

Welcome to use our company's power supply products

Be sure to read the User Manual carefully

For users to operate the device more quickly and safely

The HB Series bidirectional programmable DC test power supply User Manual

Shandong Wocen Power Source Equipment Co., LTD

Introduction

This manual provides users with relevant precautions and guidance on product parameters, installation, troubleshooting and daily maintenance. To ensure the proper installation and operation of the power supply, please read this manual carefully before use, and please keep it properly for later use. Customers please submit this manual to the end user of the power supply.

- ◆ When opening the box, please carefully check whether the model and electrical parameters of the machine nameplate are consistent with your order. The box contains the machine, key, product certificate, user manual, warranty card, etc.
- ◆ After unpacking the box, please check whether the product is damaged during the transportation process. If any omission or damage is found, please contact us or your supplier immediately.
- ◆ For the users who use the product for the first time, they should first read the manual carefully. If you have any questions about some features and performance, please contact with our technical support staff for help.
- ◆ The pictures or schematic involved in this manual are for reference only and the actual product shall prevail.
- ◆ Because we are constantly striving to improve the high-quality products, the information provided by the company is subject to change without notice.

Special Statement

Unauthorized conversion or copying of all or any part of the contents of this manual is prohibited.

The company has guaranteed as much as possible that the contents contained in this book are correct and to find any errors or omissions, please contact the manufacturer or distributor.

The Company will not be liable for any direct or indirect losses caused by use purposes beyond the product design, use by non-professional trainees, reassembly by customers, and failure to operate according to this manual.

The power number is the company record file code, users must properly keep, so that we can do a good job of after-sales service.

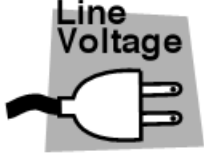
Security Symbol

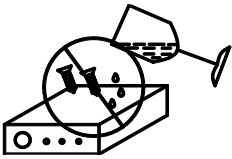
1. Definition of electrical symbols, safety signs, and warning signs

Symbol	Description		Symbol	Description
	Earthing			Power on
				Power off
	PE	Protective conductor		It represents a switch that turns the power on / off with the same operating piece. The normally used keys has two stable positions.
	Prohibition			High temperature: indicates that the temperature here is higher than the acceptable range of human body, do not contact to avoid human injury
	Be careful: To avoid personnel injury or damage to the instrument, the operator must refer to the instructions in the manual.			Danger! electric shock
	This sign indicates risks. If you cannot follow the operating instructions, it may cause personal injury. Please do not perform the operation without understanding the instructions.			This sign indicates a risk. If you fail to follow the instructions, it arouses your ideas about procedures, practices, conditions, etc

2. Brief safety

The following general safety precautions must be noted during operation or maintenance of this instrument and we will not be liable for any personal injury or machine damage due to these precautions or any explicit warnings in this manual.

	Please refer to this manual before use and keep it properly.
	Do not use the product for circumstances not described in the manual The product is only used for the situations described in the product manual
	Before connecting the power supply, check that the power supply meets the rated input value of the instrument and confirm that the switch is disconnected.
	Protective earthing: Before turning on the power, confirm the protective earthing to prevent electric shock.
	Necessity of protective earthing: Do not cut the internal or outer protective earthing wire or interrupt the connection of the protective earthing terminals. Or, potential electric shock may be caused and human body may be injured.
	Fuses: Use only the required rated current, voltage, and specific form of fuse (normal fuse, time delay, etc.). Do not use fuses of different specifications or short circuit fuse holders; otherwise, it may cause electric shock or fire.
	Do not remove the instrument housing Operators shall not remove the enclosure of the instrument. Parts replacement and internal adjustment can only be performed by qualified maintenance personnel.

	Do not operate under explosive or corrosive atmosphere Do not operate the instrument in flammable gas or corrosive environment
	Please turn off the power switch and disconnect all connections when replacing the product position. ·If the product weighs more than 20kg, please have more than two people operate when resetting the position. You can find the product weight in the product manual. ·Please handle the product carefully during transportation to avoid collisions. High products are prone to toppling over, so please handle them with care. Please attach the product manual when resetting the product location
	·Check and ensure that the AC input voltage setting is consistent with the fuse specification, and the power line surface is normal. Before checking, ensure that the power line is disconnected or the power switch is turned off. ·In case of any abnormality or fault, please immediately stop using, disconnect the power line or disconnect the power from the distribution box. Do not use the product before maintenance. ·Output or load cables shall be cables with large overcurrent capacity. ·Please do not disassemble or change the product. If necessary, please contact the company.
	·Do not allow water drops or metal objects to enter the interior of the product.
	·If the product is damaged due to the use of wrong grid input, it is not covered by the product warranty; ·The product must be used only for the purpose for which it was designed; ·When the power supply is used: when the DC output of the product is turned on, do not connect the load, especially the low resistance load, to the product. This operation may generate sparks, cause combustion and damage equipment or load; ·When the electronic load is used: when the DC input of the product is

	opened, do not connect the power source to the product. This operation may generate sparks, cause combustion and damage equipment or power source; ·Insert the USB stick into the slot according to ESD rules; ·Insert or remove the USB stick only when the product is turned off. This operation does not need to open the product; ·External power source cannot be inversely connected to the DC terminal of the product! Even if the product is completely closed, it will still damage the product; ·Do not connect external power supplies that generate voltages higher than the product's rated voltage to the product! ·Do not plug the network cable or its components connected to Ethernet into the master and slave sockets on the rear panel of the product! ·Various protection functions must be set to avoid overcurrent, overpower, etc. so that the sensitive load is applicable to the requirements of current application; ·Do not operate this product as AC source of generator or UPS equipment. Only and only connected to the grid!
	Danger to life: ·When the voltage and current are set and the output is started, the DC output terminal is dangerous voltage, and any touch may cause casualties; ·When the product is just disconnected from the power grid, do not directly touch the power line or connect the plug. At this time, there is a danger of electric shock; ·When closing the DC terminal, do not directly contact the contact piece of the DC terminal, because there is dangerous voltage on it, pull down the voltage more or less according to the size of the connected load; ·Even if the DC output/input of the product is not opened, but the product is still running, its DC negative pole to ground, or DC positive pole to ground, there will be dangerous voltage because the X capacitor is charged!

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Chapter 1 Overview

Summary of this chapter

- Product profile
- Product function characteristics
- Use
- Specifications
- Functional profile

1.1 Product Introduction

HB series bidirectional programmable DC test power supply (hereinafter referred to as HB series power supply) is a high-power servo power supply with beautiful appearance and superior performance, with multiple superior performances and unprecedented flexibility.

HB series power supply is the most advanced high-performance DC power supply developed by our company with the latest switching power supply technology and several independent invention patent technologies. It adopts active power factor correction, high-frequency LLC multi-resonance inversion, multi-loop waveform correction, intelligent temperature control air cooling, high-speed CPU programming control, software and hardware multi-protection and other advanced technologies. It is an advanced multi-purpose DC power supply with high power factor, fast dynamic response, low output ripple, small volume, light weight, low noise, high efficiency, convenient operation, comprehensive functions and reliable operation.

HB series power supply adopts 19-inch 3U standard crate design, which provides DC power supply capacity up to 21KW in 3U size. It has multiple special functions and multiple detection and protection capabilities, especially applicable to aviation, aerospace, radar, military industry, universities, scientific research institutes or maintenance agencies.

The principle of the HB series power supply is shown in Figure Figure 1-1.

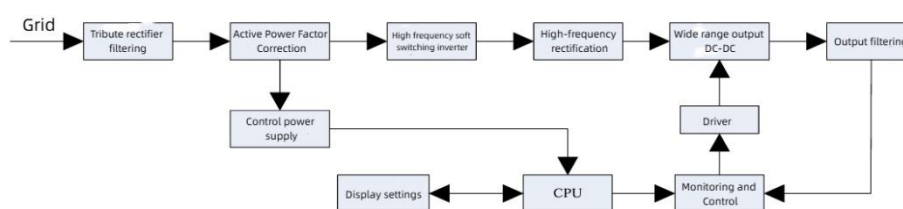


Figure 1-1 Schematic diagram of the principle

1.2 Product characteristics

HB series power supply has the following technical features:

- ◆ Wide range of output capability, reducing output current can achieve higher output voltage or reducing output voltage can achieve larger output current, providing more comprehensive power supply testing capabilities
- ◆ Three-phase input 340~460VAC, using advanced high-frequency active power factor correction technology, with a power factor of over 0.99
- ◆ Using advanced high-frequency LLC multi-resonant inverter technology, with an efficiency of up to 95.5%
- ◆ Output power range: 0~7KW, 0~14KW, 0~21KW
- ◆ Output voltage range: 0~80V to 0~1500V
- ◆ Output current: 0~25A to 0~510A
- ◆ Complete protection functions: input over-voltage and under-voltage, busbar over-voltage, output over-voltage, output/feed over-current, output/feed overpower, overheating, module failure, etc
- ◆ Conductor voltage drop compensation technology with automatic identification function
- ◆ Three working modes of constant voltage, constant current, and constant power to meet more testing needs
- ◆ A multi-waveform generator with multiple waveform editing modes, supporting multi-curve looping and linking, providing users with fast and accurate test wave forms
- ◆ Adjustable range configuration, alarm configuration, knob function configuration,

communication configuration, software protection configuration, system information configuration, automatic adjustment backlight configuration and other powerful function settings

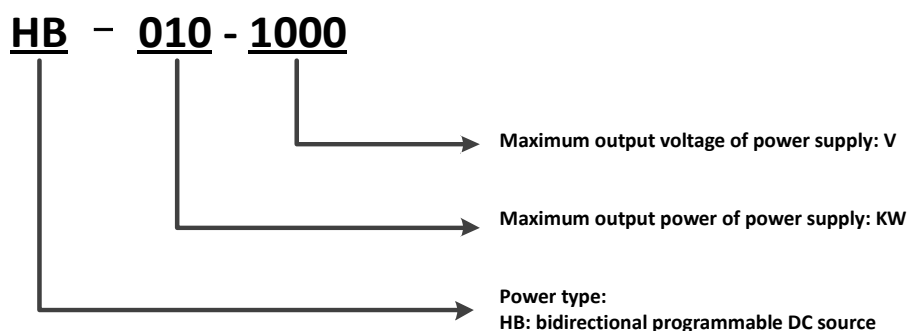
- ◆ Step-less speed control, temperature control, forced air cooling, low power consumption and low noise
 - ◆ It can achieve parallel output, which is convenient for users to expand capacity, and the parallel expansion can be up to 210KW
 - ◆ Supports multiple remote controls, CAN+RS485+LAN (standard)
- 1.3 Expected use of the product

1.3 Expected use of the product

This product can be used as a power supply or battery charger, but only as a variable voltage source or current source. It can also be used as an electronic load, but only as a variable current sink. Typical applications include providing DC power to any related equipment when used as a power supply, charging various types of batteries when used as a battery charger, and replacing an ohmic resistor with an adjustable DC sink when used as an electronic load, allowing it to upload any type of voltage and current source.

1.4 Naming rules of product models

The naming rules of HB series product models on the nameplate are as follows:



1.5 Introduction of the main functions

1.5.1 Wide range output capability of automatic range

Compared to traditional fixed-range DC power supplies, the HB series can provide full-power output for various voltage and current combinations within the power range. A single HB power supply covers the output range of three traditional power supplies. For example, the

500V/90A/15kW model of the HB series power supply can provide 500V30A output or 166.6V 90A output, and has the ability to provide full-power output of 15KW at any voltage point between 166.6V and 500V, greatly improving the output power supply capability of the product and significantly reducing the complexity and space occupied by system construction.

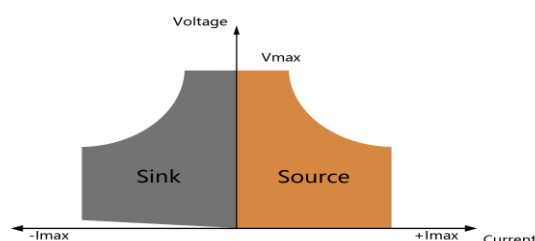
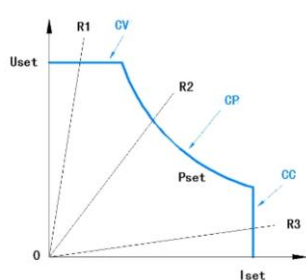


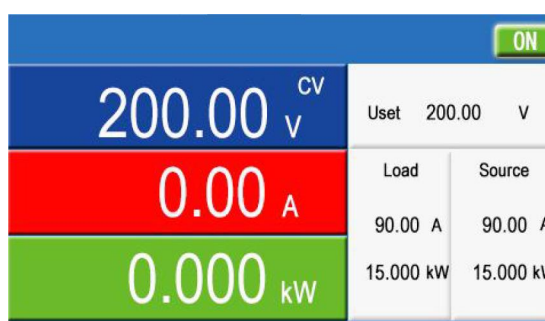
Figure 1-2 HB series bidirectional programmable power supply output characteristic curve

1.5.2 Multiple output work models

The HB series power supply has three output modes: constant voltage (CV), constant current (CC), and constant power (CP). The output mode depends on the set values of output voltage, current, and power, as well as the size of the load resistance. As shown in Figure 1-3, R1, R2, and R3 are three loads with different resistance values. When R1 crosses the set voltage V_{set} line, it is in CV operation mode; when R2 crosses the set power P_{set} line, it is in CP operation mode; when R3 crosses the set current I_{set} line, it is in CC operation mode.



(1) Output mode curve



(2) The CV display signal

Figure 1-3 Schematic diagram of the HB series power supply output mode

1.5.3 Reliable protection mechanism

The HB series power supply provides comprehensive and reliable protection mechanisms for abnormal input AC voltage (too high, too low, phase loss), abnormal DC bus voltage (too high, too low), internal power tube overcurrent, overtemperature, output overvoltage, undervoltage, output overcurrent, output current limit, voltage limit, etc. It provides fast and reliable protection alarm mechanisms for abnormal states, and the protection threshold related to the load can be set.



(1) The alarm setting interface

(2) Adjustable range configuration interface

Figure 1-4 Schematic diagram of the alarm/protection setting interface

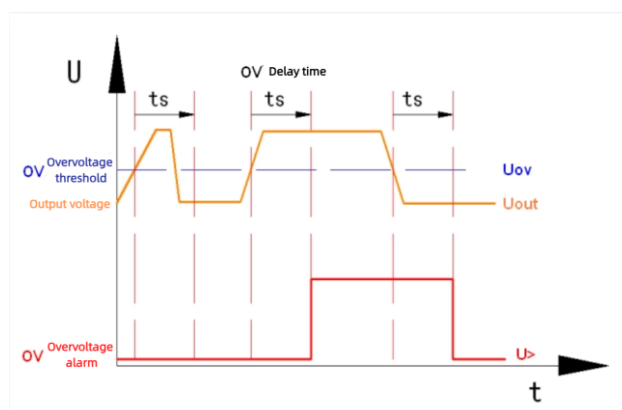


Figure 1-5 OV Schematic diagram of over-voltage alarm

1.5.4 Voltage, source-load current and source-load power settings

The power supply can be modified through the knob for data modification, or through the function keys + numeric keys for numerical modification.

① : Knob

The U knob is used to adjust the voltage setting value;

The I/P knob is used to adjust the source load current/source load power settings

② : Button

Select the voltage, source current or source power item through the ← and → buttons, and modify its value through the numeric buttons or the ↑ and ↓ buttons

1.5.5 5 groups of non-volatile storage and readback quick groups

To meet different testing requirements, 5 sets of working parameters are saved and stored in non-volatile memory. They are not lost after power failure and can be easily called.

In particular, the HB series power supply supports online reading of quick groups, allowing users to directly read the quick group switching settings in the power output state for rapid switching of output parameters.

1.5.6 The sequence test

The sequence test function contains 50 sequences, which are stored in non-volatile memory. Each group contains 20 test steps. Users can edit the functions of each step according to the actual needs, so that the power supply can be output in fixed voltage, current or power mode to meet the specific test requirements.

1.5.7 Up to 10 parallel machines are supported

Up to 10 power supplies of the same model can be connected in parallel. There are two network ports on the back panel of the chassis, marked with "PARAOUT" and "PARA IN" respectively. Through these two interfaces, the main and slave mode can be connected in parallel.



The parallel connection function only supports parallel connection of power supply of the same model, and parallel connection between power supplies of different models is strictly prohibited!!!

1.6 Technical specifications

Table 1-1 Technical specifications of HB Series power supply

Model	HB-010-1000		HB-015-1500	
Input	Voltage	Three-phase three-wire + PE, 342V~460VAC		
	Frequency	45-65HZ		
	Feedback efficiency	≤94.5%		
Output	Voltage	0~1000V	0~1500V	
	Current	-40A~40A		
	Power	-10KW~ 10kW	-15KW~15kW	
Display mode	4.3-inch color LCD			
Voltage resolution	0.1V			
Current resolution	0.01A			
Power resolution	0.001kW			
Set the accuracy ^①	voltage	≤0.1%Umax		
	current	≤0.2%Imax		
Accuracy of measurement ^②	voltage	≤0.1%Umax		
	current	≤0.2%Imax		
Ripple wave ^③	Vrms	<300mV		<400mV
	Vpp	<1600mV		<2400mV
Load effect	Voltage	≤0.05%Umax		
	Current	≤0.15%Imax		
Source effect	Voltage	≤0.02%Umax		
	Current	≤0.05%Imax		
Load response time ^④	≤2mS			
10% -90% rise time	2mS			
Warm drift	voltage	0.05% Setpoint		
	current	0.05% Setpoint		
Noise	≤65dB（A）			
Over-voltage protection	0 ~ 110% Umax is adjustable			
Maximum lead voltage drop compensation	20V		30V	

Digital communication interface	CAN + RS485 + LAN (standard standard)	
Protection and alarm	Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.	
Refrigeration method	Temperature control forced air cooling	
productiveness ^⑤	~90%	
Insulation withstand voltage	Output terminal positive electrode to ground	±1500VDC
	Output terminal positive electrode to ground	±1800VDC
Service temperature	0~40°C	
Storage temperature	-20~70°C	
Humidity	<80%, with no condensation	
Overall dimensions (W * H * D)	19-inch standard case, 3U height, 482 * 132.5 * 700mm	
Weight	≈25kg	≈32kg
Remarks	1. The test conditions for setting accuracy are: 25°C±5°C; 2. The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3. RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4. The time required for the output voltage to return to within "rated value ± 0.75%" when the load changes from 100% to 50% or vice versa. 5. Typical values at 100% output voltage and 100% power	

Table 1-2 Technical specifications of HB Series power supply

Model		HB-005-500	HB-010-500	HB-015-500
Input	Voltage	Three-phase three-wire+PE, 342V~460VAC		
	frequency	45-65HZ		
	Feedback efficiency	≤94.5%		
output	Voltage	0~500V		
	Current	-40A~40A	-80A~80A	-120A~120A
	Power	-5KW~5kW	-10KW~10kW	-15KW~15kW
Display mode		4.3-inch color LCD		
Voltage resolution		0.1V		
Current resolution		0.01A		
Power resolution		0.001kW		
Set the accuracy ^①	voltage	≤0.1%U _{max}		
	current	≤0.2%I _{max}		

accuracy of measurement ^②	voltage	$\leq 0.1\%U_{max}$		
	current	$\leq 0.2\%I_{max}$		
Ripple wave ^③	Vrms	$< 70mV$		
	Vpp	$< 500mV$		
Load effect	voltage	$\leq 0.05\%U_{max}$		
	current	$\leq 0.15\%I_{max}$		
Source effect	voltage	$\leq 0.02\%U_{max}$		
	current	$\leq 0.05\%I_{max}$		
Load response time ^④		$\leq 2mS$		
10% -90% rise time		2mS		
Warm drift	voltage	0.05% Setpoint		
	current	0.05% Setpoint		
Noise		$\leq 65dB$ (A)		
Over-voltage protection		0 ~ 110% U_{max} is adjustable		
Maximum lead voltage drop compensation		25V		
Digital communication interface		RS485 standard; RS232/USB/CAN/ETHERNET optional		
Protection and alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.		
Cooling method		Temperature control forced air cooling		
Efficiency ^⑤		~90%		
Insulation withstand voltage	Output terminal negative pole to ground	$\pm 1500VDC$		
	Output terminal positive electrode to ground	$\pm 1800VDC$		
service temperature		0~40℃		
Storage temperature		-20~70℃		
humidity		<80%, with no condensation		
Overall dimensions (W * H * D)		19-inch standard chassis, 3U height, 482 * 132.5 * 700mm		
Weight		$\approx 18kg$	$\approx 25kg$	$\approx 32kg$
Remarks		1.Set the test conditions for accuracy: $25\text{ }^{\circ}C \pm 5\text{ }^{\circ}C$; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value $\pm 0.75\%$ " when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power		

