JUNCTEK®

Battery Monitor Model: KH-F series

User's Manual

Hangzhou Junce Instruments Co.,Ltd.

KH-F series coulometer

Shunt Sampling

User's Manual

Rev1.0 March 2023

(The pictures in the manual are for reference only)

Guaranty and Declaration

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JUNCTEK products are covered by P.R.C. patents, issued and pending.
This document replaces all previously published documentation.

Contact Us

If you have any problem or requirement when using our products or this manual, please contact JUNCTEK.
E-mail: **junce@junteks.com**
Website: **www.junteks.com**

Safety Requirement

General Safety Summary

Please review the following safety precautions carefully before putting the meter into operation so as to avoid any personal injury or damage to the meter and any product connected to it. To prevent potential hazards, please follow the instructions specified in this manual to use the meter properly.

Observe All Terminal Ratings

To avoid fire or shock hazard, observe all ratings and markers on the meter and check your manual for more information about ratings before connecting the meter.

Use Proper Over-voltage Protection

Ensure that no over-voltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the operator might be exposed to the danger of an electric shock.

Do Not Operate Without Covers

Do not operate the meter with covers or panels removed.

Do Not Insert Anything Into the Air Outlet

Do not insert anything into the air outlet to avoid damage to the meter.

Avoid Circuit or Wire Exposure

Do not touch exposed junctions and components when the unit is powered on.

Do Not Operate With Suspected Failures

If you suspect that any damage may occur to the meter, have it inspected by JUNCTEK authorized personnel before further operations. Any maintenance, adjustment or replacement especially to circuits or accessories must be performed by JUNCTEK authorized personnel.

Provide Adequate Ventilation

Inadequate ventilation may cause an increase of temperature in the meter, which would cause damage to the meter. So please keep the meter well ventilated and inspect the air outlet and the fan regularly.

Do Not Operate in Wet Conditions

To avoid short circuit inside the meter or electric shock, never operate the meter in a humid environment.

Do Not Operate in an Explosive Atmosphere
To avoid personal injuries or damage to the meter, never operate the meter in an explosive atmosphere.

Keep Meter Surfaces Clean and Dry
To avoid dust or moisture from affecting the performance of the meter, keep the surfaces of the meter clean and dry.

Prevent Electrostatic Impact
Operate the meter in an electrostatic discharge protective environment to avoid damage induced by static discharges. Always ground both the internal and external conductors of cables to release static before making connections.

Handle with Caution
Please handle with care during transportation to avoid damage to keys, knobs, interfaces, and other parts on the panels.

Notices

1. Do not exceed the voltage and current range of the meter, otherwise the meter will be damaged.
2. The positive and negative poles cannot be reversed, and the reverse connection cannot be handled correctly.
3. The shell of the meter is fragile and easy to corrode. Please don't hit or close to chemicals to avoid corrosion.
4. Storage temperature: -25~50□, and keep the meter in a dry environment.
5. Do not attempt to disassemble the meter，it will void the warranty. There are no user-serviceable parts inside the meter. Repairs can only be made through designated repair outlets or sent back to the factory.
6. The display screen is a fragile device, please do not touch or bump it . Please avoid children playing with the meter. When there is dirt on the LCD surface, wipe it carefully with a soft cloth.
7. Please do not move the meter violently to avoid causing irreparable damage to the internal circuit. If the meter does not work properly, please contact the supplier!

Contents

Inspection

When you get a new KH-F series coulometer, it is recommended that you inspect the meter according to the following steps.

Inspect the Packaging

If the packaging has been damaged, do not dispose the damaged packaging or cushioning materials until the shipment has been checked for completeness and has passed both electrical and mechanical tests. The consigner or carrier shall be liable for the damage to the meter resulting from shipment. We would not be responsible for free maintenance/rework or replacement of the meter.

Check the Contents

Please check the contents according to the packing lists. If the meter is damaged or incomplete, please contact your JUNCTEK sales representative.

Host	KH-F series of Measurement module	1pc
	KH-F series of display module	1pc
	KH-F series of the Sampler	1pc
Accessory	5m communication cable	1pc
	Temperature Sensor	1pc
	4P connection cable	1pc
	3P connection cable	1pc
	3P power socket	1pc
	Quick guide	1pc

Inspect the Meter

In case of any mechanical damage, missing parts, or failure in passing the electrical and mechanical tests, contact your JUNCTEK sales representative.

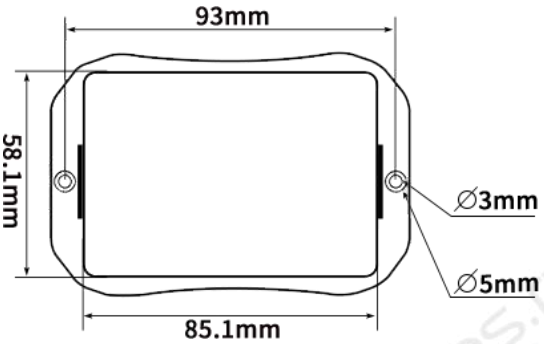
Chapter 1 Overview

1.Brief Introduction

The KH-F series multifunctional voltage and current meter is a new type of coulomb meter that can measure various parameters such as voltage, current, power, charging and discharging capacity, watt-hour, and more. It also has multiple protection functions such as overvoltage protection, undervoltage protection, overcurrent protection, over-power protection, over-temperature protection, and timed protection. The instrument can automatically identify the direction of charging and discharging currents and can monitor the battery capacity in real-time. It features a 2.4-inch high-definition color screen, which provides more comprehensive display information. The mobile app can control the instrument via bluetooth wireless communication, enabling real-time viewing of voltage and current curves and supporting data export. The firmware can be updated for free for life.

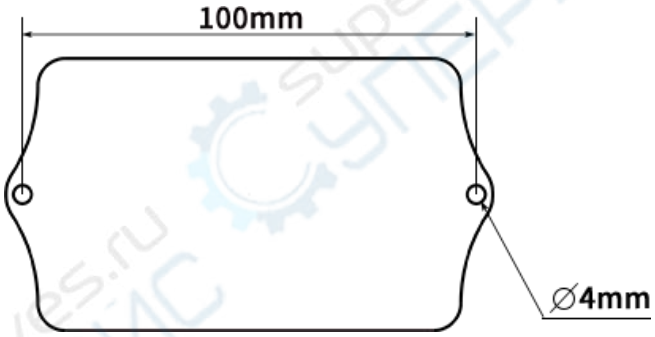
2.Dimensions

Dimension of display module
Note: display module inlay hole size: 85.1 * 58.1mm



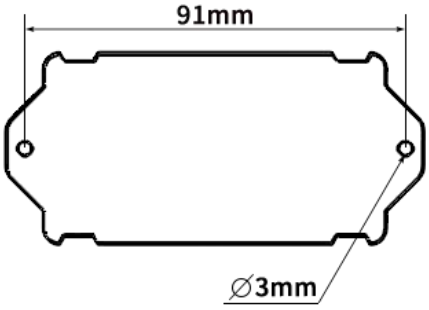
Hole bitmap of display module

Dimension of measurement module



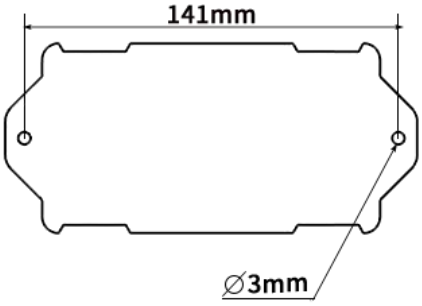
Hole bitmap of measurement module

Dimension of the 100A sampler

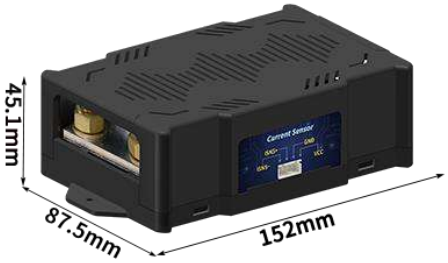


Hole bitmap of the 100A sampler

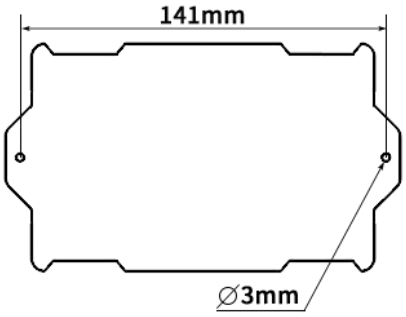
Dimension of the 400A sampler



Hole bitmap of the 400A sampler



Dimension of the 400A sampler



Hole bitmap of the 600A sampler

3.Specification

Model	KH110F	KH140F	KH160F
Sampling method	The Shunt	The Shunt	The Shunt
Voltage measurement range (External power supply)	0-120V	0-120V	0-120V
Voltage measurement range (Self-powered)	10-120V	10-120V	10-120V
Voltage resolution	0.01V	0.01V	0.01V
Current measurement range	0~100A	0~400A	0~600A
Current resolution	0.01A	0.1A	0.1A
Relay	Optional		
Temperature measurement range	-20-120□		
Capacity display range	0%~100%		
Power measurement range	0~72KW		
Power resolution	0.01W		
Ampere-hour measurement range	0~9999.99AH		
Capacity resolution	0.001AH		
Watt-hour measurement range	0~9999.99kWH		
Watt-hour resolution	0.001WH		
Time measurement range	0~999:59:59S		
Time resolution	1 second		
Bluetooth communication distance	Up to 10 meters (No obstacle)		
Voltage accuracy	±1%+2 digits		
Current accuracy	±1%+0.02A	±1%+0.01A	±1%+0.01A
Sampling rate	1 time / second		
Measurement module power consumption	About 0.4W		
Display module power consumption	About 0.5W		
Over power protection	0-99999.99W		
Negative over current protection	100A/400A/600A		
Forward over current protection	100A/400A/600A		
Over voltage protection	0~120V		
Under voltage protection	0~120V		
External over temperature protection	0-120□		
Protection recovery time	0-99s		
Screen-off time	0-60s/I=0 and time>20s		
Delay time setting	0-99S		
Communication address	P01-P99, 99 in total		

Chapter 2 Meter Introduction

1.Introduction of display module

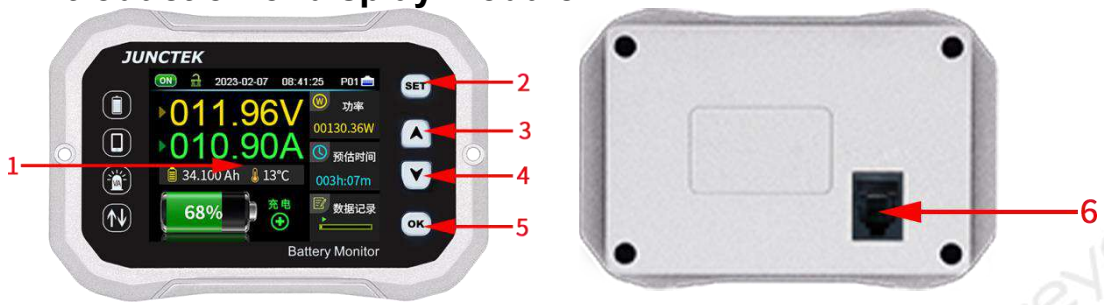


Figure 2-1-1 KH-F series display module diagram

Table 2-1-1 KH-F series display module diagram instructions

No.	Description	No.	Description
1	LCD screen	4	【▼】button
2	【SET】button	5	【OK】button
3	【▲】button	6	Communication port

(1).LCD screen

A 2.4-inch TFT color LCD display screen shows the menu of current functions and settings of parameters, etc.

