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Contents

1. Product Overview 3
1.1 Product Features 3
1.2 Main Function and Test Range 3
1.3 System Components 3
1.4 Working Conditions 3
1.5 Environment & Energy Impact 3
1.6 Storage Conditions 3
2. Precautions for Safe Use 4
2.1 General Rule 4
2.2 Common Incorrect Operation 4
2.3 Damage Probably Caused By Incorrect Operation 4
2.4 Emergency Treatment In Exceptional Cases 4
2.5 Precautions In Exceptional Circumstances 4
2.6 Other Safety Alerts 4
3. Technical Features 4
4. Operating Instructions 6
4.1 Device interface and buttons 6
4.2 Connection method 7
4.3 Operation 8
Warranty 19

1. Product Overview

EP401 is a battery module charge-discharge equipment developed by Smartsafe, mainly used for fast charging and discharging of offline battery pack modules for new energy vehicles, improving the maintenance efficiency of battery pack modules. This product is mainly connected directly to the positive and negative terminals of the battery pack module through the device output terminal, and quickly charged and discharged through high voltage and high current at the group terminal, so as to quickly reach the target set level of battery pack power.

1.1 Product Features

- Adopting the latest charging and charging test technology, it will not cause interference to the BMS management system, and is suitable for daily discharge and charging of battery packs.
- Wide voltage design, can be applied to the current battery test of different voltage levels.
- Voltage and temperature monitoring and protection during test can prevent over-charge and over-discharge.
- Multiple discharge auto-stop conditions make testing mode more intelligent and flexible, and avoid over-charge and over-discharge.
- Support multiple protection design and alarm settings of voltage, current, temperature abnormal to protect the battery and the equipment.
- Support functions such as overvoltage, undervoltage, overcurrent, output short circuit, anti-reverse protection and overheating protection.
- Charging completion condition: The charging procedure can be completed by setting the total charging time, constant voltage time, charging capacity, and charging current.
- 10-inch touch screen, easy to operate.
- Built in memory, supporting automatic storage of operation records.
- Portable design: easy to carry and transport.

1.2 Main Function and Test Range

Mainly used for battery charge and discharge test, suitable for voltage levels of 2~400V.

1.3 System Components

The equipment is composed of main unit, 24CH sampling box and discharge cable. The main unit includes color display screen, data processing unit, data monitoring unit, auxiliary power unit, power consuming unit, and panel operation unit.

1.4 Working Conditions

NO CORROSIVE, NO EXPLOSIVE, NO ELECTRICAL BREAKDOWN AIR OR CONDUCTIVE DUST.

1.5 Environment & Energy Impact

The equipment can convert the tested battery energy into heat and use cooling system to blow the heat out of the unit, so during the discharge test, please pay more attention to heat dissipation and ventilation.

1.6 Storage Conditions

Placed in a dry storage room, temperature: -20℃ ~ 70℃, humidity: 10% ~ 93%.

2. Precautions for Safe Use

2.1 General Rule

Please follow the user manual to use this equipment.

2.2 Common Incorrect Operation

1） Tools for connecting is not well insulated.

2） Operating without following the user manual.

2.3 Damage Probably Caused By Incorrect Operation

1） Short circuit accident: Tools is not well insulated, or battery pack positive and negative electrodes are too close.

2） Failure to follow the correct operation method will cause the equipment not working properly.

2.4 Emergency Treatment In Exceptional Cases

Disconnect the equipment power supply and test cables.

2.5 Precautions In Exceptional Circumstances

If the operator uses tools without well insulation or improper operate to cause short circuit, please separate the cables immediately.

2.6 Other Safety Alerts

Strict compliance with safety operating norms and correct operating procedure.

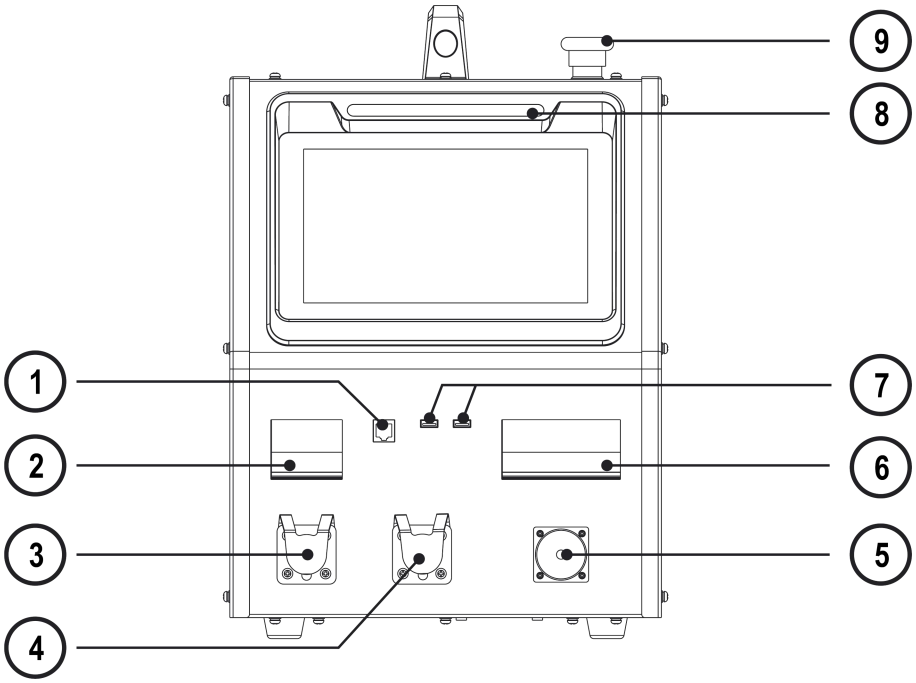
3. Technical Features

Parameter	Description
Model	EP401
Power input	AC 90 ~ 264V, 50/60Hz
Display	10-inch TFT LCD screen with resolution 1280*800
Data communication	RJ45*1, USB*2
Data dump	Internal storage of device or data transfer to USB flash drive
Data storage	32G
Module data acquisition communication	Harness sampling
Group voltage accuracy	≤±(0.5%FS+0.3V), resolution： 0.001V *Note: The voltage displayed during the testing process may deviate from the actual voltage. Please refer to the static voltage when the test is stopped.*

Cell voltage accuracy	≤±(0.1%FS + 5mV), resolution：0.001V *Note: The voltage displayed during the testing process may deviate from the actual voltage. Please refer to the static voltage when the test is stopped.*
Current measurement accuracy	≤ ±(1%FS + 0.2A)，resolution：0.1A
Charging voltage range	DC 2V ~ 400V
Discharge voltage range	DC 2V ~ 400V
Charge current range	0A ~ 100A, maximum power 4.4kw
Discharge current range	0A ~ 100A, maximum power 7.2kw
Charge control	Constant current charging + constant voltage charging
Discharge mode	Constant current discharge
Protection mechanism	Overcharge and over discharge protection Over voltage, over current, over temperature protection Battery short connection, reverse connection protection Abnormal protection against power cord and main cable failure Fan abnormal protection
Shutdown actuator	DC air circuit breaker + release
Alarm prompt	Screen prompt + buzzer
Working Environment	
Cooling	Forced air cooling
Working Temperature	-5℃ ~ 45℃
Working Humidity	5% ~ 93%
Dimension	548*339*482 mm

