



# **TPCS-500-G**

## **Power Conversion System**

### **User Manual**

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Chengdu Tecloman Energy Storage Technology Co.,Ltd

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# 1.Overview

## 1.1.Introduction

Thank you for choosing the power conversion system products independently developed and produced by Chengdu Tecloman Energy Storage Technology Co., LTD.!

The final interpretation right of this manual belongs to Chengdu Tecloman Energy Storage Technology Co., LTD. In order to meet your needs, we have specially opened a 24-hour service phone for you, and hope that you can pass your valuable opinions to us in the first time, so that we can continue to improve technology and quality.

## 1.2.Applicable Product

This manual is applicable to the following product models of power conversion system:

- TPCS-500-G
- Keyword explanation: In this manual, inverter and power conversion system all refer to energy storage series products.

## 1.3.Applicable Personnel

This manual applies to the installation of this product. Applicable personnel: Personnel are required to have certain professional knowledge of electrical, electrical wiring and mechanical installation; Maintenance personnel must have electrical and mechanical schematics and understand the characteristics of electrical and electronic components.

## 1.4.Manual Applicable

**Please read this manual carefully before installation and use. If you do not carefully read the relevant instructions, violation of safety regulations may cause serious accidents!** If there is anything difficult to understand, you can call our company 24 hours service telephone, we will serve you wholeheartedly!

After the equipment is in normal operation, be sure to archive and save this manual in a place that is easy to read.

## 1.5.Safety Symbol

In order to ensure the safety of life and property of users when applying this product, relevant warning labels are pasted on the equipment, and relevant information will be provided in the manual:



“ Danger”safety sign:

- ◆ Danger! Failure to operate as required may result in loss of life, serious personal injury or equipment damage! !



“ Warning”safety sign:


- ◆ Warning! Personal injury or equipment damage may result from not operating as required!



“ Danger electricity”sign:

- ◆ Electricity danger! This sign indicates that the internal equipment is charged and may cause electric shock if touched!



“ Caution burns”sign:

- ◆ Beware of burns! This sign indicates the internal high temperature, touch may cause burns!



“ Grounding”sign:

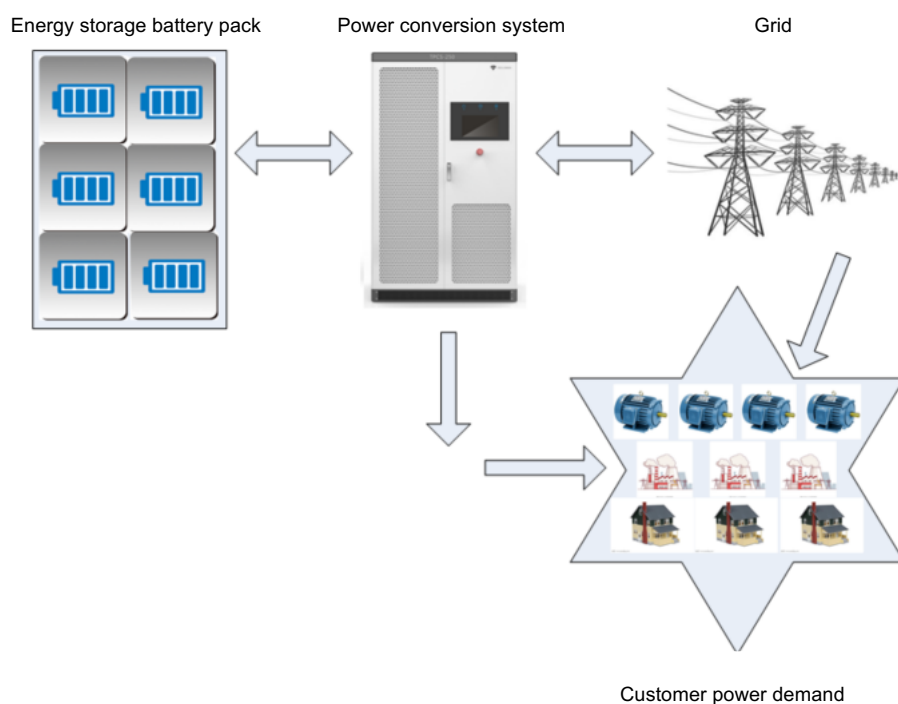
- ◆ Grounding! This sign indicates that it needs to be firmly grounded to ensure the personal safety of the operator!

## 2.Safety Precautions

### 2.1.Product Applicable Scope

The series of power conversion system developed by Chengdu Tecloman Energy Storage Technology Co., Ltd. is to provide an interface between the grid and the battery, realize the charging and discharging of the battery, and integrate into the grid after transformer boost isolation. This series of power conversion system product protection grade is IP20.

Charging and discharging system diagram of energy storage system:



### 2.2.General Safety Notes

When installing and running, be sure to read this manual carefully first. Please follow the general minimum labor safety standards during installation and operation. Special safety instructions see this manual for detailed introduction!



## 2.2.1 Manual Placement

This manual contains important information such as transportation, installation and operation of power conversion system; Please read the relevant contents of this manual carefully before performing the above operations.

- ✧ Please strictly follow the instructions in this manual for transportation, installation, operation, storage and other operations, otherwise, it may lead to equipment damage, casualties and property loss.
- ✧ After the equipment acceptance, please be sure to keep this manual properly!
- ✧ After the installation of the equipment, please make sure that the sundries, tools and other items in the cabinet are cleaned.

## 2.2.2 Personnel Requirement

- ✧ Only professional electricians or personnel with professional qualifications can carry out the installation and operation of the product;
- ✧ The operator is fully familiar with the structure and working principle of the whole system;
- ✧ Operators should fully read this manual;
- ✧ Operators should understand relevant national standards, laws and regulations;

## 2.2.3 Safety Warning Label

In the implementation of installation, routine maintenance, overhaul and other operations of the power conversion system, in order to prevent unrelated people from approaching and misoperation or accidental injury. Please follow the following:

- ✧ Establish a clear sign at the front or back switch of the power conversion system to prevent accidents caused by misclosing;
- ✧ Set up warning signs or safety warning signs near the installation area;
- ✧ After the installation, please be sure to close the door, properly keep the key and related information;

## 2.2.4 Safety Protection

In large energy storage power station, the positive and negative voltage of the battery is quite high. If it is accidentally touched, it will cause electric shock and even threaten life.

- ✧ When maintaining the equipment, ensure that the connection between the power conversion system and the battery is completely disconnected.
- ✧ Set up a warning sign after disconnection to ensure that the switch will not be accidentally closed.

## 2.3. Installation Safety Instructions

Equipment installation is divided into mechanical installation and electrical installation two parts; Mechanical installation mainly refers to the transportation and fixed installation of the cabinet, and electrical installation refers to the connection of electrical wiring and various system components. Both installation requires professionals to install in accordance with this manual.

### 2.3.1 Equipment Installation

In order to avoid the noise generated by the power conversion system during operation and other possible emergencies affecting the normal life of residents or causing safety accidents, the power conversion system must be installed in the electrical room.

- ✧ Electrical room as far as possible away from the residential living area, if necessary, can take appropriate sound insulation measures;
- ✧ No combustible and flammable items are allowed to be stacked in and around the electrical room;
- ✧ The electrical room should be designed with good ventilation, personnel escape and other channel requirements;
- ✧ The electrical room should meet relevant standards;

## 2.3.2 Electrical Connection

The electrical connection of the equipment must be strictly in accordance with this manual and electrical schematic diagram.

- ✧ The battery configuration, related current, voltage, power and other parameters must conform to the technical parameters of the power conversion system;
- ✧ Only professional technicians permitted by the local power supply company can connect the power conversion system to the grid (connect the power conversion system to the grid).
- ✧ All electrical connections must comply with national/industry standards;

## 2.3.3 Complete Power Off Operation

Each operation can only be carried out if it is ensured that the power conversion system is completely uncharged.

- ✧ Ensure that the power conversion system is not accidentally re-powered;
- ✧ Make the multimeter determine that the power conversion system is not charged at all;
- ✧ Complete grounding of the device and necessary short-circuit connection;
- ✧ Use insulating materials to cover the live parts that may be accidentally touched;
- ✧ After the power conversion system is completely out of operation, be sure to wait 5~10 minutes to ensure that the internal capacitor is fully discharged before operating the power conversion system.

## 2.3.4 Electrostatic Protection

For printed circuit boards or other electrostatic sensitive components must be electrostatic protection, to avoid device damage.

- ✧ Avoid unnecessary circuit board contact;
- ✧ Comply with electrostatic protection regulations, need to wear electrostatic bracelet or gloves.

## **2.3.5 Environmental Condition Protection**

### **Storage and installation environment requirements of the equipment:**

- ✧ Equipment storage and installation should be indoors;
- ✧ Equipment should avoid direct rain wet during the transportation process ;
- ✧ Equipment installation environment should be free of acid fog, salt fog, conductive metal dust, etc.;
- ✧ The equipment should not be installed in the space with flammable, toxic, harmful gases or articles;
- ✧ Screws, tools and metal objects should not be placed in the cabinet;
- ✧ Other environment installation requirements.

## **2.3.6 Product Obsolescence**

When the power conversion system needs to be discarded, it cannot be treated as conventional waste, please let the unit with relevant qualifications handle it!

## **2.3.7 Other Protection**

- ✧ Product maintenance should ensure that there are at least two personnel on site at the same time;
- ✧ When the product is maintained, overhauled and other work, relevant personnel shall take appropriate protective measures according to the need;
- ✧ Product installation site is usually far away from the city, according to the need, prepare the corresponding emergency rescue facilities;

## **2.4.Operational Safety Instructions**

### **2.4.1 Battery Protection**

For large power stations, there is a very high voltage between the energy storage battery

packs, which can cause life danger if accidentally touched!

- ✧ During equipment maintenance, ensure that the battery and the inverter are completely disconnected;
- ✧ After disconnection, a warning mark should be set to avoid accidents.

## **2.4.2 Power-on Test Precautions**

- ✧ Prepare for personnel safety;
- ✧ It must be operated by more than two people to ensure personal safety

## **2.4.3 Measuring Equipment Use Precautions**

In the electrical connection or test operation of the power conversion system, in order to ensure that the electrical parameters meet the requirements, attention should be paid to when using the instruments and equipment of the project:

- ✧ Select the corresponding range, the use conditions are in line with the requirements of the site;
- ✧ Ensure that the equipment is connected and used correctly to avoid damage;

## **2.4.3 Touch Screen Setting Precautions**

The touch screen can set the parameters of the power conversion system and change its running state. When changing the touch screen parameters, it is necessary to ensure that the operating status of the system and the power conversion system is analyzed before modification. When setting parameters, we should pay attention to:

- ✧ Improper modification may affect the normal operation of the equipment;
- ✧ Wrong parameter Settings can have serious consequences;
- ✧ If the parameters really need to be modified, the modification can only be authorized by the professional personnel;

## 2.4.4 Overhaul And Maintenance Notice

When performing overhaul and maintenance, we should pay attention to the following points:

- ✧ Make sure the product is off;
- ✧ Ensure that the power conversion system will not be accidentally powered on;
- ✧ Use a multimeter to ensure that the internal power of the power conversion system is all discharged;
- ✧ Take necessary grounding and short-circuit connections;
- ✧ In the process of maintenance and overhaul, it is necessary to ensure that the escape channel is unblocked;

## 2.4.5 Additional Notes

In the process of safety protection, in addition to the above attention points, we often need to carry out other necessary protection for equipment and personal safety problems;

## 3.Product Deliver And Parameters

### 3.1.Supply Scope

Supply range of standard power conversion system:

Number	Name	Quantity	Remarks
1	Power conversion system	1	Includes cabinet key and accessories
2	User manual	1	
3	Inspection report	1	
4	Certification	1	

If there are any special requirements, comply with the contract!





### 3.2.Product Transportation And Packaging

#### 3.2.1Product Transportation

In the transportation process of power conversion system, we can use a variety of transportation modes:

- ✧ Motor transport
- ✧ Marine transport
- ✧ Rail transport
- ✧ Air transport
- ✧ Forklift truck transport

In the process of transportation, the corresponding mode of transportation should be taken according to the actual situation, but it must be smooth and steady. Also follow the logo on the package:

Sign	Description
	<p>Fragile</p>
	<p>Keep dry</p>
	<p>This side up</p>
	<p>No pressing</p>



## 3.2.2 Product Packaging And Handling

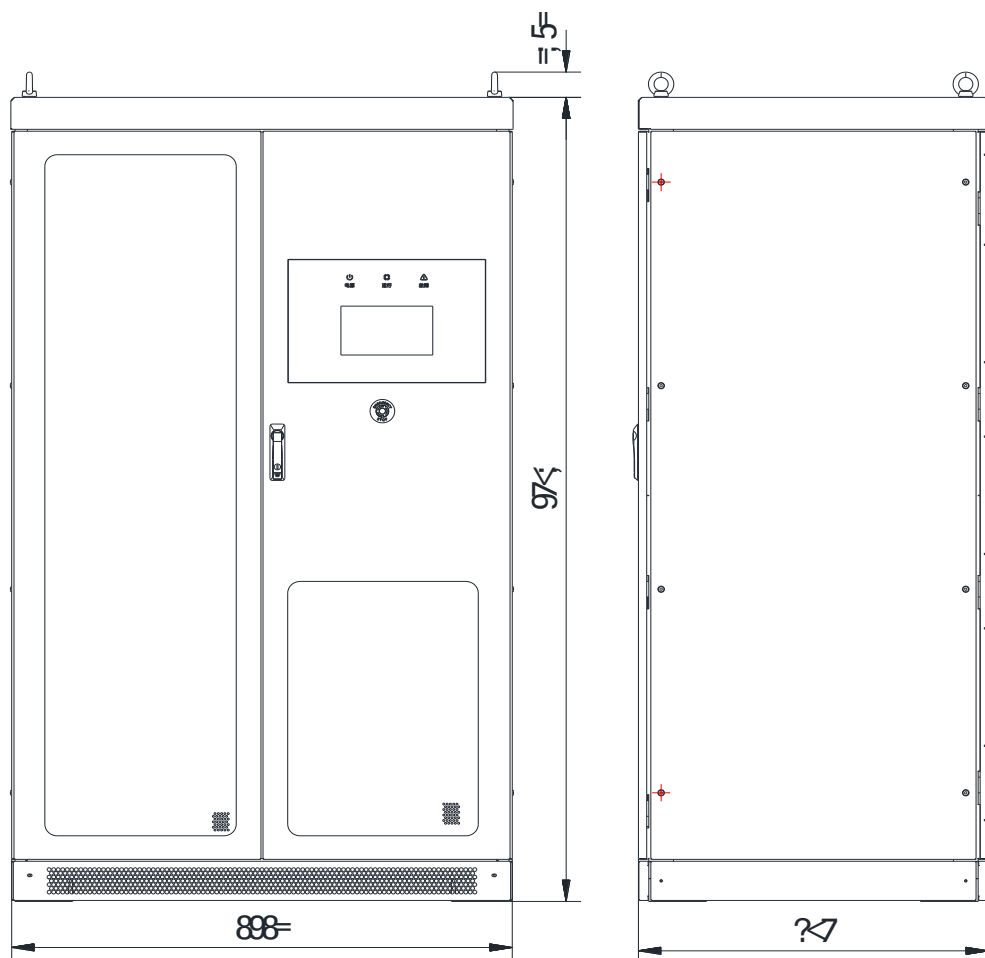
The outer packaging of the power conversion system cabinet is packed in wooden cases, and the packaging wooden cases can be reused. It can also be treated as a renewable resource.