(2).【SET】button

Pressing the【SET】button briefly can quickly switch to the settings interface; while on the main interface, pressing and holding the【SET】button can select the address and use the【▲】【▼】buttons to quickly adjust the address.

(3).【▲】button

When setting parameters, it is used to change the parameters; when in system settings, pressing the 【▲】button can select the corresponding system settings; on the main interface, long-pressing the 【▲】button can pop up a current zero-point saving window to remember the zero-point current state. Note: When the current is zero, perform the zero-point saving operation. Do not operate when it is not zero.

(4).【▼】button

When setting parameters, it is used to change the parameters; when in system settings, pressing the【▼】button can select the corresponding system settings; on the main interface, long-pressing the【▼】 button can turn off the display

screen. While the screen is off, do not press other buttons. Pressing【▼】button again can turn the display screen back on.

(5).**【OK】**button

On the main interface, pressing the【OK】button briefly can control the relay on and off if there is one; long-pressing the【OK】 button can quickly lock or unlock the buttons.

(6).Communication port
Used to connect with the measurement module.

2.Introduction of the measurement module

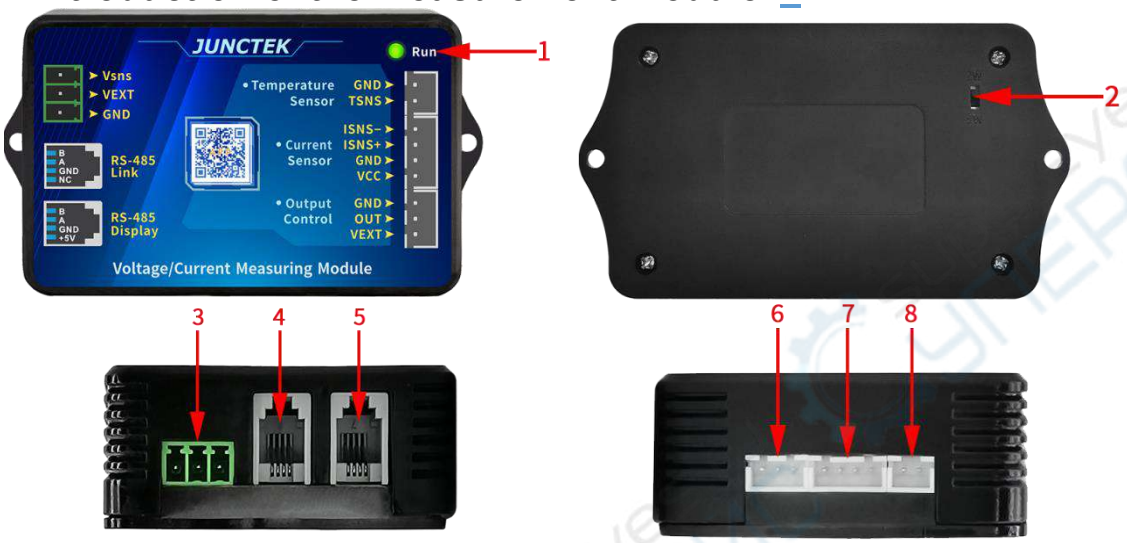


Figure 2-2-1 KH-F series measurement module diagram

Table 2-2-1 Instructions diagram of the KH-F series measurement module

No.	Description	No.	Description
1	Indicator light	5	485 communication display interface
2	2wires&3wires switch	6	Relay output control interface
3	Power supply interface	7	Sampler interface
4	485 communication connection interface	8	External temperature measurement interface

(1).Indicator light

The indicator light represents the working status. Slow flashing indicates normal power supply and normal measurement.

(2).2-wire/3-wire power selection switch

The switch can be toggled to select external power or self-power. When the switch is toggled up to 2W, it is suitable for self-power, and the voltage measurement range is 10-120V. When the switch is toggled to 3W, it is suitable for external power, and the external power voltage is 10-80V. For KH-F, the voltage measurement range is 0-120V.

(3).Power interface

There are a total of three power interfaces, including the battery positive interface (Vsns), the external power positive interface (VEXT), and the external

power negative interface (GND).

(4).RS-485 communication connection interface
Used for protocol communication, and can also be used to connect another measurement module for multi-machine communication. From left to right, they are: B, A, GND, NC.

(5).Display screen communication interface
Connected to the display module,when the measurement module is powered, this communication interface is live. From left to right, they are: B, A, GND, +5V.

(6).Relay output control interface
The relay output control interface can be used with the relay. From left to right, they are: GND, OUT, VEXT.

(7).Sampler interface
Connected to the sampler, used to detect current. From left to right, they are: VCC, GND, ISNS+, ISNS-.

(8).External temperature measurement interface
Connected to the temperature sensor, used to measure external temperature. From left to right, they are: TSNS, GND.

3.Introduction of the Sampler

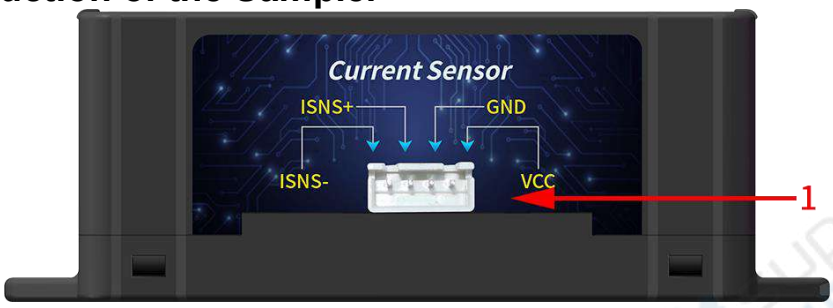


Figure 2-3-1 KH-F series of the Sampler diagram

Table 2-3-1 KH-F series of the Sampler diagram instructions

No.	Description	No.	Description
1	The Sampler interface		

(1).Sampler interface
Connected to the sampler interface of the measurement module for measuring current.

4.Introduction of the display interface

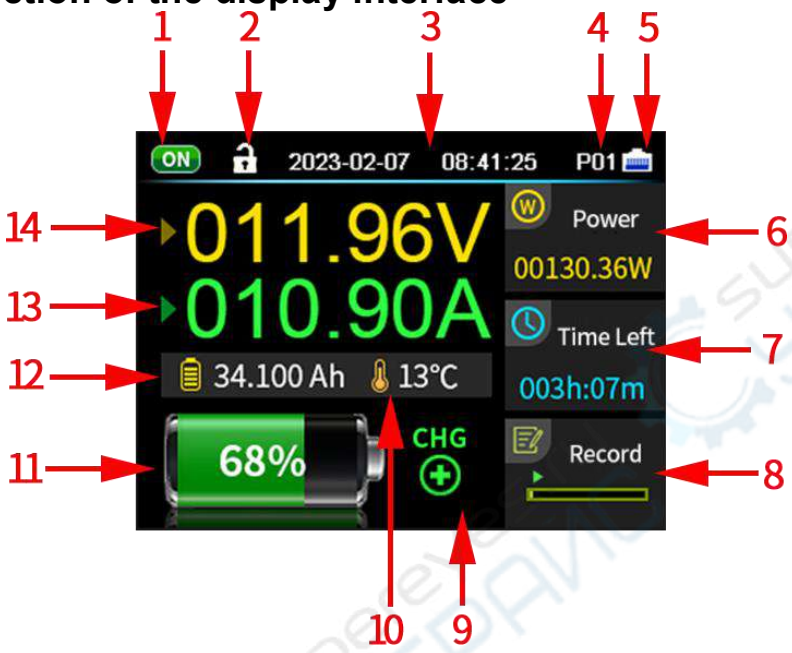


Figure 2-4-1 KH-F series display interface diagram

Table 2-4-1 KH-F series display interface diagram instructions

No.	Description	No.	Description
1	Output status	8	Data record
2	Keypad lock status	9	Current direction
3	Actual time	10	External temperature
4	Communication address	11	Battery remaining capacity
5	Communication signal indication	12	Remaining capacity
6	Power	13	Measured current value
7	Estimated time	14	Measured voltage value

(1). Output status and data recording

Short press the【OK】button to control the on/off status of the output.

(2). Key lock status
The current status display indicates that the button can be operated. After long-pressing the OK button, it will display to indicate that the button is locked.

(3). Actual time
Represents the current actual time.

(4). Communication address
The communication address range is P01-P99, with P01 representing the current communication address as P01, and the data viewed is for the P01 address.

(5). Communication signal indication
The current graphic represents that the display panel and measurement module are connected normally. When there is a red × in the graphic, it indicates a communication interruption. Check whether the communication address is correct, and then check whether the communication line is in good contact.

(6). Power
Displays the actual measured power value in watts.

(7). Expected Time
Under current capacity and current discharge current/load power, shows how long the device can still operate in the future. Under current capacity and charging current, shows how long it will take to fully charge. When the current changes from greater than 0A to 0A, the expected time will remain the same for one minute before changing to "---h:--m." When the current changes from 0A to greater than 0A, the expected time will remain "---h:--m" for one minute before updating to the calculated time.

(8). Data Recording
Displays the percentage of data storage space used with a progress bar. When the progress bar is full, it means the data recording storage space is full and the data needs to be cleared, otherwise no data will be recorded. The symbol "□" represents that data recording is turned off, while "□" represents that data recording is turned on.

(9). Charging and Discharging Current Direction
When the current color is green, it indicates that the device is charging and the remaining capacity is increasing. When the current color is blue, it indicates that the device is discharging and the remaining capacity is decreasing.

(10). External temperature
Displays the ambient temperature, currently showing 13□, which represents the temperature of the environment where the external sensor is located.

(11). Battery remaining capacity graphical display

Displays the remaining battery capacity in a graphical and more intuitive way. When on the main interface, the battery remaining capacity graphic displays in red when the remaining capacity percentage is less than or equal to 20%, and in green when the remaining capacity percentage is greater than 20%.

(12). Remaining capacity

Represents the remaining capacity of the battery through charge and discharge, remaining capacity = preset battery capacity -accumulated capacity

(13). Measured current value

Represents the actual current value measured by the sampler.

(14). Measured voltage value

Represents the voltage value measured by the voltage measurement interface in the power supply interface.

Chapter 3 Basic Operation of the Meter

1.System settings

System settings instructional video:

On the main interface, press the【SET】button to enter the system settings page, and use the【▲】and【▼】buttons to switch between functions. Press the【OK】button to enter the setting options.