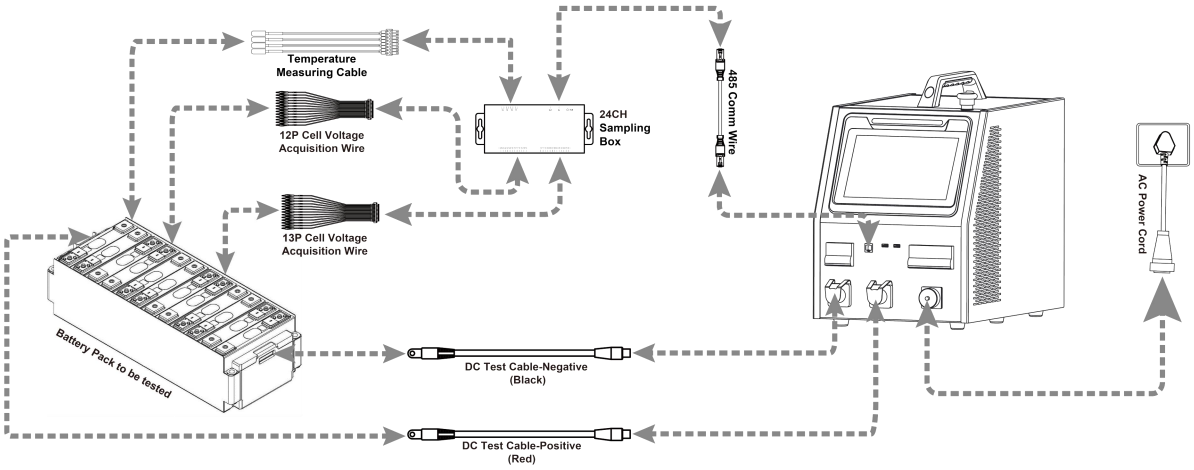
4. Operating Instructions

4.1 Device interface and buttons



No.	Name	Description
1	Communication interface	For communication and other expandable functions
2	DC circuit breaker	Turn on/off DC output. When turned on: The device can output according to the set parameters; When turned off: Output port is closed, unable to output.
3	DC output port - negative pole	Connect to the negative terminal of the battery pack module.
4	DC output port - positive pole	Connect to the positive terminal of the battery pack module.
5	Power input port	Connect to the positive terminal of the battery pack module
6	AC circuit breaker	Turn on/off AC input.
7	USB port	Export data
8	Light strip	Green constant light indicates that the device is in standby mode; Blue constant light indicates work in progress; Yellow constant light indicates a non-stop warning; Red flashing indicates a fault/shutdown warning.
9	Emergency stop switch	Used to cut off the power supply of the device in an emergency and stop the device immediately. After pressing this emergency stop switch button, the emergency stop switch must be turned to the right to reset it before the AC circuit breaker ⑥ can be closed again.

4.2 Connection method



DC test cable connection

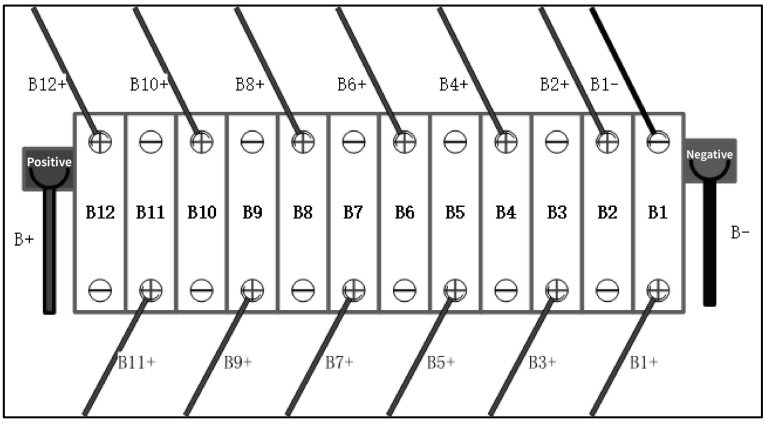
Insert the black DC test cable into the **DC output port - negative pole** interface (Black) of the device, and connect the other end to the negative pole of the battery module; insert the red DC test cable into the **DC output port - positive pole** interface (Red) of the device, and connect the other end to the positive pole of the battery module.

Voltage sampling - Module sampling connection

(1) Use communication network cable to connect the communication interface of the device and the IN interface of the 24CH sampling box.

(2) If the number of test cells does not exceed 12: use a 13P voltage acquisition cable (connected to the 13P acquisition interface of the voltage and temperature acquisition box);
If the number of test cells exceeds 12: an additional 12P voltage acquisition cable needs to be used (connected to the 12P acquisition interface of the voltage and temperature acquisition box);
If the number of test cells exceeds 24: need to add more voltage and temperature acquisition boxes (up to 3 voltage and temperature acquisition boxes can be connected).

(3) According to the wire label on the cell voltage acquisition wire, B1 - is connected to the negative electrode of No. 1 single cell (B1), B1 + is connected to the positive electrode of No. 1 single cell (B1), B2 + is connected to the positive electrode of No. 2 single cell (B2), and connected in sequence.



Temperature sampling - Module sampling connection

Connect one end of the temperature acquisition wire (optional) to the temperature acquisition interface of

the 24CH sampling box, and connect the other end (probes or clips) to the battery cells.

Working power supply connection

Use the AC power cord (Include UK/US/EU/AU, choose the appropriate plug according to the region of use) equipped with the device to connect the device power interface and power socket to power the device. At this time, it is recommended to only use it for operating the discharge function.

Connect the single-phase three wire AC input power cord equipped with the device to the power interface, and connect the other end of the power cord to the distribution box to supply power to the device. At this time, the device can operate charging and discharging functions. Please set the charge current limit according to the size of the connected AC input load (see parameter table for details) to prevent overcurrent.

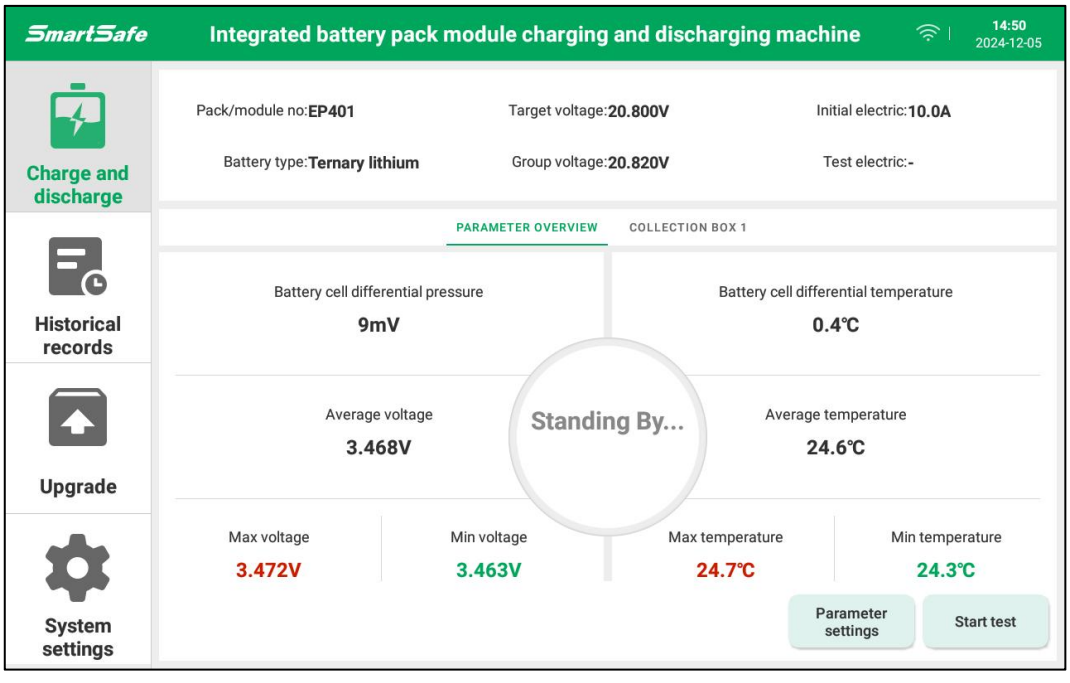
4.3 Operation

After the device is connected, close the AC circuit breaker to turn on the device, then set the charging and discharging parameters and protection conditions. Before starting the test, close the DC circuit breaker.