## 3.3.Product Parameter

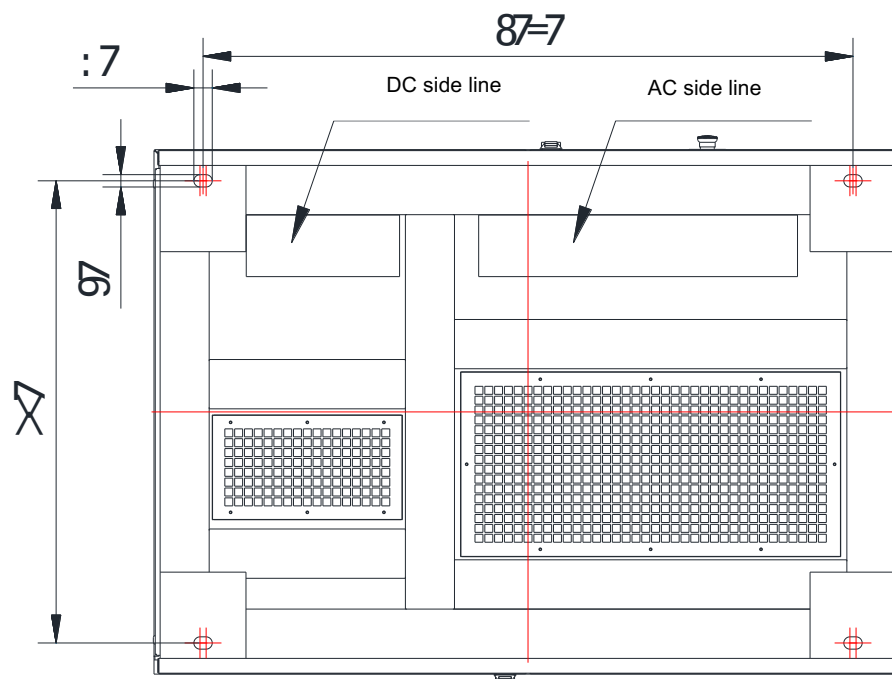
### 3.3.1 Product Structural Parameters

Item	Parameter
Overall dimension	1420mm×1050mm×2350mm
Clear dimension	1216mm×850mm×2054mm
Net weight	1200KG

Dimensions parameters of power conversion system:



Installation size parameters of power conversion system:



Appearance image of power conversion system:



### 3.3.2 Product Electrical Parameters

#### Product feature:

TPCS-500-G series power conversion system adopts advanced digital control technology, unique control algorithm to improve the reliability of the system, suitable for different voltage levels of battery charging and discharging needs, and in the structure of the

functional, modular design, convenient installation and maintenance. Its main performance characteristics are as follows:

- ◆ Support grid-connected mode
- ◆ Can accept power grid dispatching, with a variety of communication methods;
- ◆ With low voltage through and reactive power compensation function;
- ◆ It has the function of independent frequency modulation and controlled frequency modulation and voltage regulation.
- ◆ Multiple inverters can run in parallel;
- ◆ 1.1 times the long-term overload operation capacity;
- ◆ Long product life, stable and reliable system;
- ◆ Modular, functional design, easy maintenance;
- ◆ Service life: mean time to failure: 30000 hours;

**Product technical specification:**

Manufacturers		Chengdu Tecloman Energy Storage Technology Co., LTD
Model		TPCS-500-G
Operation mode		On-grid Only
DC parameter	Maximum input voltage range	570V-1000V
	Battery voltage range	590V-850V
	Maximum input current	721A
	Rated power	500kW
	Maximum DC power	550kW
	Rated output	500kW
	Maximum AC apparent power	550kVA
	Maximum AC current	793A
	Maximum total current harmonic distortion rate	<3%

AC parameter	Rated grid voltage	400V
	Allowable grid voltage range	340V~440V
	Rated grid frequency	50Hz/60Hz
	Allowable grid frequency range	45~55Hz/55~65Hz (Settable)
	Power factor (rated power)	>0.98
	DC current component	<0.5% rated output current
	Power factor adjustable range	1 (lead) ~1 (lag)
	Independent inverter voltage range	400V±3% (Three phases and three wires)
	Independent inverter with unbalanced load capacity	100%
	Independent inverter voltage response	Within 10% (resistive load 0<=>100%)
	Three phase isolation transformer	None
Performance parameter	Maximum efficiency	99 %
	Reactive power control function	Possess
	Soft switch machine function	Possess
	Access to distribution grid <input checked="" type="checkbox"/>	380V voltage level <input checked="" type="checkbox"/> 10 (6) kV Voltage level distribution grid <input type="checkbox"/>
	Shutdown consumes power	<50W
General parameter	Dimensions (W*D*H)	1216×850×2054mm
	Weight	1200kg
	Operating temperature range	-30°C~60°C (Reduce capacity over 55°C)
	Cooling mode	Forced cooling
	Protection level	IP20

	Relative humidity	0~95%, non-condensing
	Highest altitude	≤4000m (≥2000m derating)
Display  communication	Human machine interface	Touch screen
	Communication interface	RS485.Ethernet.CAN
	Supporting specifications	Modbus TCP.Modbus RTU

## Remark:

- 1.According to user's manual, an external AC relays needs to be installed on at the final plant. This external relay, must be approved by Synergrid:
- 2.For South Africa,this equipment can be equipped with additional filtering and that installation is physically separated from residential environments by distance greater than 30 m. The installer is invited to check the mitigated installation against CISPR 11 in-situ measurements as indicated in clause 6.4 of this standard.

## 4.Product Installation

### 4.1、 Mechanical Installation

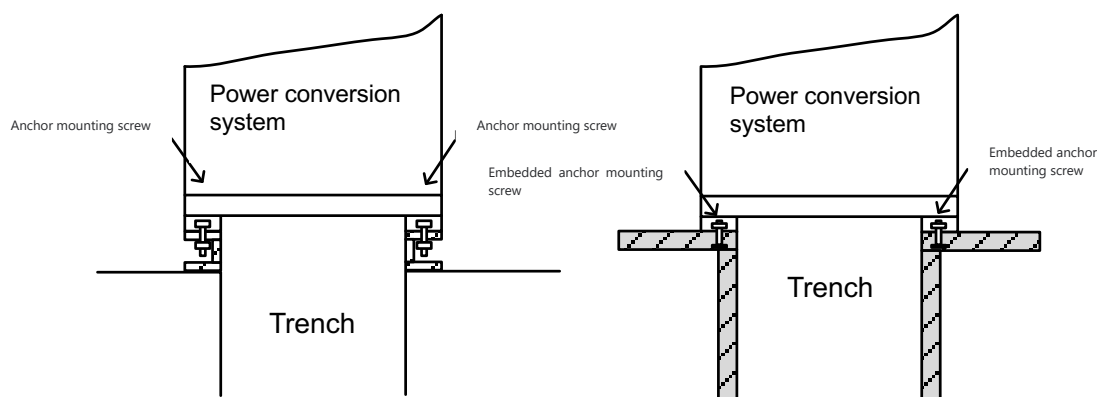
The protection level of the power conversion system is IP20, which is suitable for installation in a dry and dusty indoor environment. According to the environmental noise requirements, the design of the power conversion system should meet the installation requirements in the industrial environment:

- ✧ The power conversion system must be installed in the electrical control room;
- ✧ The inlet and outlet of the electrical control room must have a professional dustproof and mouse-proof design;
- ✧ The ambient temperature range of the installation site is:  $-25^{\circ}\text{C}\sim+50^{\circ}\text{C}$ , the relative humidity allowable range is 0~95% (no condensation);

#### 4.1.1 Basic Installation Requirements

When installing the power conversion system, we need to install the equipment on the dedicated foundation to ensure that the power conversion system is connected to the foundation smoothly and reliably. The installation base requires the following considerations:

- ✧ It is recommended to level the foundation before installing the power conversion system and install the fixed U-steel;
- ✧ Ensure that the cable trench laying meets the installation requirements of electrical equipment;
- ✧ Ensure that the installation holes on the U-steel meet the installation hole position requirements of the equipment;
- ✧ Upstairs installation, please pre-design the floor load-bearing;
- ✧ The installation ground is dry and flat;
- ✧ No standing water on the ground;
- ✧ Make sure the ground level does not shake;



The fixed mode of the power conversion system

## 4.1.2 Installation Space Requirements

There are strict requirements for the installation space of the power conversion system to ensure the normal operation and reliable heat dissipation of the power conversion system.

In terms of installation space, please follow the following requirements:

- ✧ Reserve enough distance between the front and rear of the power conversion system, the top and the wall to ensure ventilation and heat dissipation, installation and maintenance, safe escape, etc. (See below for details)
- ✧ No combustible gases and flammable items in the installation space;
- ✧ Clean installation environment;

## 4.1.3 Other Requirements

- ✧ Ground resistance of power conversion system  $< 4\Omega$ ;
- ✧ LCD orientation position should be easy to observe;
- ✧ The ground, space, cable trench, air duct and ventilation equipment of the electrical room should meet the design requirements;
- ✧ The installation of electrical equipment must meet the minimum position requirements;
- ✧ The electrical room shall meet the relevant fire protection requirements;
- ✧ If there are special requirements for installation space and location, please contact our company for custom design;

## 4.2.Electrical Installation

In order to ensure the safety of personnel and equipment during electrical connection, all safety instructions in this manual, especially in this chapter, must be followed, as well as the relevant safety regulations in the location of installation.

During the electrical connection of the power conversion system, as well as all other operations performed on the power conversion system, the following rules should be observed:

- ✧ Disconnect all external connections of the power conversion system and the connection with the internal power supply of the device;
- ✧ Ensure that the power conversion system will not be accidentally powered on;
- ✧ Use a multimeter to ensure that the inside of the inverter is completely uncharged.
- ✧ Implement necessary grounding and short-circuit connections;
- ✧ Cover the energized area with insulation;

### **Installation tool:**

- ✧ Torque wrench;
- ✧ Screwdriver;
- ✧ Terminal wire press;
- ✧ Wire stripper;
- ✧ Megohmmeters and multimeters;
- ✧ Other auxiliary tools;

### **Cable requirements:**

The selected cable must have sufficient current carrying capacity;

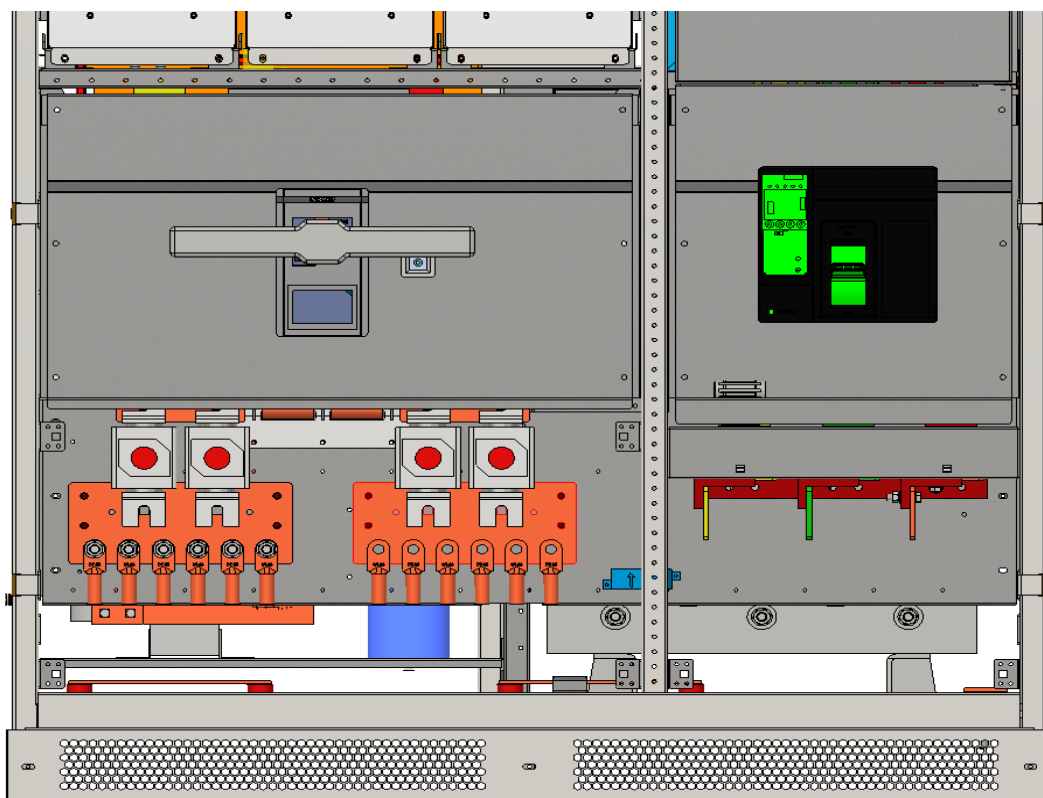
- ✧ The size of all cables is determined by installing the maximum current of the power conversion system, and sufficient margin is reserved.
- ✧ The cable connection wire on the same side selects the same specification and type of wire;
- ✧ Please choose flame retardant cable;