(1). System settings-Page 1

Figure 3-1-1 System settings - page 1

1). Date and time

On the system settings page, use the【▲】【▼】 buttons to switch to the date and time setting. The corresponding icon will be highlighted. Press the【OK】 button to select the value and use the【▲】【▼】 buttons to adjust the value. Press the【OK】 button again to switch to the next value, which can be changed in the order of year, month, day, hour, minute, and second. When the cursor is on the "second" position, press the【OK】 button again to confirm and save the date and time (The date and time are automatically synchronized with the phone after connecting to the APP).

2). Language selection: Chinese/English

On the system settings page, use the【▲】【▼】buttons to switch to the language selection setting. Press the【OK】 button to select the language, and use the【▲】【▼】buttons to toggle between Chinese and English language modes. After selecting the desired language, press the【OK】button again to confirm the selection.

3). Sound option: On/Off

On the system settings page, use the【▲】【▼】buttons to switch to the sound setting. Press the【OK】button to select the sound option, and use the【▲】【▼】buttons to toggle the switch on or off. After selecting the desired option, press the【OK】button again to confirm the selection.

4). Temperature Unit: Fahrenheit/Celsius

In the system settings interface, press the【▲】【▼】buttons to switch to the temperature unit setting. Press the【OK】button, and the cursor will select the temperature unit. Press the【▲】【▼】buttons to switch between Fahrenheit and Celsius, and then press the【OK】button to confirm the change.

5). Preset Battery Capacity: 0000.0Ah

In the system settings interface, press the【▲】【▼】buttons to switch to the preset battery capacity setting. Press the【OK】button, and the cursor will select the value. Press the【▲】【▼】buttons to change the value, and press the【OK】button to switch between digits from the smallest to the largest. When the highest digit is selected, press the【OK】button again to confirm and save the rated battery capacity value.

6). Remaining Capacity Percentage: 100%

In the system settings interface, press the【▲】【▼】buttons to switch to the remaining capacity percentage setting. Press the【OK】button, and the cursor will select the value. Press the【▲】【▼】buttons to change the value, and press the【OK】button again to confirm and set the percentage of the current battery capacity to the preset battery capacity. You can set the current battery capacity based on actual usage. The current capacity percentage can be continuously adjusted from 0% to 100%.

7). Daytime Screen Brightness: 0-100%, default brightness 80%, default time (6:00-22:00) .When adjusting the daytime screen brightness time, the nighttime screen brightness time will also change accordingly. For example, if the daytime screen brightness time is changed to (7:00-20:00), the nighttime screen brightness time will automatically become (20:00-7:00).

8). Nighttime Screen Brightness: 0-100%, default brightness 30%, default time (22:00-6:00) When adjusting the nighttime screen brightness time, the daytime screen brightness time will also change accordingly.

(2). System Settings-Page 2:

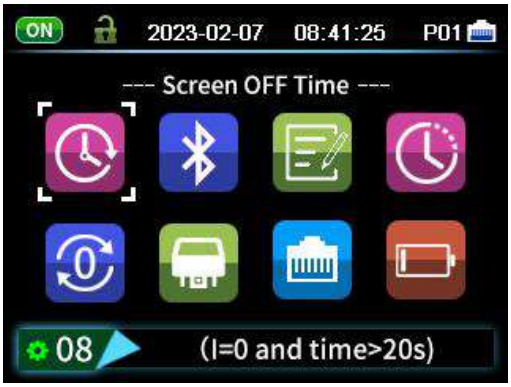


Figure 3-1-2 System Settings - Page 2

9). Screen-off time
0 indicates the screen is always on, while setting 1-60 seconds means the screen will turn off after no operation for the specified time (regardless of whether there is current or not). Press any key to wake up the screen. (I=0 and time>20s) means that the current is 0 and lasts for 20 seconds, the screen will turn off, and the screen will immediately turn on once there is current.

10).Bluetooth pairing password
The Bluetooth pairing password is 0000 by default. The Bluetooth pairing password can only be modified through the display screen, and the mobile APP cannot be modified. After the instrument is powered off and restarted, the Bluetooth pairing password will return to the default value: 0000.
Press the【▲】【▼】keys to switch to the Bluetooth pairing password setting, press the【OK】key to select the value, press the【▲】【▼】keys to change the value, and press the【OK】key again to confirm the Bluetooth pairing password.

11).Data record: On/Off (default is On)
In the system settings, press the【▲】【▼】keys to switch to the data record switch. Press the【OK】key to select the On/Off/Clear mode, and then press the【▲】【▼】keys to switch. After selecting, press the【OK】key to confirm. When selecting the Clear mode, the data record frequency can be set, which is set to once per second by default.

12).0-99s Delay Protection Setting: 0-99s
In the system settings interface, press the【▲】【▼】keys to switch to the delay protection time setting. Short press the【OK】key to select the value with the cursor, and press the【▲】【▼】keys to change the value. Press the【OK】key again to confirm the set protection delay time.
When the delay time is set to 00s, the instrument will immediately enter protection mode as the measured value exceeds the set protection value. If

the delay time is greater than 00s, for example, as the delay time is set to 5s, the instrument will enter protection mode immediately as the measured value exceeds the set protection value for 5s continuously.
The protection function requires the purchase of a separate relay. If a relay is not equipped, do not set this value, and install a relay in the circuit before it can act as a protective device to disconnect the circuit.

13).Zero Current Memory: Confirm

In the system settings interface, press the【▲】【▼】buttons to switch to the zero current memory setting. After a short press of the【OK】button, a pop-up window for zero current memory will appear. Use the【▲】【▼】buttons to select whether to confirm or cancel the zero current memory. When the cursor is on the "Confirm" option, press the【OK】button. If the display shows "Success," the storage of the state where the current is 0 at the zero point is completed.

14).Relay Mode: Normally Open/Normally Closed

In the system settings interface, press the【▲】【▼】keys to switch to the relay tmode setting. Short press the【OK】key to select normally open or normally closed with the cursor. Use the【▲】【▼】keys to switch, and press the【OK】key again to confirm the relay mode. When using this function, select normally open or normally closed based on the actual relay mode connected.

15).Address Matching

In the system settings interface, press the【▲】【▼】keys to switch to the address matching setting. Short press the【OK】key to select the value with the cursor. Use the【▲】【▼】keys to switch the communication address, and press the【OK】key again to confirm the communication address between the display module and the measurement module. The communication address is set to P01 by default.
When multiple measurement modules are connected, switching the current communication address can control the corresponding measurement module.

16).Low battery warning: 0-100%

In the system settings interface, press the【▲】and【▼】buttons to switch to the low capacity reminder setting. Short press the【OK】button to select the value with the cursor, use the【▲】and【▼】buttons to change the value, and press the【OK】button to confirm the set low capacity reminder. If the current capacity is lower than the set low capacity, a warning sound will be appeared and a pop-up reminder will last for 5 seconds.

(3). System Settings-Page 3:

Figure 3-1-3 System Settings - Page 3

17).Overvoltage Protection: 0.00-120.00V

In the system setting interface, press the【▲】【▼】buttons to switch to overvoltage protection setting. Press the【OK】button to select the value, use the【▲】【▼】buttons to change the value, press the【OK】button to switch the digit, and switch from the smallest digit to the highest digit. Press the【OK】button again when in the highest digit to confirm the set overvoltage protection value.

If the value is 000.00V, the protection function is not activated. If the value is greater than 000.00V, the protection function will be activated. If the current voltage is greater than the set overvoltage protection value, the screen will display OVP in the upper left corner, indicating that the protection function is activated.

The protection function requires the purchase of a relay. If there is no relay, do not set the value. Install the relay in the circuit to disconnect the circuit and activate the protection function.

18).Undervoltage protection: 0.00-120.00V

In the system setting interface, press the【▲】【▼】buttons to switch to undervoltage protection setting. Press the【OK】button to select the value, use the【▲】【▼】buttons to change the value, press the【OK】button to switch the digit, and switch from the smallest digit to the highest digit. Press the【OK】button again when in the highest digit to confirm the set undervoltage protection value.

If the value is 000.00V, the protection function is not activated. If the value is

greater than 000.00V, the protection function will be activated. If the current voltage is less than the set undervoltage protection value, the screen will display LVP in the upper left corner, indicating that the protection function is activated.

The protection function requires the purchase of a relay. If there is no relay, do not set the value. Install the relay in the circuit to disconnect the circuit and activate the protection function.

19). Charging overcurrent protection: 0-100A/400A/600A (depending on the machine model)

In the system setting interface, press the【▲】【▼】buttons to switch to charging overcurrent protection setting. Press the【OK】button to select the value, use the【▲】【▼】buttons to change the value, press the【OK】button to switch the digit, and switch from the smallest digit to the highest digit. Press the【OK】button again when in the highest digit to confirm the set charging overcurrent protection value.

If the value is 000.00A, the protection function is not activated. If the value is greater than 000.00A, the protection function will be activated. If the current charging current is greater than the set charging overcurrent protection value, the screen will display NCP in the upper left corner, indicating that the protection function is activated.

The protection function requires the purchase of a relay. If there is no relay, do not set the value. Install the relay in the circuit to disconnect the circuit and activate the protection function.

20). Discharge overcurrent protection: 0-100A/400A/600A (depending on the machine model)

In the system settings interface, press the【▲】【▼】buttons to switch to the discharge overcurrent protection setting. Short press the【OK】button to select the value. Press the【▲】【▼】buttons to change the value, and press the【OK】button to switch the digit from the smallest to the highest. When the highest digit is reached, press the【OK】button again to confirm the discharging overcurrent protection setting.

If the value is 000.00A, the protection function is not activated. If the value is greater than 000.00A, the protection function is activated. If the current discharge current is greater than the set discharge overcurrent protection value, OCP will be displayed in the upper left corner of the screen, indicating that the protection is active.

The protection function requires the purchase of an additional relay. If no relay is installed, do not set this value. Install the relay in the circuit to enable the protection function and cut off the circuit when necessary.

21). Power protection: 0-12000.00W/48000.00W/72000.00W (depending on the machine model)

In the system settings interface, press the【▲】【▼】buttons to switch to the

power protection setting. Short press the【OK】button to select the value. Press the【▲】【▼】buttons to change the value, and press the【OK】button to switch the digit from the smallest to the highest. When the highest digit is reached, press the【OK】button again to confirm the power protection setting. If the value is 00000.00W, the protection function is not activated. If the value is greater than 00000.00W, the protection function is activated. If the current power is greater than the set power protection value, OPP will be displayed in the upper left corner of the screen, indicating that the protection is active.
The protection function requires the purchase of an additional relay. If no relay is installed, do not set this value. Install the relay in the circuit to enable the protection function and cut off the circuit when necessary.