4.3.1 Main Menu

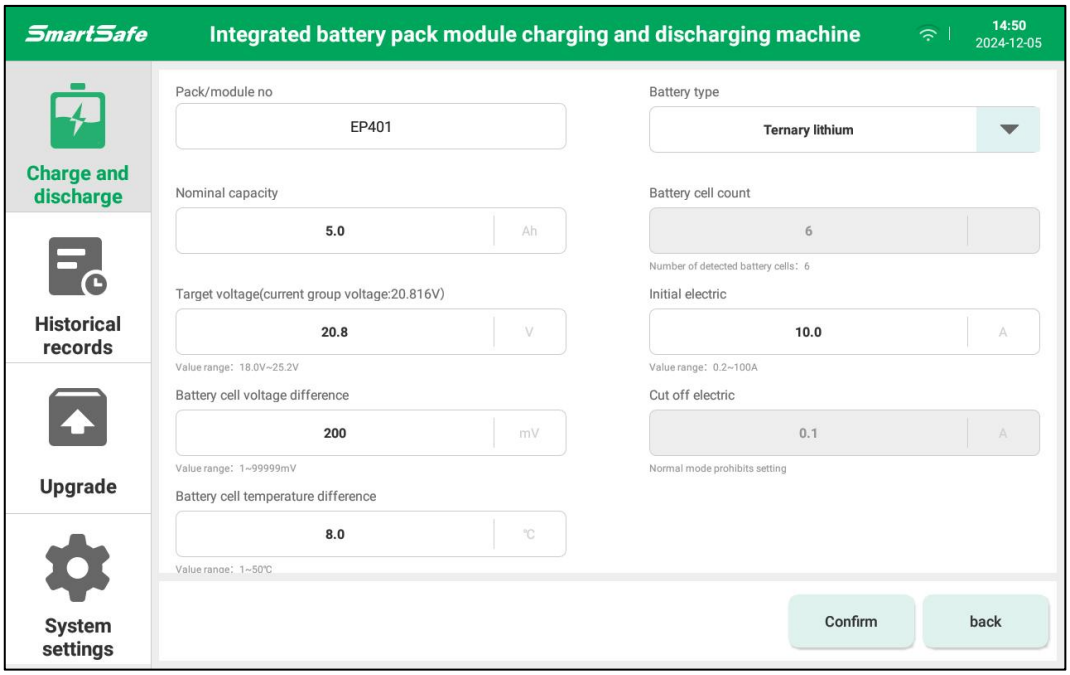
After the device is turned on, it enters the charge and discharge detection interface by default. Users can click the function module icon on the left side of the screen to switch to different function module interfaces. The function modules on the left include charge and discharge detection, history, software upgrade and system settings.

Note: In the charge and discharge detection interface, users can click "Instructions" in the lower left corner of the screen to view the device operation instructions.



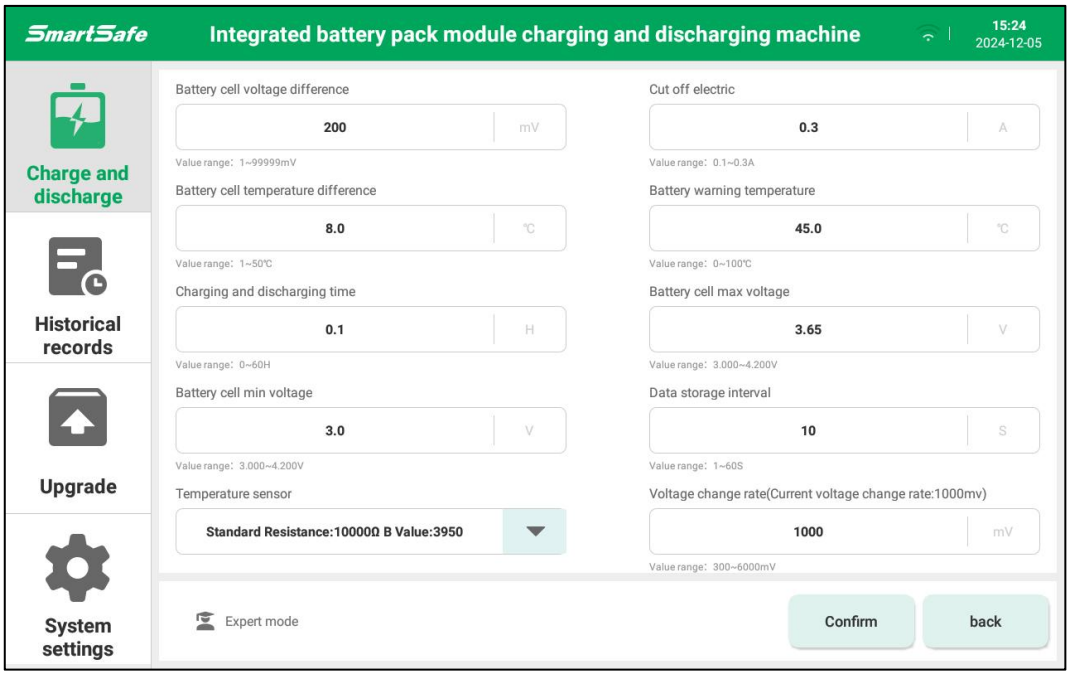
4.3.2 Charge and discharge

(1) In the charge and discharge interface, click **Parameter settings** to preset the charge and discharge parameters.



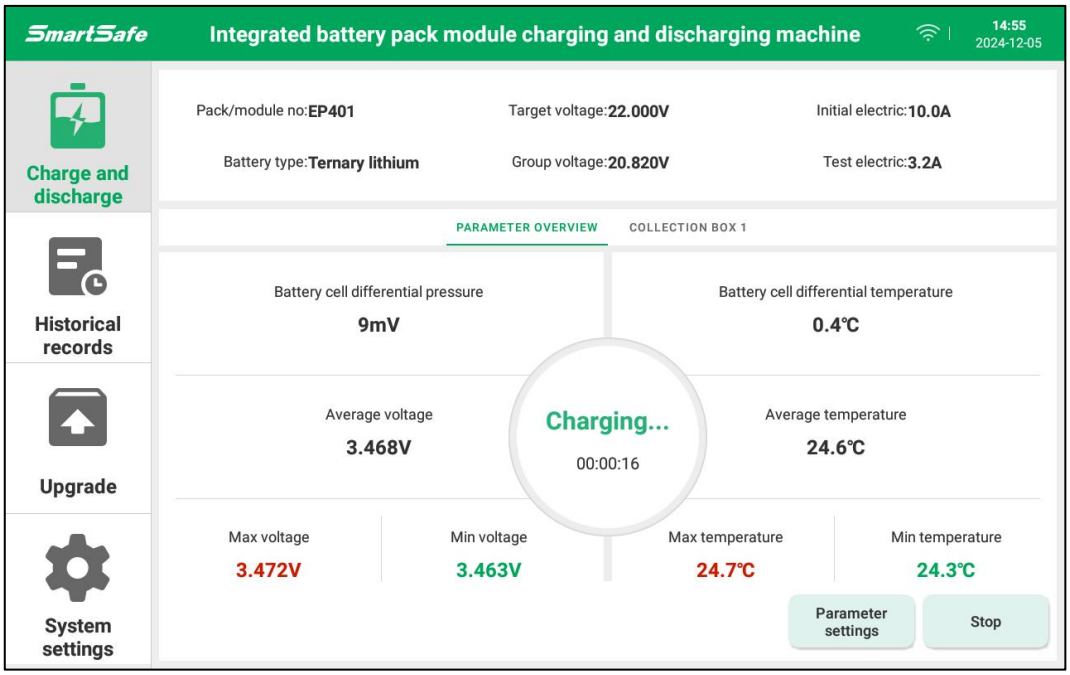
Parameter description	
Pack/module no.	Enter the battery pack number to name it.
Nominal capacity	The nominal capacity of the battery pack module, which can be identified from the label according to the actual input.
Target voltage	The target voltage value for charging and discharging the battery module. The device will automatically judge whether to charge or discharge according to the current voltage of the battery pack and the target voltage.
Battery cell voltage difference	The voltage deviation between the highest and lowest cell voltages.
Battery cell temperature difference	Excessive temperature difference protection threshold.
Battery type	Select the battery type according to the battery pack to be tested.
Battery cell count	The number of battery cells contained in the connected battery pack.
Initial electric	The initial current value of charging and discharging.
Cut off electric	The current threshold for terminating the charging and discharging.

The parameter setting interface defaults to normal mode. If you need to enter expert mode to set more parameter items, you can click **System settings** function module on the left side of the screen, and then click **Expert mode** on the system settings interface to enter the parameter settings interface.