Table 1-3 Technical specification table of HB Series power supply

Model		HB-005-80	HB-010-80	HB-015-80
Input	Voltage	Three-Phase Three-Wire + Pe, 342V~460Vac		
	Frequency	45-65Hz		
	Feedback Efficiency	$\leq 94.5\%$		
Output	Voltage	0~80V		
	Current	-120A~120A	-240A~240A	-360A~360A
	Power	-5Kw~5kw	-10Kw~10kw	-15Kw~15kw
Display Mode		4.3-Inch Color Lcd		
Voltage Resolution		0.1V		
Current Resolution		0.01A		
Power Resolution		0.001kw		

Set The Accuracy ^①	Voltage	$\leq 0.1\%U_{max}$		
	Current	$\leq 0.2\%I_{max}$		
Accuracy Of Measurement ^②	Voltage	$\leq 0.1\%U_{max}$		
	Current	$\leq 0.2\%I_{max}$		
Ripple Wave ^③	Vrms	$< 16mv$	$< 25mv$	$< 25mv$
	Vpp	$< 320mv$	$< 320mv$	$< 320mv$
Load Effect	Voltage	$\leq 0.05\%U_{max}$		
	Current	$\leq 0.15\%I_{max}$		
Source Effect	Voltage	$\leq 0.02\%U_{max}$		
	Current	$\leq 0.05\%I_{max}$		
Load Response Time ^④		$\leq 2ms$		
10% -90% Rise Time		2ms		
Warm Drift	Voltage	0.05% Set value		
	Current	0.05% Set value		
Noise		$\leq 65db (A)$		
Overvoltage Protection		0 ~ 110% U_{max} is Adjustable		
Maximum lead voltage drop compensation		4V		
Digital Communication Interface		RS485 standard; RS232 / USB / CAN / Ethernet optional		
Protection and Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.		
Cooling Method		Temperature Control Forced Air Cooling		
Efficiency ^⑤		~90%		
Insulation withstand voltage	Output terminal negative pole to ground	$\pm 400Vdc$		
	Output terminal positive electrode to ground	$\pm 400Vdc$		
Operate Temperature		0~40℃		
Storage Temperature		-20~70℃		
Humidity		<80%, With No Condensation		
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm		
Weight		$\approx 18kg$	$\approx 25kg$	$\approx 32kg$
Remarks		1.Set the test conditions for accuracy: $25^{\circ}C \pm 5^{\circ}C$; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value $\pm 0.75\%$ " when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power		

Table 1-4 Technical Specification table of HB Series power supply

Model		HB-005-100	HB-010-100	HB-015-100
Input	Voltage	Three-Phase Three-Wire + Pe, 342V~460Vac		
	Frequency	45-65Hz		
	Feedback Efficiency	$\leq 94.5\%$		
Output	Voltage	0~100V		
	Current	-170A~170A	-340A~340A	-510A~510A
	Power	-5Kw~5kw	-10Kw~10kw	-15Kw~15kw
Display Mode		4.3-Inch Color Lcd		
Voltage Resolution		0.1V		
Current Resolution		0.01A		
Power Resolution		0.001kw		
Set The Accuracy ^①	Voltage	$\leq 0.1\%U_{max}$		
	Current	$\leq 0.2\%I_{max}$		
Accuracy Of Measurement ^②	Voltage	$\leq 0.1\%U_{max}$		
	Current	$\leq 0.2\%I_{max}$		
Ripple Wave ^③	Vrms	$< 40mv$	$< 40mv$	$< 40mv$

	Vpp	<250mv	<250mv	<250mv
Load Effect	Voltage	$\leq 0.05\%U_{max}$		
	Current	$\leq 0.15\%I_{max}$		
Source Effect	Voltage	$\leq 0.02\%U_{max}$		
	Current	$\leq 0.05\%I_{max}$		
Load Response Time ^④		$\leq 2ms$		
10% -90% Rise Time		2ms		
Warm Drift	Voltage	0.05% Set value		
	Current	0.05% Set value		
Noise		$\leq 65db$ (A)		
Overvoltage Protection		0 ~ 110% U_{max} Is Adjustable		
Maximum lead voltage drop compensation		6.5V		
Digital Communication Interface		RS485 Standard; RS232 / USB / CAN / Ethernet Optional		
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.		
Cooling Method		Temperature Control Forced Air Cooling		
Efficiency ^⑤		~90%		
Insulation withstand voltage	Output terminal negative pole to ground	$\pm 400V_{dc}$		
	Output terminal positive electrode to ground	$\pm 400V_{dc}$		
Operate Temperature		0~40℃		
Storage Temperature		-20~70℃		
Humidity		<80%, With No Condensation		
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm		
Weight		~18kg	~25kg	~32kg
Remarks		1.Set the test conditions for accuracy: 25 ℃ $\pm$ 5 ℃; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value $\pm$ 0.75%" when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power		

Table 1-5 Technical Specification table of HB Series power supply

Model		HB-014-1000		HB-021-1500	
Input	Voltage	Three-Phase Three-Wire+Pe, 342V~460Vac			
	Frequency	45-65Hz			
	Feedback Efficiency	≤94.5%			
Output	Voltage	0~1000V		0~1500V	
	Current	-40A~40A			
	Power	-10Kw~10kw		-15Kw~15kw	
Display Mode		4.3-Inch Color Lcd			
Voltage Resolution		0.1V			
Current Resolution		0.01A			
Power Resolution		0.001kw			
Set The Accuracy ^①	Voltage	≤0.1%Umax			

	Current	$\leq 0.2\%I_{max}$	
Accuracy Of Measurement ^②	Voltage	$\leq 0.1\%U_{max}$	
	Current	$\leq 0.2\%I_{max}$	
Ripple Wave ^③	Vrms	$< 400\text{mv}$	
	Vpp	$< 2400\text{mv}$	
Load Effect	Voltage	$\leq 0.05\%U_{max}$	
	Current	$\leq 0.15\%I_{max}$	
Source Effect	Voltage	$\leq 0.02\%U_{max}$	
	Current	$\leq 0.05\%I_{max}$	
Load Response Time ^④		$\leq 2\text{ms}$	
10% -90% Rise Time		2ms	
Warm Drift	Voltage	0.05% Set value	
	Current	0.05% Set value	
Noise		$\leq 65\text{db (A)}$	
Overvoltage Protection		0 ~ 110% U_{max} Is Adjustable	
Maximum lead voltage drop compensation		20V	30V
Digital Communication Interface		CAN + RS485 + LAN (Standard)	
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.	
Cooling Method		Temperature Control Forced Air Cooling	
Efficiency ^⑤		$\sim 94\%$	
Insulation Withstand Voltage	Output terminal negative pole to ground	$\pm 1500\text{Vdc}$	
	Output terminal positive electrode to ground	$\pm 1800\text{Vdc}$	
Operate Temperature		$0\sim 40^{\circ}\text{C}$	
Storage Temperature		$-20\sim 70^{\circ}\text{C}$	
Humidity		$< 80\%$, With No Condensation	
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm	
Weight		$\approx 27\text{kg}$	$\approx 40.5\text{kg}$
Remarks		1.Set the test conditions for accuracy: $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value $\pm 0.75\%$ " when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power	

Table 1-6 Technical Specification table of HB Series power supply

Model		HB-007-500	HB-014-500	HB-021-500
Input	Voltage	Three-Phase Three-Wire + Pe, 342V~460Vac		
	Frequency	45-65Hz		
	Feedback Efficiency	$\leq 94.5\%$		
Output	Voltage	0~500V		
	Current	-40A~40A	-80A~80A	-120A~120A
	Power	-7Kw~7kw	-14Kw~14kw	-21Kw~21kw
Display Mode		4.3-Inch Color Lcd		
Voltage Resolution		0.1V		

Current Resolution		0.01A
Power Resolution		0.001kw
Set The Accuracy ^①	Voltage	$\leq 0.1\%U_{max}$
	Current	$\leq 0.2\%I_{max}$
Accuracy Of Measurement ^②	Voltage	$\leq 0.1\%U_{max}$
	Current	$\leq 0.2\%I_{max}$
Ripple Wave ^③	Vrms	$< 70\text{mv}$
	Vpp	$< 500\text{mv}$
Load Effect	Voltage	$\leq 0.05\%U_{max}$
	Current	$\leq 0.15\%I_{max}$
Source Effect	Voltage	$\leq 0.02\%U_{max}$
	Current	$\leq 0.05\%I_{max}$
Load Response Time ^④		$\leq 2\text{ms}$
10% -90% Rise Time		30ms
Warm Drift	Voltage	0.05% Set value
	Current	0.05% Set value
Noise		$\leq 65\text{db (A)}$
Overvoltage Protection		0 ~ 110% U_{max} Is Adjustable
Maximum lead voltage drop compensation		25V
Digital Communication Interface		Rs485 Standard; RS232 / USB / CAN / Ethernet Optional
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.
Cooling Method		Temperature Control Forced Air Cooling
Efficiency ^⑤		~90%
Insulation withstand voltage	Output terminal negative pole to ground	$\pm 1500\text{Vdc}$
	Output terminal positive electrode to ground	$\pm 1800\text{Vdc}$
Operate Temperature		0~40°C
Storage Temperature		-20~70°C
Humidity		<80%, With No Condensation
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm
Weight		$\approx 18\text{kg}$ $\approx 27\text{kg}$ $\approx 40.5\text{kg}$
Remarks		1.Set the test conditions for accuracy: 25 °C $\pm$ 5 °C; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value $\pm$ 0.75%" when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power

Table 1-7 Technical specifications of HB Series power supply

Model		HB-021-750
Input	Voltage	Three-Phase Three-Wire+Pe, 342V~460Vac
	Frequency	45-65Hz
	Feedback Efficiency	$\leq 94.5\%$
Output	Voltage	0~750V
	Current	-75A~75A

Power		-21Kw~21kw
Display Mode		4.3-Inch Color Lcd
Voltage Resolution		0.1V
Current Resolution		0.01A
Power Resolution		0.001kw
Set The Accuracy ^①	Voltage	≤0.1%U _{max}
	Current	≤0.2%I _{max}
Accuracy Of Measurement ^②	Voltage	≤0.1%U _{max}
	Current	≤0.2%I _{max}
Ripple Wave ^③	V _{rms}	<90mv
	V _{pp}	<800mv
Load Effect	Voltage	≤0.05%U _{max}
	Current	≤0.15%I _{max}
Source Effect	Voltage	≤0.02%U _{max}
	Current	≤0.05%I _{max}
Load Response Time ^④		≤2ms
10% -90% Rise Time		30ms
Warm Drift	Voltage	0.05% Set value
	Current	0.05% Set value
Noise		≤65db (A)
Over-voltage Protection		0 ~ 110% U _{max} Is Adjustable
Maximum lead voltage drop compensation		15V
Digital Communication Interface		RS485 Standard; RS232 / USB / CAN / Ethernet Optional
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.
Cooling Method		Temperature Control Forced Air Cooling
Efficiency ^⑤		~90%
Insulation withstand voltage	Output terminal negative pole to ground	±1500V Dc
	Output terminal positive electrode to ground	±1800V Dc
Operate Temperature		0~40°C
Storage Temperature		-20~70°C
Humidity		<80%, With No Condensation
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm
Weight		≈40.5kg
Remarks		1.Set the test conditions for accuracy: 25 °C ± 5 °C; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value ± 0.75%" when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power

Table 1-8 Technical Specification table of HB Series power supply

Model		HB-021-1000
Input	Voltage	Three-Phase Three-Wire + Pe, 342V~460Vac
	Frequency	45-65Hz

	Feedback Efficiency	≤94.5%
Output	Voltage	0~1000V
	Current	-75A~75A
	Power	-21Kw~21kw
Display Mode		4.3-Inch Color Lcd
Voltage Resolution		0.1V
Current Resolution		0.01A
Power Resolution		0.001kw
Set The Accuracy ^①	Voltage	≤0.1%U _{max}
	Current	≤0.2%I _{max}
Accuracy Of Measurement ^②	Voltage	≤0.1%U _{max}
	Current	≤0.2%I _{max}
Ripple Wave ^③	V _{rms}	<100mv
	V _{pp}	<1000mv
Load Effect	Voltage	≤0.05%U _{max}
	Current	≤0.15%I _{max}
Source Effect	Voltage	≤0.02%U _{max}
	Current	≤0.05%I _{max}
Load Response Time ^④		≤2ms
10% -90% Rise Time		30ms
Warm Drift	Voltage	0.05% Set value
	Current	0.05% Set value
Noise		≤65db (A)
Over-voltage Protection		0 ~ 110% U _{max} Is Adjustable
Maximum lead voltage drop compensation		20V
Digital Communication Interface		RS485 Standard; RS232 / USB / CAN / Ethernet Optional
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.
Cooling Method		Temperature Control Forced Air Cooling
Efficiency ^⑤		~90%
Insulation withstand voltage	Output terminal negative pole to ground	±1500V Dc
	Output terminal positive electrode to ground	±1800V Dc
Operate Temperature		0~40℃
Storage Temperature		-20~70℃
Humidity		<80%, With No Condensation
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm
Weight		≈40.5kg
Remarks		1.Set the test conditions for accuracy: 25 ℃ ± 5 ℃; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value ± 0.75%" when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power

Table 1-9 Technical Specification table of HB Series power supply

Model		HB-007-330	HB-014-330	HB-021-330
Input	Voltage	Three-Phase Three-Wire + Pe, 342V~460Vac		
	Frequency	45-65Hz		
	Feedback Efficiency	≤94.5%		
Output	Voltage	0~330V		
	Current	-75A~75A	-150A~150A	-225A~225A
	Power	-7Kw~7kw	-14Kw~14kw	-21Kw~21kw
Display Mode		4.3-Inch Color Lcd		
Voltage Resolution		0.1V		
Current Resolution		0.01A		
Power Resolution		0.001kw		
Set The Accuracy ^①	Voltage	≤0.1%U _{max}		
	Current	≤0.2%I _{max}		
Accuracy Of Measurement ^②	Voltage	≤0.1%U _{max}		
	Current	≤0.2%I _{max}		
Ripple Wave ^③	V _{rms}	<100mv		
	V _{pp}	<650mv		
Load Effect	Voltage	≤0.05%U _{max}		
	Current	≤0.15%I _{max}		
Source Effect	Voltage	≤0.02%U _{max}		
	Current	≤0.05%I _{max}		
Load Response Time ^④		≤2ms		
10% -90% Rise Time		30ms		
Warm Drift	Voltage	0.05% Set value		
	Current	0.05% Set value		
Noise		≤65db (A)		
Over-voltage Protection		0 ~ 110% U _{max} Is Adjustable		
Maximum lead voltage drop compensation		6.5V		
Digital Communication Interface		RS485 Standard; RS232 / USB / CAN / Ethernet Optional		
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.		
Cooling Method		Temperature Control Forced Air Cooling		
Efficiency ^⑤		~90%		
Insulation withstand voltage	Output terminal negative pole to ground	±400V Dc		
	Output terminal positive electrode to ground	±600V Dc		
Operate Temperature		0~40°C		
Storage Temperature		-20~70°C		
Humidity		<80%, With No Condensation		
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm		
Weight		≈18kg	≈27kg	≈40.5kg
Remarks		1.Set the test conditions for accuracy: 25 °C ± 5 °C; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value ± 0.75%" when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power		

Table 1-10 Technical Specification table of HB Series power supply

Model		HB-015-1000		
Input	Voltage	Three-Phase Three-Wire + Pe, 342V~460Vac		
	Frequency	45-65Hz		
	Feedback			
	Efficiency	≤94.5%		
Output	Voltage	0~1000V		
	Current	-75A~75A		
	Power	-15Kw~15kw		
Display Mode		4.3-Inch Color Lcd		
Voltage Resolution		0.1V		
Current Resolution		0.01A		
Power Resolution		0.001kw		
Set The Accuracy ^①	Voltage	≤0.1%U _{max}		
	Current	≤0.2%I _{max}		
Accuracy Of Measurement ^②	Voltage	≤0.1%U _{max}		
	Current	≤0.2%I _{max}		
Ripple Wave ^③	V _{rms}	<100mv		
	V _{pp}	<1000mv		
Load Effect	Voltage	≤0.05%U _{max}		
	Current	≤0.15%I _{max}		
Source Effect	Voltage	≤0.02%U _{max}		
	Current	≤0.05%I _{max}		
Load Response Time ^④		≤2ms		
10% -90% Rise Time		30ms		
Warm Drift	Voltage	0.05% Set value		
	Current	0.05% Set value		
Noise		≤65db (A)		
Over-voltage Protection		0 ~ 110% U _{max} Is Adjustable		
Maximum lead voltage drop compensation		20V		
Digital Communication Interface		RS485 Standard; RS232 / USB / CAN / Ethernet Optional		
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.		
Cooling Method		Temperature Control Forced Air Cooling		
Efficiency ^⑤		~90%		
Insulation withstand voltage	Output terminal negative pole to ground	±1500V Dc		
	Output terminal positive electrode to ground	±1800V Dc		
Operate Temperature		0~40℃		
Storage Temperature		-20~70℃		
Humidity		<80%, With No Condensation		
Dimensions (W * H * D)		19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm		
Weight		≈18kg	≈27kg	≈40.5kg
Remarks		1.Set the test conditions for accuracy: 25 ℃± 5 ℃; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal;		

	3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value $\pm 0.75\%$ " when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power
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Table 1-11 Technical Specification table of HB Series power supply

Model		HB-005-750	HB-010-750	HB-015-750
Input	Voltage	Three-Phase Three-Wire + Pe, 342V~460Vac		
	Frequency	45-65Hz		
	Feedback			
	Efficiency	$\leq 94.5\%$		
Output	Voltage	0~750V		
	Current	-75A~75A		
	Power	-5Kw~5kw	-10Kw~10kw	-15Kw~15kw
Display Mode		4.3-Inch Color Lcd		
Voltage Resolution		0.1V		
Current Resolution		0.01A		
Power Resolution		0.001kw		
Set The Accuracy ^①	Voltage	$\leq 0.1\%U_{max}$		
	Current	$\leq 0.2\%I_{max}$		
Accuracy Of Measurement ^②	Voltage	$\leq 0.1\%U_{max}$		
	Current	$\leq 0.2\%I_{max}$		
Ripple Wave ^③	Vrms	$< 90\text{mv}$		
	Vpp	$< 800\text{mv}$		
Load Effect	Voltage	$\leq 0.05\%U_{max}$		
	Current	$\leq 0.15\%I_{max}$		
Source Effect	Voltage	$\leq 0.02\%U_{max}$		
	Current	$\leq 0.05\%I_{max}$		
Load Response Time ^④		$\leq 2\text{ms}$		
10% -90% Rise Time		30ms		
Warm Drift	Voltage	0.05% Set value		
	Current	0.05% Set value		
Noise		$\leq 65\text{db (A)}$		
Over-voltage Protection		0 ~ 110% U_{max} Is Adjustable		
Maximum lead voltage drop compensation		15V		
Digital Communication Interface		RS485 Standard; RS232 / USB / CAN / Ethernet Optional		
Protection And Alarm		Module fault alarm (including input voltage abnormal protection, DC bus voltage abnormal protection, internal overcurrent protection, short circuit protection, etc.), output overvoltage alarm (software+hardware), overcurrent protection, internal overheating alarm, output wire compensation fault alarm.		
Cooling Method		Temperature Control Forced Air Cooling		
Efficiency ^⑤		$\sim 90\%$		
Insulation withstand voltage	Output terminal negative pole to ground	$\pm 1500\text{V Dc}$		
	Output terminal positive electrode to ground	$\pm 1800\text{V Dc}$		
Operate Temperature		0~40°C		
Storage Temperature		-20~70°C		
Humidity		$< 80\%$, With No Condensation		

Dimensions (W * H * D)	19-Inch Standard Chassis, 3U Height, 482 * 132.5 * 700mm		
Weight	≈18kg	≈27kg	≈40.5kg
Remarks	1.Set the test conditions for accuracy: $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$; 2.The measurement accuracy is the error between the actual value and the displayed value of the DC output terminal; 3.RMS value: LF 0~300KHz; PP value: HF 0~20MHz 4.The time required for the output voltage to return to the "rated value $\pm 0.75\%$ " when the load changes from 100% to 50% or reversely. 5.Typical values at 100% output voltage and 100% power		