**The recommended connection cable specifications are as follows:**

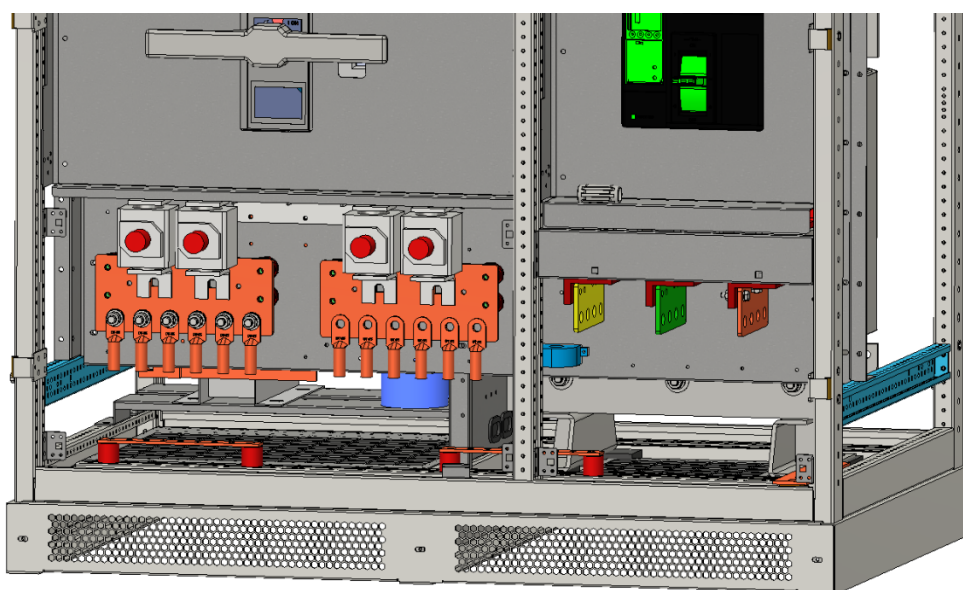


<b>Wiring position</b>	<b>Suggested wire diameter</b>
<b>DC+</b>	240mm <sup>2</sup> ×3
<b>DC-</b>	240mm <sup>2</sup> ×3
<b>L1 phase of grid</b>	240mm <sup>2</sup> ×3
<b>L2 phase of grid</b>	240mm <sup>2</sup> ×3
<b>L3 phase of grid</b>	240mm <sup>2</sup> ×3
<b>Electrical neutral axis N</b>	240mm <sup>2</sup> ×3
<b>Ground lead</b>	95mm <sup>2</sup> ×1
<b>Control cable</b>	1.5mm <sup>2</sup> multi-core cable
<b>Power cable</b>	4mm <sup>2</sup> ×2 power cable
<b>Communication cable</b>	0.75mm <sup>2</sup> ×2 twisted shielded pair cable

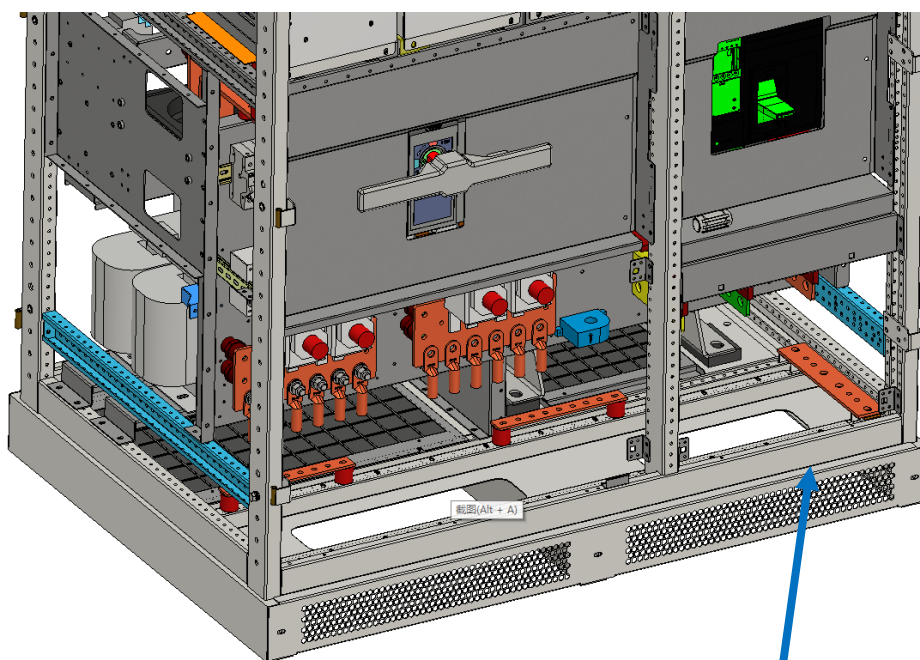
**Main line connection position:**



**Side view of main line connection position:**

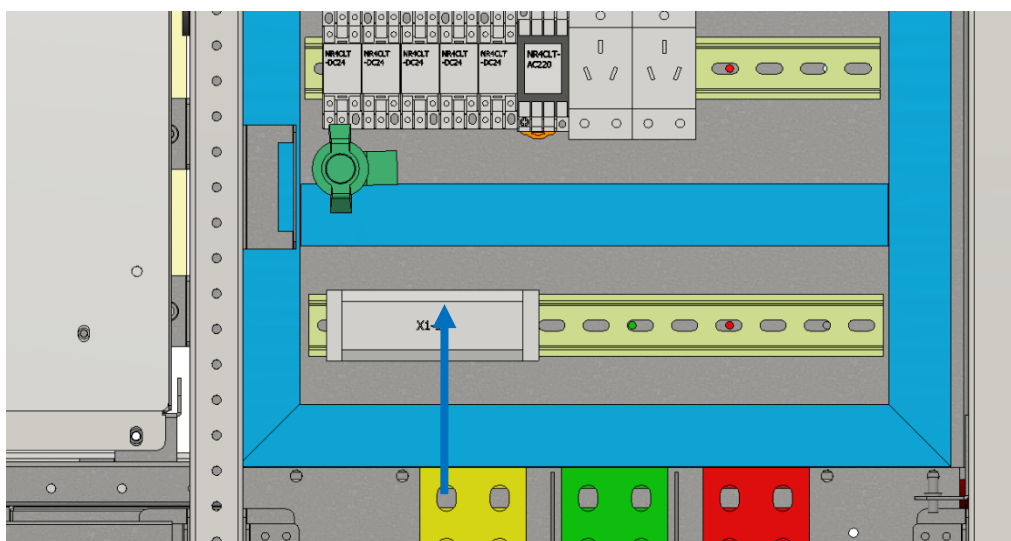


**Ground wire connection position:**



Ground connection position

### Communication terminal:

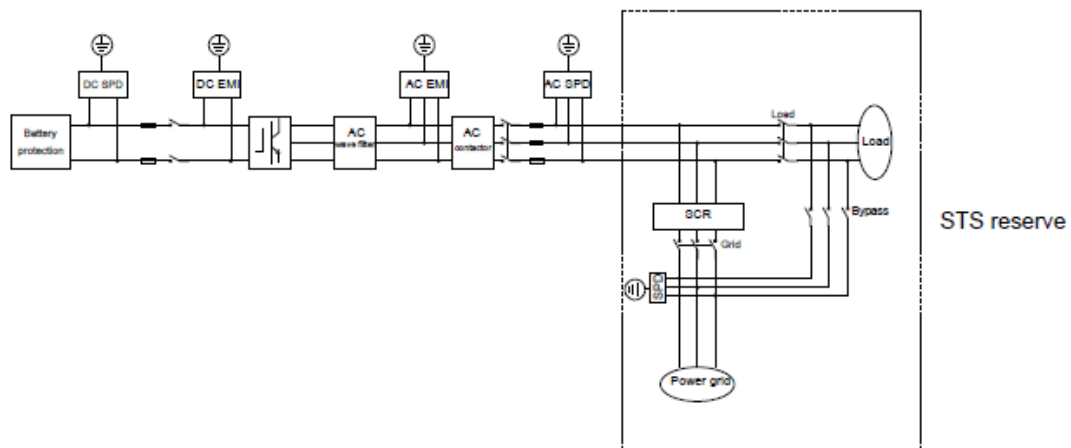


Communication terminal

### Connection note:

- ✧ DC cable must confirm the "+", "-";
- ✧ Press head must be tightly connected, and set heat shrink tube;
- ✧ When crimping the terminal head, please be sure to apply conductive paste;
- ✧ Cables must be marked with cable labels;
- ✧ The ground cable should be more than 95mm<sup>2</sup>, and the ground resistance should not be higher than 4Ω.

**Connection system diagram:**



## 5.Trial Power-on Operation

### 5.1.Current Condition

Before power-on trial operation, the installation points should be thoroughly checked again;

- ✧ Ensure that all connecting cables are securely connected; All screws are secured in place;
- ✧ Ensure that the polarity of "+" and "-" of DC cable is correct;
- ✧ Ensure that the AC side cable connection meets the inverter wiring requirements;
- ✧ Ensure that all communication cables and control cables are correctly connected;
- ✧ Ensure good grounding, grounding resistance value need to be measured, and meet the requirements;
- ✧ Ensure that all switches are turned off;

**All operations during the trial run must be performed by professional electrical personnel. No individual shall operate without permission!**

### 5.2.Pilot Run Check

Before the trial operation, it is necessary to carry out a comprehensive check on the whole energy storage system, among which the check points are as follows:

#### 1.Check cable connections;

- Check all points for damage or cracks; Ensure that all connecting cables are intact;
- Check all cable connections carefully again against the system schematic diagram;
- Ensure that all cables are securely connected;
- PE wire is firmly connected, and the measured connection resistance value meets the requirements;

#### 2.Check the power conversion system

- Ensure that AC circuit breakers are off;
- Ensure that the emergency stop button has been released and is working properly;

- Check that no tools and cables are left in the power conversion system cabinet;
- Check that all contact points inside the power conversion system are connected reliably;

### 3. Battery check

- Check whether battery string connections meet requirements.
- Ensure that the battery polarity is correctly connected.
- Use megohm meter to determine cable resistance;

### 4. Check the grid connection

- The measurement grid cable is open circuit between phase and phase and between phase and zero;
- Measure whether the voltage between the three phases meets the requirements;
- If conditions permit, grid frequency and THD equivalent can be measured;

## 5.3. Power-on Preparation

After the above checks have been completed, please prepare for starting up;

- Install the protective plate back to ensure that it is firm;
- Close and lock the cabinet door;
- Clean the equipment site to ensure that the site is clean;
- Ensure proper ventilation of equipment;
- Check again that all electrical switches and buttons operate normally;

## 5.4. Power-on Operation

When powering on the power conversion system for the first time, perform the following steps:

**Step 1:**Control loop switch QF3.1, QF3.2, QF3.3, QF3.4 all closed; See the electrical schematic diagram for details. Control circuit power supply and ensure that the switch power supply, circuit board, and touch screen are powered on normally. If there is any abnormality, please check the corresponding circuit;

**Step 2:**Please wait about 30 seconds for the touch screen initialization. At this time, the panel

stops to light up;

**Step 3:**After the touch screen is initialized, set the touch screen parameters. For details, see the "Touch Screen Operation Guide" in this manual.

**Step 4:**Switch on DC switch QF1 on battery side as required;

**Step 5:**Switch on AC switch QF2 on the AC side as required;

**Step 6:**After setting the parameters, click the "Run" button on the touch screen. The system runs, and the running indicator lights up; The system enters the grid-connected operation state;

**Step 7:**In operation, the system parameters can be read and viewed through the touch screen;

## 5.5.Complete Trial Run

After the power conversion system is connected to the grid, confirm the following information:

- Check whether the power conversion system has any abnormalities, such as loud noise, large heat, smoke, and abnormal smell.
- Check whether the voltage and current of the power conversion system are normal.
- Check whether the cabinet is properly grounded.
- Parameters on the touch screen are displayed normally.

**If the trial run is successful, the machine can work normally, you can carry out routine maintenance and inspection process!**

## 6. Operating Instructions

### 6.1. Startup Operation Process

The startup operation of the power conversion system is as follows:

1. DC circuit breaker and AC circuit breaker are powered on successively; All control power circuit breakers are energized.
2. After the touch screen initialization is complete, set the parameters according to the touch screen parameter setting guide.
3. Click the "Power on" button on the home page of the touch screen to make the device run;

After starting the power conversion system, it will automatically detect whether the AC, DC voltage and other parameters meet the requirements. If all requirements are met, the system automatically switches to the Running mode and starts working.

### 6.2. Power Off

#### 6.2.1 Normal Power Off

Normal power off refers to the operation that stops the device when it needs to be maintained or overhauled during normal operation. Its operation process is as follows:

1. Click the "Shutdown" button on the home page of the touch screen, and the "Confirm" dialog box will pop up. After "Confirm", the system will stop working;
2. DC circuit breaker The AC circuit breakers are turned off in sequence
3. All control power circuit breakers are disconnected;
4. Power conversion system power off completed;

Note:

Do not operate the inverter until 5 minutes after it is shut down to prevent personal injury caused by internal capacitor discharge.

When the machine is working normally, it is strictly prohibited to disconnect the circuit



breaker directly to avoid accidents!

## **6.2.2 Failure or emergency shutdown**

In case of an emergency or a fault, you can perform the following operations:

1. Press the emergency stop button;
2. Disconnect the front switch of the power conversion system;
3. Disconnect the rear switch of the power conversion system;
4. Disconnect the UPS power supply of the power conversion system;
5. The power conversion system stops completely;

**The emergency stop button is only for the system to operate in emergency situations.**

**When normally shutting down, please use the touch screen for normal shutdown process!**

## 7.Mode Introduction

### 7.1.Basic function introduction

Tps-630/0.4-v10 power conversion system has the following functions:

- Battery charging and discharging function

The power conversion system can charge and discharge the battery. The charging power and discharging power can be set, and the charging and discharging control can be set by the touch screen or the upper computer;

The charging mode includes constant current charging. Constant voltage charging, constant power charging, etc.

The discharge mode includes constant discharge. Constant voltage discharge, constant power discharge, etc.;

- Reactive power control

Power conversion system can control the reactive power ratio.

Power factor setting range is 0.9 (lead) ~0.9 (lag);

- Grid-connected control

Power conversion system has charge and discharge control function in grid-connected system

### 7.2.Operating Mode

#### **Grid-connected mode**

In grid-connected mode, the inverter can charge and discharge the battery. At the same time, it can also dispatch the customer's energy system according to the dispatching instruction to achieve peak cutting and valley filling!

At the same time, in the grid-connected mode, the power conversion system also has a variety of special functions. Such as power factor. Low voltage crossing. Active island and other functions.

### 7.3. Derating usage requirements

Power conversion system in special environment or state of operation, considering the equipment long-term. We need to derate the equipment; Derating operation is required when the following conditions are met:

1. When the altitude is higher than 2000 meters, capacity reduction of the equipment is required when the power conversion system is used. The specific amount of reduction can be based on relevant industry standards or consult our company.
2. When the environment is stable and higher than 50°C, derate the device.

Environment temperature t	Permissible running condition
$t < 50^{\circ}\text{C}$	PCS can run 1.1 times for a long time
$50^{\circ}\text{C} \leq t \leq 55^{\circ}\text{C}$	PCS derating use
$t > 55^{\circ}\text{C}$	PCS cannot run

3. Other special conditions requiring derating.

### 7.4. Protect Function

The power conversion system is equipped with perfect protection function. When the input voltage or the power grid is abnormal, it can be effectively operated to ensure the safe operation of the power conversion system. After the abnormal situation disappears, it will continue to run on the grid-connected.

- DC over/under voltage protection

When the energy storage battery voltage exceeds or falls below the allowable voltage range, the power conversion system will stop working and send an alarm signal, which will be displayed on the touch screen.