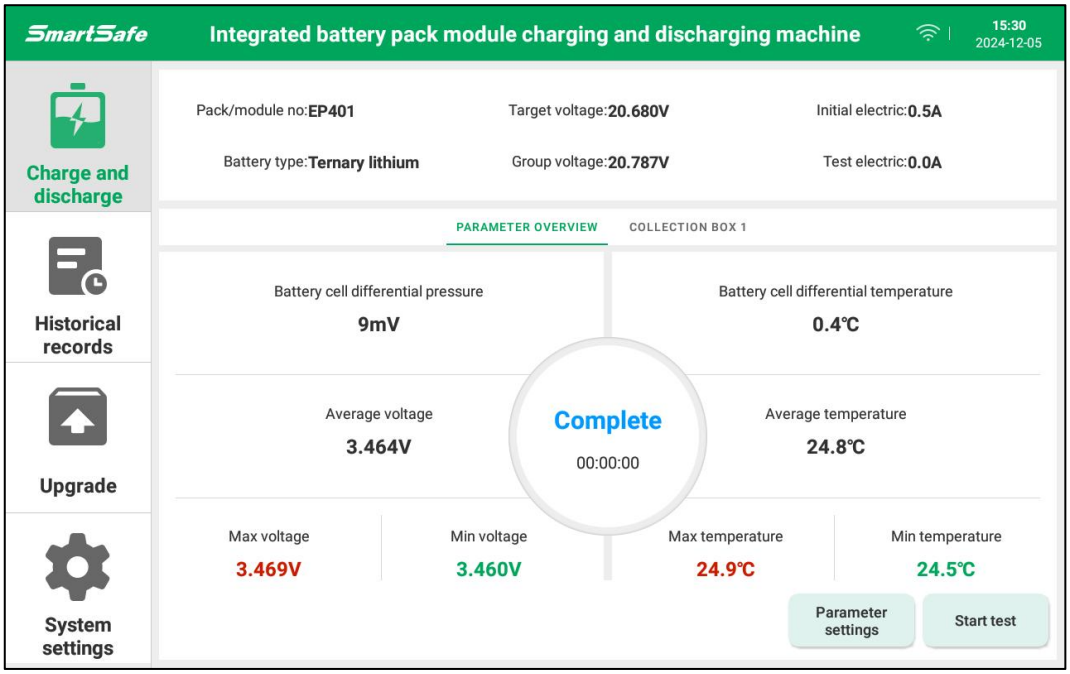


Parameter description	
Battery warning temperature	The system will automatically alarm when the set temperature is reached.
Charging and discharging time	Set the charging and discharging duration, and automatically stop charging and discharging after reaching the set time.
Battery cell max voltage	The highest voltage threshold of the battery cell. When the battery cell voltage reaches the set voltage value, charging will automatically stop.
Battery cell min voltage	The lowest voltage threshold of the battery cell. When the battery cell voltage reaches the set voltage value, discharging will automatically stop.
Data storage interval	The interval time for automatic data storage.
Temperature sensor	Select a temperature sensor or temperature measuring cable to .

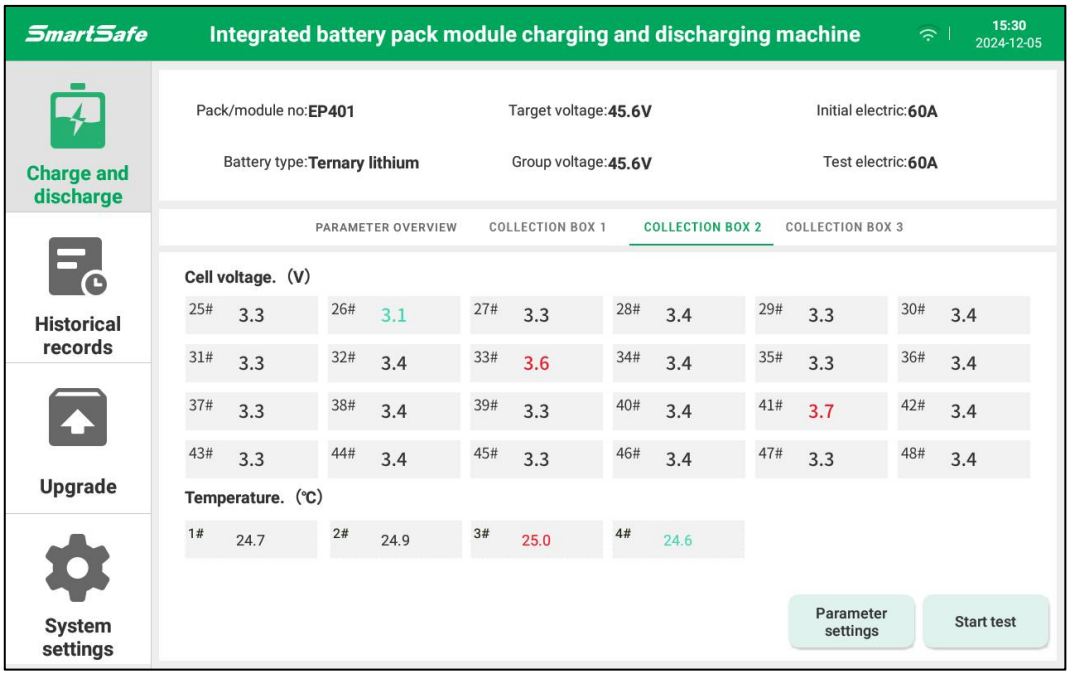
(2) After setting the parameters, click **Confirm** to save the current settings and return to the charging and discharging interface. Click **Start test** in the charging and discharging interface to start charging and discharging.



(3) During the charging and discharging process, you can check the test progress and wait for the test results. Click **Stop** to end the current charging and discharging process.

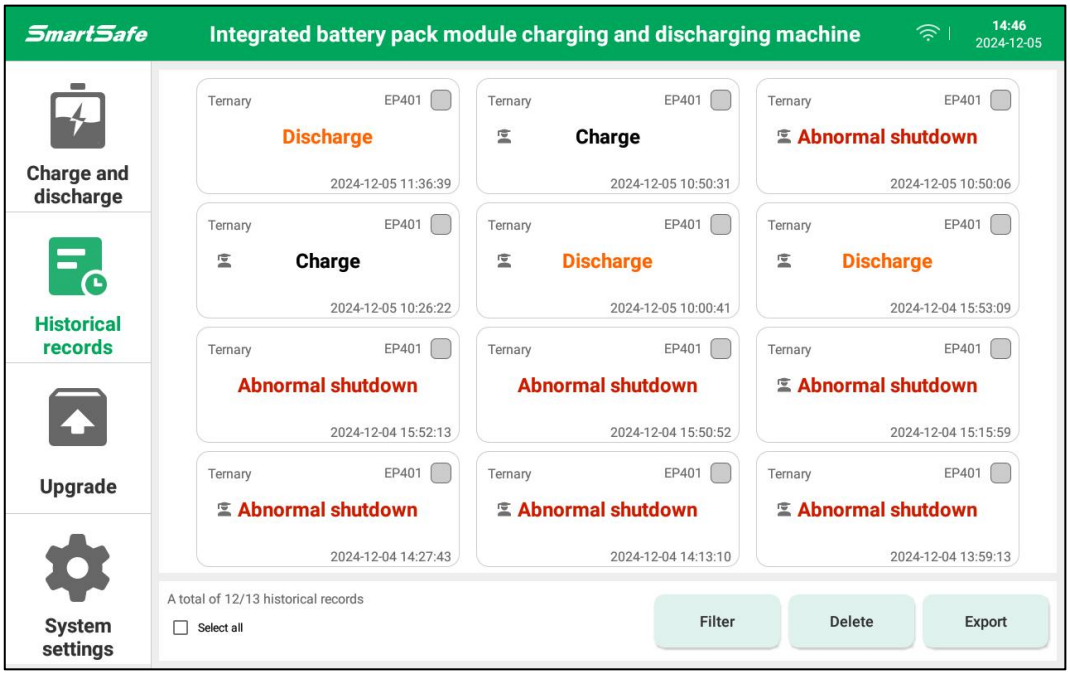


(4) If multiple 24CH sampling boxes are connected, you can click the corresponding sampling box to view the charging and discharging results of the battery module connected to it.