1.7 View from all sides

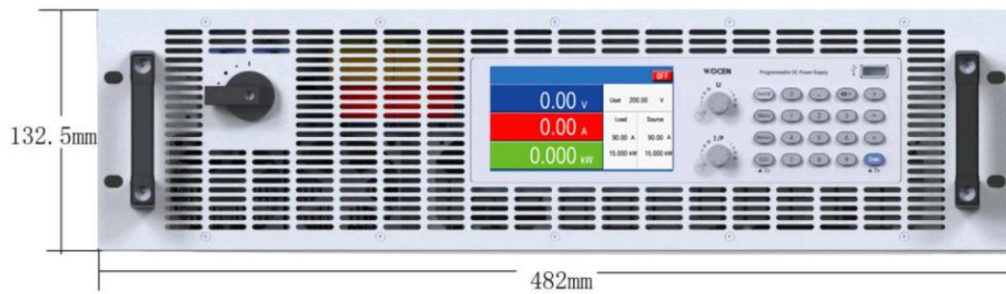


Figure 1-8 Front view

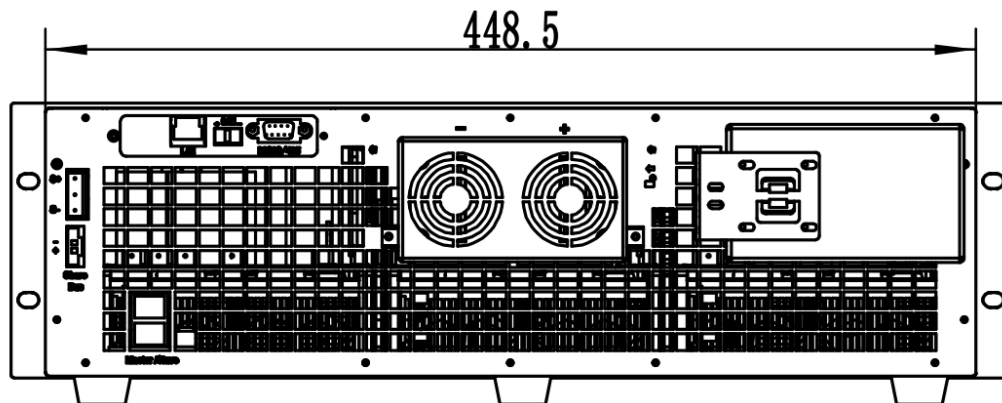


Figure 1-9 Back view

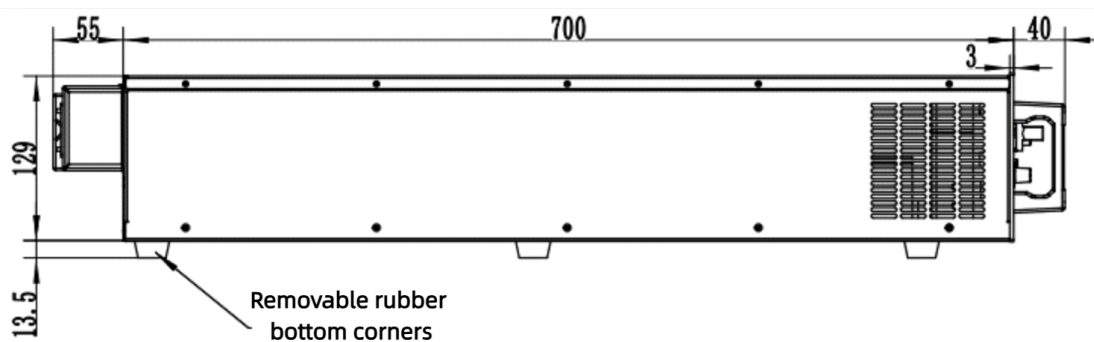


Figure 1-10 Right view

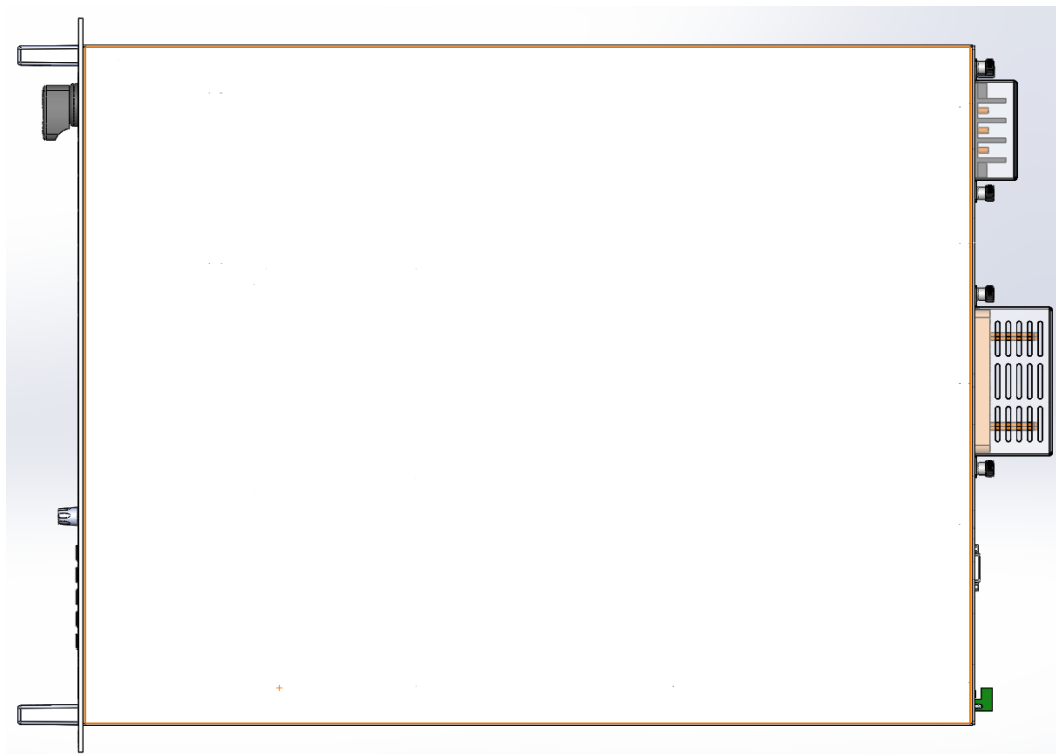


Figure 1-11 Top view

1.8 Operation panel and interface

1.8.1 Function description of front panel

Users can set the operating parameters through the buttons or knobs on the front panel, and the output status is displayed through the color LCD. The main functions are:

- In standard mode, parameter editing, storage, and start/stop operations
- In the sequence test mode, operations such as parameter editing, storage, and start/stop are available
- Save or read back the quick memory group.
- Protection functions such as voltage, current, step response, leakage detection, and limit setting operations
- Screen brightness and sound adjustment
- Knob activation mode setting
- Keypad lock
- Language selection
- Product information inquiry

- Set communication functions (such as baud rate).
- Parallel function setting.

1.8.2 Description of the front panel



(1) Schematic diagram of the front panel



(2) Display and operation area of the front panel

Front panel description:

1. Power switch: Close or cut off the system power supply.
2. LCD display area: 4.3-inch color LCD, showing settings or output information and power status.
3. Knob area: used to modify the setting parameters. The knob has a button function for adjusting the editing status

1) U (Select) knob:

Standard mode: used to set the output voltage, adjust the set voltage value by rotating the knob, and execute the cyclic work logic by pressing the knob button: enter voltage editing low position→voltage editing high position→confirm editing and exit editing state;

In other states: used to switch between options, rotating the knob selects the next or

previous option, and the knob button executes a cyclic work logic: enter the current option→exit the option

2) I/P (Edit) knob:

Standard mode: used to set the output current and output power, adjust the set current or power value by rotating the knob;

In other states: used to edit the current selection, rotate the knob to adjust the current parameters, and press the knob button to switch the current parameter step.

4. Function button area: Provides quick function operation

1) On/Off: Start/stop button, start power output or stop power output.

2) MENU: Main menu button, open the menu bar → enter the second-level menu → return to the first-level menu

3) Memory: Shortcut group call and edit keys, open the shortcut group call bar → enter the shortcut group editing interface → return to standard mode

4) ESC  2s :

Cancel button: Cancel editing and read back the parameters before editing

Exit button: Exit the editing state

Back button: return to the first level menu interface

Unlock key: Unlock when the keyboard is locked

5. Digital keypad area:

1) 0 ~9: numeric keys for numeric input

2) ←: Direction key, delete key

During numeric input: Delete key, used to modify the numeric input

Other status: direction key, switch to the left to select items

3) →: Direction key, switch to the right selection

4) ↑, ↓: Edit keys, used to adjust the current option parameters. For digital parameter editing, press and hold to automatically adjust the stride length

5) Enter key  2s:

Confirm the current operation with the OK button→save the set parameters and exit the editing state

Press and hold the key lock for 2 seconds to enter the key lock state, and press the  2s key to unlock.

6) USB interface:

The USB interface is used for firmware upgrades. For firmware upgrade methods, please consult Shandong Wocen Power Source Equipment Co., Ltd.

Description:

Level 1 menu interface: standard mode interface, sequence test mode interface and PV simulation interface (optional)

Secondary menu interface: all operation interfaces other than the primary menu are secondary menus.

1.8.3 Back panel description

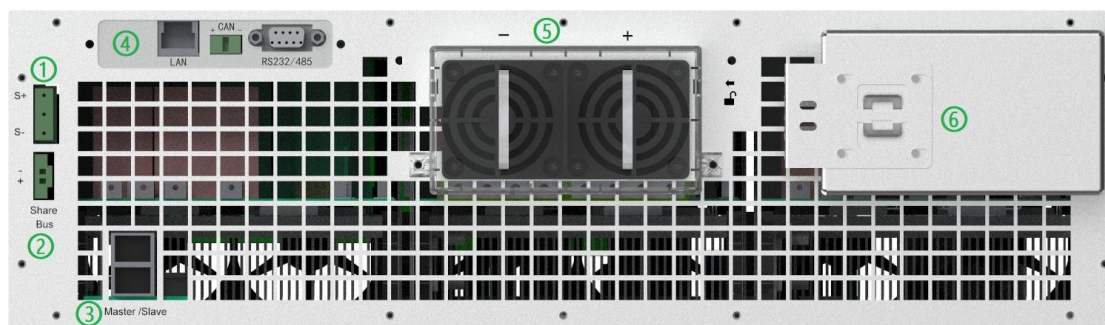


Figure 1 – 13 Schematic representation of the back panels

① Sensing connection port (S port):

OPEN OR CLOSED. To compensate for the voltage drop across the DC line to the load, the "S+ and S -" inputs can be connected to the load. The maximum compensation value is indicated in "Maximum lead voltage drop compensation" in 1.5 technical specifications.

② Shared bus port:

It is used in parallel mode to exchange parameters such as current and voltage setting values of master and slave.

③ Master - slave bus port:

Used in parallel mode for digital signal interaction between master and slave.

④ Digital communication interface: remote control via digital communication interface, CAN+RS485+LAN (standard configuration).

⑤ DC output terminal protection cover:

Safety hook is designed for the installation of the protective cover. The protective cover will not fall off after the screw is loosened. The protective cover can only be removed after being lifted upwards in the direction of arrow.

⑥ Protection cover of AC input terminal:

Safety hook is designed for the installation of the protective cover. The protective cover will not fall off after the screw is loosened. The protective cover can only be removed after being lifted upwards in the direction of arrow.

1.9 The configuration list

Power supply product x1 set;
X 2 zip pockets;
X1 user manuals;
USB stick x1;
Rubber sheathed flexible cable x 3m;
Serial port shell x1;
Serial port-weld wire type x1;
Shield wire x 5m;
HB quick operation guide x1;
Plug-in terminal (head) x1;
X1 terminal heads;
PCB connector x1;
X1 finished network cables;

Chapter 2 Unpacking and installation

Summary of this chapter:

- Unpacking inspection
- Service environment
- Input wiring
- Output wiring
- Wire diameter requirements

2.1 Unpacking and inspection

2.1.1 Inspection before unsealing

Check whether the packing box is damaged. If any, inform the freight forwarder to inspect the goods and record the damage during delivery to protect yourself.

If there is no damage, open the box according to step 2.1.2.

2.1.2 Unsealing

(1) Unpack and take out the equipment according to the requirements of the external packing box of the equipment.

(2) Firstly, check the product nameplate to confirm that the model is consistent with the order, and check the items in the packing box to confirm that they are consistent with the packing list. If the items in the packing box are inconsistent with the contents listed in the "packing list", please contact the customer service center or dealer of Shandong Wocen Power Source Equipment Co., Ltd.

(3) Visually observe whether there are obvious metal scratches, dents, etc. Check whether there are loose connections, whether fasteners fall off, or other abnormal phenomena. Products with obvious damage (such as internal parts falling off, shell deformation and damage, etc.) shall not be put into use under any circumstances.

(4) In order to prevent accidental electric shock, do not open the product shell. If any abnormality occurs to the product, please ask for technical support.

2.2 Handling and storage

2.2.1 Handling



- The handle on the front panel of the product is not for handling purposes!
- Due to the weight of the product, it should be avoided to handle it by hand as much as possible. If it is unavoidable, only the product casing can be supported instead of external components (such as handles, DC terminals, knobs) for transportation.
- Please do not move the product when it is already open or connected to other devices!
- When the product's usage location changes, it is recommended to use the original packaging material.
- This product should always be moved or placed horizontally.
- When moving products, please wear suitable protective clothing, especially protective shoes. Due to its heavy weight, falling may cause serious consequences.

2.2.2 Packaging

It is recommended to store the complete packaging materials of the product for its lifespan, so that they can be used during product migration or return to the original factory for repair. Otherwise, these packaging materials should be handled in accordance with environmental protection regulations.

2.2.3 Storage

If the product will be stored for a long time, it is recommended to use original or similar packaging. It should be stored indoors in a dry environment, with only the opening sealed to prevent corrosion of internal components due to moisture.

2.3 Installation

2.3.1 Safety specifications before installation and use



- The equipment used to place the product (table, cabinet, rack, 19 "rack) must be able to withstand its weight.
- Using 19 " When installing the cabinet, it is necessary to use rails that are suitable for the width and weight of the product casing.
- Before connecting to the mains, make sure you are using the voltage indicated on the

product label. Overvoltage of AC power may damage the product.

- This series of products has an energy feedback function, similar to solar feedback devices, which can return energy to the local or public power grid. Therefore, it is absolutely necessary to operate according to the specifications of the local power supply company, and before installation, or at least before initial commissioning, it should be investigated whether it is necessary to install grid or power plant protection devices.

2.3.2 Preliminary preparation

The connection between the HB series power supply and the power grid needs to be completed through the 5-pin socket on the back board of the product. The wire on the plug should be at least 3 strands (2 * L, PE) and have a suitable cross-section and length. Some models require 4 strands (3 * L, PE). It is recommended to connect all wires as they may be used on other interfaces or series products of the same type.

For suggestions on the cross-sectional connection, please refer to 2.7 Cable Requirements. The wiring specifications between the DC terminal and the load/voltage source should also follow the following rules:



- The cross-section of the connecting wire should be marked with the parameters required for the maximum current of the product.
- Continuous operation of this product at the allowable limit will generate a certain amount of heat, as well as pressure drop based on the length and heat generation of the connection. To compensate for these losses, it is necessary to increase the constant cross-section of the connection and minimize the length of the connection.

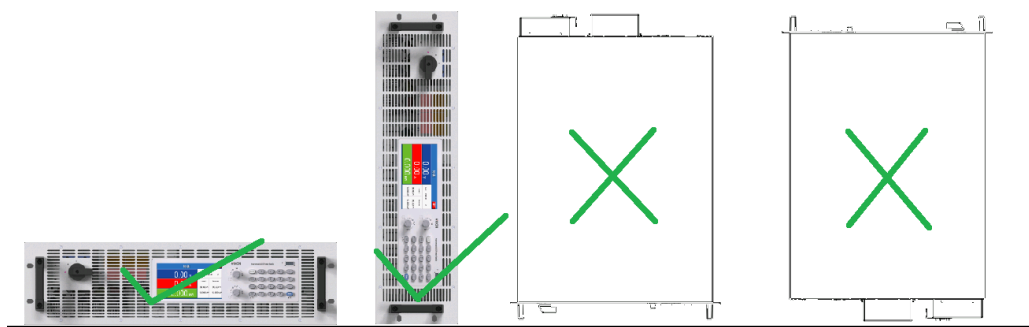
2.3.3 Installation of products



- Choose a location for the product that has the shortest possible connection distance to the load or external source.
- Reserve enough space behind the product, at least 30cm, for smooth ventilation.

The 19" enclosure is usually mounted on a suitable rail and placed inside a 19" rack or cabinet. However, attention must be paid to the depth and weight of the product. The handle on the front plate is used to push and pull inside the cabinet. The oval slot on the front metal panel is used to secure the product (the locking screw is not provided with the shipment).

Some models in this series come with mounting brackets that can be removed to secure the product within the 19" rack, allowing the desktop product to operate on a horizontal surface. The acceptable and unacceptable placement schematics are as follows:

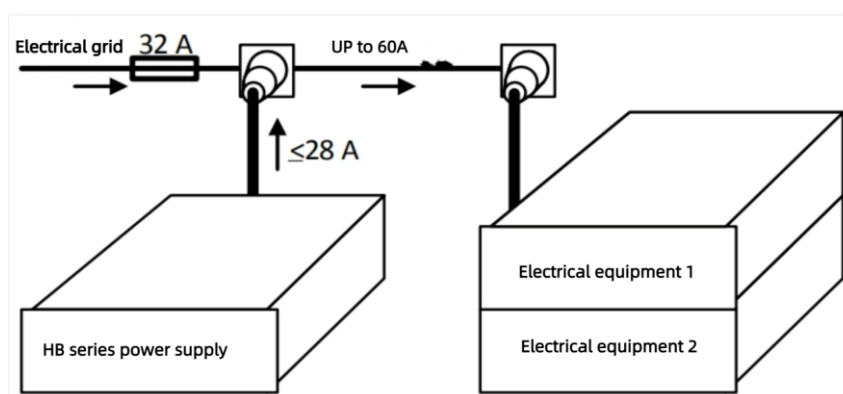


upright face

2.3.4 Installation concept of energy feedback equipment

The HB series can convert energy and return it to the local power grid. The returned current will accumulate on the grid current (see the schematic diagram below), which will overload existing installation equipment. If it is any kind of two-output socket, there is usually no additional fuse installed. Once any consumer device AC part fails (such as short circuit), or multiple connected products can absorb more power, the total current will pass through the connecting wire that cannot withstand such a large current, resulting in product damage and even causing wires or connection ends to catch fire.

To avoid such damage and accidents, it is important to consider existing installation concepts before installing such feedback-type equipment. The following diagram illustrates the principles of a feedback-type device and a consumable device:



If multiple feedback products are running on the same foot of the installed device, the total current of each phase should increase accordingly.

2.4 Use environment

(1) Please confirm whether the AC power to be connected meets the specifications.

(2) For ambient temperature and humidity, please refer to the specifications of each model.

(3) After the power supply is installed and tested, it is recommended to leave the power supply in a powered-on state, which can provide optimal operating conditions for electronic components and prevent some of the important components from being wet. If it has not been used for a long time, it should first be visually inspected. If moisture is found anywhere inside, it must be fully dried before it can be used. General environmental conditions:

- Indoor use
- Keep away from flammable, explosive, and corrosive media: such as alcohol, diluent, sulfuric acid, and other flammable, explosive, and corrosive materials.

- Keep away from heat sources and avoid exposure to the sun.

- Working environment temperature: 0°C~+40°C

Storage temperature: -25°C~+65°C

- Keep away from items that are prone to moisture, such as boilers, humidifiers, and water sources.

- Relative humidity of work: maximum 80%, no condensation

- Storage relative humidity: not more than 80% (for storage in high humidity environments, it is recommended to periodically power on the device for 20 minutes to prevent condensation).

- Keep away from strong electromagnetic interference sources.

- Keep away from obvious vibration and shock.

The working environment requires good ventilation and no dust. Please keep the area within 30cm of the air vent clear of any debris.

- It is necessary to avoid sharp changes in temperature, as this can cause moisture condensation inside the machine. When moisture condensation occurs, it is forbidden to use

this power supply.

- The input AC power voltage can fluctuate within $\pm 15\%$ of the rated voltage.

2.5 Input wiring

The three-phase input, the terminal block on the rear panel of the chassis is shown in Figure 2-1. Before wiring, please ensure that the input power supply is cut off. The wiring points are marked with L1, L2, L3 and "⊕" grounding marks. Please follow the markings for wiring. The power supply voltage range is: line voltage 340V~460VAC.