- Grid over/under voltage protection

When the power conversion system detects that the power grid voltage exceeds and is lower than the allowable voltage range, the power conversion system will stop working

and send an alarm signal, which will be displayed on the touch screen.

- Grid over/under frequency protection

When the power conversion system detects that the power grid frequency exceeds the allowable range, the power conversion system will stop working and send an alarm signal, which is displayed on the touch screen.

- Island protection

When the power conversion system detects that the power grid voltage is 0 or the power grid frequency exceeds the allowable range, the power conversion system will stop working and send an alarm signal, which will be displayed on the touch screen.

- AC overcurrent protection

When the power of the energy storage battery exceeds the maximum power of the energy storage inverter, the integrated machine will work at the maximum AC power limit. When the AC current is detected to be greater than 1.2 times the rated current, the integrated machine will stop working and send an alarm signal.

- AC leakage protection

The power conversion system has the function of grounding protection, and the leakage current detection device is installed on the grounding line. When the leakage current is detected to exceed a certain value, the machine will stop immediately, send an alarm signal and display it on the touch screen.

- Module overtemperature protection

The IGBT module has a high precision temperature sensor, which can monitor the module temperature in real time. When the temperature is too high, the distributed energy storage will stop working to protect the stable operation of the equipment.

- AC voltage unbalance protection

When the power conversion system detects that the three-phase AC voltage exceeds the allowable range, the power conversion system will stop working and send a warning signal, which will be displayed on the touch screen.

- Transformer overheating protection

The isolation transformer and reactor of the system have a temperature switch, which can detect the temperature of the transformer and reactor in real time. When the

temperature is too high, the power conversion system stops running and sends a fault signal to display on the touch screen.

- Module fault protection

The IGBT module of the power conversion system has the function of self-protection. When the module detects the phenomenon of overcurrent in the module, it can quickly send the fault signal to the control system, and the system will send an alarm signal and display it on the touch screen.

- Fan failure

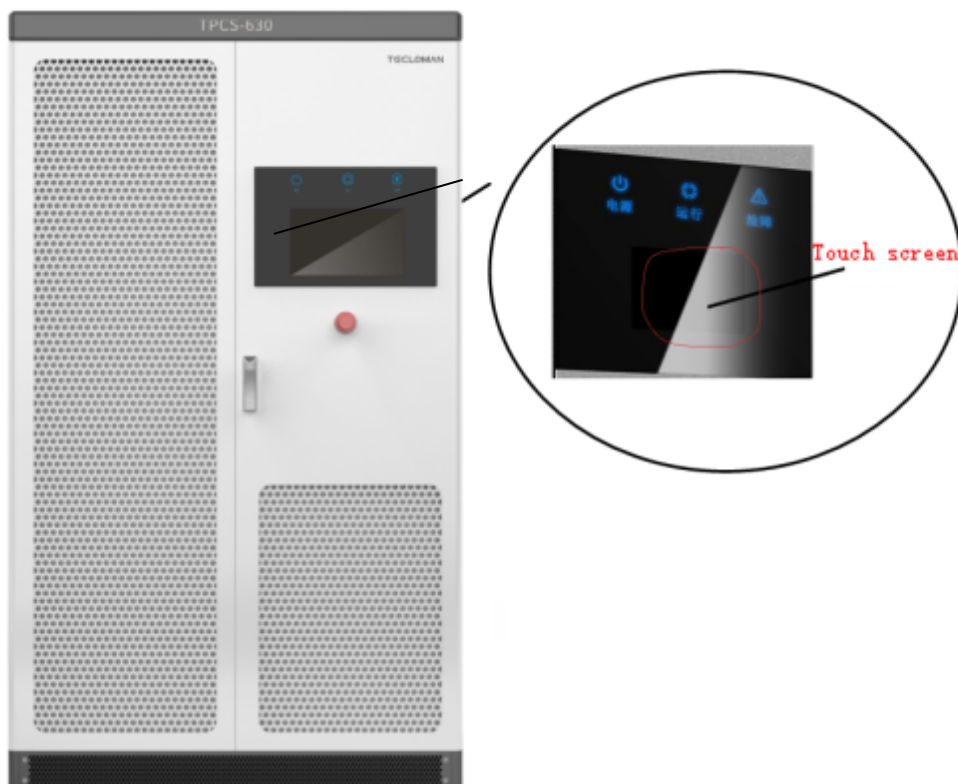
When the heat dissipation fan of the power conversion system fails, the front protection switch will trip and send the signal to the main system to display the alarm signal.

- Grid-connected contactor fault

When the power conversion system is running, the grid-connected contactor is detected to be disconnected, and the power conversion system will stop working and send an alarm signal, which will be displayed on the touch screen.

## 8.Touch Screen Operation Description

The power conversion system is configured with a touch screen operation interface. There are three indicators above the touch screen: voltage indicator. Running indication. Failure indication.



## 8.1. Touch screen communication protocol

Touch screen communication is currently designed as follows:

- (1) Touch screen and motherboard, using RS485, protocol MODBUS; The touch screen is the host, the motherboard is the slave;
- (2) Touch screen and upper computer, using RS485, MODBUS protocol; The touch screen is the slave, and the upper computer is the host.
- (3) Touch screen and upper computer, using TCP/IP, MODBUS protocol; The touch screen is the slave, and the upper computer is the host.
- (4) Touch screen and BMS, using RS485, MODBUS protocol; Touch screen as slave, BMS as host;

## 8.2. Touch Screen operation interface description

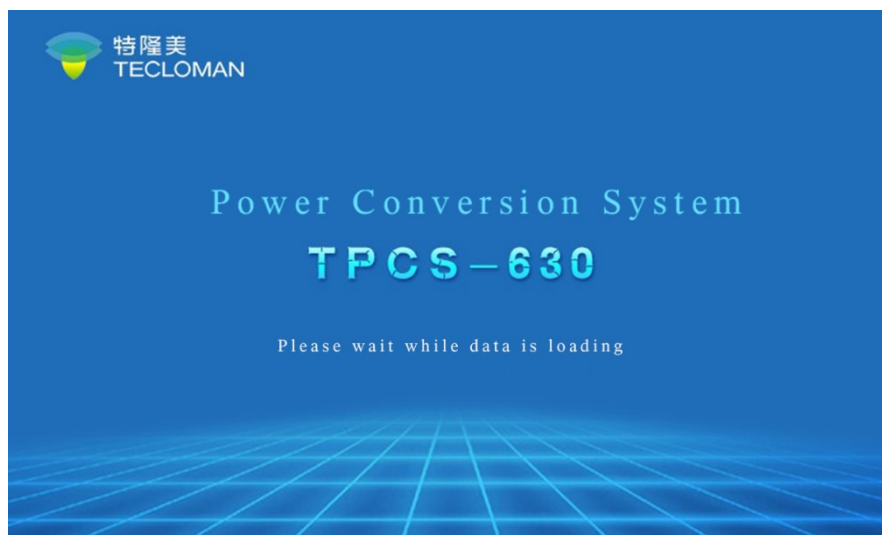
- **Backlight function**

If no operation lasts for more than 10 minutes, the LCD backlight will automatically turn off, exit the current login, and return to the main page. When the user operates again, the

LCD backlight lights up to display the main interface.

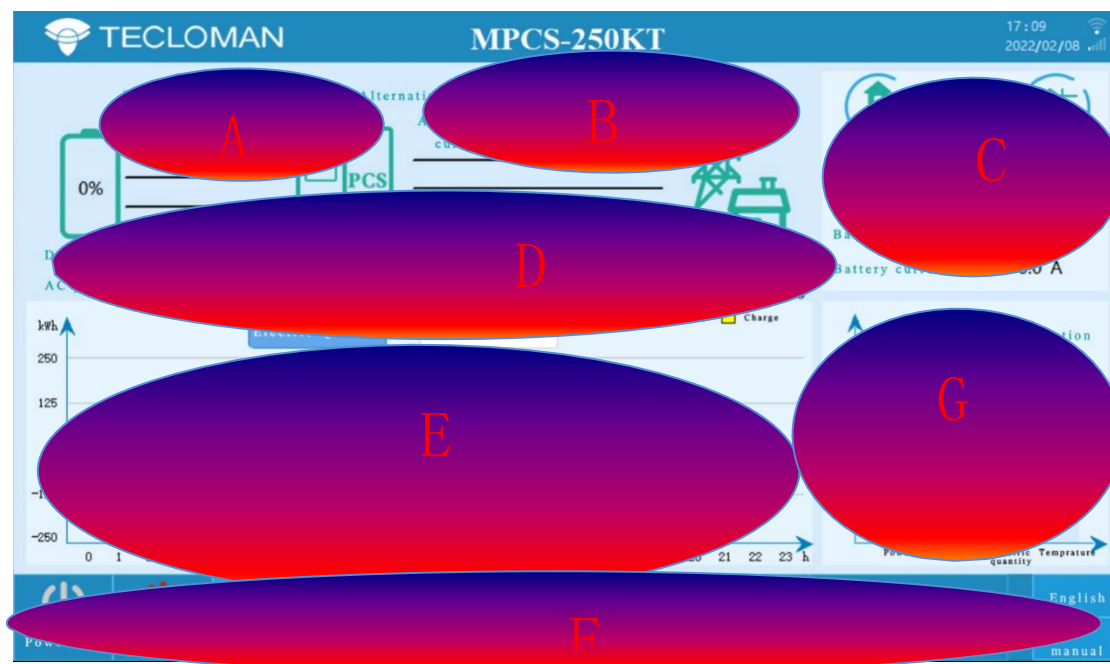
## 8.2.1 Boot Screen

After the PCS is powered on, the touchscreen automatically starts and the startup page is displayed.



Startup page, which is displayed each time you power on. After the startup process is complete, the LCD automatically enters the default main page.

## 8.2.2 Main Page



A user can directly perform operations on the LCD touch screen. To facilitate operations, four main buttons are set in the F area of the main screen. The three buttons are: **Power on and power off. Home Page. Function. Fault alarm. Battery management**; In addition, add **remote/local** and **English current status display**.

Information displayed in area A:

DC voltage	.....V
DC current	.....A

Information displayed in area B:

Three-phase AC voltage	.....V
Three-phase AC current	.....A

Information displayed in area C:

Ambient temperature	.....°C
Cabinet temperature	.....°C
Battery capacity	.....kWh



Battery voltage	.....V
Battery current	.....A

Information displayed in area D:

DC power	.....kW
AC power	.....kW
Daily charge	.....kWh
Daily discharge	.....kWh
Total charge	.....kWh
Total discharge	.....kWh/
Working condition	Start, Standby, Charge, Closing, Running. Failure, Shut down.
Current mode	Constant current charge. Constant current discharge. Constant voltage charging

Information displayed in area E: The bar chart shows the charge and discharge amount of the day. Power curve;

Information displayed in area G: Display power, Current, Electricity quantity and Temperature percentage.

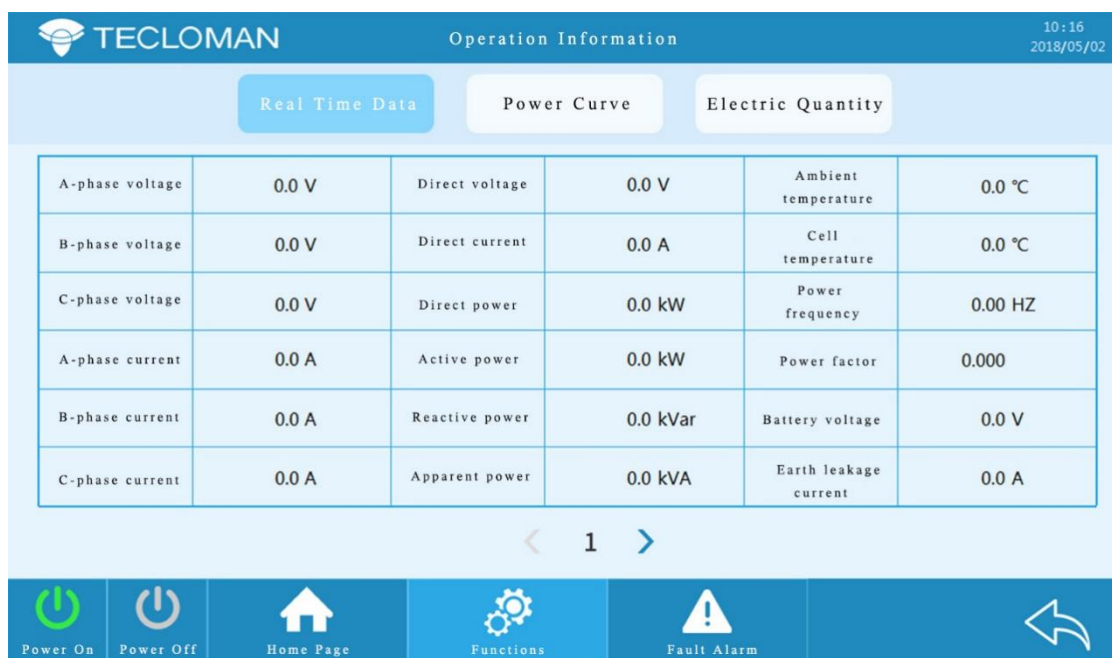
### 8.2.3 Function Table Advanced Sub-menu Layout

Except the main page, all the other pages have the same layout, including the title bar, data display area, and main menu. Therefore, this page contains: operation information. Historical information. Mode Setting. Parameter sets four controls.



### Operating information

Click "Operating Information" to enter the operating information page. The operation information page can be switched in three pages: real-time data, power curve, and Electric quantity bar chart. The following is real-time data, showing the current inverter running parameters and working status.