4.3.3 Historical records

(1) Click **Historical records** in the left function menu to enter the historical records interface.

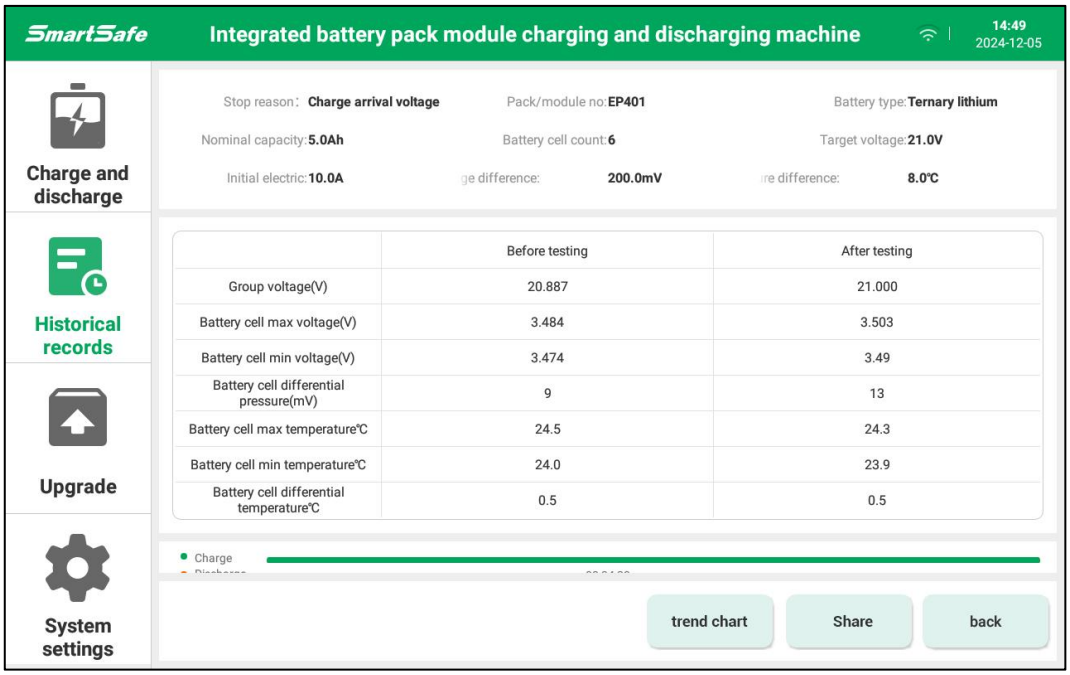


(2) Select a single or multiple historical records, and click **Delete** to remove the selected records.

(3) Select a single or multiple historical records, insert the USB flash drive into the USB port on the panel, and then click **Export** to transfer the selected historical records to the USB flash drive.

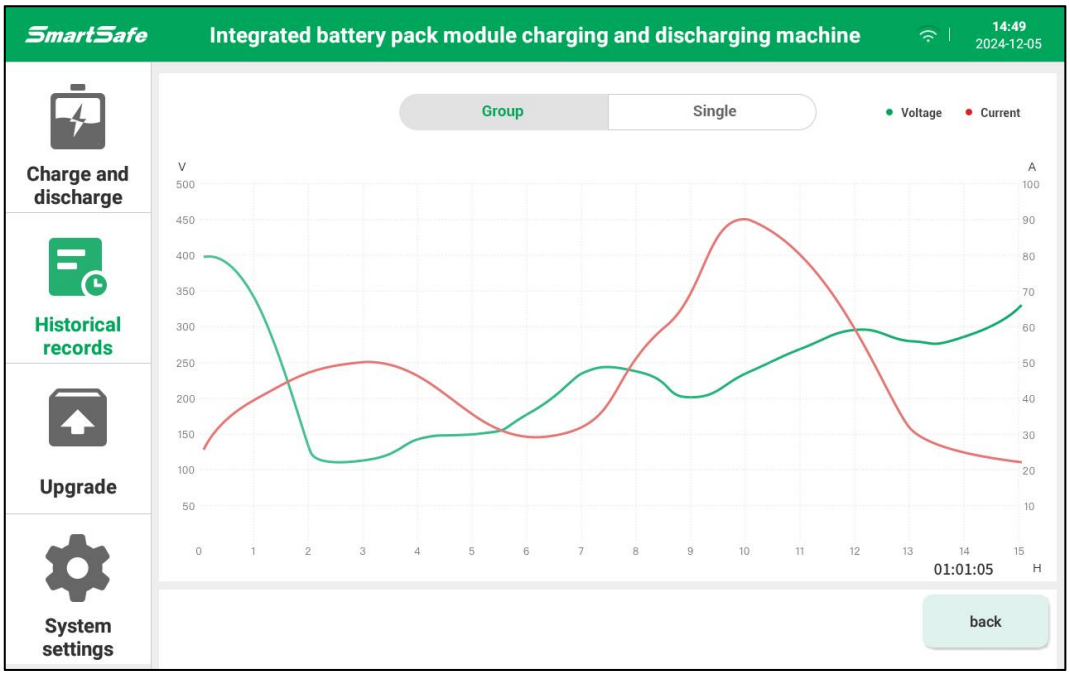
(4) Click **Filter** to set conditions to filter out records that meet the conditions.

(5) Click on a single record to view its details.



Click **Share** to share the historical record.

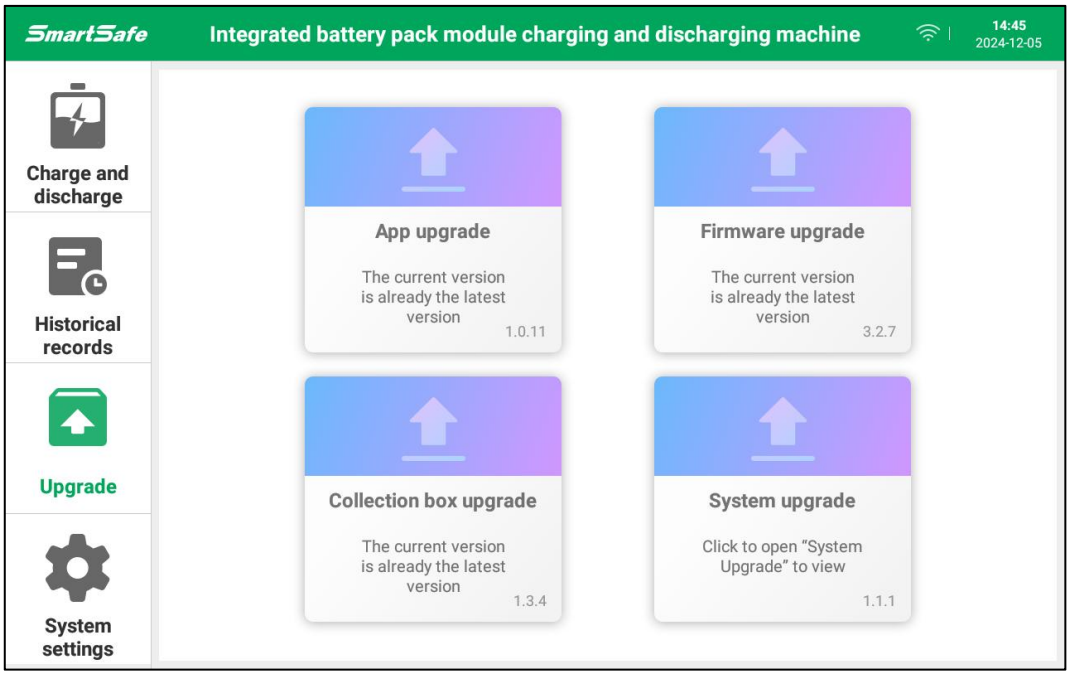
Click **Trend Chart** to view the charging and discharging trend chart of the group or single cell.