In addition, a standard clamp is installed on the AC input end of the product to prevent the AC plug from loosening and disconnecting due to vibration or similar reasons. This fixture is also used for tidying and securing the end of the cable. It is recommended to use four M3 rubber nuts to secure the AC filter after each plug is inserted. It is recommended to use a suitable cable tie (not provided with the product) to secure the end of the cable, as shown in the following image:

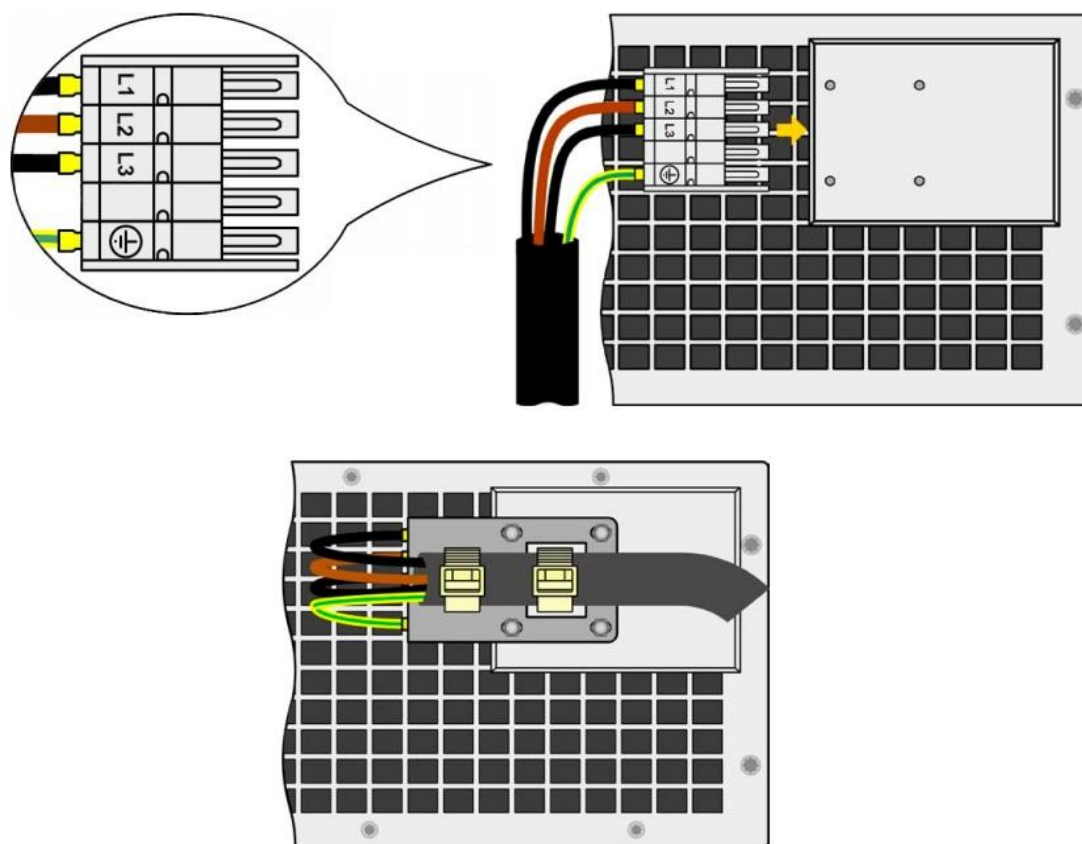


Figure 2-1 Schematic diagram of the input terminal in the rear panel

The HB series DC test power supply has three-phase unbalanced power consumption characteristics depending on the model. For example, the 5KW model only draws power from L1/L2 phases, and the appropriate input wire diameter (see Section 2.4.4 for wire diameter requirements) needs to be selected based on the actual model when wiring. Connect the input power cord to the device terminal block, and connect the PE wire to the ground terminal.

When multiple HB series power supplies are used in the system, it is recommended to use a staggered connection input line. The following diagram shows a wiring method with almost symmetrical current distribution:

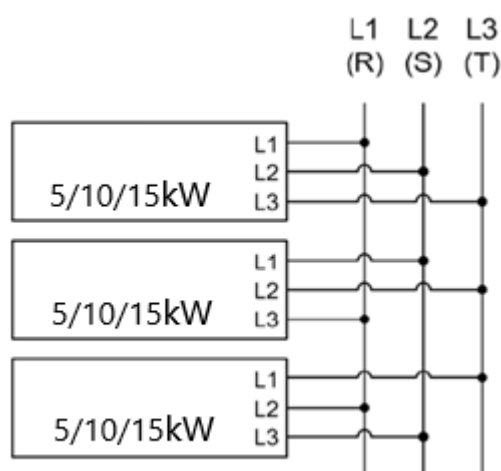


Figure 2-2 Schematic diagram of the staggered input wiring



Before connecting the wires, please confirm that the input power has been disconnected, and the ground terminal PE should be well grounded to protect the safety of personnel.

2.6 Output wiring

2.6.1 Wiring instructions of the sensing connection port (S port):

Connect the S port to the load as shown in Figure 2-3, with S+ connected to the load "+" terminal and S- connected to the load "-" terminal. The displayed voltage value is the actual voltage across the load, achieving the function of compensating for lead voltage drop.

 注意	- Remote sensing is only valid in constant voltage (CV) operation mode, while for other adjustment modes, the sensing input should be left empty, as connecting it will increase the tendency for oscillation; - It is recommended to use a cable with a cross-sectional area of 0.5mm² for sensing lines below 5m; - The sensing line should be wrapped and placed near the DC line to suppress the possible oscillations that may occur when the product is operating in power mode. If necessary, a capacitor can be installed at the power supply end to eliminate oscillations; - The sensing line and the load/power supply should be connected with + and +, - and -, otherwise their sensing input terminals will be damaged. - In parallel mode, the remote sensing line can only be connected to the host product.
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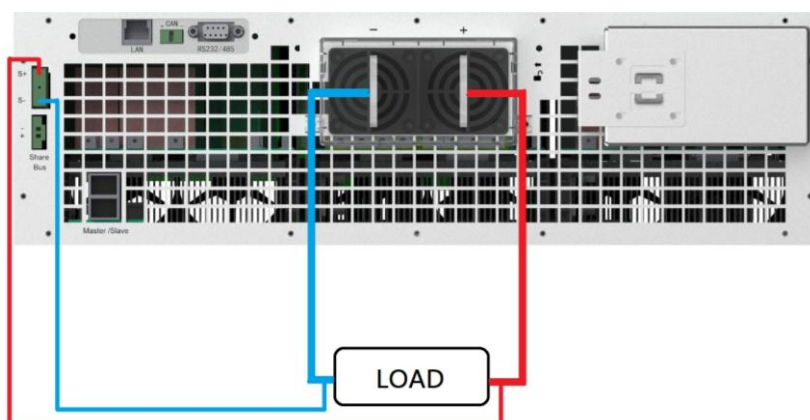


Figure 2-3 Wiring diagram of the sensing connection port

2.7 Cable requirements

2.7.1 Input cable requirements

The HB series power supply is equipped with a 3P wiring block and an independent ground terminal. Depending on the model, it will be connected to the 3-phase power supply

according to the description of the plug in the table below.

Table 2-1 Connection phase requirements for power supply input terminal

Power Rating	Phase Position	Power Supply Type
5 kW	L1, L2, PE	Three phases ranging from 340 to 460 VAC
10 kW	L1, L2, L3, PE	Three phases ranging from 340 to 460 VAC
15 kW	L1, L2, L3, PE	Three phases ranging from 340 to 460 VAC
>15 kW	L1, L2, L3, PE	Three phases ranging from 340 to 460 VAC

The specifications of the input line are determined by the power and length of the product. For a single product, Table 2-2 lists the maximum input current for each phase and the minimum cross-sectional area of the input line.

Table 2-2 Maximum current and minimum cross-sectional area of input cable

Input line specifications	L1		L2		L3	
power rating	ϕ	I _{max}	ϕ	I _{max}	ϕ	I _{max}
5 kW	2.5 mm ²	11 A	2.5 mm ²	11 A	-	-
10 kW	4 mm ²	28 A	4 mm ²	16 A	4 mm ²	16 A
15 kW	4 mm ²	28 A	4 mm ²	28 A	4 mm ²	28 A

Due to the internal resistance of the input line, which increases with the length of the line, the input voltage may be too low, resulting in abnormal product operation. Therefore, when the line length exceeds 5m, it is necessary to increase the diameter of the input line to reduce the internal resistance!

2.7.2 Output cable requirements

- If the rated current of the product is large, one or several thick and heavy DC connection wires are required. At this time, the weight of the connection wires and the tensile force of the DC terminal need to be considered. Especially when the product is installed in a 19" cabinet or similar cabinet, the connection wires will hang from the DC output terminal. Additional wiring fixtures are required to avoid damage to the product.
- It is strictly prohibited to connect or operate with a transformerless DC-AC inverter (such as a solar inverter), as the inverter may transfer the potential voltage of the negative output (DC-) to the ground (PE). Be aware of the maximum allowable voltage transfer (see the technical specifications table).
- Due to the product structure, when he is connected to an external source, even if the DC source input is turned off, a small current will be absorbed, which is less than 0.1% of the rated current.

The DC load output terminal is located at the back of the product and is not equipped with a fuse. The cross-section of the connection here is determined by the operating current, wire length, and ambient temperature.

We recommend using the following specifications of cords that are not longer than 1.5 m, with an average ambient temperature of no more than 50°C

Table 2-3 Recommended wire diameter for the output cable

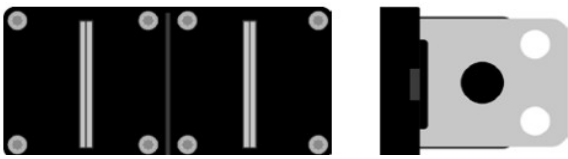
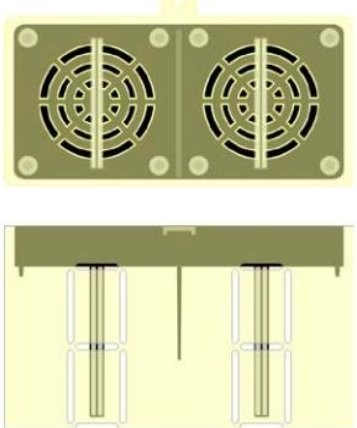
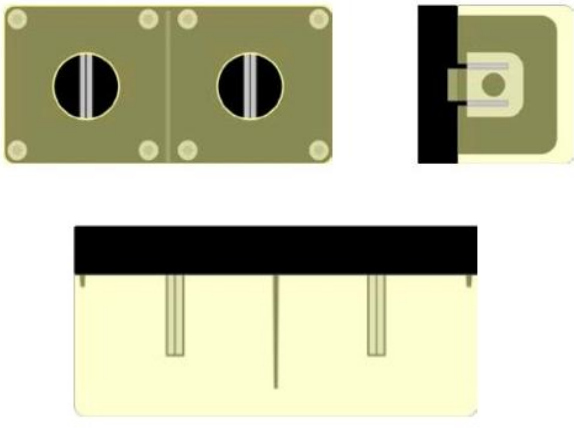
Below 30 A: 6 mm ²	Below 70 A: 16 mm ²
Below 90 A: 25 mm ²	Below 140 A: 50 mm ²
Below 170 A: 70 mm ²	210 A below: 95 mm ²
Below 340 A: 2x70 mm ²	510 A below: 2x120 mm ²

Single-core line, such as 70 mm², can be replaced by a 2x35 mm² line. If the connection is very long, increase the cross section to avoid voltage offset and overheating.

2.7.3 Type of wiring terminal

Table 2-4 shows the DC terminals of different types of products. It is recommended to use the flexible cord with ring wiring pads as the load line.

Table 2-4 The HB series power terminal block

Type 1: Model with output voltage below 360 V	Type 2: Model with output voltage above 500 V
	
	
The output terminal is designed with three bolt mounting holes: M12, M8, and M5. Users can choose the appropriate circular connection terminal based on the actual working current requirements	The output terminal is designed with one M6 and two M4 bolt mounting holes, allowing users to select the appropriate circular connection terminal based on their actual working current requirements

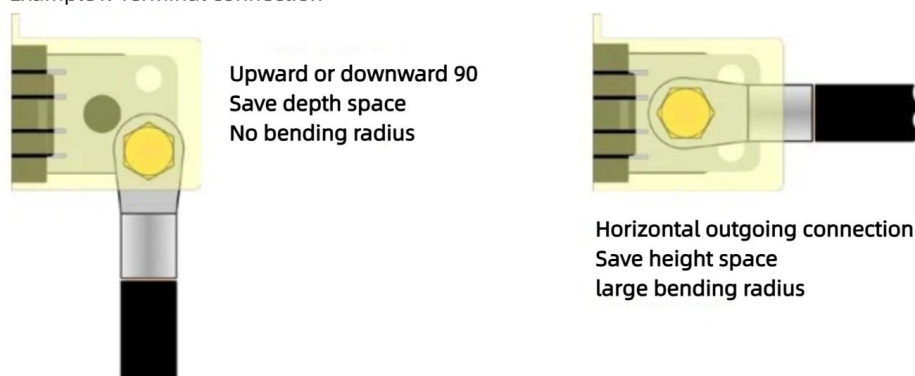
2.7.4 Connected leads and plastic cover

The DC terminal has a plastic cover with a protective contact. This cover should always remain on. The outer cover of type 2 terminals (see image above) is already fixed to the terminal, while type 1 terminals are fixed to the back of the product. Furthermore, the outer cover of type 1 terminals is cut out to accommodate the power cord;



Place the power supply inside the cabinet or similar device, and consider the connection angle and bending radius of the DC cable in detail. Type 2 DC terminals can only be horizontally drawn out to install the terminal cover;

Example1: Terminal connection



2.7.5 Communication port wiring

The HB series power supply achieves remote programmable control through an external communication bus.

Standard ports: RS485+LAN+CAN

Optional ports: ① USB, RS485+analog ② USB, RS232+analog ③ USB, LAN+analog ④ USB, CAN+analog.

The communication protocols of USB, RS232 and RS485 interfaces are MODBUS RTU protocols; the communication protocol of LAN interface is MODBUS TCP protocol; and the communication protocol of CAN interface is CAN2.0B protocol.

For detailed operation commands, please refer to Chapter 5, "Remote Communication Protocol".

1. RS485 serial communication interface

The RS485 connector adopts standard DB-9 hub with pins defined as follows:

1	A	data-signal A
2	B	data-signal B
5	S GND	Signal ground

Communication settings are described in Section 3.8.1

2. RS232 serial communication interface

RS232 wiring port adopts standard DB-9 hub with pins defined as follows:

2	RXD	Receive Data
---	-----	--------------

3	TXD	Send Data
5	S GND	Signal Ground

Communication settings are described in Section 3.8.1

3. CAN bus interface

The CAN bus interface adopts 3P terminal, from left to right pin is defined as follows:

1	CAN-H	Data-Signal H
2	SGND	Signal Ground
3	CAN-L	Data-Signal L

Communication settings are described in Section 3.8.1

4. USB serial communication interface

The USB serial communication interface adopts the standard USB-B mother base, and the pin is defined as follows:

1	SVCC	Data-Signal L
2	SGND	Signal Ground
3	S GND	Signal Ground
4	CAN-H	Data-Signal H

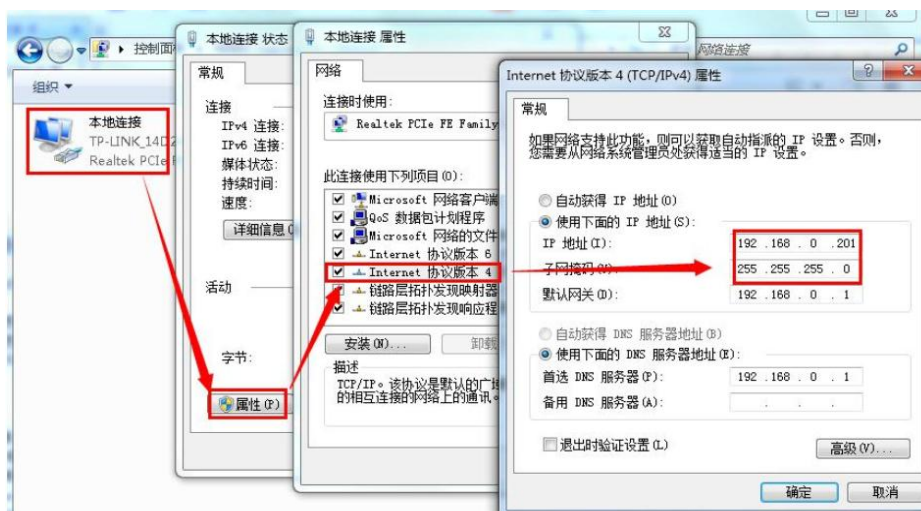
Communication settings are described in Section 3.8.1

5. Ethernet (Ethernet) network interface

- 10M / 100M adaptive Ethernet interface, supports AUTO-MDIX network cable
- The power supply adopts **TCP Sever** working mode, and the upper computer shall be set to **TCP Client** mode



- MODBUS TCP communication protocol bidirectional transparent transmission
- When directly connecting to the PC, the PC side needs to be set to a static IP address on the same network segment as this power supply,



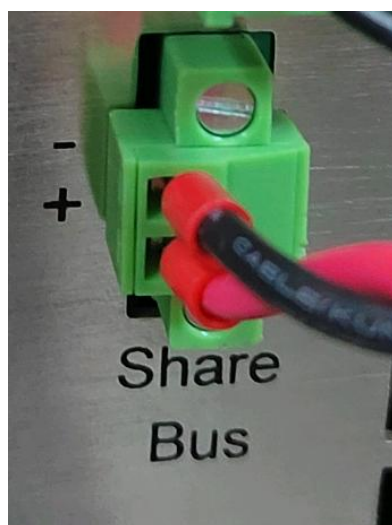
2.8 Combined machine installation instructions

2.8.1 Description of the wiring mode

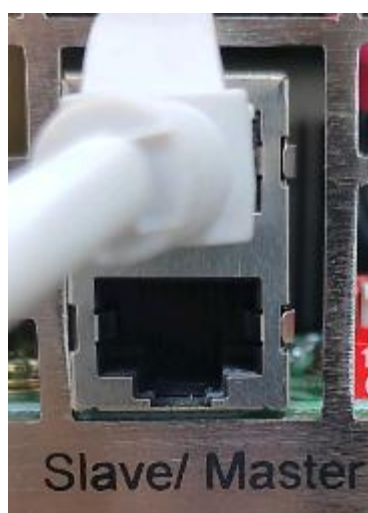
Multiple products of the same model (see "1.4 Introduction to main features" for the number of parallel machines) can be connected in parallel to create a system with higher current and greater power. For parallel operation under master-slave operation, the output terminals of each product, the "Slave/Master" bus terminals, and the shared bus "Share Bus" terminals need to be connected.

The "Share Bus" terminal on the back panel of the product is usually connected to the shared bus terminals of other products in the same series, allowing multiple products to be connected in parallel to achieve current balance, especially when using the host's built-in function generator.

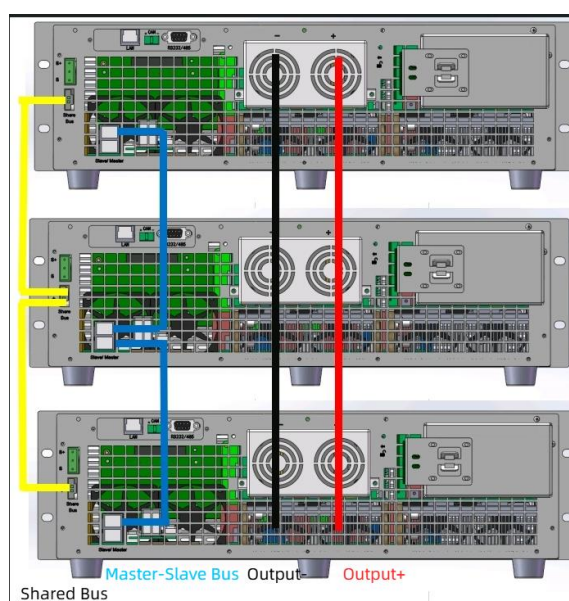
The wiring schematic diagram is as follows:



shared bus



Master-slave bus



Overview of parallel connection wiring

The following must be noted when connecting to a shared bus:

-  If one or more machines in the system are not used via the shared bus configuration, it is recommended to disconnect these machines from the shared bus because the application only requires a small amount of power. Even if there is no power supply, the impedance on the bus can have a negative impact on the control signal. Simply unplug or use a switch from the bus to complete the process.
- This series of shared buses works bi-directionally in source and sink modes. It is compatible with a few models in this series, but if the products to be connected will operate as separate sinks (electronic loads) or sources (power supplies), care must be

taken when arranging the system.

- When creating a series system (whether it is allowed depends on the product model) with reference to the DC negative electrode, the potential of the DC negative electrode will shift, so the shared bus will also change.



This parallel connection function only supports parallel connection of power supplies of the same model. It is strictly prohibited to connect power supplies of different models in parallel!!!

Chapter 3 Basic Operation

Summary of this chapter:

- Brief Introduction
- Preparation And Examination Before Use
- Power on
- Current and Voltage Setting
- Power off

3.1 Introduction

This section will show you how to operate on the front panel. The specific operation functions are shown as follows:

- In UIP standard working mode, interface editing, storage, and startup stop operations.
- In the sequence test mode, the interface editing, stores, and starts and stops
- Set the threshold value, time and mode of voltage protection, current protection, step protection and leakage protection (optional)
- Set the voltage limits, the current limits, and the power limits
- Communication settings (such as port rate, mailing address, etc.).
- Operation settings (e. g. brightness, sound, knob mode, etc.)
- Set the parallel working parameters
- Product information query (such as system version, language settings, etc.)

3.2 Preparation and inspection before use

- ① Ensure that the power lines and input / output lines are properly connected.
- ② Please read the safety and warning signs posted on the instrument itself carefully before use.

3.3 Boot up

Check the power cord and ensure it is correct before turning on the power switch. After

booting, the self-checking welcome screen will appear, as shown in Figure 3-3-1



Figure 3-3-1 Power on interface

Under normal conditions, it takes about 5-6 seconds to enter the model interface (as shown in Figure 3-3-2), and then about 3-4 seconds to enter the standard mode standby interface. Before entering the standby interface, the power supply will perform a self-test. If the test fails, it will enter the corresponding alarm state based on the self-detected errors.