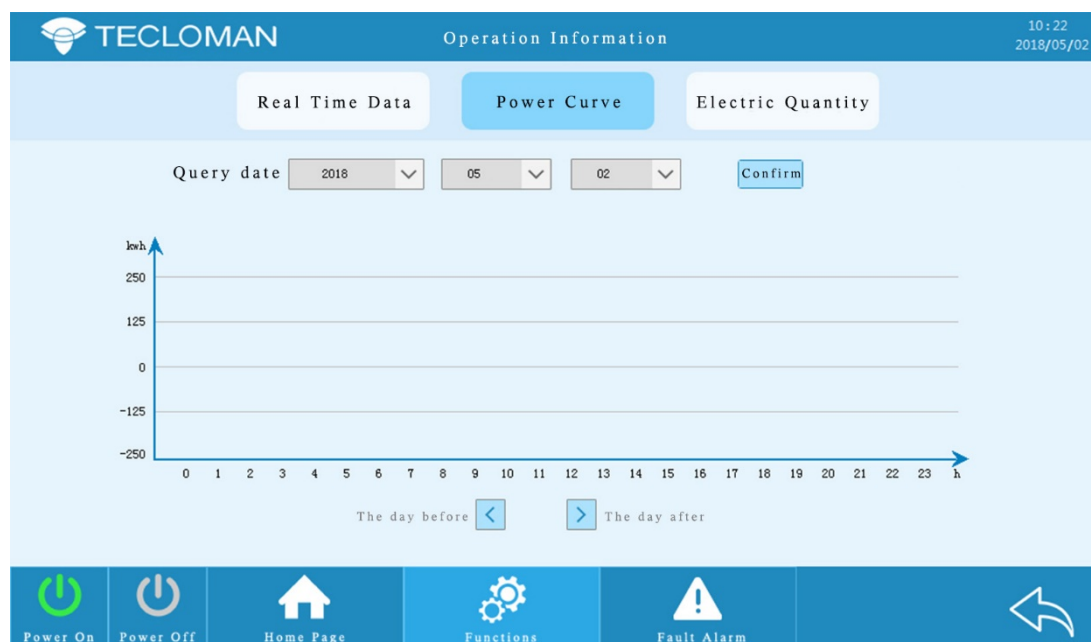


Real-time data includes the following data:

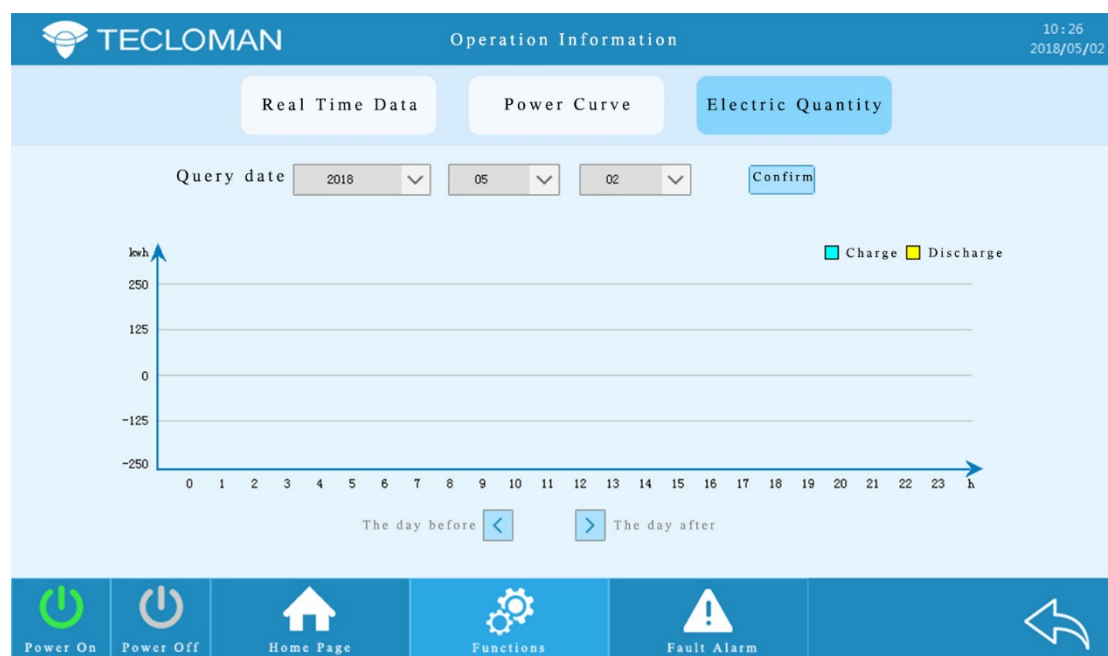
Real-time operational data	Internal statistics
A-phase voltage	Daily charge

B-phase voltage	Daily discharge
C-phase voltage	Total charge
A-phase current	Total discharge
B-phase current	Ambient temperature
C-phase current	Unit temperature
DC voltage	Ambient humidity
DC current	System state
DC power	
Active power	
Reactive power	
Apparent power	
Power frequency	
Power factor	
Battery voltage	
Earth Leakage Current	
DC voltage1	
DC voltage2	

Click "Power Curve" to go to the Power Curve page. "Power Curve" displays the charging curve and discharge curve of the device. You can query the power records of the last three months. Click Query Date and enter the year you want to query. If you click "Yes", the power curve showing the date will appear, or click the previous day or the next day to turn the page. If there is no historical data for the queried date, the data of the queried day will appear! Positive discharge, negative charge.



Click "Electric quantity " to enter the battery bar chart interface. Displays the percentage of the charge and discharge rate per hour with the rated power rate per hour. You can query the data of the last 3 months. Click Query date and enter the year you want to query. If you click "Yes", the power curve showing the date will appear, or click the previous day or the next day to turn the page. If there is no historical data for the queried date, the data of the queried day will appear!

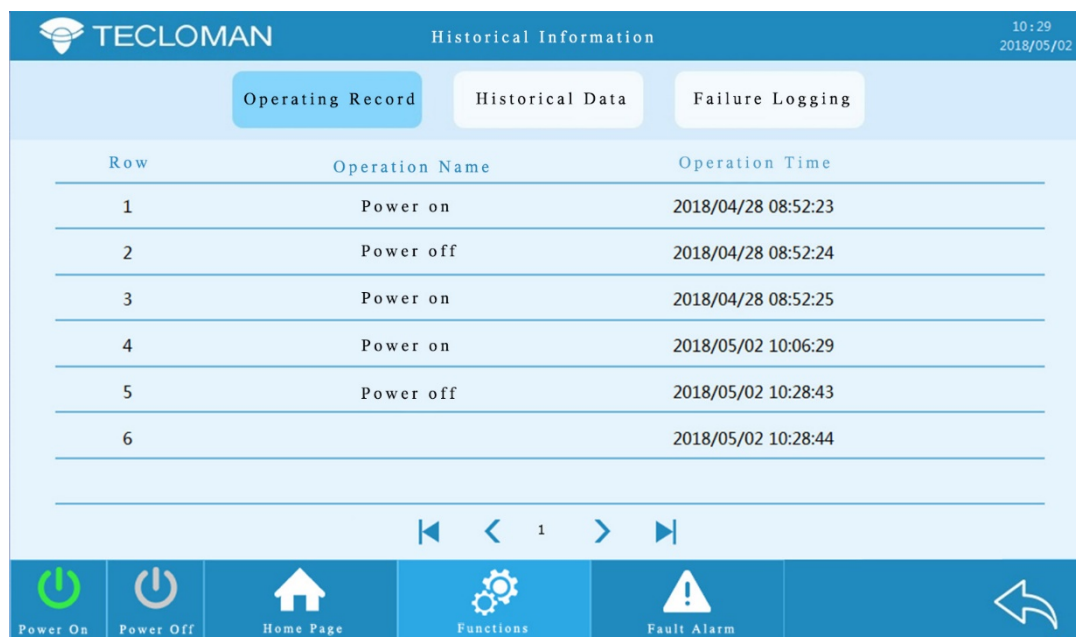


### Historical Information

Historical information is classified into event records. Historical data. Fault records;

### Operating record

Event logging mainly includes the **operation of switching on and off**. **Work mode** and other records;



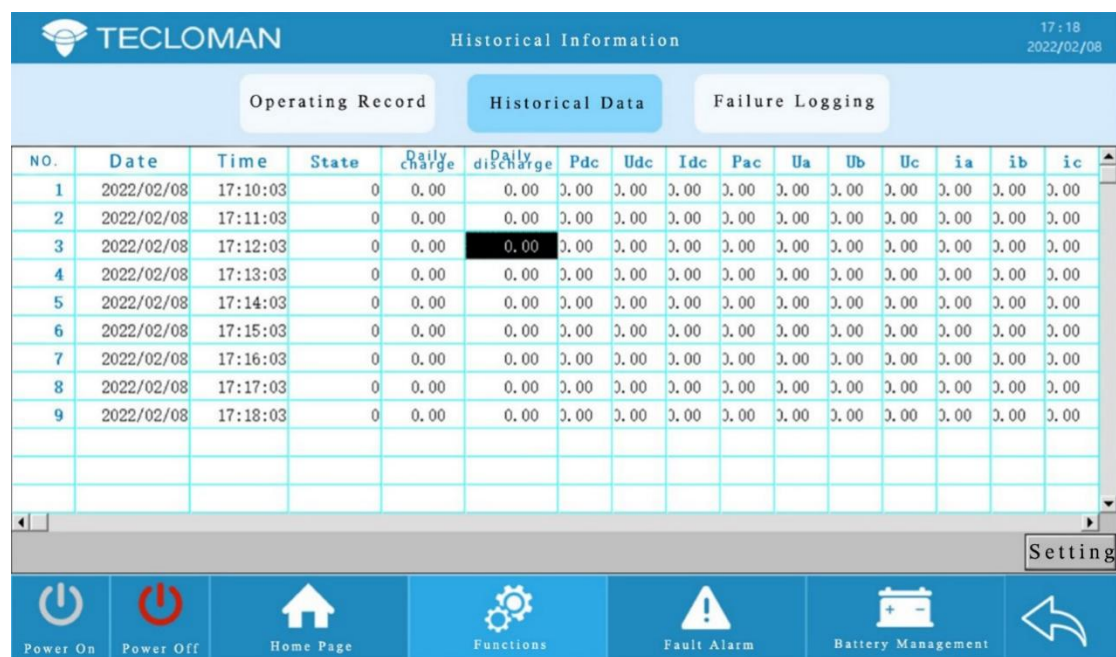
Row	Operation Name	Operation Time
1	Power on	2018/04/28 08:52:23
2	Power off	2018/04/28 08:52:24
3	Power on	2018/04/28 08:52:25
4	Power on	2018/05/02 10:06:29
5	Power off	2018/05/02 10:28:43
6		2018/05/02 10:28:44

On this page, you can view the events of the latest three months, that is, the running status.

### Historical Data

The system records the running data of the last 90 days every 10 minutes.

The historical data contains the historical information of the electric quantity and electrical parameters related to the inverter.



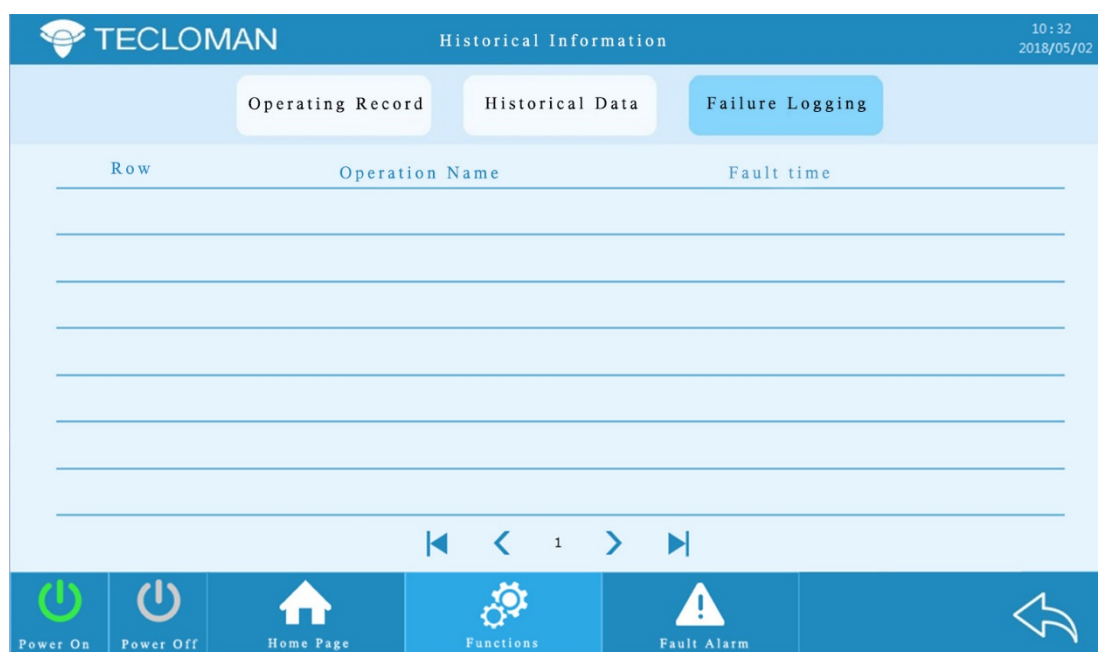
NO.	Date	Time	State	Daily charge	Daily discharge	Pdc	Udc	Idc	Pac	Ua	Ub	Uc	ia	ib	ic
1	2022/02/08	17:10:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
2	2022/02/08	17:11:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
3	2022/02/08	17:12:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
4	2022/02/08	17:13:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
5	2022/02/08	17:14:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
6	2022/02/08	17:15:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
7	2022/02/08	17:16:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
8	2022/02/08	17:17:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
9	2022/02/08	17:18:03	0	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

The historical data table displays the following contents:

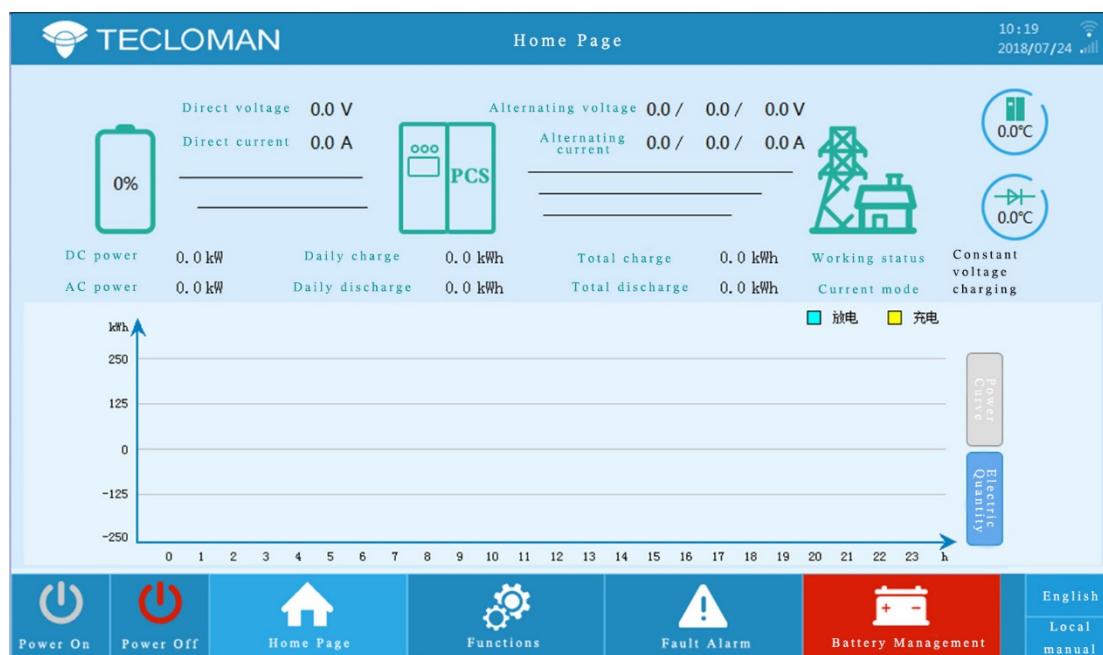
Date	Time	State	Daily charge	Daily discharge	Pdc	Udc	Idc	Pac	Uab	Ubc	Uca	ia	ib	ic
		System data	Daily charge	Daily discharge	DC power	DC voltage	DC current	Equipment active power	A-phase voltage	B-phase voltage	C-phase voltage	A-phase current	B-phase current	C-phase current

