 Contact Us

Fonrich (Shanghai) New Energy Technology Co., Ltd.

Add: 1st Floor, Building 5, No.999 Jiangyue Road, Minhang District, Shanghai

Tel: +86 21 61679671

Email: sales@fonrich.com

Web: www.fonrich.com