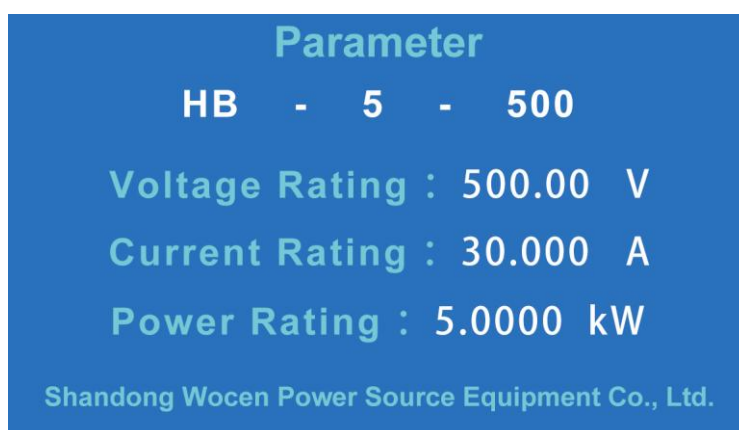


Figure 3-3-2 Model 1 interface

After self-checking, it will enter the standby interface at the last shutdown.

3.4 Standard working mode

3.4.1 Introduction of the interface layout

Standard working mode standby interface is as shown in Figure 3-4-1:

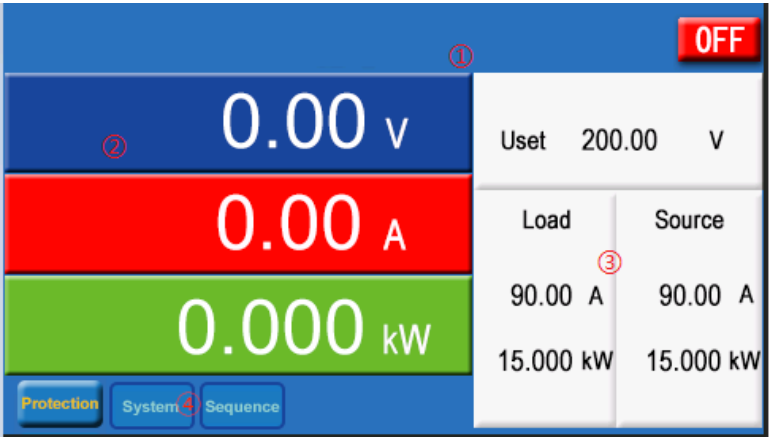


Figure 3-4-1 standard working mode standby interface

As shown in Figure 3-4-1, the interface is divided into four areas, namely status bar area ①, output state / measurement area ②, setting area ③, and menu bar area ④. Other working mode adopts regional layout modes similar to the standard mode, which is convenient for users to use.

1、Status bar area



graph 3-4-2 A Schematic diagram of the status bar information

Table 3-4-1 Overview of the area functions and icons in the status bar

Order Number	State Description	Icon	Icon Meaning
a	Power alarm / prompt status		U>: Output over-voltage
			+ I>: Forward overcurrent
			- I <: Negative overcurrent
			+ P>: Forward overpower
			- P>: Negative overpower

			Output voltage rise step timeout alarm / prompt
			Output voltage drop step timeout alarm / prompt
b	None		
c	Power supply working mode		Work mode indicator, used to indicate the current work mode, including standard mode (standard), serial programmable mode (continuous, single step), and other modes
d	Host / slave mode	 	When multiple power supplies are connected in parallel, the power supply works in the host or slave state
e	U-disk access status (optional)		Indicates whether a U disk is inserted correctly
f	Key-lock status		Indicates whether the keyboard is in a locked state Long press the confirmation key for 2 seconds to enter the key lock state Press the ESC key to exit the key-lock state
g	output state		Start
			Stop

			suspend
--	--	---	---------

2、Output information display area



Figure 3-4-3 Output information display area

The CV, CC and CP in the upper right corner indicate that the power supply is in the output state of CV (constant voltage), CC (constant current) and CP (constant power) respectively;

The numbers in the blue, red and green areas are the real-time measurements of the output voltage, current and power respectively.

3. Set the parameter area

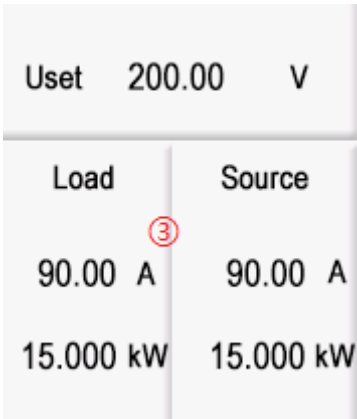


Figure 3-4-4 Set the parameter area

The black data in the setting parameter area are editable data, which are the voltage setting value, source load current setting value, and source load power setting value. They can be edited during standby or startup.

4. Menu area

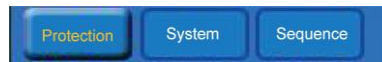


Figure 3-4-5 The system menu



graph 3-4-6 Quick group reading

In standard mode, the menu bar is divided into two sub-menus: system menu and shortcut group reading;

In other modes, the menu bar has only one sub-menu of the system menu.

The menu area is hidden. To operate the menu bar, press the MENU key or MEMORY key to bring up the corresponding menu interface for operation. For specific instructions, see Section 3.4.2.

3.4.2 Standard working mode standby mode



(1) Full-screen display

(2) System menu

(3) Quick group reading

Figure 3-4-6 Standard operating mode is in standby mode

As shown in Figure 3-4-6, there are three standby display states in the standard working mode, which are mainly divided into three display operation states: full-screen display, system menu reading, and shortcut group reading. The operation of each state is as follows:

1. Full screen display status

Set voltage, source current and source power- -see **Section 3.4.3** for specific operation

Start the output- -press ON / OFF to enter the standard mode operating state, see section 3.4.4 for details

Call system menu- -press MENU key, menu bar display, optional menu;

Call the shortcut group menu- -press the MEMORY key, enter the shortcut group read state, can call the shortcut memory group;

2. System menu reading status

Enter the system sub-menu- -press MENU, ENTER or press U knob button to enter the operation interface corresponding to the selected menu;

Call the shortcut group menu- -press the MEMORY key, enter the shortcut group read state, can call the shortcut memory group;

Start output- -press ON / OFF to cancel system menu operation and enter standard mode. See section 3.4.4 for details

Switch menu options- -Press the ←, → keys or rotate the U knob

Exit system menu - -Press ESC to return to full screen display

3. Quick group read status

Switch the shortcut group- -Press the ↑, ↓ keys or rotate the I/P knob

Call the shortcut group- -press the ENTER key or press the I / P knob button

Edit the shortcut group- -press MEMORY to enter the shortcut group editing interface, see Section 3.5

Exit the shortcut group menu- -Press ESC to return to the full screen display status

Start the output- -press ON / OFF to cancel the shortcut group read and enter the standard mode. See section 3.4.4 for details

3.4.3 Parameter editing operation

The standard mode standby state (Figure 3-4-6(a)) and start state (Figure 3-4-7) allow users to set output parameters.

Parameter editing supports multiple methods such as buttons and knobs, and users can flexibly choose according to their usage habits. The editing state is shown in Figure 3-4-7:

Uset 200.00 <u> </u> V	U knob button (or ↑, ↓key) lowest bit edit
Uset 200.0 <u>0</u> V	U knob button (or ↑, ↓key) Sub-low-level editing
Uset 20 <u>0</u> .00 V	U knob button (or ↑, ↓key) Individual editing
Uset <u>2</u> 00.00 V	U knob key (or ↑, ↓key) ten-place editing

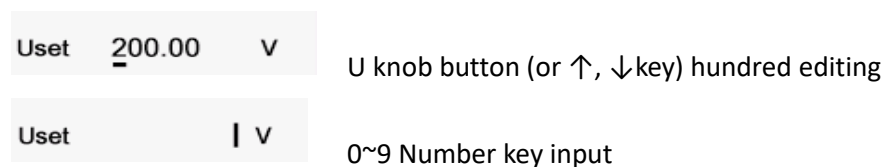


Figure 3-4-7 Schematic diagram of the parameter editing

The specific operations are performed as follows:

Select edit item:

- ① Press the ← and → buttons to switch between voltage, source current, and source power editing states
- ② Rotate the U knob to automatically enter the voltage editing state and modify the voltage value
- ③ Rotate the I/P knob to enter the source current (or source power) editing and modify the parameter value

Modify parameters:

- ① Press the ↑ and ↓ keys to increase or decrease the selected editing item, and long press the ↑ and ↓ keys to automatically adjust the editing stride
- ② Rotate the U knob to modify the voltage value, and press the U knob button to switch between low and high voltage
- ③ Rotate the I/P knob to modify the current or power value, and press the I/P knob button to switch between low and high current (or power) settings
- ④ The 0-9 number keys and the decimal point key are used to modify the selected editing items. Press the  key to delete the entered numbers.

Explanation:

The HB series power supply provides two knob activation methods: "instant effect" and "effect after confirmation"

Effective immediately: In the standard mode operation state, when modifying the set parameters by rotating the knob, pressing the ↑/↓ keys, or invoking the shortcut group, the parameter changes take effect immediately, synchronizing the adjustment of the power output.

Effective after confirmation: In the standard mode operation state, when changing the set parameters using the rotary knob, $\uparrow/\downarrow$ keys, or shortcut group, the parameter changes do not affect the actual output. Only after clicking "Confirm" can the parameters be changed and become effective, adjusting the power output to the confirmed value.

The configuration method of the effective method is described in Section 3.10.2

Confirm parameters:

- ① Press ENTER to confirm the modified parameters. If it is in the running state, adjust the power output to the adjusted value.
- ② Press the U button or the I/P button to confirm the modified parameters. If it is in operation, adjust the power output to the adjusted value.

Cancel the parameter modification:

Press the ESC key to cancel the modification of the parameter and return to the value before modification (When the effective method is configured as "Effective immediately", it is not possible to cancel the modification of the parameter.)

In standard mode: When the lower or upper data bit is selected, the $\uparrow$, $\downarrow$ keys and U knob can be used to increase or decrease the data being operated on;

In other modes: When the data low bit is selected or the high bit is selected, the $\uparrow$, $\downarrow$ keys and I/P knob can be used to increase or decrease the data being operated on;

Whether in the high or low selection state, pressing the 0-9 or . number keys will change to a numeric input effect.

3.4.4 Standard working mode operation state

The standard working mode standby power supply starts outputting by pressing the ON/OFF button. If the start is successful, the status bar displays the corresponding working information. As shown in Figure 3-4-8

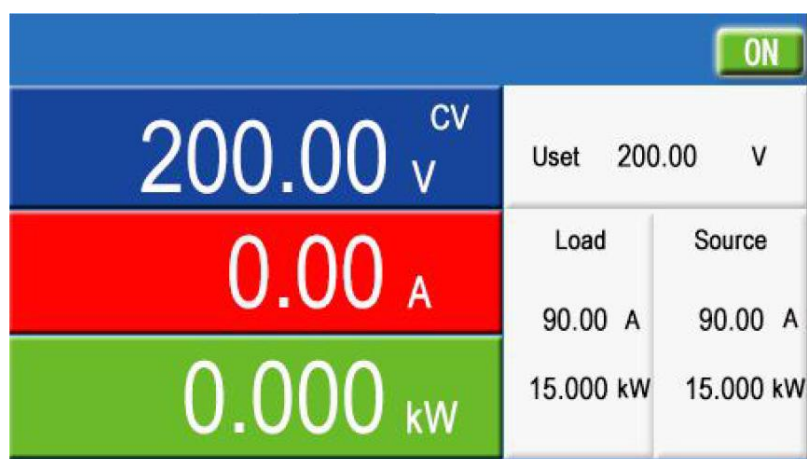


Figure 3-4-8 Operation interface of standard operation mode

The actions available at this time:

ON / OFF key: stop the power supply output;

←\→ Key: Select the switch voltage, current, power and other options.

↑\↓ Key: Modify the selected data.

U knob: voltage adjustment knob, adjust the output voltage;

I / P knob: current / power adjustment knob, adjust the output current / power;

U knob button cycle into each voltage edit position;

The I / P knob key cycles into the edit bits of the current or power selected by the \ key;

MEMORY Key: Call the shortcut group, and the operation is the same as in standby mode;

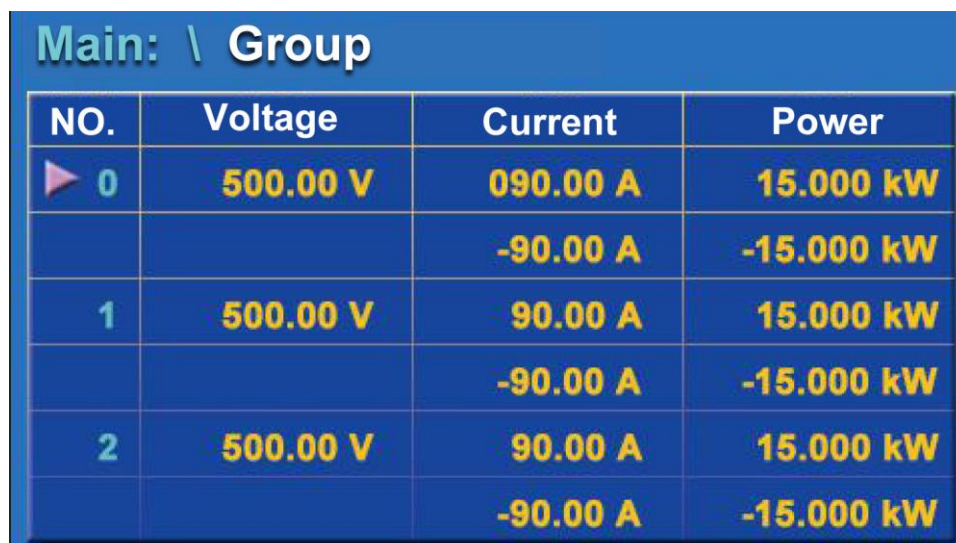
Note: When the power supply is working in the startup state, if the "Knob Effectiveness Mode" in the system settings is set to "Effective immediately" (see Section 3.9.2), when using the knob or the ↑ and ↓ keys to change the voltage, current, and power settings, the data changes will take effect immediately with the adjustments made, without needing to confirm with the ENTER key.

3.5 Quick group editing

The shortcut group is used to store 5 sets of standard mode working parameters, and other modes do not support the shortcut group storage and reading.

In standby state in standard working mode, press MEMORY twice to enter the shortcut

group editing interface, as shown in Figure 3-5-1



NO.	Voltage	Current	Power
▶ 0	500.00 V	090.00 A	15.000 kW
		-90.00 A	-15.000 kW
1	500.00 V	90.00 A	15.000 kW
		-90.00 A	-15.000 kW
2	500.00 V	90.00 A	15.000 kW
		-90.00 A	-15.000 kW

Figure 3-5-1 The editing interface of the shortcut group

The shortcut group editing interface,  pointing to the current operation group, this interface has 2 working states:

① Quick group number selection:

←\→ Key or U knob button: Enter the parameter editing state, and the cursor flashes on the edited item;

↑\↓ Key or U knob: switch the shortcut group;

ENTER Key: confirm the current selection of shortcut group and return to standby mode;

ESC key: cancel the shortcut group selection and return to the standby state;

② Quick Group Parameters editing:

←\→ Key: Select the data item.

I / P knob: Modify the selected data.

I / P knob button: switch data high and low;

ENTER Key or U knob button: The cursor disappears, the data is saved, and the group number selection status is returned;

ESC key: Cancel the data modification and return to the group number

selection status.

3.6 Sequence testing

The sequence testing function allows users to set a series of parameters such as voltage, current, power, and operation mode and time, and automatically output them in the set steps, better meeting user's requirements for automatic testing and aging applications.

The sequence testing function can store a total of 20 sequences (sequence numbers 0-19), each containing 50 steps (step numbers 0-49). The function of each step can be independently set, including rich control functions such as loop control and slope mode output.

3.6.1 Sequence test standby interface

In the standard working mode standby state, press the MENU key to enter the menu interface, select "Sequence Test" through the $\leftarrow \rightarrow$ keys or U knob, and press the ENTER key or U knob button to enter the main interface of sequence test, as shown in Figure 3-6-1.

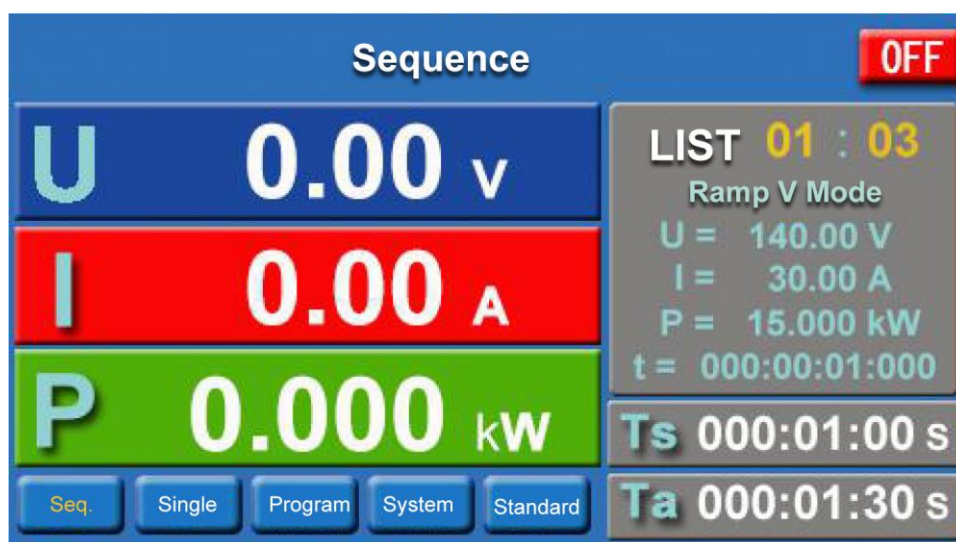


Figure 3-6-1 Sequence test standby interface

Executable operations:

- ① MENU key enters the menu selection state, and press ENTER to enter the corresponding interface:

"Sequence": enter the sequence working mode, in which press ON / OFF to start the current sequence, and the sequence starts in sequence from step 0 of setting the sequence;

"Single Step": Enter the sequence single-step working mode, in which press ON / OFF to start the current sequence current step run 1 time.

"Edit": Enter the sequence editing working mode;

"System": enter the series editing interface to browse and modify the system parameters;

"Standard": Return to the standard working mode.

- ② ON / OFF key: Start the current sequence.
- ③ $\leftarrow \backslash \rightarrow$ Key or U knob: Select a data item.
- ④ $\uparrow \backslash \downarrow$ Key or I / P knob: modify the selected data.
- ⑤ U-knob button: equivalent to the MENU key;



When using a sequence test, avoid frequent and drastic voltage switching, as this may cause the power supply to operate abnormally or even damage internal components. The following principles should be followed when using it

1. Pre-estimate the frequency of the required sequence and the peak-to-peak voltage (VPP)
2. Then estimate the proportion of the total voltage output occupied by VPP, which is the VPP percentage. If the VPP of the design sequence is 10V and the maximum voltage of the power supply is 100V, then it is recorded as $\%VPP = 10/100 = 10\%$
3. The relationship between frequency and VPP percentage should not exceed the following table

frequency	%VPP
10HZ	100%
50HZ	28%
100HZ	14%
150HZ	9.2%
200HZ	4.8%

4. When setting the running time for each step, it is also necessary to consider the actual output rise or fall time. If the setting is not appropriate, although there is no danger, the

output waveform may be very different from what is needed. This time is closely related to the actual load conditions. If you want to know more, please contact the manufacturer.