22).Over temperature protection: -20-120□/-4-248□
In the system settings interface, press the【▲】【▼】buttons to switch to the over temperature protection setting. Short press the【OK】button to select the value. Press the【▲】【▼】buttons to change the value, and press the【OK】button again to confirm the over temperature protection setting.
If the value is ---□, the protection function is not activated. If the current ambient temperature exceeds the set over temperature protection value, OTP will be displayed in the upper left corner of the screen, indicating that the protection is active. **The protection function requires the purchase of an additional relay. If no relay is installed, do not set this value. Install the relay in the circuit to enable the protection function and cut off the circuit when necessary.**

23).Low temperature protection: -20-120□/-4-248□
In the system settings interface, press the【▲】【▼】buttons to switch to the low temperature protection setting. Press the【OK】button briefly to select the value, then press the【▲】【▼】buttons to change the value. Press the【OK】button again to confirm the low temperature protection setting.
If the value is set to ---□, the protection function is not enabled. If the current ambient temperature exceeds the set low temperature protection value, the screen will display LTP in the upper left corner, indicating that the device is in protection mode.
The protection function requires the purchase of a relay separately. If the relay is not equipped, do not set this value, and install the relay in the circuit before the protection function can be used to disconnect the circuit.

24).Recovery time: 0-99s
In the system setting interface, press the【▲】【▼】buttons to switch to the recovery time setting. Press the【OK】button briefly to select the value with the cursor. Use the【▲】【▼】buttons to change the value, then press the【OK】button again to confirm the recovery time setting.

When the value is set to 00s, the protection status will last until the【OK】button is pressed in the main interface to release the protection status. If the value is greater than 00s, for example, if the recovery time is set to 5s, it means that after the value returns to normal and lasts for 5s, the instrument will automatically cancel the protection status, close the circuit, and start working.

The protection function requires the purchase of a separate relay. If a relay is not equipped, do not set this value, and install a relay in the circuit before it can act as a protective device to disconnect the circuit.

(4). System Settings-Page 4:

Figure 3-1-4 System Settings - Page 4

25).Display Host Mode (Display Screen Communication)

In the system settings interface, press the【▲】【▼】keys to switch to the display host mode. Short press the【OK】key to select open or close with the cursor. Use the【▲】【▼】keys to switch, and press the【OK】key again to confirm whether to turn on or off the display screen communication. It is necessary to turn on the display screen communication function when using communication protocol communication. (After turning off the display screen communication function, the display module will not update data automatically.)

26).Factory Reset: Confirm

In the system settings interface, press the【▲】【▼】keys to switch to the factory reset. After a short press of the【OK】button, a pop-up window for restoring factory settings will appear. You can select to confirm or cancel the factory reset with the【▲】【▼】keys. When "Confirm" is selected with the cursor, press the【OK】key. If the display shows "Success", the factory reset is

completed.

2.Wiring method

Wiring method instructional video:

(1). Self-powered wiring method

If the voltage range of the battery being tested is between 10-120V during normal operation, the self-powered wiring method can be used. First, switch the power selection interface to "2W". Then, when wiring, connect the positive pole of the battery to the "Vsns" port of the power supply interface using a wire that doesn't have to be particularly thick, 13-16AWG wires are all acceptable. Pay attention not to connect the positive and negative poles of the battery incorrectly.

Connect the negative pole of the battery to the screw with the "BATT-" mark on the sampler, and connect the negative pole of the charger and the negative pole of the load to the screw with the "LOAD-" mark on the sampler. It is better to use copper nose for wiring as it is more secure. During charging, the direction of the current symbol is green and shows "charging", while the remaining capacity value increases. During discharge, the direction of the current symbol is light blue and shows "discharging", while the remaining capacity value decreases.

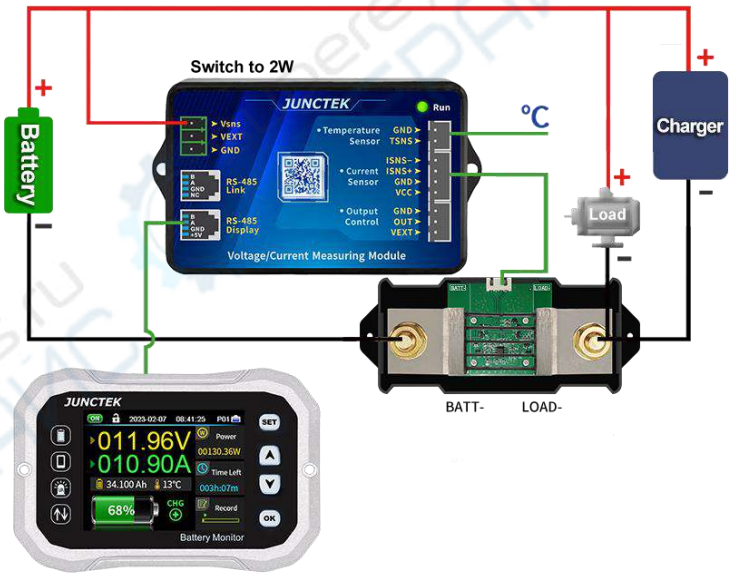


Figure3-2-1 Self-powered wiring method
(wiring method for KH140F as a example)

(2). External Power Supply Connection Method

The voltage range for external power supply measurement is 0-120V. First, turn the power supply selection interface switch to "3W", connect the positive pole of the external power supply to the "VEXT" interface of the power supply, and connect the negative pole of the external power supply to the "GND" interface. Then, connect the positive pole of the battery to the measurement module "Vsns" of the power supply. It is important to ensure that the positive

and negative poles of the external power supply are not connected incorrectly. The negative pole of the battery is connected to the screw on the sampler marked with the "BATT-" symbol, and the negative pole of the charger and the negative pole of the load are connected to the screw on the sampler marked with the "LOAD-" symbol. It is best to use a copper nose for the connection to ensure stability. During charging, the direction of the current symbol is green and shows charging, and the remaining capacity value increases. During discharging, the direction of the current symbol is sky blue and shows discharging, and the remaining capacity value decreases.

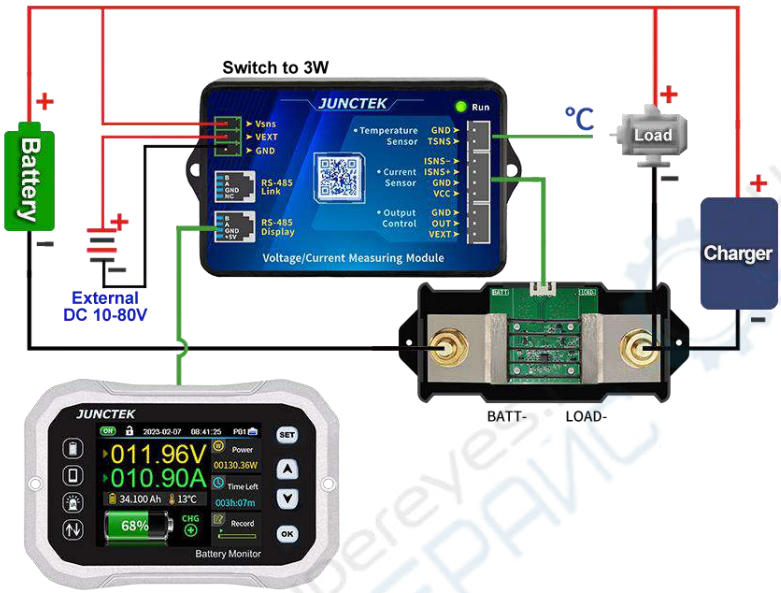


Figure3-2-2 External Power Supply Connection Method
(wiring method for KH140F as a example)

(3). External Power Relay Wiring Method

The relay's working power is provided by an external power supply. If you want to connect a relay, you need to provide an external power supply that has the same voltage as the relay's working voltage. Connect the relay's control ports to the "OUT" and "VEXT" of the Output Control of the measurement module respectively. Connect the positive pole of the external power supply to "VEXT" of the output control, and the negative pole to "GND". Be careful not to connect the positive and negative poles of the battery and the external power supply incorrectly or in reverse.

if you want to control charging or discharging, please refer to the external power relay wiring diagram in Figure 3-2-3 for wiring. When the relay is activated, the indicator light will turn on, and it will turn off when it is released, as a reminder. Connect the negative pole of the battery to the screw with the "BATT-" mark on the sampler. Connect the negative pole of the charger and the negative pole of the load to the screw with the "LOAD-" mark on the sampler. It is better to use a copper nose for wiring. During charging, the direction of the current symbol is green and shows charging, and the remaining capacity value increases. During discharging, the direction of the current symbol is sky blue and shows discharging, and the remaining capacity value decreases.

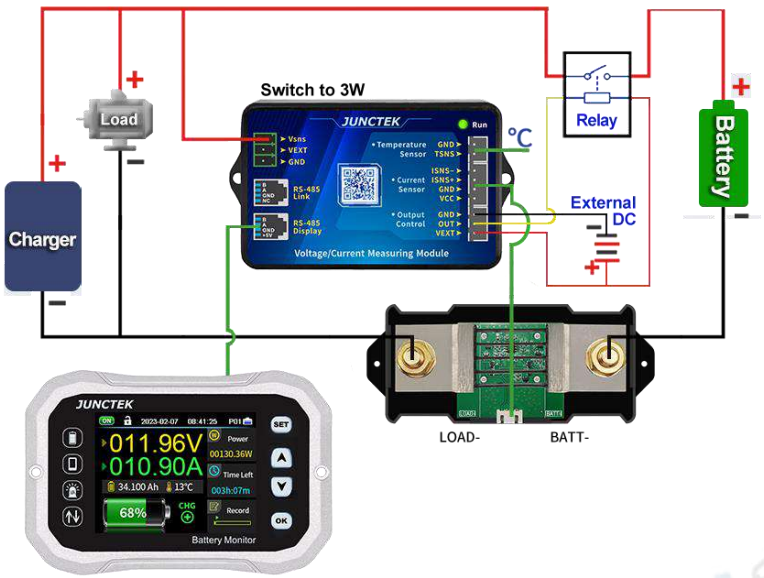


Figure 3-2-3 External Power Relay Wiring Method
(wiring method for KH140F as a example)

3.Communication Protocol Control

We only provide communication protocol, and users can perform secondary development based on the communication protocol.

(1). Overview

The control instructions are generally in the form of command lines, and the communication rate is 115200. Commands are sent from the PC, parsed and executed by the local machine, and the results are returned to the PC. The following explains different commands.

The data transmission format is as follows:

Start code	Function code	Function number	Link symbol	Address symbol
:	W,R	00~99	=	1-99

Delimiter	Checksum	Delimiter	Numeric field	Delimiter	End symbol
,	1-255	,	see instructions	,	<CR><LF>

Instructions:

1). Function code: "W" is a write instruction used to set various parameters, "R" is a read instruction used to return parameters in the machine.
2). Function number: different values represent different parameter settings.
3). Address symbol: The address range is 1-99, and 0 is the broadcast address.
4). Checksum: The value of the checksum is obtained by adding up all the numbers behind the checksum and taking the remainder when divided by 255, then adding 1. If the checksum is 0, it means no checksum is performed.
5). Numeric field: The numeric field is equivalent to the operand of the command. For example, in the command W20=1,216,2000, the operand is 2000, which represents setting the overvoltage protection to 20.00V.
6). End symbol: Each command is terminated by a carriage return and line feed, <CR> represents the carriage return in the ASCII character table (hexadecimal representation is 0x0d). <LF> is the line feed in the ASCII character table (hexadecimal representation is 0x0a). Both represent the carriage return and line feed.