### Failure Logging

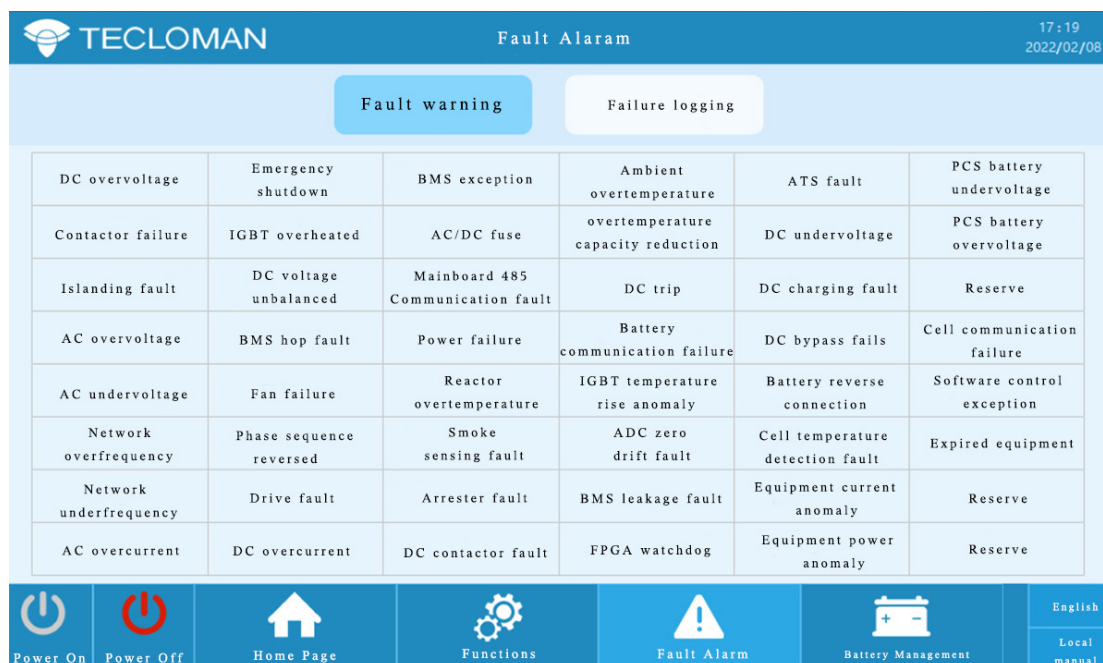
When the inverter is faulty, you can view the fault information on the LCD page. You can also view historical fault records. The operation procedure is as follows:



The current fault can be viewed on the main screen. Click the "Fault Alarm" button.

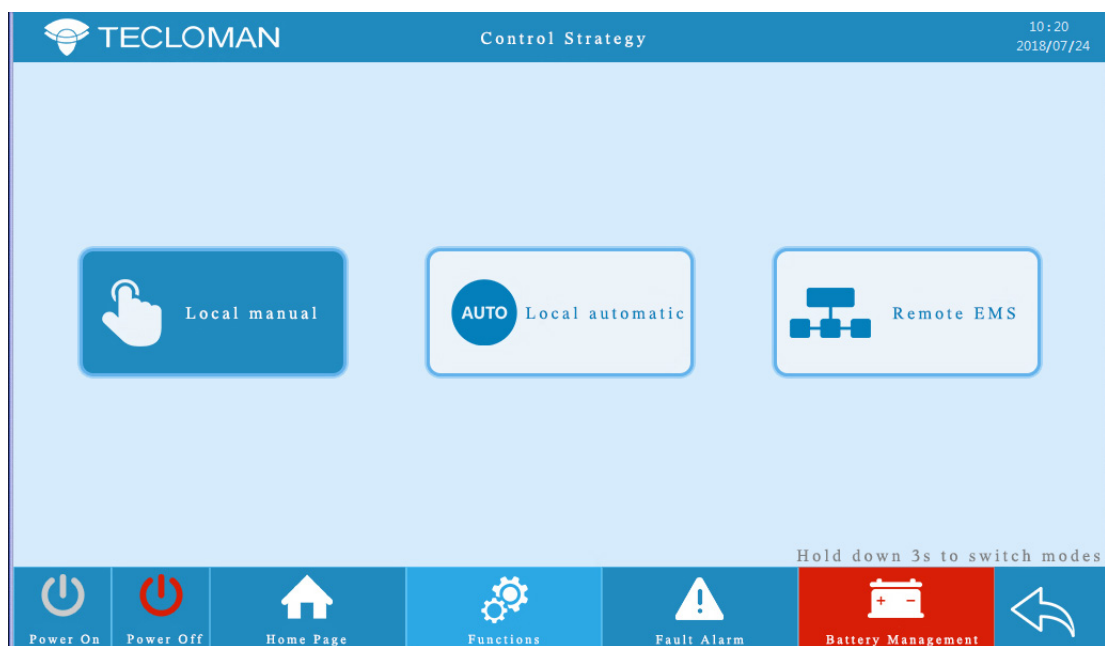


The fault page is displayed. If the current fault occurs, the button turns red and the corresponding text turns red.



## Control Strategy

Click the "Remote/Local" button to enter the interface:



Hold down 3s to switch modes

Tap local to enter the setting screen manually



You can set the current charge and discharge. Active power, you can see the current real-time active power


Click Local to automatically enter the setting screen(Blue is the charge, yellow is the discharge, will not be described below)



TECLOMAN		Local Automatic				10:21 2018/07/24
Set time period	Charge/ Discharge	Active instruction (kW)	Set time period	Charge/ Discharge	Active instruction (kW)	>
00:00 - 00:30	充	10	06:00 - 06:30	充	10	
00:30 - 01:00	充	10	06:30 - 07:00	充	10	
01:00 - 01:30	充	10	07:00 - 07:30	充	10	
01:30 - 02:00	充	10	07:30 - 08:00	充	10	
02:00 - 02:30	充	10	08:00 - 08:30	放	10	
02:30 - 03:00	充	10	08:30 - 09:00	放	10	
03:00 - 03:30	充	10	09:00 - 09:30	放	10	
03:30 - 04:00	充	10	09:30 - 10:00	放	10	
04:00 - 04:30	充	10	10:00 - 10:30	放	10	
04:30 - 05:00	充	10	10:30 - 11:00	放	10	
05:00 - 05:30	充	10	11:00 - 11:30	放	10	
05:30 - 06:00	充	10	11:30 - 12:00	放	10	
Power On	Power Off	Home Page	Functions	Fault Alarm	Battery Management	←

Set charge and discharge and active power for a node every half hour.

Click the remote EMS, and you can view the current charge and discharge direction, active power and real-time power controlled by the remote




TECLOMAN


Remote EMS

10:21  
2018/07/24


Charge and discharge instruction	<div>Charge</div>
Active power instruction	0 kW
Real time active power	0.0 kW




Power On




Power Off




Home Page




Functions



Fault Alarm

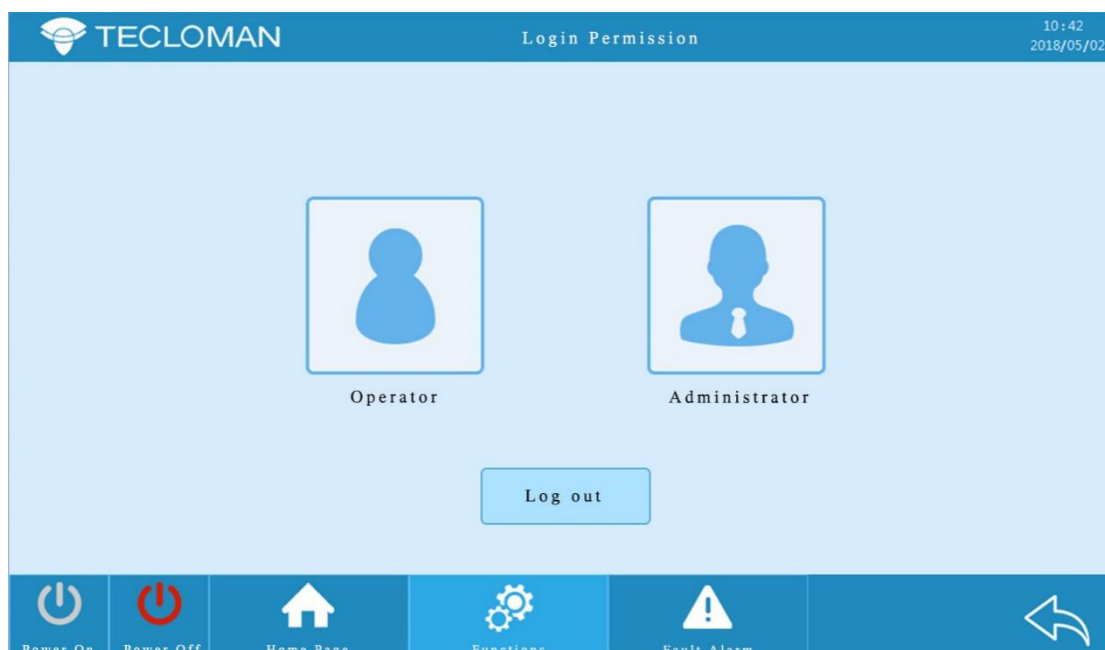


Battery Management



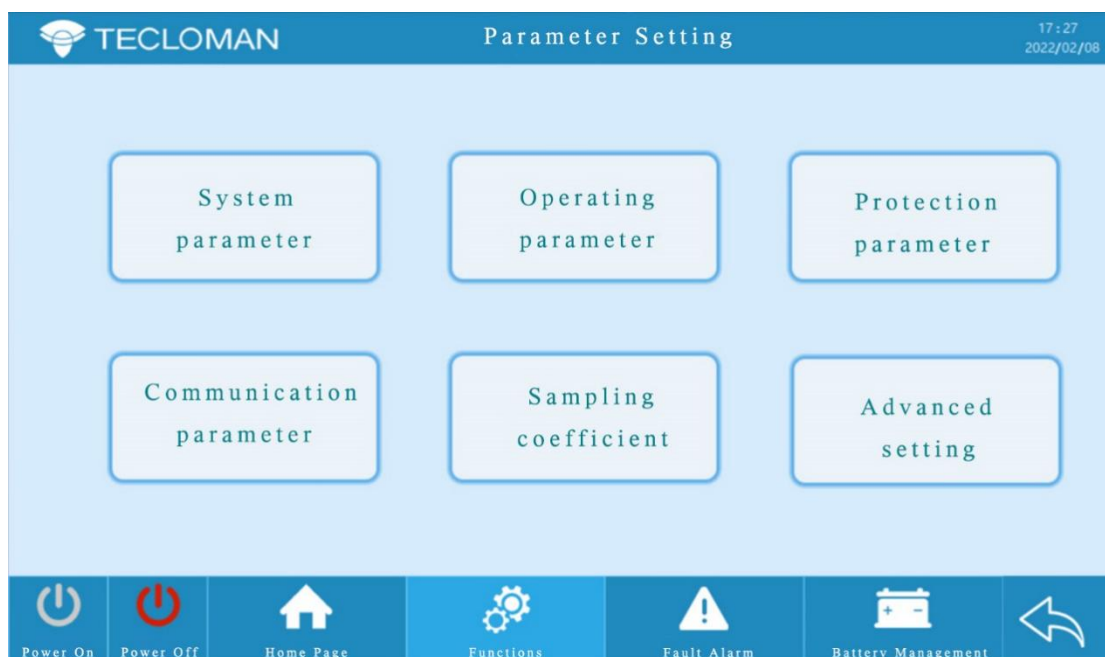
### Parameter setting

Users can enter Parameter Settings only after entering the correct password. That is, the converter parameters are protected by the password.



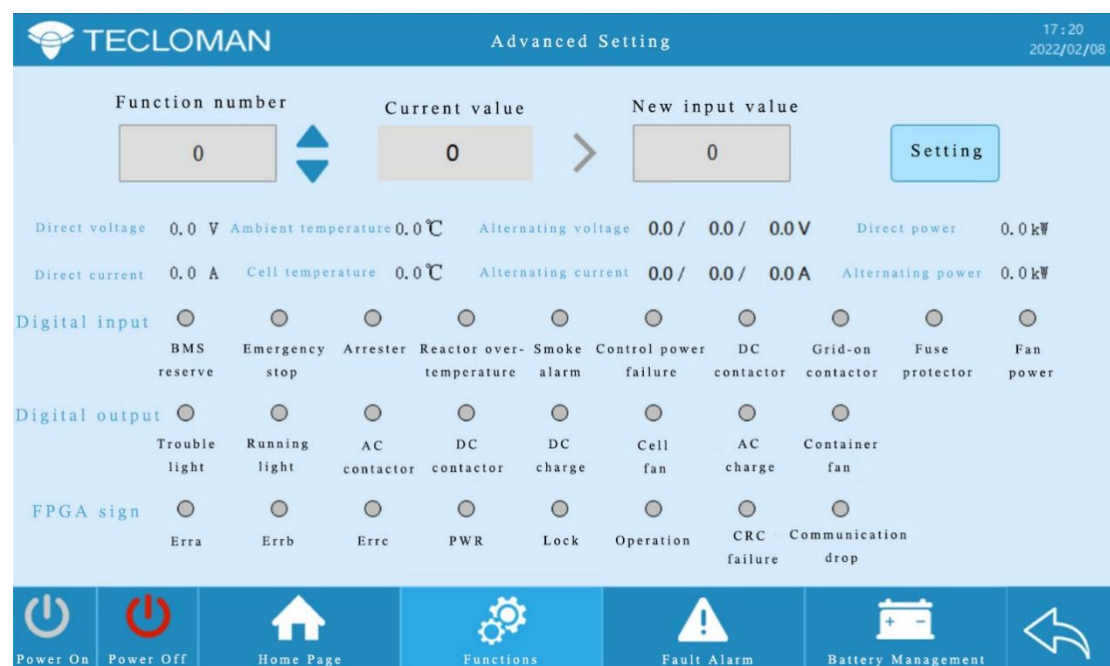
After the administrator logs in successfully, the parameter setting page is displayed:

The rights are classified into operator and administrator modes. Only the administrator mode shows advanced Settings



### Advanced Setting

Advanced Setting are available only for administrators. The highest level parameters can be set and checked.



The station number can be removed. Other items are shown below.