3.6.2 Sequence test run interface

Sequence test standby state (either sequence mode or single step mode), press the ON/OFF button to start the power sequence test, enter the sequence test running interface, as shown in Figure 3-6-2

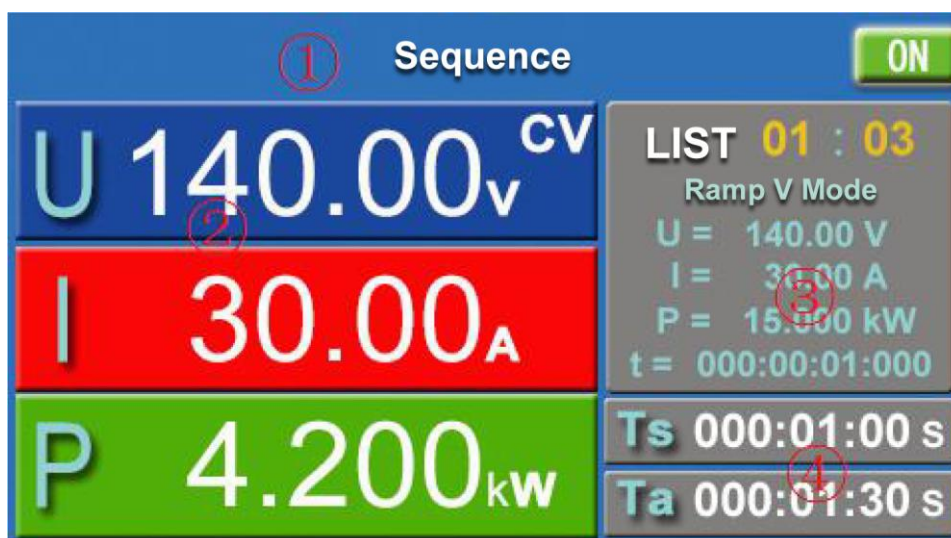


Figure 3-6-2 The sequence test run interface

The information for the current run is displayed in the sequence test run interface:

1. Display status bar, leakage, start and stop information and other status information, as in the standard mode
2. Measurement area, showing the current power supply operation mode (CV \ CC \ CP) and the output measurement value, the same as the standard mode
3. Set up the information area, from top to bottom, as follows:
 - a) The currently running serial number and step number, for example, 01:03 indicates the step numbered "03" in a sequence numbered "01"
 - b) The current step operation mode is divided into "step mode", "voltage ramp mode", "Voltage sinusoidal mode" and so on
 - c) Main setting information of current step
4. Running time display area

Ts: Sequence test curve execution time, indicating the actual running time of the sequence curve. When the running is paused, Ts pauses the timing. When the running is resumed, Ts continues timing. After stopping the output, Ts stops timing

Ta: Sequence test working time, indicating the total output time after the sequence test is started. Ta keeps timing during the pause, and stops timing after stopping the output

Operations allowed for the sequence running status:

ON/OFF button: Stops power output and returns to the sequence test standby interface.

3.6.3 Sequence editing interface

In the standby state of the sequence test, press the MENU key to enter the menu selection state, select "Edit" and press the ENTER key to enter the sequence test editing interface, as shown in Figure 3-6-3

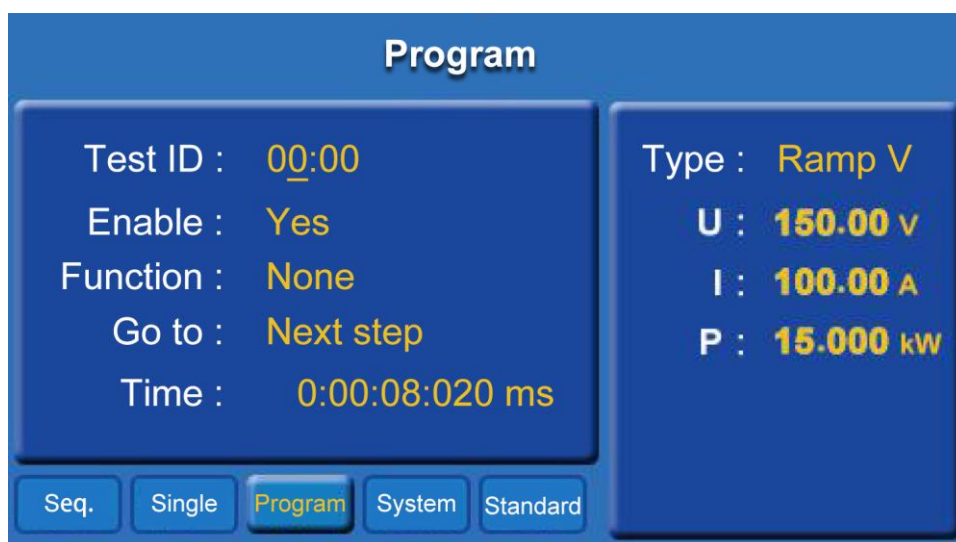


Figure 3-6-3 The sequence-editing interface

The actions available at this time:

MENU key: enter the menu selection state, and press ENTER to enter the corresponding interface

←\→ Key or U knob: Select a data item.

↑\↓ Key or I / P knob: modify the selected data.

ENTER Key: Save the current parameter value.

ESC key: cancel the data modification and read back the parameters;

U-knob button: equivalent to the MENU key;

I / P knob button: switch data high and low;

3.6.4 Editing instructions for sequence testing

1. Enable

If the current step is performed, if set to No, skip this step and run the next step.

2. Functions

None - no other actions, normal execution according to the sequence

Cycle Cycle Start 00--This command is used in conjunction with the Cycle Stop command. The number in the command is the number of cycles, which is defined as the number of times to repeat all steps between the Cycle Start command and the Cycle Stop command. The maximum is 65535. After completing the set number of cycles, continue to execute the steps linked to the Cycle Stop command. The ↑\↓ keys, I/P knob, or numeric keys can be used to edit the number of repetitions.

Stop the cycle - This command is used in conjunction with the Start the cycle command. This command is placed after the last step of the cycle execution, indicating that the steps between the Start the cycle and Stop the cycle commands are repeated. If there is no Start the cycle before Stop the cycle or the number of cycles is 0 during the sequence test run, the sequence test will stop and return to the main interface of the sequence test.

Stop - Stops the sequence test and returns to the main sequence test interface. This command is often used at the end of a sequence to stop the test.

Pause--This command is used to pause the sequence test.

3. Link

The command to be executed after the current step is completed.

Next step -- execute the next operation of this step. If it is the last step of this sequence, stop running.

Sequence 00 - After completing the current step, exit the current sequence and execute the operation of sequence "00". The number in the command is the sequence number. It is used to combine multiple sequences into a single test, often used in the final step of the sequence. The values of the parameters can be adjusted using the ↑\↓ keys, I/P knob, or numeric keys.

4. Time

The time to run the current step. The format is --hour: minute: second: millisecond (the last 3 digits are milliseconds), with a minimum running time of 10mS. Use the soft keyboard with the numeric keys or knobs to set it.

5. Type

1) Step mode

In this mode, it is necessary to set the voltage, current, power value, and duration to output at the set voltage, current, power, and duration.

2) Voltage ramp mode

The output voltage changes linearly from the initial value (U_i) to the set end value (U_f) in a ramp manner within a set time

3) Voltage sinusoidal mode

A sinusoidal signal with amplitude U_a and frequency f is superimposed on the DC voltage value U_z .

If the instantaneous value of the output voltage synthesis exceeds the upper and lower limits of the power supply, it will be forced to be limited within the limits.

If the instantaneous value of the output current synthesis exceeds the upper and lower limits of the power supply, it will be forced to be limited within the limits.

3.6.5 Sequence test example

A typical aging test process is as follows: first, input a certain slope voltage to the tested object for a certain period of time, then suddenly rise to another voltage for a period of time, and then increase the voltage for a period of time... Finally, the voltage is reduced to zero in a slope manner. In some cases, a voltage switch cycle test sequence is also required. Figure 3-6-4 below shows a voltage waveform for aging testing.

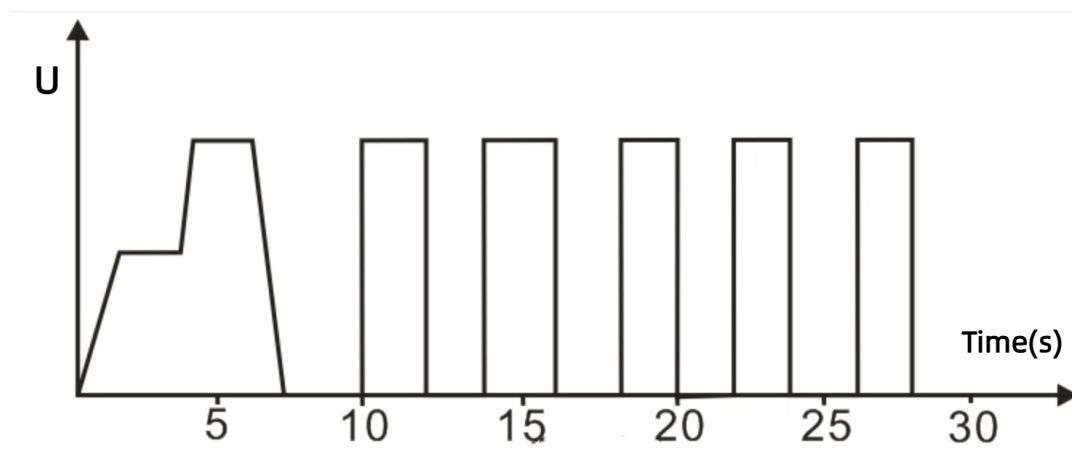


Figure 3-6-4 Example of sequence tests

The waveform can be set according to the following step parameters: Figure 3-6-4

Figure 3-6-4 Example of sequence tests

Step Number	Enable	Function	Inter linkage	Time	Type	Voltage U/Ui	Voltage Uf
0	yes	not have	next step	1s	Voltage slope	0V	20V
1	yes	not have	next step	2s	phase step	20V	
2	yes	not have	next step	0.5s	Voltage slope	20V	40V
3	yes	not have	next step	2.5s	phase step	40V	
4	yes	not have	next step	2s	Voltage slope	40V	0V
5	yes	not have	next step	2s	phase step	0V	
6	yes	Cycle initiation 4	next step	2s	phase step	0V	
7	yes	circulatory arrest	next step	2s	phase step	40V	
8	yes	cease	next step	2s	phase step	0V	

3.7 Function test

The function test function allows users to set parameters such as voltage, current, power, and operation mode and time, which better meets user requirements for automatic testing and aging applications.

The function test function has 5 types of functions: sine wave function, triangular wave function, ramp, rectangular wave function, and trapezoidal function.

3.7.1 Function test standby and editing interface

In the standard working mode standby state, press the MENU key to enter the menu interface, select "Function" using the $\leftarrow \rightarrow$ keys or the U knob, and press the ENTER key or the U knob button to enter the function test interface (the default type is sine wave when first entering function mode). When the cursor is located in the type option, you can select the function type using the $\leftarrow \rightarrow$ keys.

1. Sinusoidal function:

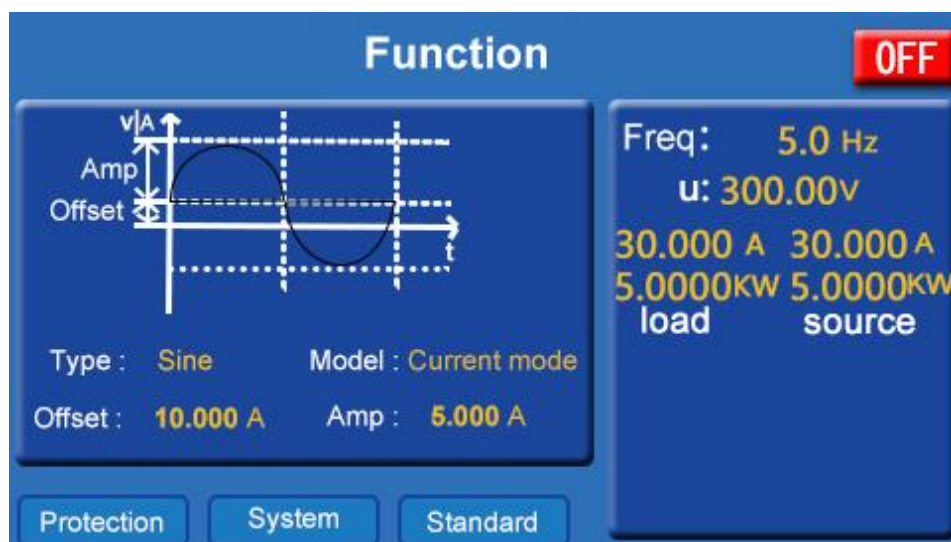


Figure 3-7-1 Function test- -Sine wave standby editable interface

Sine wave editing description:

1) Function generator voltage mode and current mode switch. After switching, the unit and value range of the waveform setting area will change according to the actual model!

2) Other parameters shall be set by the customer according to the actual demand.

Parameter configuration:

1) About the bias:

① "Bias + amplitude" is limited by the upper and lower limits of the voltage / current adjustable range;

② Voltage is also limited to the "bias amplitude";

2) About the frequency: support the value setting range from 0.1-1000Hz;

3) About the amplitude:

① Amplitude $\leq 50\%$ of rated value, but also limited by the constraint of bias + amplitude < upper limit of adjustable range;

② The relationship with the frequency f

a) Pre-estimate the peak-to-peak voltage (VPP) of the required frequency and voltage.

b) Then estimate the proportion of total voltage output occupied by VPP, which is the percentage of VPP. If the VPP of the design sequence is 10V and the maximum voltage of the power supply is 100V, then $\%VPP = 10/100 = 10\%$.

c) The relationship between frequency and VPP percentage should not exceed the following table

Frequency	%VPP
10HZ	100%
50HZ	28%
100HZ	14%
150HZ	9.2%
200HZ	4.8%

When setting the running time for each step, it is also necessary to consider the actual output rise or fall time. If the setting is not appropriate, although there is no danger, the output waveform may be very different from what is needed. This time is closely related to the actual load conditions. If you want to know more, please contact the manufacturer.

2. Triangle wave function:

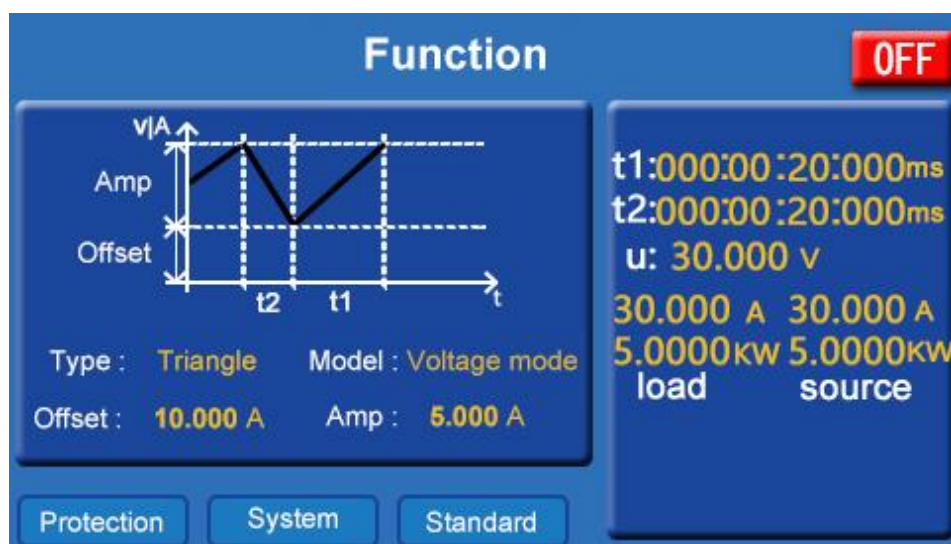


Figure 3-7-2 Function test- -triangular wave standby editable interface

Triangular wave editing instructions:

1) Switching between voltage and current modes of the function generator. After switching, the unit and value range in the waveform setting area will change according to the

actual model!

Other parameters are set by the customer according to their actual needs.

Parameter configuration:

1) Regarding the offset: limited by the lower limit of the adjustable range $< \text{offset} < \text{upper limit of the adjustable range}$, and the constraint of $\text{offset} + \text{amplitude} < \text{upper limit of the adjustable range}$

2) Regarding amplitude: limited by the constraint of $\text{bias} + \text{amplitude} < \text{upper limit of adjustable range}$

3) Time t_1/t_2 : The setting range is 0.1-36000s.

3. Slope function:

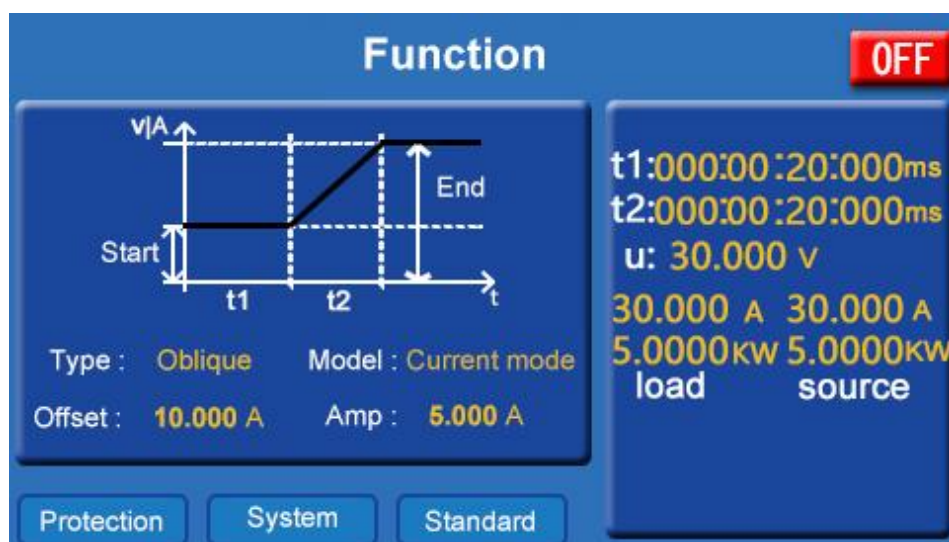


Figure 3-7-3 Function test-Slope standby editable interface

Description of slope editing:

1) Switching between voltage and current modes of the function generator. After switching, the unit and value range in the waveform setting area will change according to the actual model!

2) Other parameters are set by the customer according to their actual needs.

Parameter configuration:

1) Regarding the offset: limited by the lower limit of the adjustable range $< \text{offset} < \text{upper limit of the adjustable range}$, and the constraint of $\text{offset} + \text{amplitude} < \text{upper limit of}$

the adjustable range

2) Regarding amplitude: limited by the constraint of bias + amplitude < upper limit of adjustable range

3) Time t1/t2: set range 0.1-36000s;

4. Rectangular wave function:

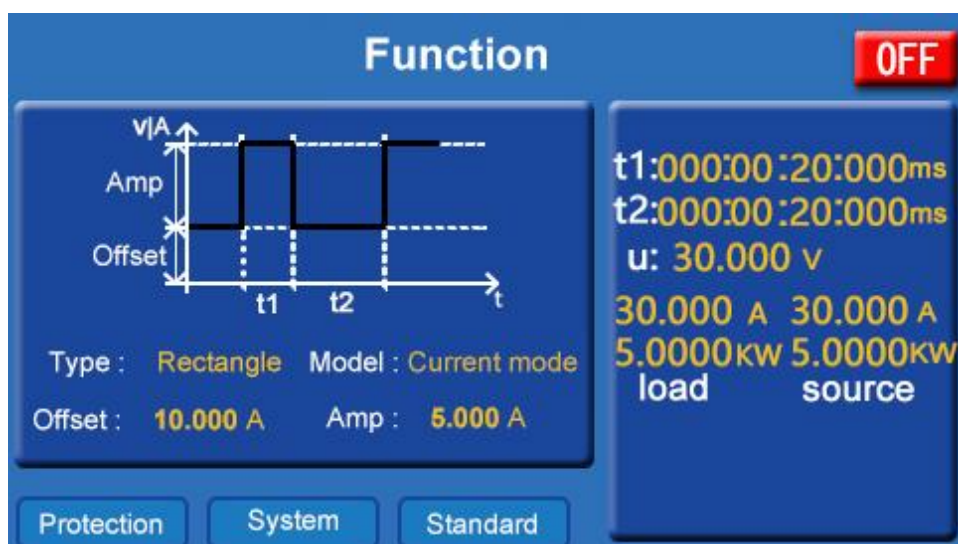


Figure 3-7-4 Function test- -rectangular wave standby editable interface

Description of rectangular wave editing:

1) Switching between voltage and current modes of the function generator. After switching, the unit and value range in the waveform setting area will change according to the actual model!

Other parameters are set by the customer according to their actual needs.

Parameter configuration:

1) Regarding bias: It is limited by the constraints of adjustable range lower limit < bias < adjustable range upper limit, and bias + amplitude < adjustable range upper limit

2) Regarding amplitude: limited by the constraint of bias + amplitude < upper limit of adjustable range

3) Time t1/t2: set range 0.1-36000s;

5. Trapezoidal wave function:

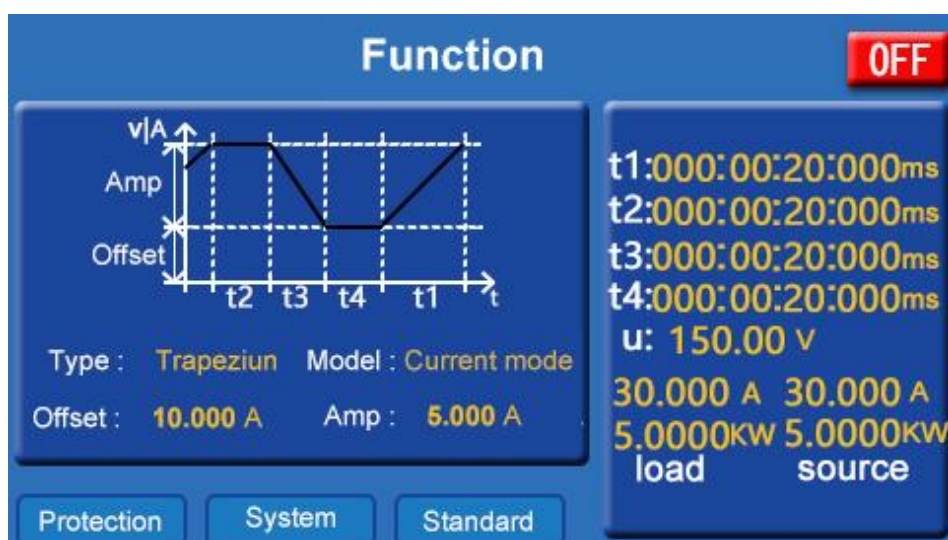


Figure 3-7-5 Function test- -Standby editable interface with trapezoidal wave

Trapezoid wave editorial description:

1) Switching between voltage and current modes of the function generator. After switching, the unit and value range in the waveform setting area will change according to the actual model!