(2). W command

Function Code	Set	Command Sent	Description
01	Address Setting	:W01=1,3,2,	Set communication address to 2 (Use with caution. You must know the current communication address and the address you want to set to. It is recommended to use a phone to modify.)
10	Output On	:W10=1,2,1, :W10=1,0,0,	Turn on output status and data recording.

			Turn off output status and data recording.
11	Date Setting	:W11=1,0,23,2,7,	Set the date to February 7, 2023.
12	Time Setting	:W12=1,0,10,15,0,	Set the time to 10:15:00.
13	Temperature Unit Setting	:W13=1,0,1,	Last digit 1: □, 0: □
14	Data Recording Switch	:W14=1,0,1,	Last digit 0: on, 1: off
15	Full Battery Voltage Setting	:W15=1,0,1000,	Set full charge voltage to 10.00V
16	Low Battery Voltage Setting	:W16=1,0,300,	Set low battery voltage to 3.00V
17	Trickle Charge Current	:W17=1,0,25,	Trickle charge current 25%
18	Detection Time	:W18=1,0,32,	Set detection time to 3.2 minutes
19	Low Temperature Protection	:W19=1,0,90,	Set low temperature protection to -10□
20	Overvoltage Protection Setting	:W20=1,216,2000,	Set overvoltage protection value to 20.00V
21	Undervoltage Protection Setting	:W21=1,216,2000,	Set undervoltage protection value to 20.00V
22	Positive Overcurrent Protection Setting	:W22=1,216,2000,	Set positive overcurrent protection value to 20A
23	Negative Overcurrent Protection Setting	:W23=1,216,2000,	Set negative overcurrent protection value to -20A
24	Overpower Protection Setting	:W24=1,216,2000,	Set over power protection value to 20W
25	Over-temperature Protection Setting	:W25=1,151,150, :W25=1,211,210,	Set over temperature protection value to 50□ Set over temperature protection value to 110□
26	Protection Recovery Time Setting	:W26=1,31,30,	Set protection recovery time to 30s
27	Delay Time Setting	:W27=1,31,30,	Set delay time to 30s
28	Battery Capacity Setting	:W28=1,216,2000,	Set battery capacity to 200.0Ah
29	Voltage Calibration Setting	:W29=1,121,120, :W29=1,81,80,	Set voltage calibration to 20, increase voltage fine-tuning. Set voltage calibration to -20, decrease voltage

			fine-tuning. (The value only represents the fine-tuning factor. The larger the absolute value of the value, the greater the amplitude of the fine-tuning.)
30	Current Calibration Setting	:W30=1,121,120, :W30=1,81,80,	Set current calibration to 20, increase current fine-tuning. Set current calibration to -20, decrease current fine-tuning. （ (The value only represents the fine-tuning factor. The larger the absolute value of the value, the greater the amplitude of the fine-tuning.)
31	Temperature Calibration Setting	:W31=1,104,103, :W31=1,99,98,	Set temperature calibration to Fahrenheit ±5□.
32	Time Adjustment	:W32=1,99,98,	Set the time to be a bit slower, 100 is original (TBD).
33	Function Reserved	TBD	TBD
34	Relay Type Setting	:W34=1,2,1, :W34=1,0,0,	Set the relay type to normally closed. Set the relay type to normally open.
35	Factory Reset	:W35=1,2,1,	Perform a factory reset.
36	Current Multiple Setting	:W36=1,4,3,	Set current multiplier to 3 (Only valid for Hall version).
37	Bluetooth Password Setting	:W37=1,0,1234,	Set Bluetooth password to 1234.
60	Setting Battery Remaining Capacity Percentage	:W60=1,51,50,	Set battery remaining capacity percentage to 50%.
61	Current Zeroing	:W61=1,2,1,	Perform current zeroing.
62	Clear Cumulative Data and Set Record Interval	:W62=1,0,1,	Perform cumulative data clearing and set recording interval to 2 seconds/time.

(3). R 指令 R command

The R command is a read command, and its command format is basically the same as the write command format, which is not repeated here. The following are example data returned by the machine.

Read	sends command	machine returns data	Read Description
Read basic information of the machine	:R00=1,2,1,	:r00=1,177,4140,116,0,	1 represents the communication address; 177 represents the checksum; The first 4 in 4140 represents the KH series, 1 represents 120V, and 40 represents 400A; 116 represents version 1.16; 0 represents the machine serial number.
Read all measurement values	:R50=1,2,1,	:r50=1,123,1198,1090,7421,2749,437,298,113,0,0,1,69,100,230208,112418,	1 represents the communication address; 123 represents the checksum; 1198 represents the voltage at 11.98V; 1090 represents the current at 10.90A; 7421 represents the remaining battery capacity at 7.421Ah; 2749 represents the discharge electricity consumption at 2.749KWh; 437 represents the charging electricity consumption at 0.437KWh; 298 represents the operational record value at 298; 113 represents the environmental temperature at 13□; 0 represents a function to be determined; 0 represents the output status as ON; (0-ON, 1-OVP, 2-OCP, 3-LVP, 4-NCP, 5-OPP, 6-OTP, 99-OFF) 1 represents the current direction, currently charging current; (0-discharge, 1-charging) 69 represents the remaining time at 69 minutes; 100 represents the time adjustment (to be determined);

			230208 represents the date as February 8th, 2023; 12418 represents the time as 11:24:18.
Read all setting values	:R51=1,2,1,	:r51=1,69,2000,1000,2000,3000,20000,120,5,3,200,120,90,101,0,0,1,100,0,10000,1000,20,20,80,0,4321,2,	1 represents communication address; 69 represents checksum; 2000 represents overvoltage protection set to 20.00V; 1000 represents undervoltage protection set to 10.00V; 2000 represents over-discharge current protection set to 20.00A; 3000 represents over-charge current protection set to 30.00A; 20000 represents over-power protection set to 200.00W; 120 represents over-temperature protection set to 20□; 5 represents protection recovery time set to 5s; 3 represents protection delay time set to 3s; 200 represents preset battery capacity set to 20.0Ah; 120 represents voltage calibration fine-tuning with 20 tuning factors; (100 represents tuning factor 0) 90 represents current calibration fine-tuning with -10 tuning factors; (100 represents tuning factor 0) 101 represents temperature calibration increase by 1□; (100 represents tuning factor 0) 0 represents undefined function; 0 represents normally open relay type; (0-normally open relay, 1-normally closed relay) 1 represents current multiplier set to 1; (only applicable to Hall version) 100 represents time fine-tuning function (undefined); 0 represents data logging enabled; 10000 represents full charge voltage set to 100.00V; 1000 represents low battery voltage set to 10.00V; 20 represents full charge current value set to 20%; 20 represents monitoring time set to

			2.0min; 80 represents low temperature protection set to -20□; 0 represents current temperature unit in Celsius; (1 represents Fahrenheit) 4321 represents Bluetooth password set to 4321; 2 represents data logging with data interval of 3 seconds per record;

4.Mobile Control

(1). Android Phone APP User Manual
Installation and operation video of the Android phone APP:

1). APP Download
Server download link:

http://68.168.132.244/KH/KH-F.apk

If you don't know how to download or can't download it, you can ask customer service personnel for the software.

2). Mobile App Software Installation
This software is only compatible with Android 5.0 and above systems. During the installation process, it will request location services, please agree and turn on location services. This manual corresponds to software version 1.1.4 and firmware version 1.20, different versions may be slightly different, it is recommended to upgrade to the latest software for a better user experience. The installation steps are shown in Figures 3-4-1 to 3-4-3.

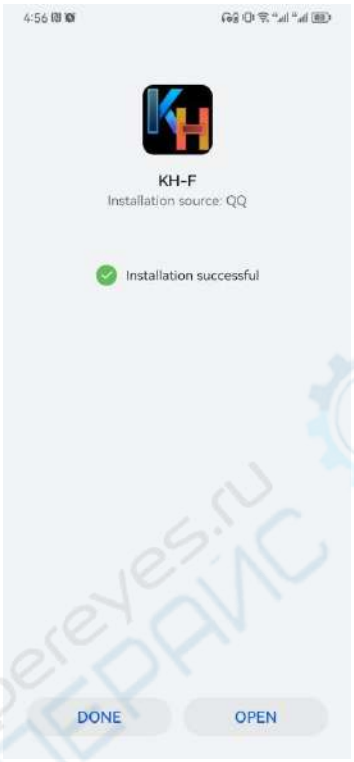


Figure 3-4-1 Installation step 1

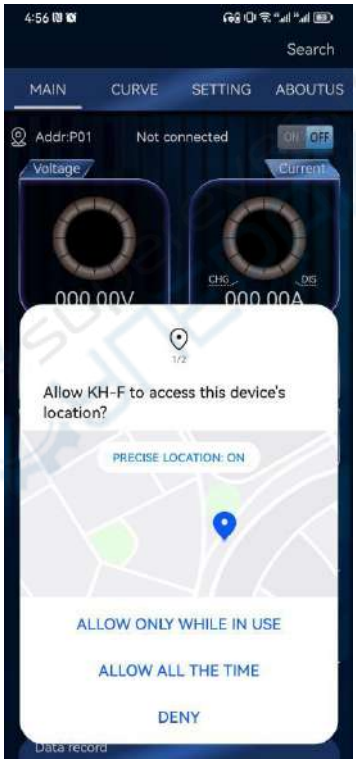


Figure 3-4-2 Installation step 2

Figure 3-4-3 Installation step 3

3). Software Update
Click the APP icon, and after the APP starts, the system will automatically check in the background for updates to the APP version. If there is a new version, a pop-up window will remind you to update.

4). APP interface display

Figure 3-4-4 Main interface

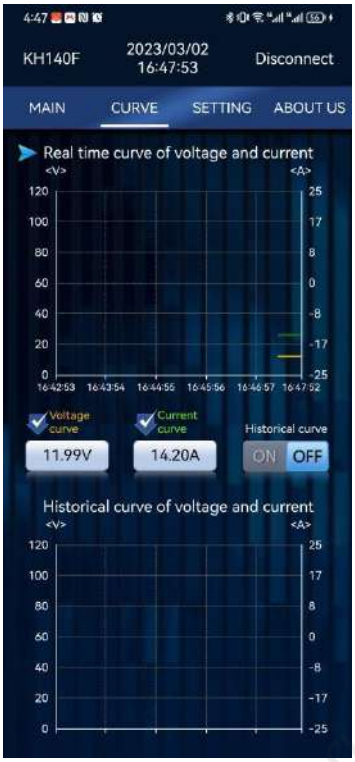


Figure 3-4-5 line curve

Figure 3-4-6 System Settings - Basic Settings

Figure 3-4-7 System Settings - Protection Settings

Figure 3-4-8 System Settings - Advanced Settings

Figure 3-4-9 About us

5). APP Operation Instructions

➢ Connection

Open the APP on the homepage and click the search icon in the upper right corner to search for the corresponding Bluetooth device. After selecting the corresponding Bluetooth device, the interface will display "Connected," and the search icon in the upper right corner will change to "Disconnect," with the machine model displayed, indicating that the connection has been completed. Refer to Figures 3-4-10, 3-4-11, and 3-4-12.