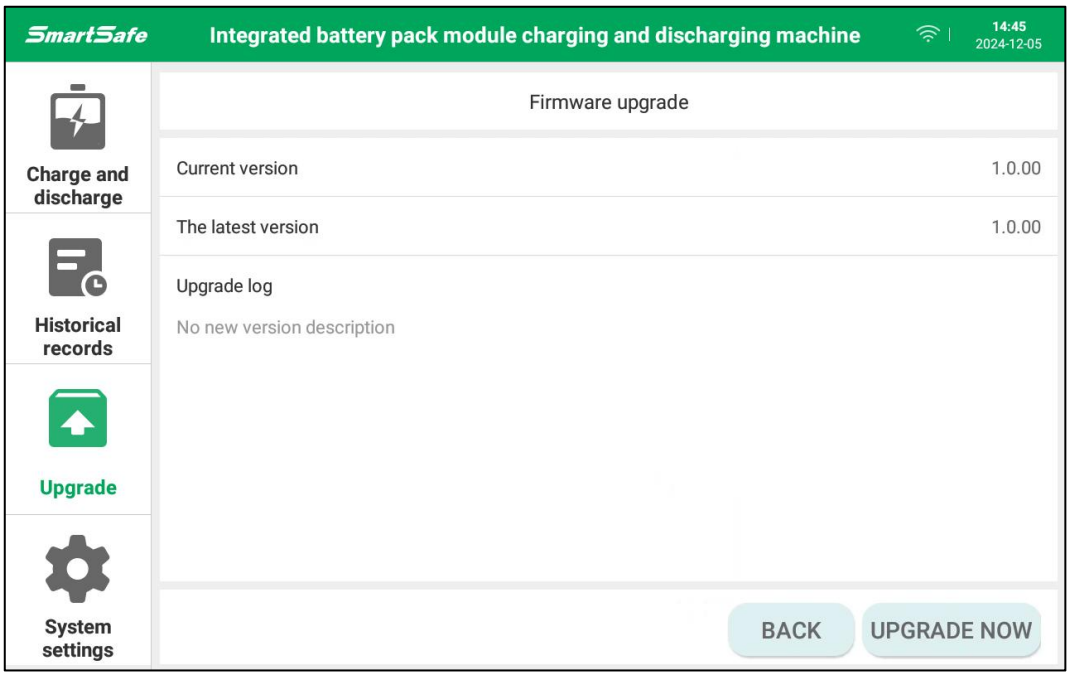


4.3.4 Upgrade

Click **Upgrade** in the function menu on the left to enter the software upgrade interface. Select options such as **APP Upgrade**, **Firmware Upgrade**, **Collection box upgrade** or **System Upgrade** to view the current version and the latest version, and click **Upgrade Now** to upgrade the APP, firmware, collection box or system to the latest version.

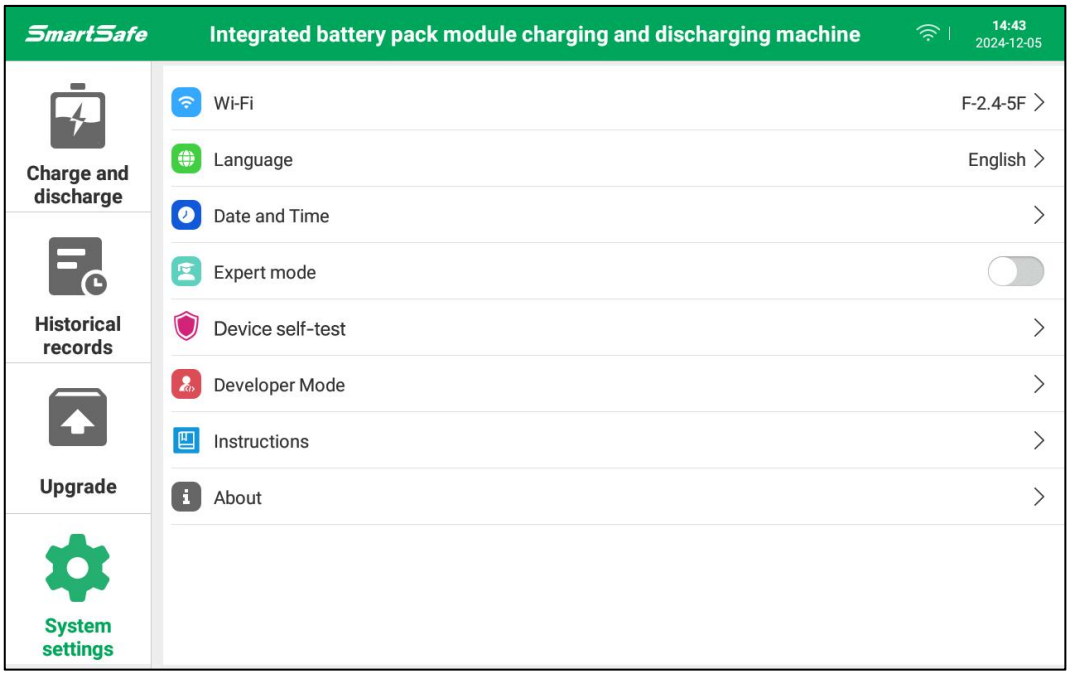
Note: To perform software upgrade functions, it is necessary to connect to a wireless network firstly; To ensure the normal upgrade, please ensure network stability during the upgrade process.