Function ID	Read the address of the PCS
Current value	Used to display function ID values
New input value	Used to set the function ID value
Settings	Confirm button
DC voltage UDC	_____V
DC current IDC	_____A
Ambient temperature	_____°C
Unit temperature	_____°C
AC voltage Uab	_____V
AC voltage Ubc	_____V
AC voltage Uca	_____V
AC current Ia	_____A
AC current Ib	_____A
AC current Ic	_____A
DC power	_____kW
AC power	_____kW

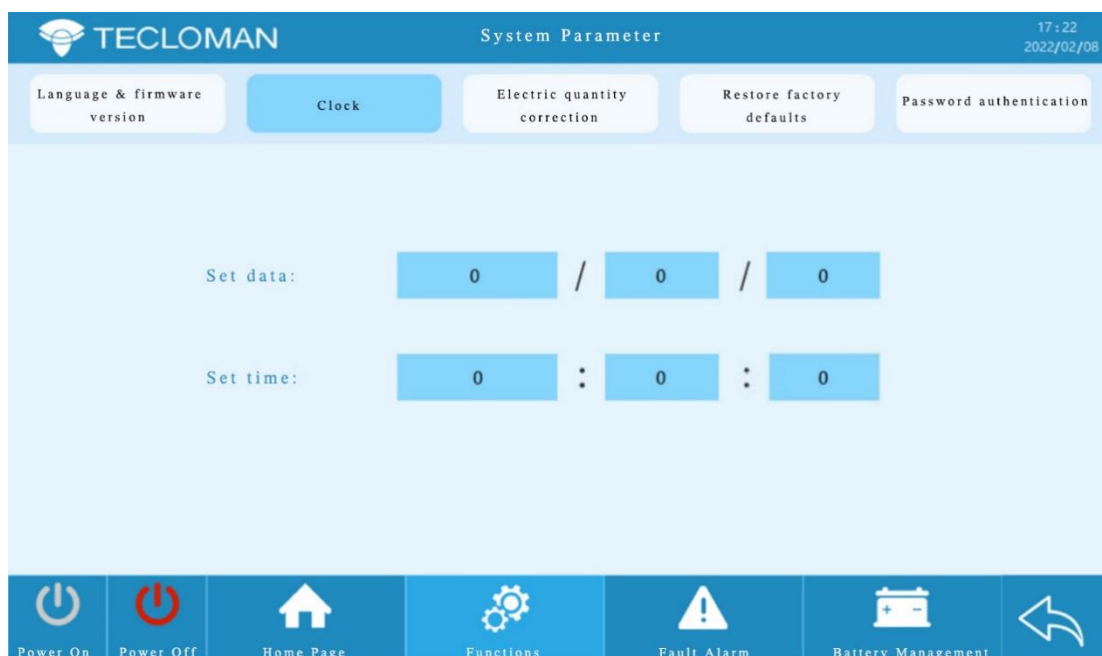
Digital input	10 DI
Digital output	8 DO

## System Parameters

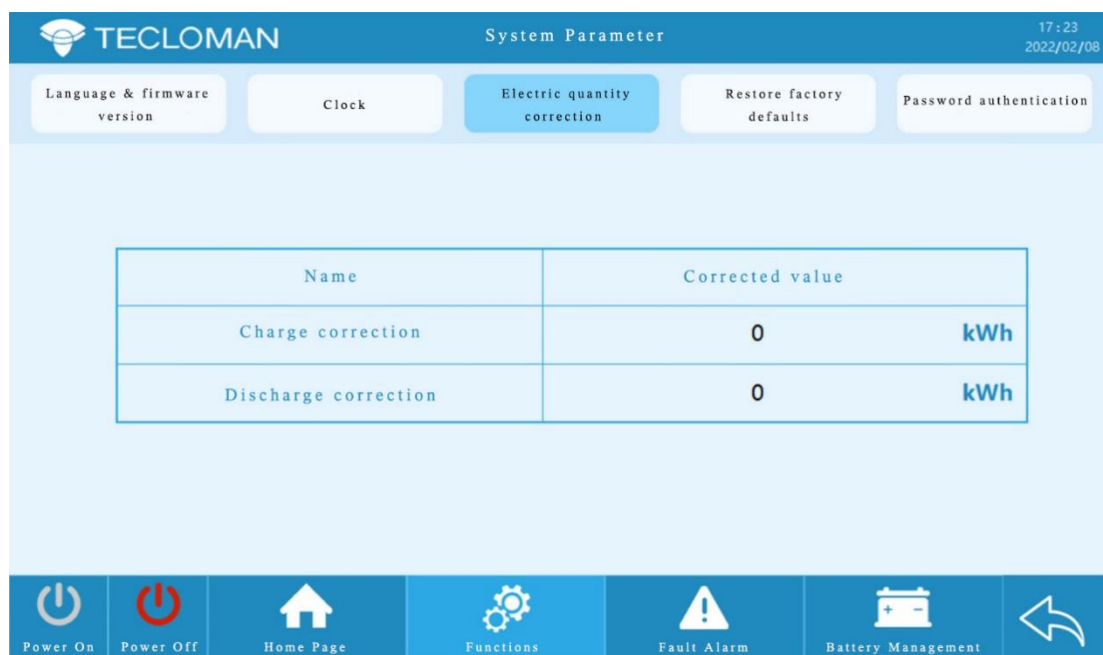
Click the "System Parameter" button to enter the "Language & Firmware version".



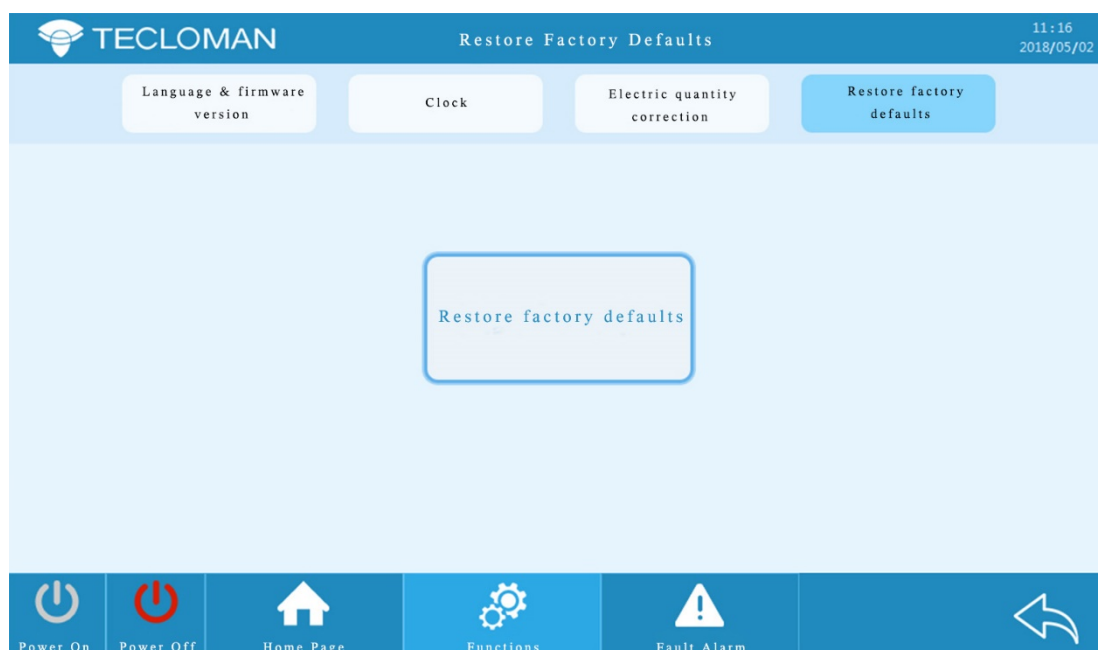
You can enter "Clock Setting" :



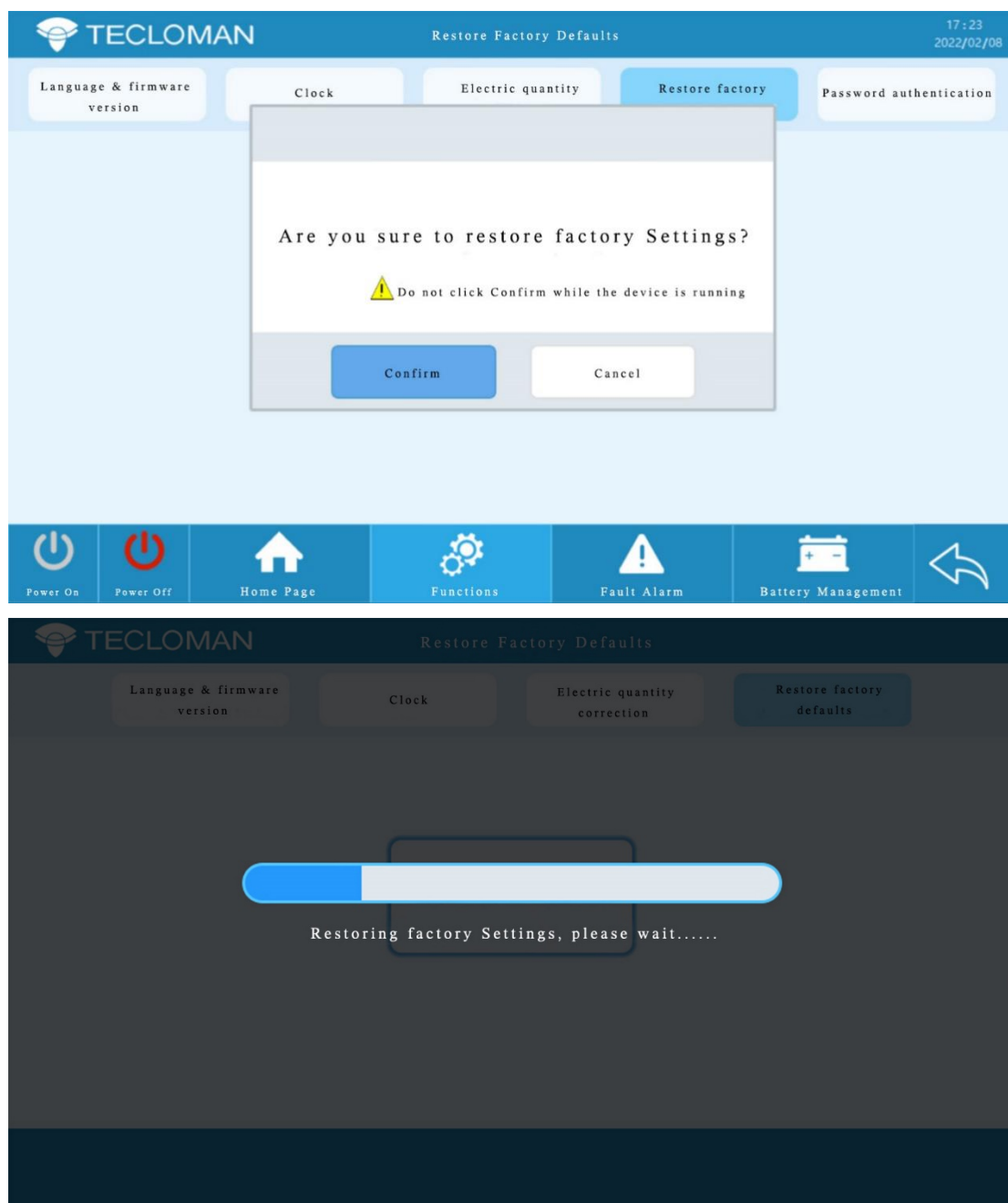
You can enter "Electricity Correction" :



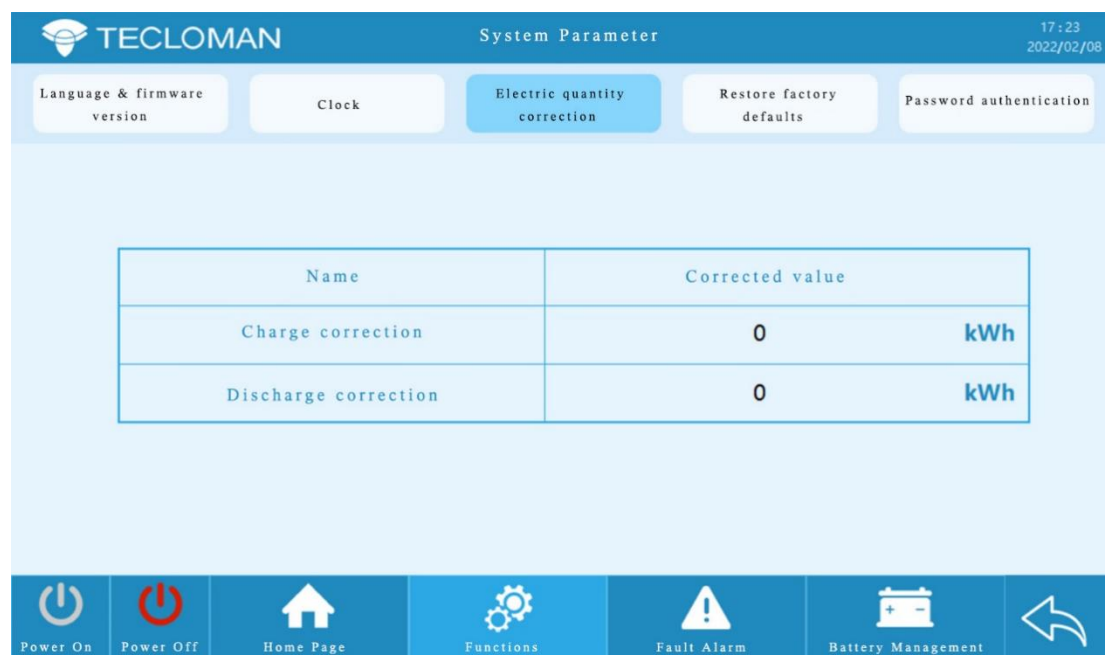
You can enter "Restore Factory Defaults" :



The "Confirm" button pops up. Click "Confirm" to restore factory Settings

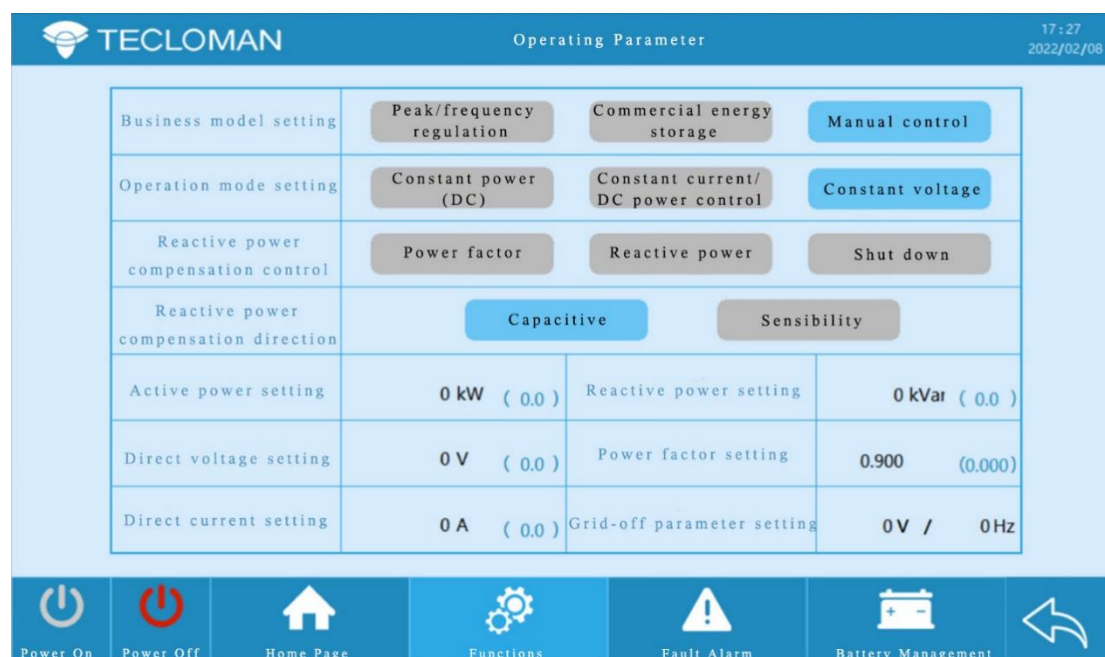


You can enter “Password Authentication”:



### Operating Parameter

Parameter Set→ Running parameters. The following screen is displayed.