Figure 3-4-10 Online 01

Figure 3-4-12 Online 02

Figure 3-4-13 Online 03

➢ Main Screen Operations

Output Status Control Switch: Click to control the output status. Different statuses will be displayed under different protection conditions, as shown in Figure 3-4-13 when the output status is closed and Figure 3-4-14 in overvoltage protection status.

Voltage Adjustment: Click on the voltage value and the 'Input Voltage Calibration' dialog box will appear, allowing for fine tuning by entering the corresponding value, as shown in Figure 3-4-15.

Current Adjustment: Click on the current value and the 'Input Current Calibration' dialog box will appear, allowing for fine tuning by entering the corresponding value, as shown in Figure 3-4-16.

Voltage Range: Click on the voltage scale, and the 'Input Voltage Range' dialog box will appear, allowing for adjustment of the voltage gauge scale by entering the corresponding value, as shown in Figure 3-4-17.

Maximum Current Scale: Click on the current scale, and the 'Input Maximum Current Value' dialog box will appear, allowing for adjustment of the maximum scale value of the current gauge by entering the corresponding value, as

shown in Figure 3-4-18.

Data Reset: Click on the data reset button, and the 'Accumulated Data Reset' dialog box will appear, allowing for setting of the data recording time interval, and clearing of historical data when confirmed, as shown in Figure 3-4-19.

Remaining Capacity Percentage: Click on the battery icon, and the 'Input Remaining Capacity Percentage' dialog box will appear, allowing for adjustment of the corresponding value by clicking the confirm button, as shown in Figure 3-4-20.

Battery Capacity Setting: Click on the setting button to the right of the effective battery capacity, and the 'Input Battery Effective Capacity' dialog box will appear, allowing for adjustment of the corresponding value by clicking the confirm button, as shown in Figure 3-4-21.

Environmental Temperature: Click on the environmental temperature icon, and the 'External Temperature Calibration' dialog box will appear, allowing for input of the correct value and completion of the modification by clicking the confirm button, as shown in Figure 3-4-22.

Environmental Temperature Unit Switching: Click on the temperature value, and the 'Temperature Unit' dialog box will appear, allowing for selection of Celsius or Fahrenheit units, with Celsius being the default setting, as shown in Figure 3-4-23.

Data Record: Click on the data record button, and the 'Data Record' dialog box will appear, allowing for selection of turning on or off the function, as shown in Figure 3-4-24.

Figure 3-4-13 Output status off

Figure 3-4-14 Overvoltage protection status

Figure 3-4-15 Voltage Calibration

Figure 3-4-16 Current Calibration

Figure 3-4-17 Voltage scale range

Figure 3-4-18 Maximum current value

Figure 3-4-19 Data clearing

Figure 3-4-20 Percentage of remaining capacity

Figure 3-4-21 Preset battery capacity

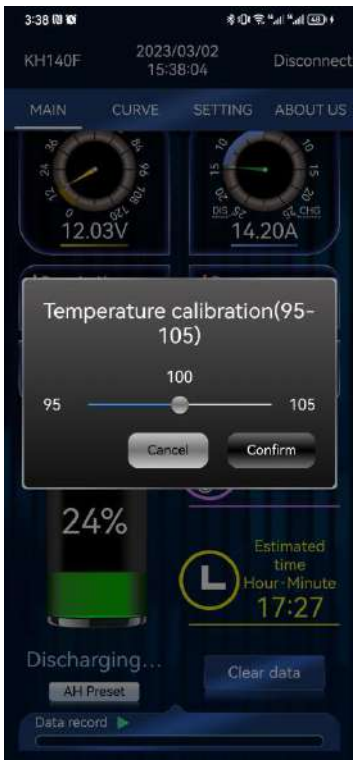


Figure 3-4-22 Ambient temperature

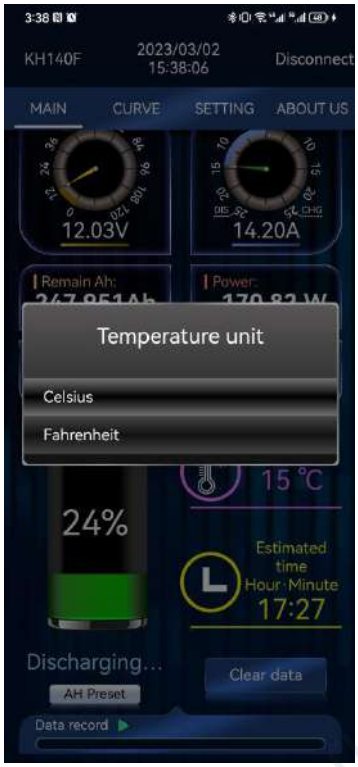


Figure 3-4-23 Temperature unit

Figure 3-4-24 Data record

➢ Curve chart interface operation

Real-time Voltage and Current Curve: When the blue arrow icon appears before the text of real-time voltage and current curve, it means that the voltage and current curve is selected. By clicking on the values displayed for voltage or current, the real-time voltage or current curve can be displayed separately. The display of the voltage and current curve is linked to the data recording switch. It will only be displayed when the data record switch is turned on. See Figure 3-4-25 for an example of the real-time voltage and current curve.

Historical Voltage and Current Curve: Click the "History: OFF" button, and a pop-up window will pop up "Prompt: Data recording will be temporarily suspended when acquiring historical curves." After selecting the OK button,The blue arrow icon will appear before the text of historical voltage and current curve, and the button will change to "History: ON". By clicking on the values displayed for voltage or current, the historical voltage or current curve can be displayed separately. In the historical voltage and current curve chart, you can click on the left and right arrows to view the voltage and current curve at different historical times. See Figure 3-4-26 Temporarily suspend data recording,Figure 3-4-27 for an example of the historical voltage and current curve.

Exporting Curves: The export curve button will appear when viewing the historical voltage and current curve. Clicking it will generate an EXCEL file that shows the voltage and current values for specific historical times. See Figure 3-4-28 for an example of exporting curves.

Customized Curve Export: The export curve button will appear when viewing the historical voltage and current curve. Click it and select the time range for exporting the curve. After confirming the selection, the export progress will be displayed on the screen. When the progress bar is full, it means the curve data export is successful. Note: Do not close the KH application during the curve export process. The time range for exporting curves is up to 12 hours, and the longer the time range, the longer the export time. Please be patient while exporting curves. See Figure 3-4-29 for an example of selecting the time range, and Figure 3-4-30 for an example of exporting curves.

Customized Curve Viewing: The view curve button will appear when viewing the historical voltage and current curve. Click it and select the time range for viewing the curve. After confirming the selection, the progress of the view curve process will be displayed on the screen. When the progress bar is full, the screen will switch to the landscape mode. In this mode, the voltage and current trend for the selected time period can be viewed. Clicking on the curve makes it easier to view the voltage and current values at a specific time point. Note: Do not close the KH application during the curve viewing process. The time range for viewing curves is up to 12 hours, and the longer the time range, the longer the viewing time. Please be patient while viewing curves. See Figure 2-5-31 for an example of selecting the time range, and Figure 2-5-32 for an example of viewing curves.

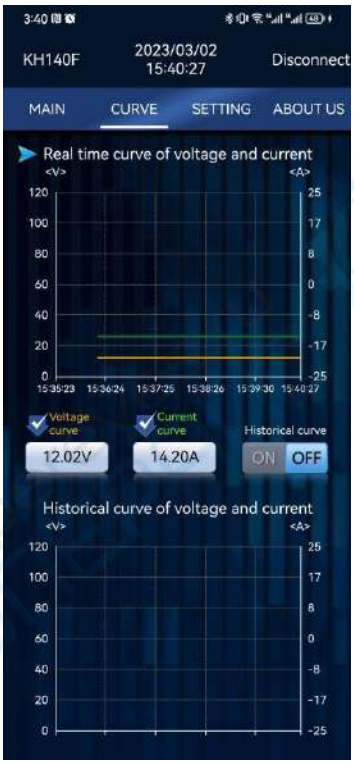


Figure 3-4-25 Voltage and current real-time curve

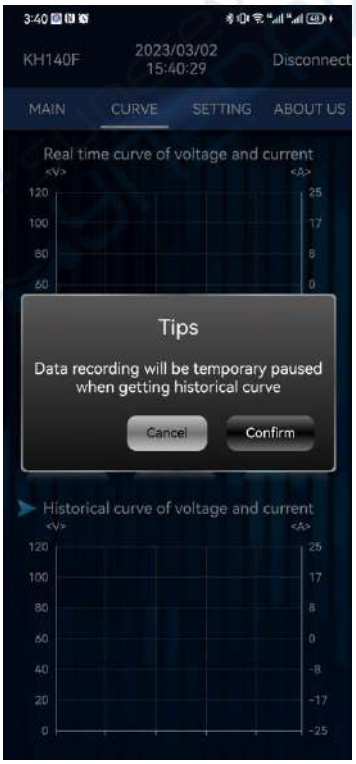


Figure 3-4-26 Temporarily suspend data recording

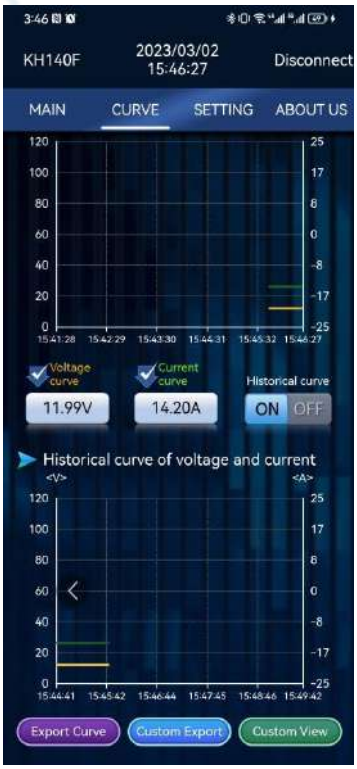


Figure 3-4-27 Voltage and current history curve

VAG

Index	Time	Voltage	Current
2100	2023/03/02 15:44:41	11.99V	-14.10A
2101	2023/03/02 15:44:42	11.99V	-14.20A
2102	2023/03/02 15:44:43	11.99V	-14.20A
2103	2023/03/02 15:44:44	11.99V	-14.20A
2104	2023/03/02 15:44:45	11.99V	-14.20A
2105	2023/03/02 15:44:46	11.99V	-14.20A
2106	2023/03/02 15:44:47	11.99V	-14.20A
2107	2023/03/02 15:44:48	11.99V	-14.20A
2108	2023/03/02 15:44:49	11.99V	-14.20A
2109	2023/03/02 15:44:50	11.99V	-14.20A
2110	2023/03/02 15:44:51	11.99V	-14.20A
2111	2023/03/02 15:44:52	11.99V	-14.20A
2112	2023/03/02 15:44:53	11.99V	-14.20A
2113	2023/03/02 15:44:54	11.99V	-14.20A
2114	2023/03/02 15:44:55	11.99V	-14.20A
2115	2023/03/02 15:44:56	11.99V	-14.20A
2116	2023/03/02 15:44:57	11.99V	-14.20A
2117	2023/03/02 15:44:58	11.99V	-14.20A
2118	2023/03/02 15:44:59	11.99V	-14.20A
2119	2023/03/02 15:45:00	11.99V	-14.20A
2120	2023/03/02 15:45:01	11.99V	-14.20A
2121	2023/03/02 1	11.99V	-14.20A