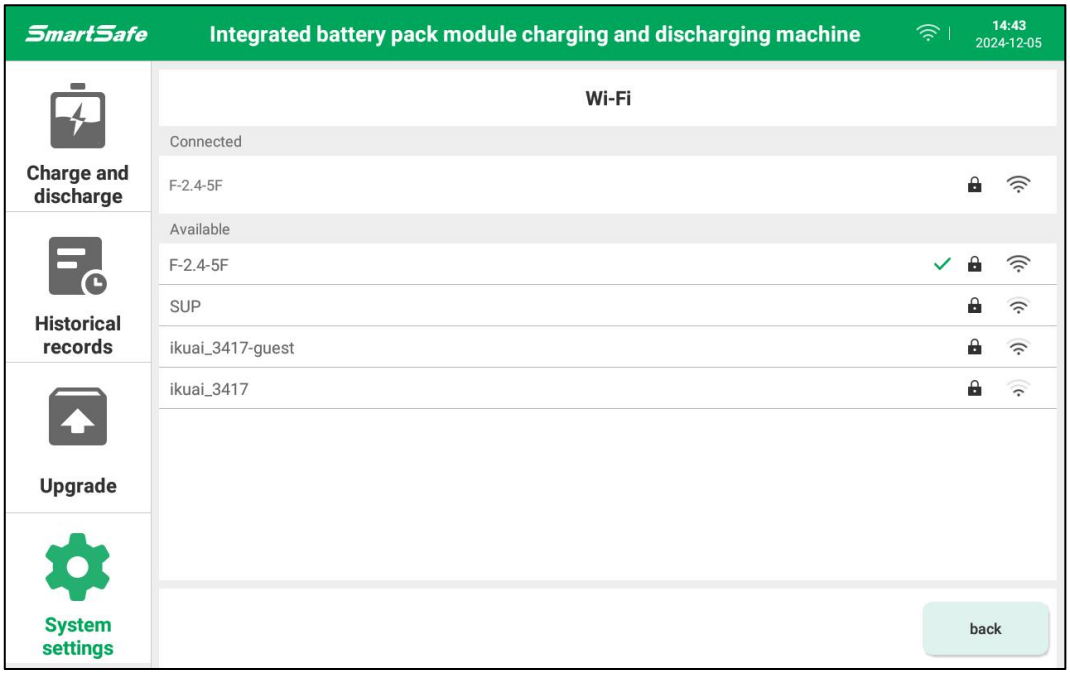


4.3.5 System Setting

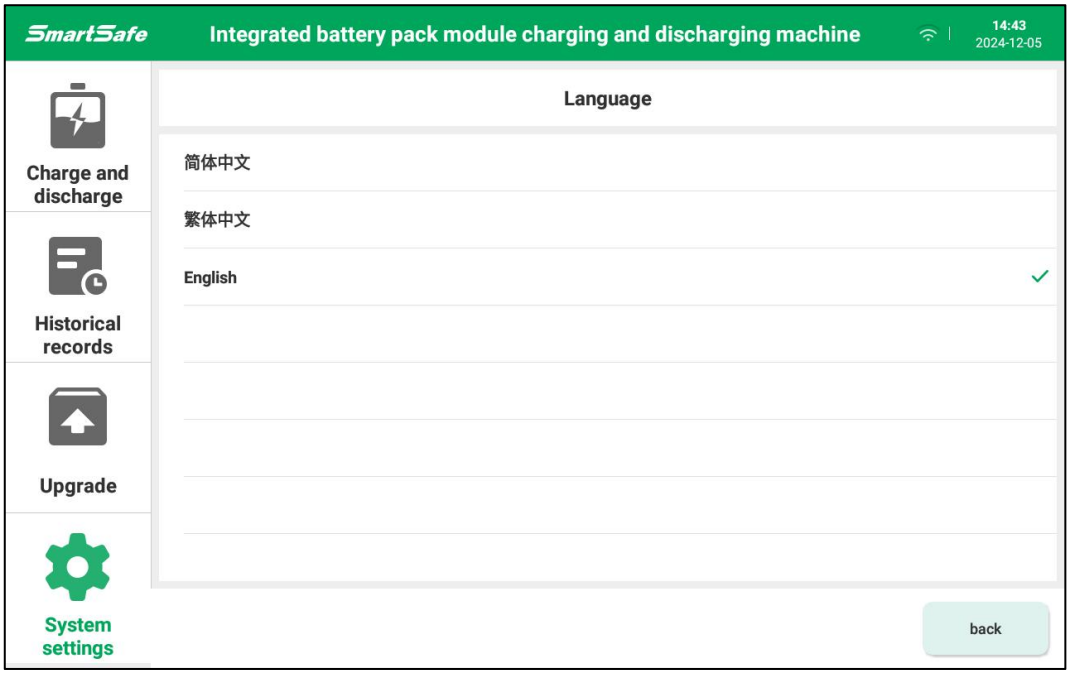
Click **System Settings** in the function menu on the left to enter the system settings interface. System settings include **Wi-Fi**, **Language**, **Date and time**, **Expert mode**, **Device self-test**, **Development mode**, **Equipment seft-test**, **Instructions** and **About**, etc.



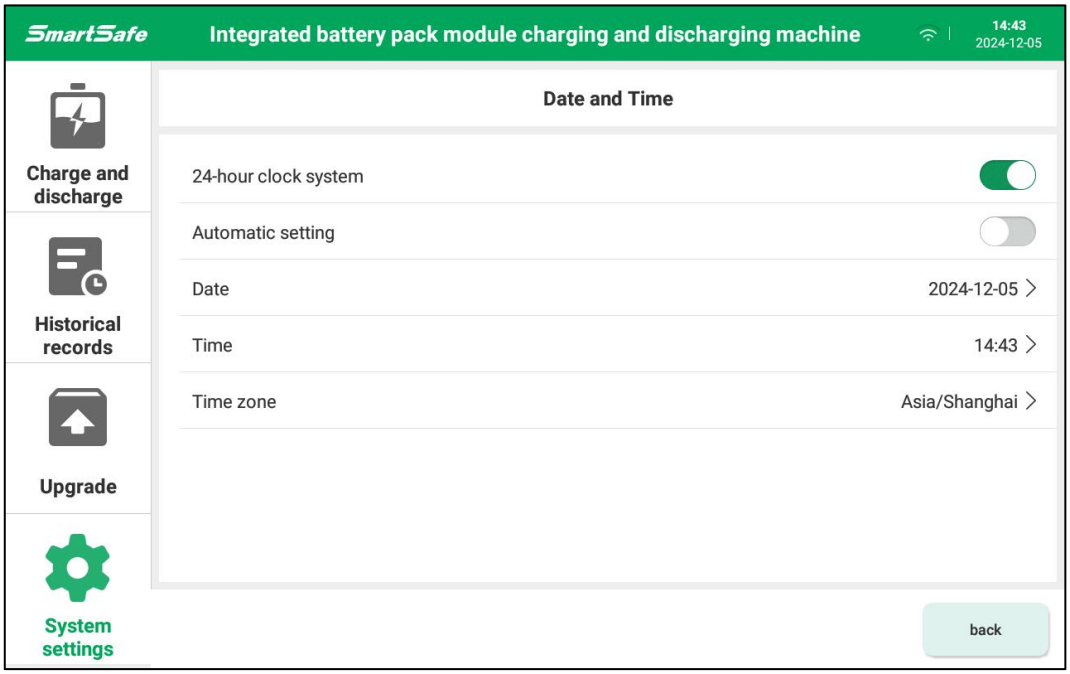
Wi-Fi: Used to set up the device's wireless network connection.



Language: Used to set the system language.

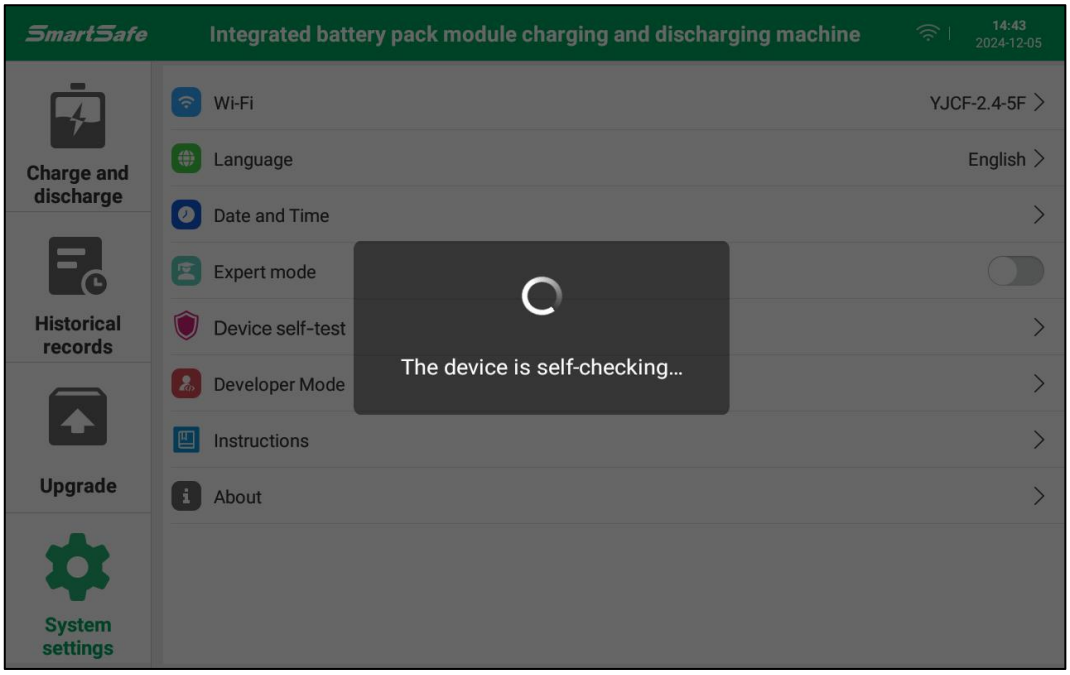


Date and time: Used to set date, time and time zone, etc.