The specific operation parameters can be set as follows:

Parameter	Description
Reactive power compensation control: power factor, Reactive power, Off	Set the reactive power compensation control mode
Reactive power compensation direction: lead. lag	Set the reactive power compensation direction



Charge and discharge control: constant voltage. Constant current	Setting mode
Charge and discharge direction: charge. discharge	Charge and discharge control
Active power instruction	Set active power
Reactive power instruction	Set reactive power
Power factor instruction	Set power factor
DC voltage instruction	Set DC bus voltage
Control power step	Set control power step
Shutdown power step	Set shutdown power step

### Protection Parameter

Function→ Protection parameters, you can enter the following screen.

Protection parameter
17:28  
2022/02/08

IGBT overtemp protection	0 °C	Grid secondary overfrequency	0.0 Hz	HMI communication fault	On	Off
Ambient overtemp	0 °C	Grid primary underfrequency	0.0 Hz	Smoke alarm	On	Off
Overtemp reduces capacity	0 °C	Grid secondary underfrequency	0.0 Hz	Low voltage crossing	On	Off
DC overvoltage	0 V	Grid primary overvoltage	0.00 PU	Active island	On	Off
Battery reverse connection	0 V	Grid secondary overvoltage	0.00 PU			
DC undervoltage	0 V	Grid primary undervoltage	0.00 PU			
DC overcurrent	0 A	Grid secondary undervoltage	0.00 PU			
Grid primary overfrequency	0.0 Hz	Grid tertiary undervoltage	0.00 PU			

Power On

Power Off

Home Page

Functions

Fault Alarm

Battery Management

The specific protection parameters are as follows:

Parameter	Description
HMI communication fault Enable: On/off	Set the HMI communication fault enable switch
Smoke alarm Enable: On/off	Set the smoke alarm enable switch
Battery communication failure: Fault/Normal	Display battery communication fault



AC 0.9 times the upper undervoltage	Set the upper limit of 0.9 times AC undervoltage. If it exceeds this threshold, it will alarm
Upper limit of AC instantaneous overvoltage	Set the upper limit of AC instantaneous overvoltage. If it exceeds this threshold, it will alarm
AC 1.1 times the upper overvoltage	Set the upper limit of 1.1 times AC overvoltage. If it exceeds this threshold, it will alarm
AC 1.2 times the upper overvoltage	Set the upper limit of 1.2 times AC overvoltage. If it exceeds this threshold, it will alarm
Grid frequency upper limit	Set the upper frequency limit of the grid. If it exceeds this threshold, it will alarm
Grid frequency lower limit	Set the lower frequency limit of the grid. If it exceeds this threshold, it will alarm
Upper DC overvoltage limit	Set the upper limit of DC overvoltage. If it exceeds this threshold, it will alarm
IGBT temperature upper limit	Set the upper limit of IGBT temperature, which will alarm if it exceeds the threshold
Upper ambient temperature limit	Set the upper limit of ambient temperature, which will alarm if it exceeds the threshold

### Communication Parameter

The inverter provides serial communication and Ethernet communication. After the hardware is connected and powered on, you can set parameters such as the communication address through the LCD. “RS485 Communication Setting” and “TCP/IP Communication Setting”.

Communication parameter

10:22  
2018/07/24

RS485 communication setting		TCP/IP communication setting	
Communication baud rate	0 ▼	Network type	TCP
Communication station number	2 ▼	Server/client Settings	Server
Data bit	0 ▼	Local IP address	192.168.1.2
Stop bit	0 ▼	Local port number	3000
Data validation mode	0 ▼	Remote IP address	
		Remote port number	

Power On
 Power Off
 Home Page
 Functions
 Fault Alarm
 Battery Management

In the “RS485 Communication Setting” area, the serial port parameter setting page is displayed. You can set baud rate, station number, data bit, stop bit, and data validation mode.

TCP is a server that has a client connection

### BMS Communication

#### BMS Interface

Battery Management

17:29  
2022/02/08

BMS management

Parameter setting

BMS alarm

Battery rechargeable capacity	0.0kWh	Single minimum voltage	0.0mV
Battery discharge capacity	0.0kWh	Single minimum voltage number	0 - 0 - 0
SOC	0%	Single maximum temperature	0.0°C
SOH	0%	Single maximum temperature number	0 - 0 - 0
Battery total voltage	0.0V	Single minimum temperature	0.0°C
Battery total current	0.0A	Single minimum temperature number	0 - 0 - 0
Single maximum voltage	0.0mV	Maximum allowable charging current	0.0A
Single maximum voltage number	0 - 0 - 0	Maximum allowable discharging current	0.0A

Power On
 Power Off
 Home Page
 Functions
 Fault Alarm
 Battery Management
 

English

Local manual

Displays the current battery status

Battery Management
17:29  
2022/02/08

BMS management
Parameter setting
BMS alarm

Precharge on voltage	0 mV	Battery system capacity	0 Ah
Precharge off voltage	0 mV	Battery floating charge voltage	0 V
Precharge flow coefficient	0 %	Charging voltage limitation	0 V
Charge control mode	<span>Standard charge</span> <span>Intelligent charge</span>	Float charge cut-off current	0 A
Cell primary overvoltage	0 mV	Cell primary undervoltage	0 mV
Cell secondary overvoltage	0 mV	Cell secondary undervoltage	0 mV
Battery string/voltage	218 String 697.6 V	Battery system capacity	0.0 kWh
Battery undervoltage protection value	0 V	Battery overvoltage protection value	0 V

Power On
Power Off
Home Page
Functions
Fault Alarm
Battery Management

English
Local manual

## BMS Alarm

Battery Management
17:29  
2022/02/08

BMS management
Parameter setting
BMS alarm

Full battery	Cell undervoltage	Overall overvoltage	High temperature
Battery blowout	Cell overvoltage	Overall undervoltage	Low temperature
Overcurrent	Abnormal insulation resistance	CAN communication failure	Level-three BMS 485 fault
Relay bonding	High voltage difference	High temp difference	PCS BMS 485 fault

Power On
Power Off
Home Page
Functions
Fault Alarm
Battery Management

English
Local manual

Current BMS alarms are displayed

## 9. Routine Maintenance

Due to the influence of ambient temperature, humidity, dust and vibration, the internal components of the energy storage inverter will suffer from aging and wear, which leads to potential faults in the energy storage inverter. Therefore, after the device runs for a certain period of time, routine and regular maintenance is required to ensure the normal operation and service life of the device.

Perform safe operations on the device during routine maintenance. Perform operations on the device only when the device is completely powered off.

### 9.1. Maintenance Time and Content

- Software data preservation

**Once a month;**

Read data in touch screen software;

Save running data, parameters and logs to a file;

Check the setting parameters;

- System running status and environment cleaning

**Semi-annually;**

Check whether the power conversion system is damaged and deformation;

Confirm whether the power conversion system has abnormal sound;

At run time, check the variables;

Check whether the main components are normal;

Check whether the heat of integrated machine is normal;

Check whether the air outlet is normal;

Clean the environment around the integrated machine;

- System cleaning

**Semi-annually;**

Check the cleaning of circuit boards and components;

Check the dust of radiator and fan, and clean up effectively;

Replace the ventilation filter;

- Check power connection points

**3 months after the first commissioning, and once a year thereafter;**

Check whether the cable connection points are loose;

Check whether the copper bar connection points are loose;

Check whether the cables are damaged;

- Check terminals and bar cables

**3 months after the first commissioning, and once a year thereafter;**

Check whether each terminal screw is loose and tighten it with a screwdriver.

Check whether the main loop terminal is loose;

Check whether the cable connection screws change color. Oxidation; If so, please replace it in time;

- Maintenance and inspection of cooling fan

**Once a year;**

Check whether the fan is running normally;

Check whether the fan guest blade is damaged;

Confirm whether there is abnormal noise in the operation of the fan;

- Circuit breaker maintenance

**Once a year;**

Routine inspection of major components;

Check whether the mechanical properties of circuit breaker and contactor are in good working condition;

Check whether the operating parameters and characteristic performance are normal;

- Safety function check

**Once a year;**

Check whether emergency shutdown and touch screen shutdown function is normal;

Check whether other protection function signals are normal;

Check whether the warning label of the machine is clearly visible;

## 10. Trouble shooting

When the power conversion system cannot charge and discharge the battery according to the normal function or the fault information is displayed on the touch screen, please first deal with it according to the conventional rules. If the problem is not solved, please contact us.

Power indicator off	Check whether the indicator power supply is normal. If the indicator power supply is normal, replace the indicator.
Running indicator off	Confirm whether the equipment is in the running state; Check whether the power supply of the indicator is normal. If yes, replace the indicator. If still not bright, please contact our company;
Fault indicator light	The power conversion system is faulty and the fault persists. Check that the fault information still exists on the touch screen. Check whether the power supply of the indicator is normal. If yes, replace the indicator.
Touch screen off	Check whether the power supply of the touch screen is normal. If yes, replace the touch screen.

### Touch screen displays fault information and handling:

Fault name	Possible cause	Solution
DC overvoltage	The DC voltage is higher than the maximum allowable DC voltage	Check the storage battery configuration and reduce the open-circuit voltage of the storage battery string
Emergency shutdown	External emergency	The system can be restored only after the external emergency source has been identified and the emergency has been eliminated
Direct current fuse	The DC fuse is	Check whether the DC fuse is blown. If it is blown,

	blown	replace it in time
Ambient overtemperature	The internal temperature of the power conversion system exceeds the allowable value	Shutdown and check the cooling fan and heat exchange fan in the electrical room
Charging failure	System charging does not reach the allowable value	Check whether any device is damaged in the charging loop and whether the charging cable is connected reliably
IGBT overheated	IGBT temperature exceeds allowable value	Shutdown and check whether the cooling fan of the module is normal;
AC fuse fault	The AC side fuse is blown	Check whether the AC fuse is blown. If it is blown, replace it in time
Ambient overtemperature capacity drop	Ambient temperature is too high	Check whether the exhaust fan works properly and whether the ambient temperature is too high. If too high, according to the requirements to reduce the capacity of use
Islanding protection	The power conversion system detects the occurrence of island phenomenon	Check the power grid. The grid can be connected again after it is restored to normal
DC voltage unbalanced	The voltage difference between positive and negative busbars is too large	Check whether the power supply on the grid side is out of phase and whether the IGBT is damaged

Mainboard 485 Communication fault	485 Communication failure	Check whether the 485 communication cable is securely connected
DC line trip	DC circuit breaker trip	Query system parameters before a trip to find the trip cause
AC overvoltage	The power grid voltage exceeds the set value	Check whether the power grid voltage is within the normal range
Main loop fault	Main loop device failure	Check the components in the main loop and replace the damaged ones in time
Power leakage	The system leakage current exceeds the set value	Check leakage points in the system and dispose or replace components in time
Battery communication failure	Communication between the inverter and the battery system fails	Check whether the communication cable between the inverter and the battery system is properly connected
AC undervoltage	The grid voltage is lower than the allowable minimum voltage range	Check the power grid and restore the system after the power grid is normal
Boot failed	System startup failure	Troubleshoot the startup failure cause
Reactor overtemperature	Reactor temperature switch trip	Check whether the cooling fan of the reactor works normally. If not, replace it in time



IGBT temperature rise abnormal	The IGBT temperature rise data is abnormal	Check whether the heat dissipation fan of the module is normal and whether the air duct of the module is normal
Grid overfrequency	Grid frequency is greater than the allowable setting range	Check the grid frequency. After the grid frequency recovers, the system can recover
Phase sequence reversed	Grid voltage phase sequence reverse connection	Check the phase sequence connections of the power grid
Smoke sensing fault	Smoke alarm	Check whether the system is on fire and determine the cause
FPGA hardware overflow	FPGA overcurrent blocking	FPGA detects the overcurrent fault signal, which is faster than DSP to block the wave operation
Voltage underfrequency	Grid frequency is less than the allowed grid frequency	Check the frequency of the power grid; After the grid frequency is restored, the system can be restored to normal
Drive fault	The drive loop is faulty	Check the driving circuit of each module, determine the fault point, and replace the circuit board
Arrester fault	The arrester failed	Check whether the arrester is invalid. If yes, replace it in time
FPGA hardware driver	FPGA driver blocking	FPGA detects the driver fault signal, and it can block the wave faster than DSP
AC overcurrent	A short circuit exists on the AC side of the inverter or other electronic components are	Check whether the cable connection and control circuit board at the AC side of the power conversion system are normal

	damaged	
DC overcurrent	A short circuit exists on the DC side of the inverter or other electronic components are damaged	Check whether the cable connection of the DC side cable of the power conversion system and the control circuit board are normal
DC charging switch	The DC charging circuit is faulty	Check whether the DC charging circuit devices (diodes and charging electrons) are damaged. If so, please replace them in time
FPGA watchdog	FPGA watchdog blockade	FPGA could not detect DSP feeding dog signal, and implemented the wave blocking operation to prevent DSP crash protection.

## 11. Quality assurance and after-sales service

Chengdu Tecloman Energy Storage Technology Co., Ltd. will provide free maintenance or device replacement services during the warranty period!

Warranty time: subject to the contract; When the customer receives the goods on site (subject to the acceptance time) as the start time of the warranty;

If you have any questions about our products, please contact us:

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