Figure 3-4-28 Export curve

Figure 3-4-29 Select time range

VAG

Index	Time	Voltage	Current
2	2023/03/02 15:09:33	12.03V	-14.20A
3	2023/03/02 15:09:34	12.03V	-14.20A
4	2023/03/02 15:09:35	12.03V	-14.20A
5	2023/03/02 15:09:36	12.03V	-14.20A
6	2023/03/02 15:09:37	12.03V	-14.20A
7	2023/03/02 15:09:38	12.03V	-14.20A
8	2023/03/02 15:09:39	12.03V	-14.20A
9	2023/03/02 15:09:40	12.03V	-14.20A
10	2023/03/02 15:09:41	12.03V	-14.20A
11	2023/03/02 15:09:42	12.03V	-14.20A
12	2023/03/02 15:09:43	12.03V	-14.20A
13	2023/03/02 15:09:44	12.03V	-14.20A
14	2023/03/02 15:09:45	12.03V	-14.20A
15	2023/03/02 15:09:46	12.03V	-14.20A
16	2023/03/02 15:09:47	12.03V	-14.20A
17	2023/03/02 15:09:48	12.03V	-14.20A
18	2023/03/02 15:09:49	12.03V	-14.20A
19	2023/03/02 15:09:50	12.03V	-14.20A
20	2023/03/02 15:09:51	12.03V	-14.20A
21	2023/03/02 15:09:52	12.03V	-14.20A
22	2023/03/02 15:09:53	12.03V	-14.20A
23	2023/03/02 15:09:54	12.03V	-14.20A

Figure 3-4-30 Customized export curve

Figure 3-4-31 Select time range

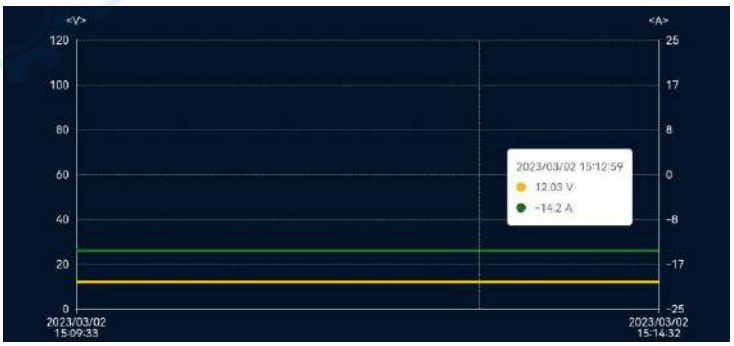


Figure 3-4-32 view curve

- System Settings Interface - Basic Settings

Temperature Unit: Click the temperature unit button, the 'Temperature Unit'

dialog box will pop up, and you can choose Celsius or Fahrenheit. As shown in Figure 3-4-33.

Battery Effective Capacity: Click the battery effective capacity button, the 'Input Battery Effective Capacity' dialog box will pop up, enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-34.

Current Capacity Percentage: Click the current capacity percentage button, the 'Input Current Capacity Percentage' dialog box will pop up, enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-35.

Data Record: Click the data record button, the 'Data Record' dialog box will pop up, and you can choose to turn it on or off, as shown in Figure 3-4-36.

Figure 3-4-33 Temperature unit

Figure 3-4-34 Preset effective capacity

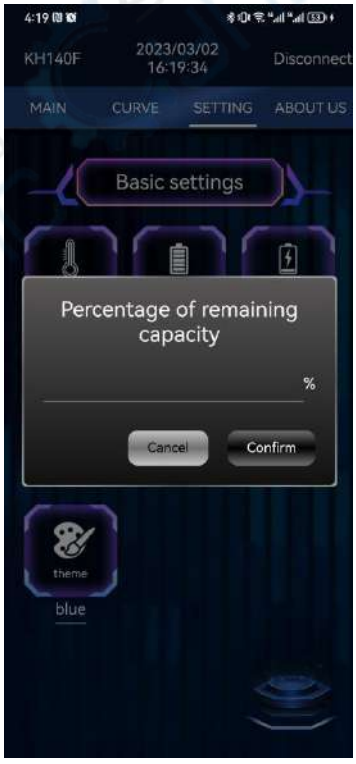


Figure 3-4-35 Current capacity percentage

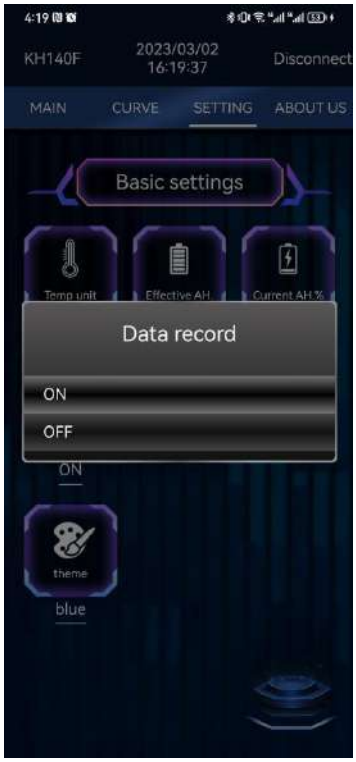


Figure 3-4-36 Data record

- System Settings Interface - Protection Functions

OVP overvoltage protection: Click the OVP overvoltage protection button, and the "Enter overvoltage protection" dialog box will pop up. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-37 below.

LVP undervoltage protection: Click the LVP undervoltage protection button, and the "Enter undervoltage protection" dialog box will pop up. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-38 below.

OCP overdischarge current protection: Click the OCP overdischarge current protection button, and the "Enter overdischarge current protection" dialog box will pop up. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-39 below.

NCP overcharge current protection: Click the NCP overcharge current protection button, and the "Enter overcharge current protection" dialog box will pop up. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-40 below.

OPP over power protection: Click the OPP over power protection button, and the "Enter over power protection" dialog box will pop up. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-41 below.

OTP Over temperature protection: Click the OTP over temperature protection button, and the "Enter Over temperature protection" dialog box will pop up. Enter the corresponding value and click OK to complete the modification. Entering "--□" means to turn off the over temperature protection, as shown in Figure 3-4-42 below.

LTP low temperature protection: Click the LTP low temperature protection button, and the "Enter low temperature protection" dialog box will pop up. Enter the corresponding value and click OK to complete the modification. Entering "--□" means to turn off the low temperature protection, as shown in Figure 3-4-43below.

Low capacity reminder: Click the low capacity reminder button, and the "Enter low capacity reminder" dialog box will pop up. Enter the corresponding capacity percentage and click OK to complete the modification. When the battery capacity percentage is lower than the set value, a low capacity reminder will be displayed in the mobile phone status bar when the KH-F mobile APP is connected to the instrument via Bluetooth, as shown in Figure 3-4-44 below.

Protection recovery time: Click the recovery time button, and the "Enter protection recovery time" dialog box will pop up. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-45 below.

Protection delay time: Click the protection delay time button, and the "Enter delay time" dialog box will pop up. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-46 below.

Relay mode: Click the relay type button, and the "Relay mode normally open or normally closed option" dialog box will pop up. Select the actual corresponding relay mode, as shown in Figure 3-4-47 below.

Figure 3-4-37 OVP overvoltage protection

Figure 3-4-38 LVP undervoltage protection

Figure 3-4-39 OCP discharge overcurrent protection

Figure 3-4-40 NCP charging overcurrent protection

Figure 3-4-41 OPP overpower protection

Figure 3-4-42 OTP over temperature protection

Figure 3-4-43 LTP low temperature protection

Figure 3-4-44 Low capacity reminder

Figure 3-4-45 Protection recovery time

Figure 3-4-46 Protection delay time

Figure 3-4-47 Relay mode

- System settings interface - Extended settings

Full charge voltage: Click on the full charge voltage button, a dialog box labeled "Enter full charge voltage (0-120V)" will appear. Enter the

corresponding value and click OK to complete the modification, as shown in Figure 3-4-48.

Full charge current: Click on the full charge current button, a dialog box labeled "Enter full charge current (0-20%)" will appear. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-49.

Discharge voltage: Click on the discharge voltage button, a dialog box labeled "Enter discharge voltage (0-120V)" will appear. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-50.

Detection time: Click on the detection time button, a dialog box labeled "Enter detection time (0-20min)" will appear. Enter the corresponding value and click OK to complete the modification, as shown in Figure 3-4-51.

Full charge voltage, discharge voltage, full charge current, and detection time instructions:
For example, for a 12V 400Ah lead-acid battery, setting the full charge voltage to 14.4V and the full charge current to 2% indicates that the full charge current is 400*0.02=8A, and setting the detection time to 2 minutes means that when the voltage is higher than 14.4V, the charging current is lower than 8A, and the duration is more than 2 minutes during the charging process, the remaining capacity percentage will automatically adjust to 100%.
Setting the discharge voltage to 10.5V and the detection time to 2 minutes means that when the voltage is lower than 10.5V and the duration is more than 2 minutes during the discharge process, the remaining capacity percentage will automatically adjust to 0% (if you feel that the discharge voltage function is not very practical, you can skip setting the discharge voltage and only set the full charge voltage, full charge current, and detection time).

Set Address: Click the 'Set Address' button, and the 'Set Address' dialog box will pop up. Enter the corresponding address and click 'OK' to complete the modification of the measurement module address, as shown in Figure 3-4-52.

Zero Current Memory: Click the 'Zero Current Memory' button, and the 'Zero Current Memory' dialog box will pop up. You can store the state when the current is zero at the zero point. This is shown in Figure 3-4-53.

Restart Machine: Click the 'Restart Machine' button, and the 'Restart Machine' dialog box will pop up. Select 'OK' to restart the instrument, as shown in Figure 3-4-54.

Restore Factory Settings: Click the 'Restore Factory Settings' button, and the 'Restore Factory Settings' dialog box will pop up. Select 'OK' to restore the instrument to its factory settings, as shown in Figure 3-4-55.

Firmware Upgrade: Click 'Firmware Upgrade', and the 'Enter After-Sales Code' dialog box will pop up. Enter '8 6 1 0' and click 'OK' to enter the firmware upgrade interface. Click 'Firmware Upgrade' again, and the 'Enter Firmware Code' dialog box will pop up. Enter the firmware code '0 0 0' and click 'OK'. The

instrument will start firmware upgrading, and the measurement module indicator light will flash quickly, indicating that the firmware upgrade is in progress. Please be patient and do not operate the instrument during the upgrade process. After the upgrade is completed, 'Upgrade Successful' will be displayed. The firmware upgrade order is shown in Figure 3-4-56 Firmware Upgrade 01, Figure 3-4-57 Firmware Upgrade 02, Figure 3-4-58 Firmware Upgrade 03, Figure 3-4-59 Firmware Upgrade 04, and Figure 3-4-60 Firmware Upgrade 05. Note: Please make sure to see the firmware upgrade success message before exiting the firmware upgrade process.