2) Other parameters are set by the customer according to their actual needs.

Parameter configuration:

1) Regarding bias: It is limited by the restrictions of adjustable range lower limit < bias < adjustable range upper limit, and bias + amplitude < adjustable range upper limit

2) Regarding amplitude: limited by the constraint of bias + amplitude < upper limit of adjustable range

3) Time t1/t2/t3/t4: The setting range is 0.1-36000s;

3.7.2 Function test running interface

There are five types of functions, and five types of function tests in the startup state. Pressing the ON/OFF button can start the power function test and enter the function running interface (the following example is based on the sine wave function startup state).

Sine function operation interface:

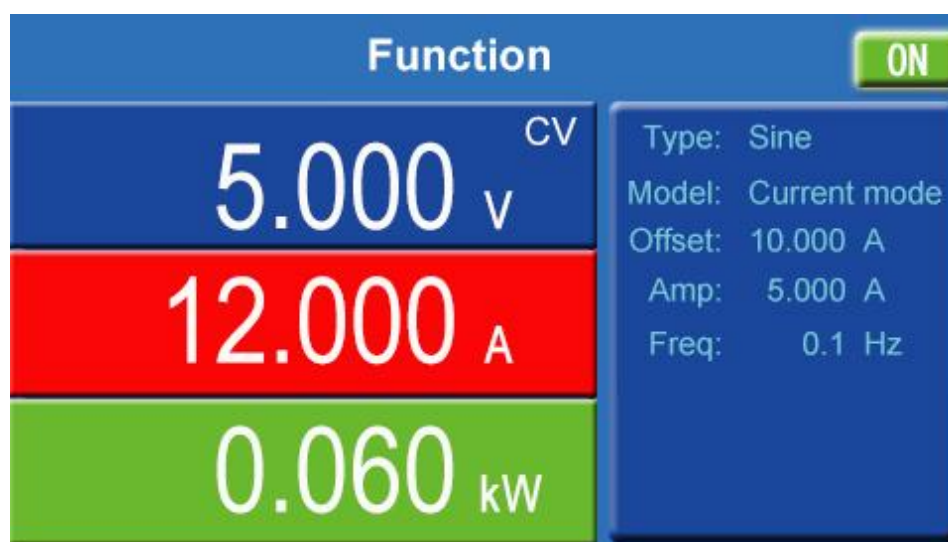


Figure 3-7-6 Function test-Sine wave operation interface

The current running information is displayed in the sine wave function test run interface:

1. The status bar displays status information such as alarm, leakage, start and stop information, etc., which is the same as the standard mode.
2. The measurement area displays the current power mode (CV\CC\CP) and output measurement value, as in standard mode.
3. Function information area, showing the mode, offset, amplitude, and frequency of the sine wave function.

3.8 Internal resistance test

The internal resistance test function has two test modes: source internal resistance and load internal resistance. When the product is working in the internal resistance adjustment/constant resistance mode with an electronic load, the operating principle is based on variable internal resistance. The constant resistance mode (CR) is basically its basic attribute. The load attempts to set the internal resistance to a value defined by the user through inputting current and voltage, based on Ohm's law $I_{in} = U_{in} / R_{set}$. For the HB series, the difference between the external supply voltage and the internal setpoint determines the true current. Specifically, there are two cases:

- 1) When the DC input voltage is higher than the set voltage

In this case, the above formula will be extended to $I_{in} = (U_{in} - U_{set}) / R_{set}$.

- 2) When the DC input voltage is equal to or lower than the set voltage

The HB series products do not absorb any current and switch to CV mode. If the supplied input voltage is almost equal to or fluctuates around the set voltage, the internal resistance adjustment/constant resistance mode will always switch between CV and CR modes. Therefore, it is recommended not to adjust the set voltage to the same level as the external power supply.

Note:

1) The internal resistance is usually limited between zero and a maximum value. Since the internal resistance cannot be zero, the minimum value it can be set varies depending on the voltage level of the power supply, ensuring that the internal electronic load can draw a larger input current from the power supply at very low input voltages, up to a maximum.

2) When the internal resistance adjustment/constant resistance mode is used, the feedback current is greater than 0.5A and meets the accuracy requirements.

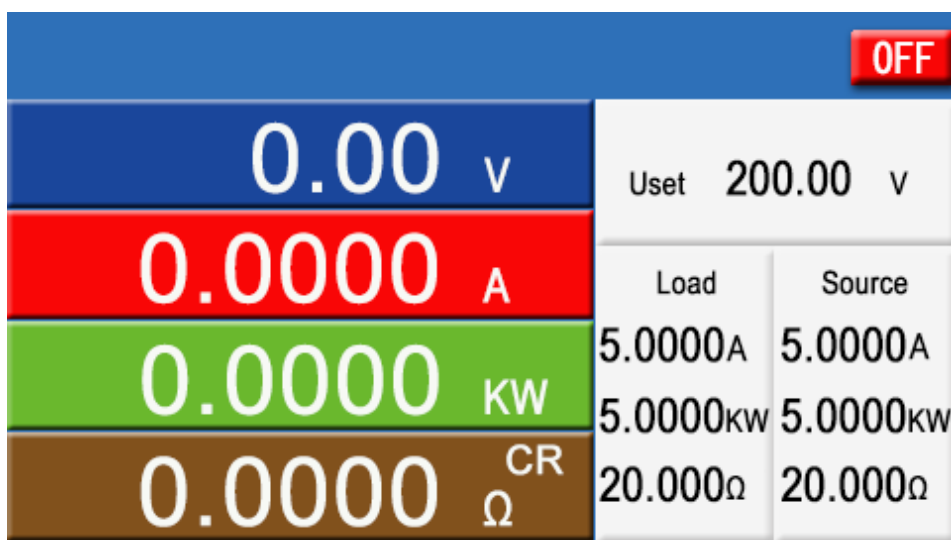
3) When the power supply is in other programming modes, the internal resistance mode is automatically disabled.

3.8.1 Standby and editing interface in internal resistance mode

In the standard working mode standby state, press the MENU key to enter the menu interface, select "System Settings" through the $\leftarrow\rightarrow$ keys or U knob, press the ENTER key or U knob button to enter the system settings interface, select "Operation Settings" through the $\leftarrow\rightarrow$ keys or U knob, press the ENTER key or U knob button to enter the operation settings interface (Figure 3-8-1), press the ENTER key or U knob button to place the cursor on the internal resistance enable option, and use the $\uparrow\downarrow$ keys and I/P knob to change the internal resistance enable status. After enabling internal resistance, return to the standard interface, as shown in Figure 3-8-2. Rotate the cursor to the source/load internal resistance setting value using the $\leftarrow\rightarrow$ keys, and use the I/P knob to change the source/load internal resistance setting value.



3-8-1 Internal resistance enabling interface



3-8-2 Internal resistance interface

Description of the source load internal resistance value:

When the power supply is started as a source output, the relationship between setting and display is $U_{out} = U_{set} - I_{out} \cdot R_{set}$. When the power supply is started as a load output, the relationship between setting and display is $I_{in} = (U_{in} - U_{set}) / R_{set}$. And it is necessary to meet the operating condition $U_{in} > U_{set}$.

3.8.2 Startup interface of internal resistance mode

After enabling the internal resistance, the working mode standby power supply presses the ON/OFF button to start output. If the start is successful, the status bar displays the

corresponding working information. The source internal resistance start-up is shown in Figure 3-8-3

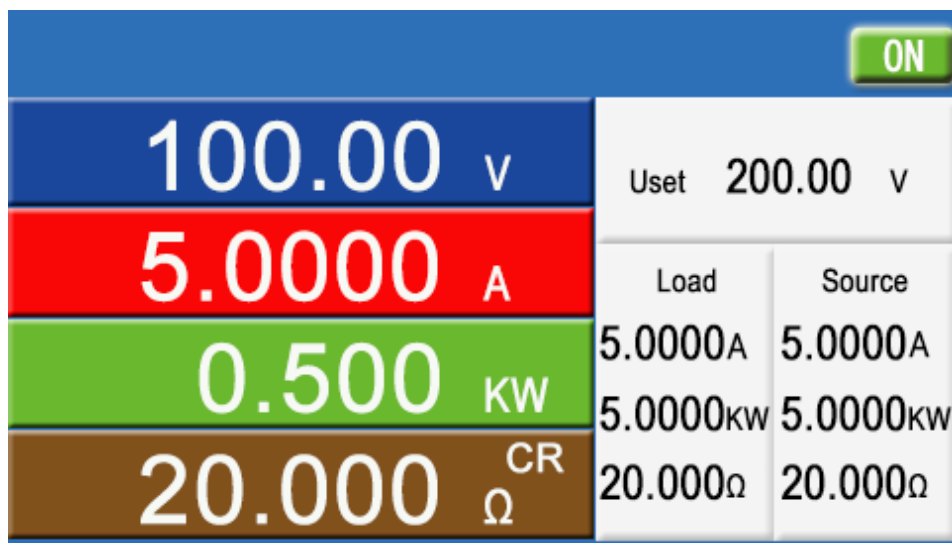


Figure 3-8-3 Internal resistance operation interface

The actions available at this time:

ON / OFF key: stop the power supply output;

←\→ Key: Select the switch voltage, current, power and other options.

↑\↓ Key: Modify the selected data.

U knob: voltage adjustment knob can adjust the output voltage;

I/P knob: current / power adjustment knob can adjust the output current / power / internal resistance;

U knob button cycle into each voltage edit position;

I/P knob button cycles through the current/power/internal resistance editing positions selected by the ←\→ keys;

Note: When the power supply is working in the startup state, if the "Knob Effectiveness Mode" in the system settings is set to "Effective Immediately" (see Section 3.12.2), when using the knob or the ↑ and ↓ keys to change the voltage, current, and power settings, the data changes will take effect immediately with the adjustments made, without needing to confirm with the ENTER key.

3.9 Battery Simulation

The HB series has a battery simulation function that can simulate various battery output characteristic curves. It can also be controlled by an upper computer to achieve battery simulation functions (the upper computer software supports custom battery models, making operation more intuitive). Note that before entering the battery simulation interface, the source current setpoint and source power setpoint need to be set to the rated current value and rated power value respectively, otherwise the output current and output power of the battery simulation will be limited by the parameter settings of the source current and source power.

3.9.1 Battery simulation interface

In the standard working mode standby state, press the MENU key to enter the menu interface, select "battery" through the $\leftarrow \rightarrow$ keys or U knob, and press the ENTER key or U knob button to enter the battery simulation interface, as shown in Figure 3-9-1.

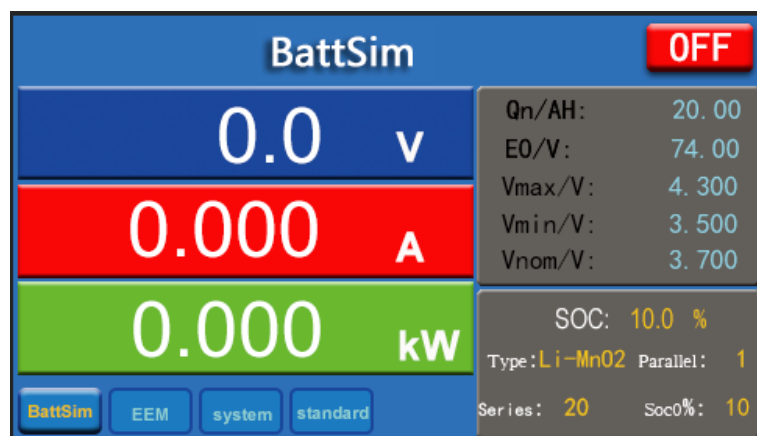


Figure 3-9-1 Battery simulation standby interface

In this state, the button can perform the following operations:

① Press the MENU button to enter the menu selection state, and press the ENTER button or the U knob button to enter the corresponding interface after selecting:

"Battery": Edit the battery type, number of series, number of parallel, SOC0%; enter the battery type (including lithium manganate, lithium cobaltate, lithium iron phosphate, lead-acid battery, ternary lithium battery), set the number of batteries in series and parallel, and set the initial SOC0%.

Wherein: series number * standard voltage = E0;

Series number * upper limit voltage rated voltage;

Parallel number * $Q_n \times 2$ rated current;

Soc0% range is 0~100.

"Metering": enter the electric energy metering interface;

"System": enter the series editing interface to browse and modify system parameters;

"Standard": Return to standard working mode.

② ON/OFF button: Start.

③ $\leftarrow \rightarrow$ button or U knob: select data item.

④ $\uparrow \downarrow$ keys or I/P knob: Modify the selected data.

⑤ U knob button: equivalent to the MENU button;

After setting the battery type, number of series, number of parallel, and Soc value, click the ON/OFF button to start the battery simulator. During the operation process, ensure that the battery simulator is working in CV state (because only in CV state can the battery charging and discharging be simulated). During the operation process, it is possible to switch between the battery simulation interface and the energy measurement interface, but it is not possible to switch to the system and standard interface, nor can it set parameters. The operation interface is shown in Figure 3-9-2.

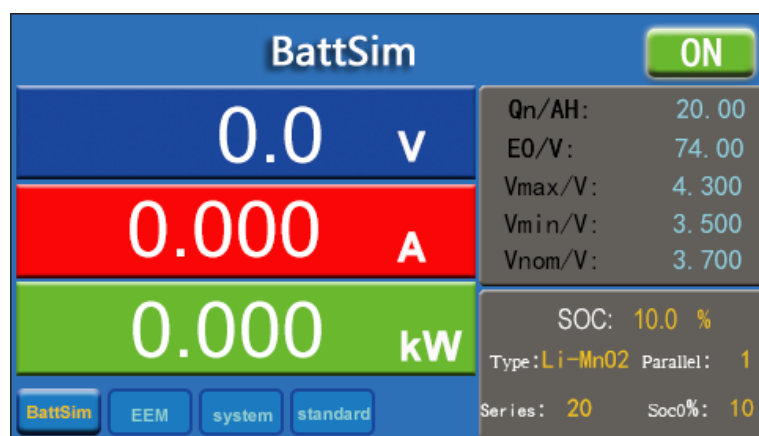


Figure 3-9-2 Fixed battery operation interface

3.9.2 Electric energy metering interface

In the battery simulation interface, press the MENU button to enter the menu interface, select "Metering" through the $\leftarrow \rightarrow$ buttons or the U knob, and press the

ENTER button or the U knob button to enter the energy metering interface, as shown in Figure 3-9-3.



Fig. 3-9-3 Electric energy metering interface

In this state, the button can perform the following operations:

- ① With \ key or U button, press ENTER button or U button button to perform the corresponding function:

"Start calculation": start to calculate energy consumption, feed energy, install time, run time, only in the battery simulation start state calculation;

"Stop the calculation": stop the calculation of energy consumption, energy feeding, safety time and running time;

"Last page": There are 10 groups of historical energy measurement records, and the previous record can be queried;

"Next page": There are a total of 10 groups of historical stored energy metering records, and the next record can be queried;

"Battery": Return to the battery simulation page.

- ② ON/OFF key: Start, start on the energy metering page and it will automatically calculate energy metering.
- ③ U-knob button: equivalent to the MENU key;
- ④ ESC key: return to the battery simulation page;

Click "Start Calculation" to start calculating various parameters. During the calculation process, click "Stop Calculation" to automatically save the data to the following table. The

energy metering operation interface is shown in Figure 3-9-4.

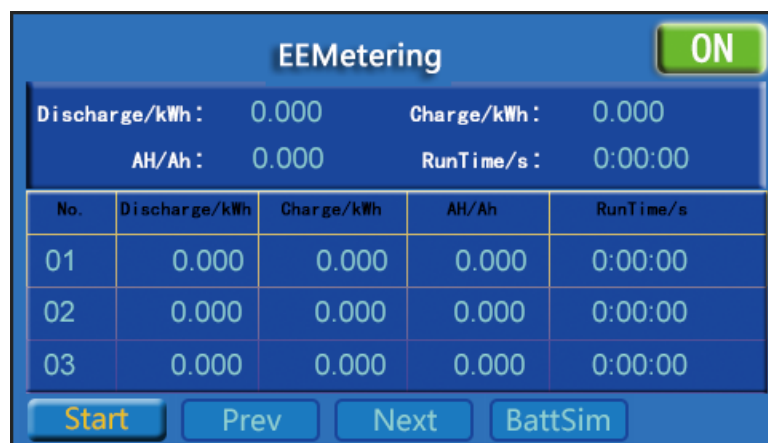


Fig. 3-9-4 Electric energy metering interface

When the calculation is stopped, the data is automatically saved to the following table. When the following table is not filled, it is automatically saved to the first row. When the table is filled, it is automatically saved to the first row, and the data in other rows is automatically moved down one row.

Note: When the SOC in the battery simulation is charged to 100% or discharged to 0% during operation, the power supply will automatically stop.

3.10 Protection settings

The HB series power supply provides powerful alarm protection settings, allowing for the setting of various protection parameters such as output voltage upper/lower limits, output current upper/lower limits, output voltage step time, output current step time, and leakage protection (optional).

In any working mode menu interface, select "protection settings" and press ENTER to enter the protection settings interface, as shown in Figure 3-10-1.

Press the MENU key to enter the menu selection state, press the ← or → key to select and then press the ENTER key to enter the corresponding interface, and press the MENU key or ESC key again to exit the protection setting interface

←\→ keys or U knob: select data items.

↑\↓ keys or I/P knob: Modify the selected data.

ENTER key: save the current parameter value.

ESC key: cancel data modification and read back parameters;

U knob button: equivalent to the MENU button;

I/P knob button: switch between high and low data bits;

3.10.1 Voltage alarm setting

Select the "voltage alarm" option in the protection setting interface menu, press the ← or → key to select it, and press the ENTER key to enter the voltage protection setting interface, as shown in Figure 3-10-1



Figure 3-10-1 Interface for editing voltage alarm

The function descriptions of each option are shown in Table 3-7-1. The alarms generated by the protection settings are displayed in the status bar, as shown in Section 3.4.1

Table 3-10-1 Information on the voltage and current alarm setting interface

The Parameter Name	Set The Range	Remarks
** threshold	0 to maximum voltage / current * 1.1	Output overvoltage/overcurrent protection, executed according to the set upper limit alarm mode (alarm, prompt, none), and display alarm information in the status bar
Delay Time	0~99.999S	The time allowed for the output value to exceed the upper limit. If it exceeds this time, it will be executed according to the upper limit alarm method
Alarm method	Alarm, prompt, and ignore	① Alarm: stop output, sound an alarm and display alarm information in the status

		bar ② Tip: Do not stop outputting, only display alarm information in the status bar ③ Ignore: ignore the alarm
--	--	--

Figure 3-10-2 shows the working process of the OV over-voltage alarm

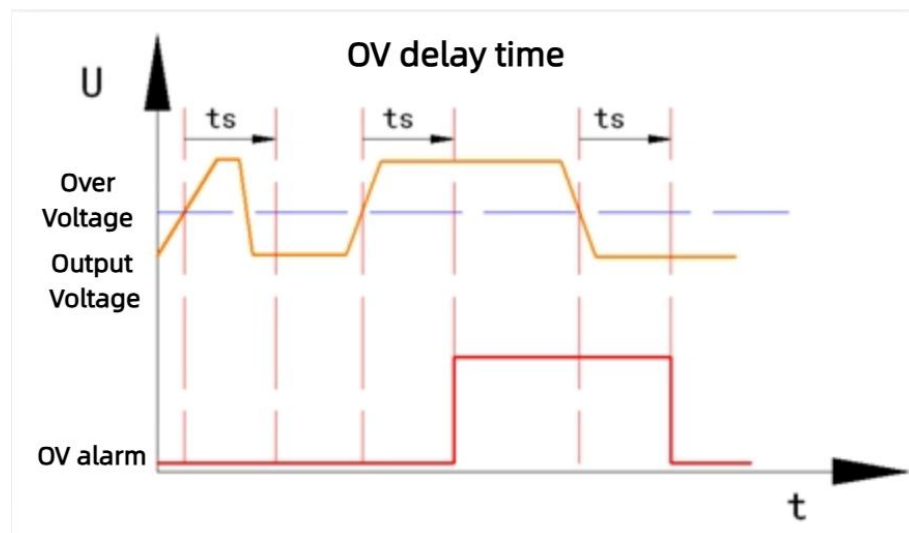


Figure 3-10-2 OV over-voltage alarm process

3.10.2 Power alarm setting

Select the "Power Alarm" option in the menu of the protection setting interface by pressing the ← or → key, and then press the ENTER key to enter the current protection setting interface, as shown in Figure 3-10-3. Its specific meaning is basically the same as that of the voltage alarm, and it will not be repeated here.