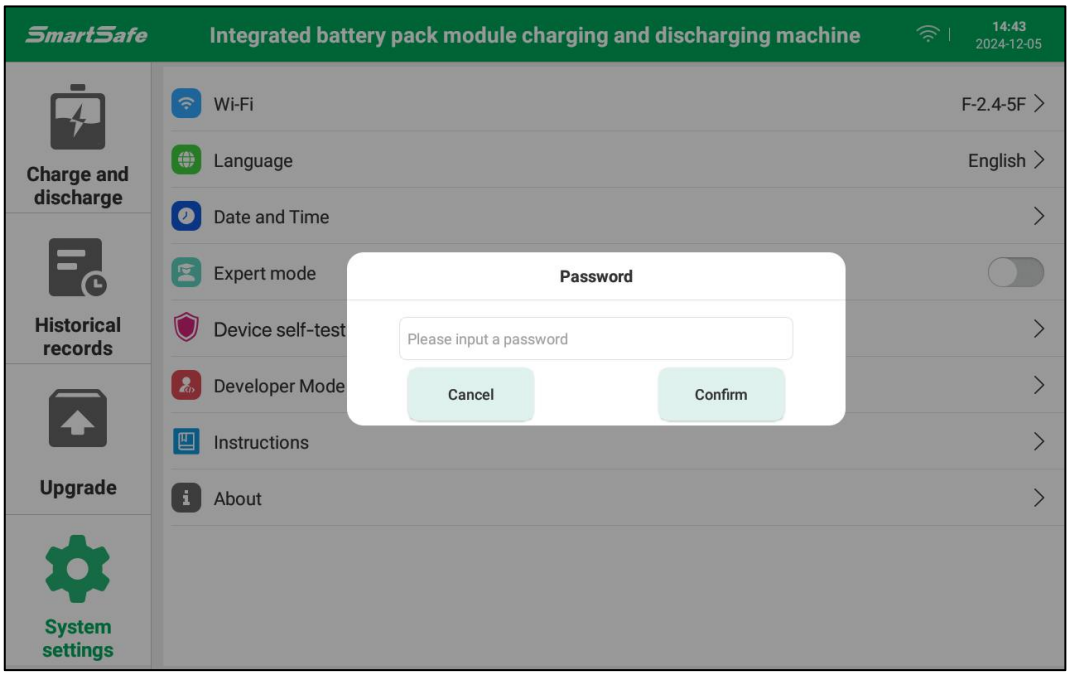


Expert mode: Used to switch the parameter setting mode of charging and discharging to Expert mode.

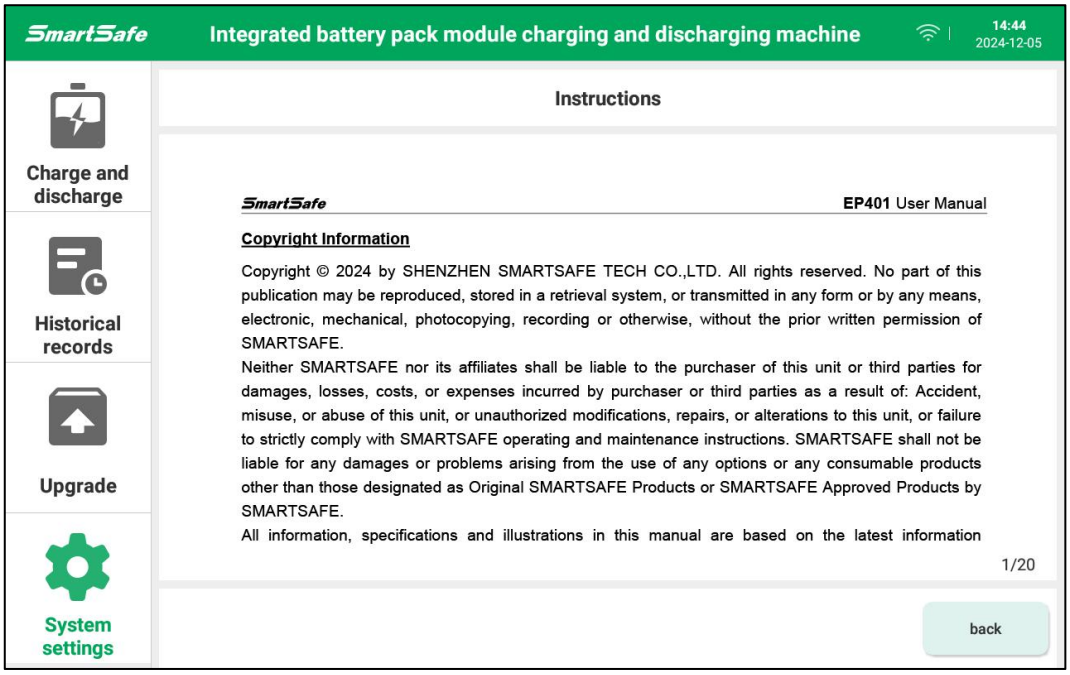
Device seft-test: Support automatic self-check of device.



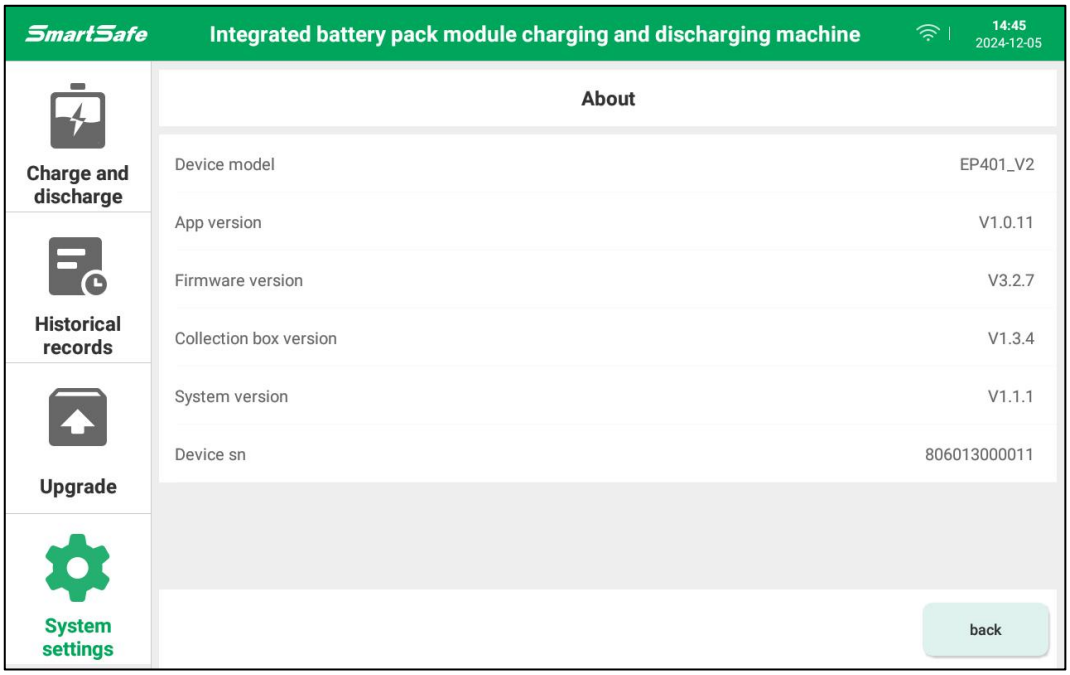
Developer Mode: This function is only for development and maintenance, a password is required.



Instructions: This function is used to view the electronic version of the user manual.



About: Used to view information such as device model, APP version, firmware version, collection box version, system version and device serial number.



Warranty

THIS WARRANTY IS EXPRESSLY LIMITED TO PERSONS WHO PURCHASE SMARTSAFE PRODUCTS FOR PURPOSES OF RESALE OR USE IN THE ORDINARY COURSE OF THE BUYER'S BUSINESS.

SMARTSAFE electronic product is warranted against defects in materials and workmanship for one year from date of delivery to the user.

This warranty does not cover any part that has been abused, altered, used for a purpose other than for which it was intended, or used in a manner inconsistent with instructions regarding use. The exclusive remedy for any automotive meter found to be defective is repair or replacement, and SMARTSAFE shall not be liable for any consequential or incidental damages.

Final determination of defects shall be made by SMARTSAFE in accordance with procedures established by SMARTSAFE. No agent, employee, or representative of SMARTSAFE has any authority to bind SMARTSAFE to any affirmation, representation, or warranty concerning SMARTSAFE automotive meters, except as stated herein.

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The above warranty is in lieu of any other warranty, expressed or implied, including any warranty of merchantability or fitness for a particular purpose.

Purchase Order

Replaceable and optional parts can be ordered directly from your SMARTSAFE authorized dealer. Your order should include the following information:

- Order quantity
- Part number
- Part name

Statement:

SMARTSAFE reserves the rights to make any change to product designs and specifications without notice. The actual object may differ a little from the descriptions in the manual in physical appearance, color and configuration. We have tried our best to make the descriptions and illustrations in the manual as accurate as possible, and defects are inevitable, if you have any question, please contact local dealer or after-sale service center of SMARTSAFE, SMARTSAFE does not bear any responsibility arising from misunderstandings.