Figure 3-4-48 Full charge voltage

Figure 3-4-49 Discharge voltage

Figure 3-4-50 Full charge current

Figure 3-4-51 Detection time

Figure 3-4-52 Set address

Figure 3-4-53 Zero current memory

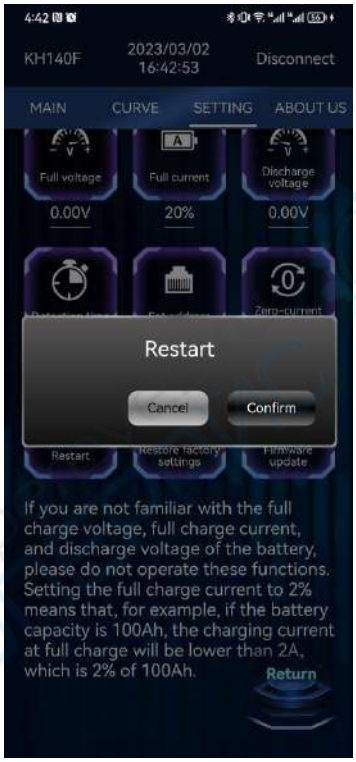


Figure 3-4-54 Restart the machine

Figure 3-4-55 Restore Factory Settings

Figure 3-4-56 Firmware upgrade 01

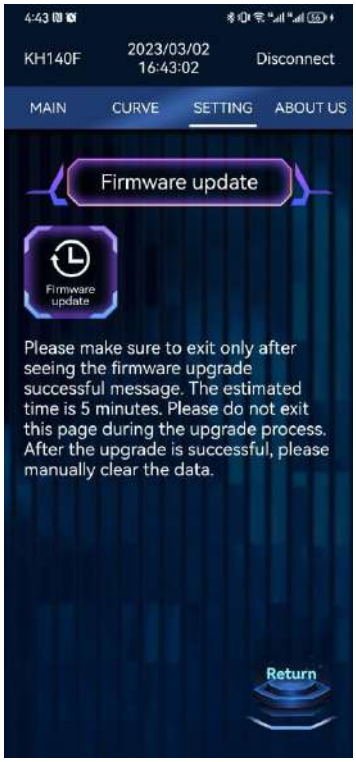


Figure 3-4-57 Firmware upgrade 02

Figure 3-4-58 Firmware upgrade 03

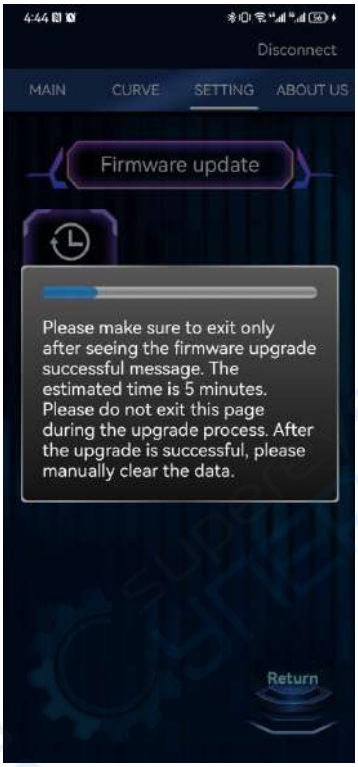


Figure 3-4-59 Firmware upgrade 04

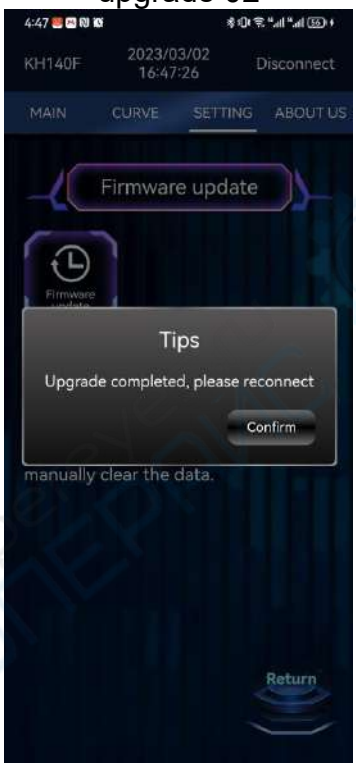


Figure 3-4-60 Firmware upgrade 05

➢ Mobile APP theme

Theme: Click the theme button to pop up the "Theme" pop-up box, you can choose blue or yellow. As shown in Figure 3-4-61 Main Interface, Figure 3-4-62 Curve Chart, Figure 3-4-63 System Settings - Basic Settings, Figure 3-4-64

System Settings - Protection Function, Figure 3-4-65 System Settings - extended functions, Figure 3-4-66 about us.

Figure 3-4-61 Main interface

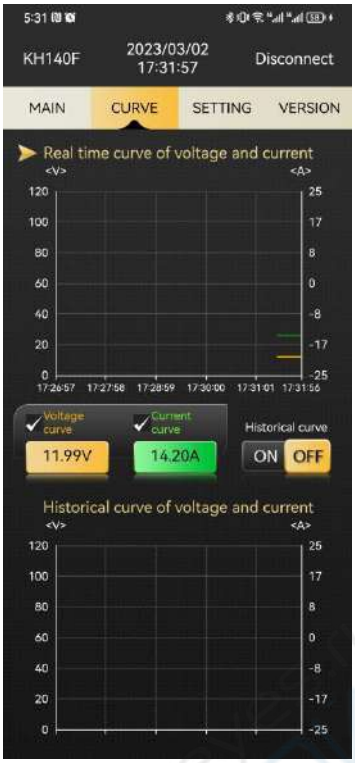


Figure 3-4-62 line graph

Figure 3-4-63 System Settings - Basic Settings

Figure 3-4-64 System Settings - Protection Function

Figure 3-4-65 System Settings - Extended Functions

Figure 3-4-66 About us

➢ About Us Interface Operations

Version: You can view the software version information, as shown in the figure 3-4-67 below.

Official Website: Clicking on the official website can redirect to our company's official website, as shown in figure 3-4-68 below.

Figure 3-4-67 Version

Figure 3-4-68 Official Website

(2). Instructions for using the IOS app

1). Downloading the app

Search for "KH-F Series" in the Apple Store to download or copy the link to your browser: https://apps.apple.com/cn/app/kh-f/id1665076881

2). Mobile App Software Installation

The software only supports IOS 9.0 or above. The first time the software links to Bluetooth, it will access Bluetooth, please agree to access. This manual corresponds to software version 1.1.4 and firmware version 1.20. Different versions may differ slightly, so it is recommended to upgrade to the latest software for a better user experience.

3). Software update

You can obtain the latest software from the Apple Store. The IOS software version corresponding to this manual is 1.1.4.

4). Display of the app interface

Figure 3-4-69 Main interface

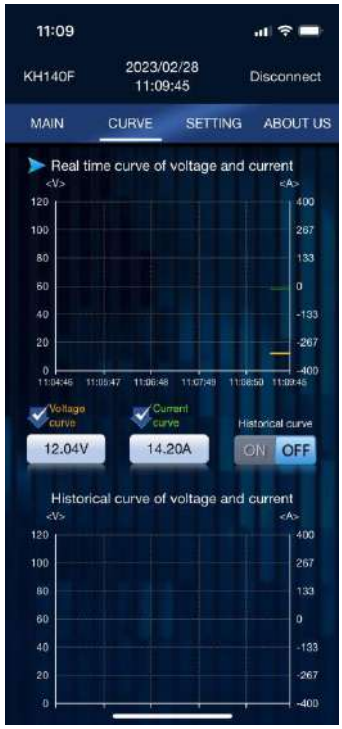


Figure 3-4-70 Line curve

Figure 3-4-71 System Settings - Basic Settings

Figure 3-4-72 System Settings - Protection Function

Figure 3-4-73 System Settings - Advanced Settings

Figure 3-4-74 About us

5). App Operation Instructions

The operation for Apple devices is the same as that for Android devices mentioned above.

Chapter 4 Troubleshooting

The following are possible malfunctions and troubleshooting methods that may occur during the use of the KH-F series. If you encounter any of these malfunctions, please follow the corresponding steps to troubleshoot. If you cannot resolve the issue, please contact JUNCTEK and provide your device information.

(1). If the screen remains black and there is no display after power-on:
1). Check if the power connection and the connection between the display module and the measurement module are properly connected.
2). After checking the above, restart the meter.
3). If the product still cannot be used normally, please contact JUNCTEK

(2). The screen is too dark to see clearly:
1). Check if the brightness setting value of the LCD screen is too small. Press the【SET】key to enter the system settings interface, then press the【▲】【▼】keys to move the cursor to the Day screen brightness/Night screen brightness, and then adjust the brightness of the LCD screen to a suitable state by pressing the【OK】key and using the【▲】【▼】keys.

(3). The display module is connected to communication but the data and time are not updated:
1). Check if the display Host mode is turned off in the system settings. Press the【SET】key to enter the system settings interface, then press the【▲】【▼】keys to move the cursor to the Display Host mode, and then select to turn on the Display Host mode by pressing the【OK】key.

(4). The communication between the display module and the measurement module is interrupted, and a red "×" is displayed in the upper right corner:
1). Check the communication cable.
2). Check the communication address. Check if the communication address of the measuring module is the same as that of the display module.
3). Check if the firmware upgrade process was interrupted or exited during use. You can re-upgrade the firmware.

Chapter 5 More Product Information

For more information on this product, please refer to the relevant manuals (which can be downloaded by logging onto the JUNCTEK official website (www.junteks.com)).
The 'KH-F Series Operation Demonstration Video' provides practical operation videos for this product.
The 'KH-F Series Communication Protocol' provides the communication protocol for KH-F series products.
The 'KH-F Series English User Manual' provides an introduction to the functions and operation methods of this product, as well as the possible faults that may occur during use and their corresponding solutions.

Chapter 6 Contact Us

If you have any questions or needs regarding the use of this product or this manual, please contact JUNCTEK.
Email: junce@junteks.com
Website: www.junteks.com

Appendix 1: Interface English and Abbreviations

English	English abbreviation
Data Record	Record
Language Selection	Language
Sound Options	Sound
Preset Battery Capacity	AH.Preset
Percentage Of Remaining Capacity	AH.Remaining
Bluetooth Password	BTE Password
Over Voltage Protection	OVP
Low Voltage Protection	LVP
Charge Current Protection	OCP
Discharge Current Protection	NCP
Over Power Protection	OPP
Over Temperature Protection	OTP
Low Temperature Protection	LTP
Discharge Current Alarm	DIS Current Alarm
Charge Current Alarm	CHG Current Alarm
Over Temperature Alarm	Over Temp.Alarm
Low TemperatureAlarm	Low Temp.Alarm
Celsius	□
Fahrenheit	□
Correspondence Address	Addr.
Charge	CHG
Discharge	DIS
Zero Current Memeory	Zero Current Mem.