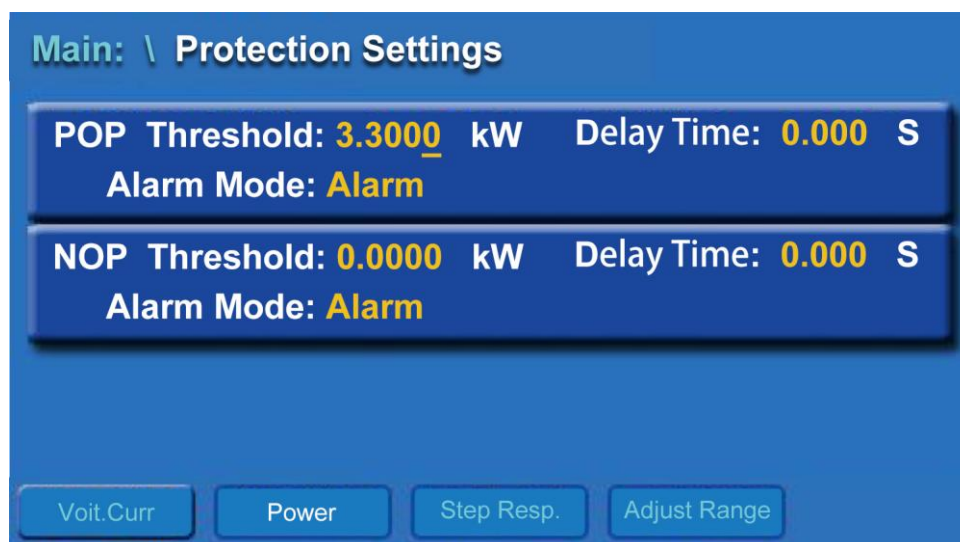


Figure 3-10-3 Power alarm setting interface

3.10.3 Step response alarm setting

Select the menu of the protection setting interface, press the $\leftarrow$ or $\rightarrow$ key to select "step response", and press the ENTER key to enter the step protection setting interface, as shown in Figure 3-10-4

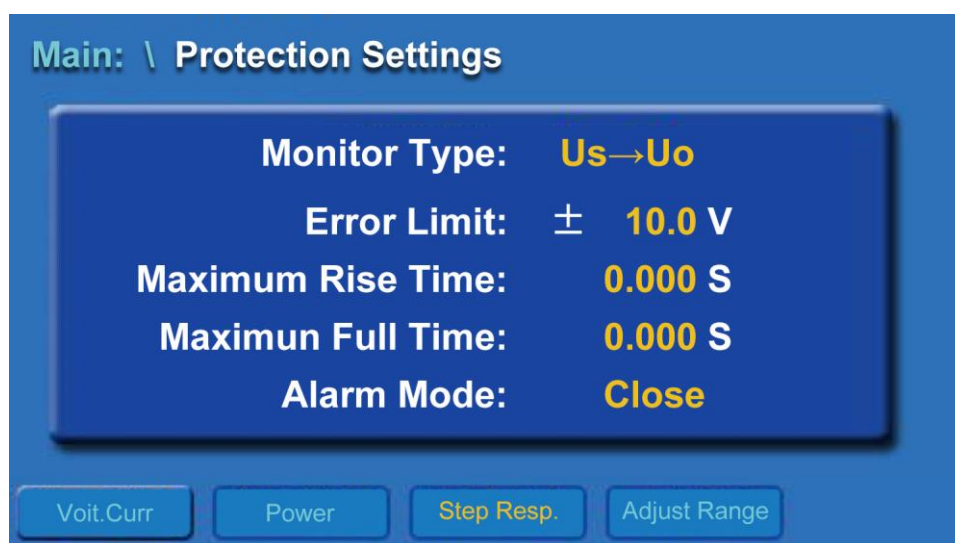


Figure 3-10-4 step response setting interface

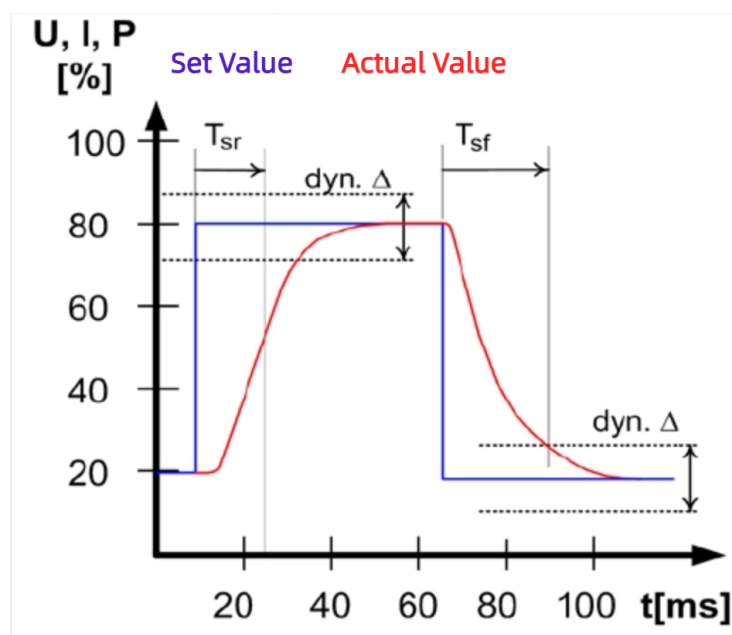


Figure 3-10-5 step response alarm curve diagram

3.10.4 Limit value setting

Select the "Protect Settings" menu, press $\leftarrow$ or $\rightarrow$ to select "Adjustable Range", and press ENTER to enter the output range setting interface, as shown in Figure 3-10-6.



Figure 3-10-6 Adjustable range setting interface

3.11 System setting and system information

The system settings interface includes various system information settings functions.

In each working mode menu interface, select "System Settings" or "System" and press

ENTER to enter the system settings interface

All system settings sub-interfaces operate in the same way:

Press the MENU key to enter the menu selection state, press the ← or → key to select and then press the ENTER key to enter the corresponding interface. When in the menu selection state, press the ESC key again to exit the system settings interface

←\→ keys or U knob: select data items.

↑\↓ keys or I/P knob: Modify the selected data.

ENTER key: save the current parameter value.

ESC key: cancel data modification and read back parameters;

U knob button: equivalent to the MENU button;

I/P knob button: switch data high and low.

3.11.1 Communication Settings

Select the "System Settings" menu in the system settings interface, press the ← or → key to select "Communication Settings", and press the ENTER key to enter the communication settings interface, as shown in Figure 3-11-1 or 3-11-2. For specific meanings, see Table 3-11-1

Table 3-11-1 Explanation of entries in the communication settings interface

The Parameter Name	Set The Range	Remarks
Communication Mode	Unable to set up, the system automatically identifies the power communication card	Different communication methods have different interface options
Protocol	Unable to set, power default protocol	
Postal Address	1~255	The address number in the communication protocol must be consistent with the settings of the host computer, otherwise the power supply will not respond to the command
Baud Rate	RS485: 9600/19200/38400/57600/115200/250K/500K CAN: 10K/20K/50K/100K/125K/250K/500K/1M	The communication mode is valid when it is RS232/RS485/USB/CAN, and it must be consistent with the settings of the host computer, otherwise the power supply will not respond to the command
IP Address	1~223 .0~255 .0~155 .0~255	This is valid when the communication method is LAN, and must be consistent with the target

		network port address settings. The PC protocol type must be TCP Client mode, otherwise the power supply will not respond to commands,
Port Number	1~65535	The communication method is valid when it is LAN, and it must be consistent with the PC side settings, otherwise the power supply will not respond to the command
120R	Open / close	RS485 terminal matching resistor on/off
Can120R	Open / close	CAN terminal matching resistance on/off
Basic Id / Broadcast Id / Loop Setting Id / Loop Read Id	0~99999	/
Status Quantity / Actual Value 1 / Actual Value 2 / Sequence Setting 1 / Sequence Setting 2 / Power Model	Off / 20 ~ 5,000 ms	Periodic active uploading
The Main Control Mouth	RS485/LAN/CAN	A communication port is set as the main control port, which can issue control commands; other communication ports have read-only functions

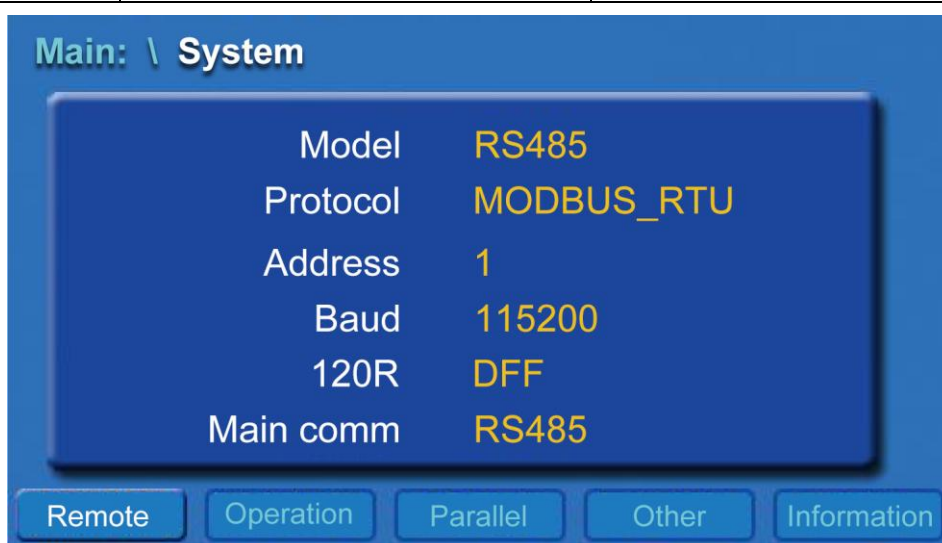


Figure 3-11-1 Communication setting interface-RS485 Communication

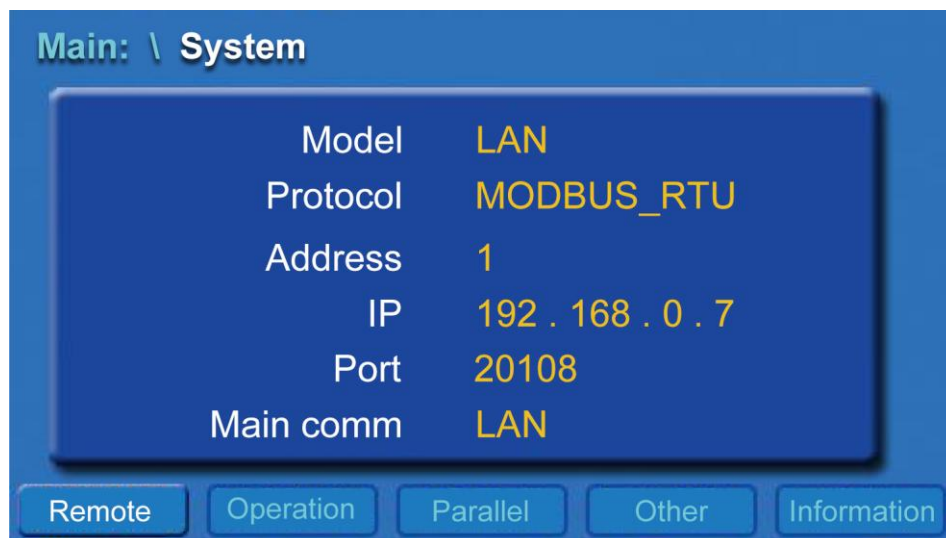


Figure 3-11-2 Communication Settings interface-LAN communication

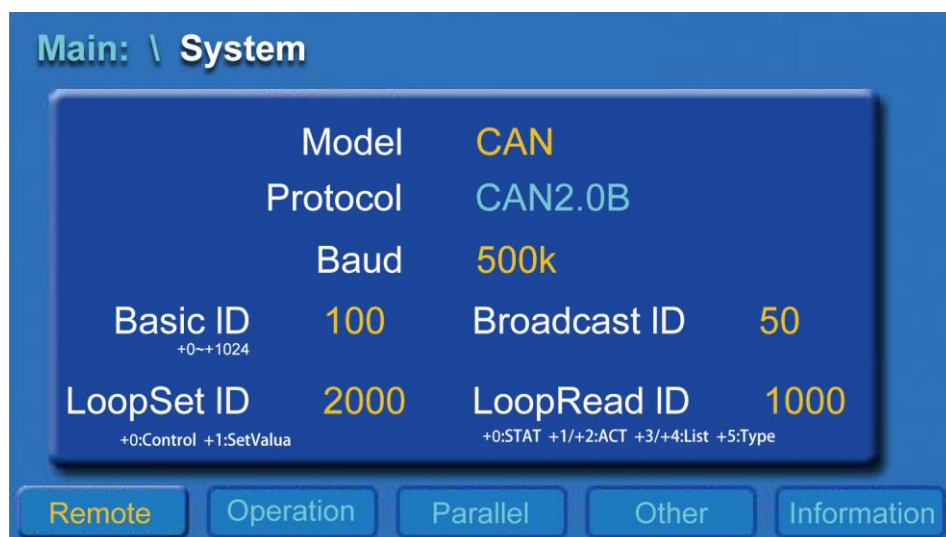


Figure 3-11-3 Communication Settings interface-CAN 1 communication

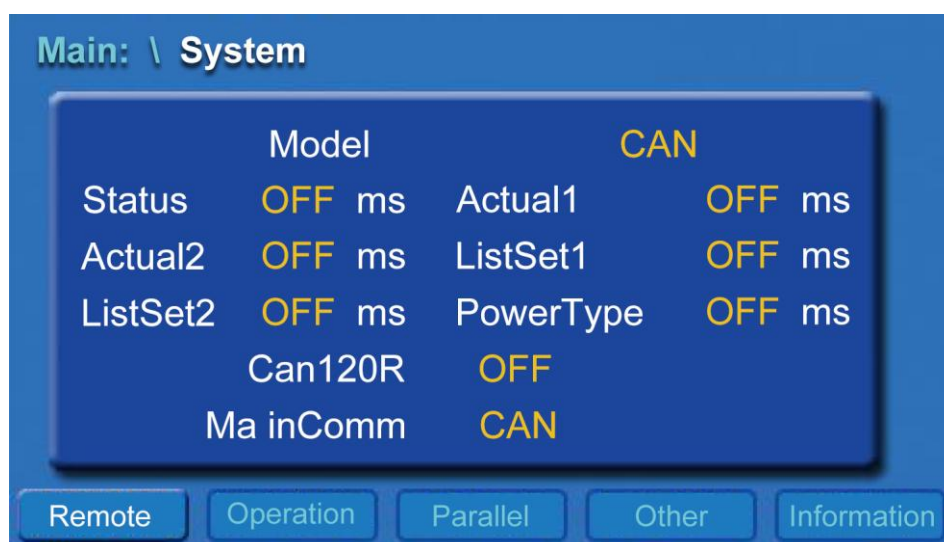


Figure 3-11-4 Communication Settings interface-CAN 2 communication

3.11.2 Operation Settings

Select the "System Settings" menu in the system settings interface, press the ← or → key to select "Operation Settings", and press the ENTER key to enter the operation settings interface, as shown in Figure 3-11-5. The specific meaning is shown in Table 3-11-2

Table 3-11-2 Interpretation of operation setting interface entries

The Parameter Name	Set The Range	Remarks
keying chirps	Open / close	Whether there is a key sound when operating the button or knob
Automatic key lock	10~300S / off	When the key is locked, the key will not be locked
The alarm	Open / close	If the power supply alarm, make the alarm sound
Method of effective knob	Effective after confirmation / with immediate effect	When adjusting the voltage, current, and power values online, press ENTER, whether the key takes effect or the change takes effect
Backlight turns off automatically	10~300S / off	Turn off the screen backlight, enter the energy saving mode time, close the screen backlight always bright
Back brightness	10%~100%	LCD back brightness adjustment
Shortcut group calls	Single / continuous	Quick group call method
Discharge resistance enables	Open / close	Internal discharge function enables or prohibited
Internal resistance enabling	Open / close	Internal resistance function enables or prohibition
After remote control state	Close / restore	Off: after the upper computer remote control is on, the machine is shut down Restoration: after the remote control of the upper machine, the state of the machine remains unchanged

State after boot	Close / restore	Off: the state is off after boot Restoration: the state is before power off
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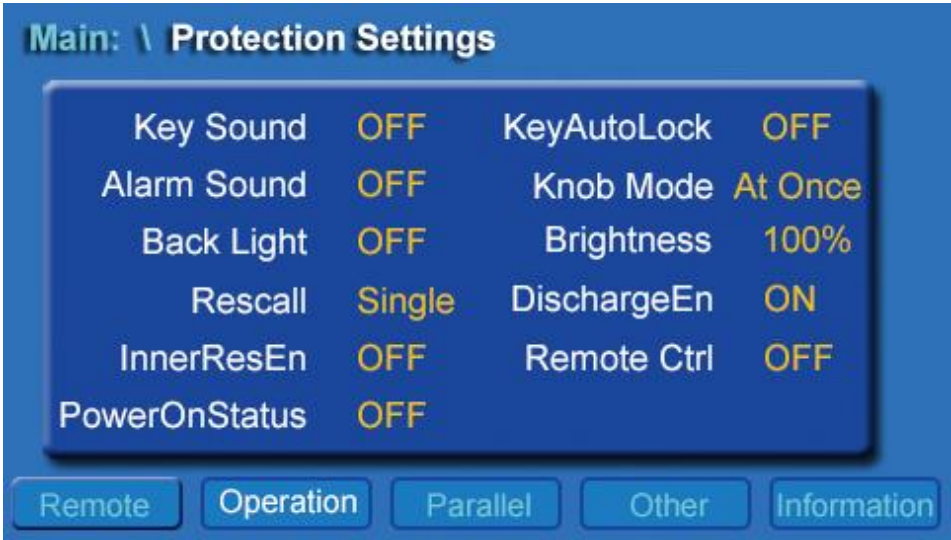


Figure 3-11-5 Operation setting interface

3.11.3 Other Settings

Select the "Other Settings" menu item in the system settings interface by pressing the ← or → keys, and then press the ENTER key to enter the Other Settings interface, as shown in Figure 3-11-6. The specific meaning is shown in Table 3-11-3

See details in Table 3-1-1-3

Table 3-11-3 Interpretation of other setting interface entries

The Parameter Name	Set The Range	Remarks
Output data export	Open / close	reserve
Set data input	Open / close	reserve
Voltage rate setting	Off / 0.001 ~ Umax / 100	Voltage change slope during online voltage adjustment
Current rate setting	Off / 0.001~0.1A/ms	Current change slope during online current adjustment
Vdc_R	0~Umax	When using analog quantity, the output voltage is higher than Vdc_R in the startup state, and DC_ON outputs a high level (+15V) (standby)
Vdc_F	0~Umax	When using analog quantity, when the output voltage is lower than Vdc_F in the stopped state, DC_ON outputs a low level (standby)

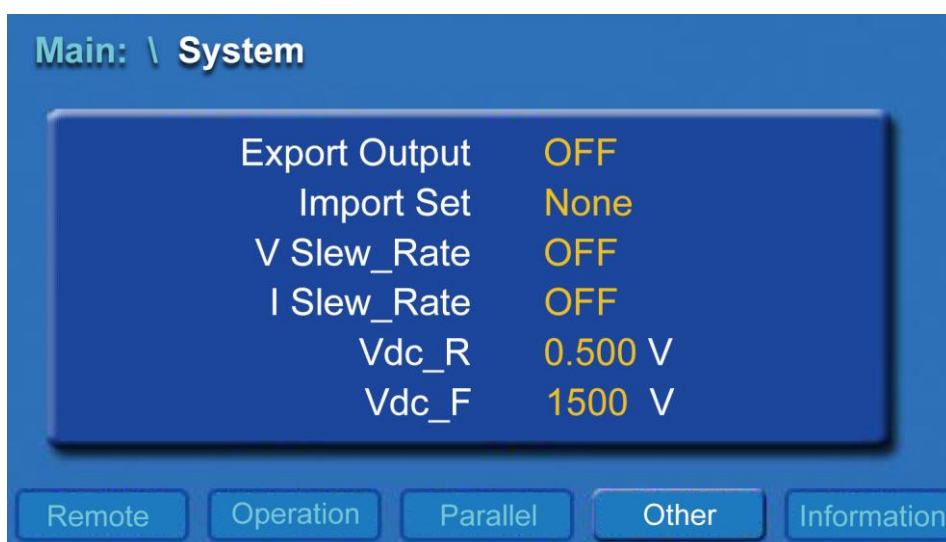


Figure 3-11-6 Other Setup Interface

3.11.4 System information

Select the "System Settings" menu in the system settings interface, press the ← or → key to select "System Information", and press the ENTER key to switch to the system information interface. You can set the language type (Chinese) and browse system information: product model, software version, version date, communication board version, etc., as shown in Figure 3-11-7.

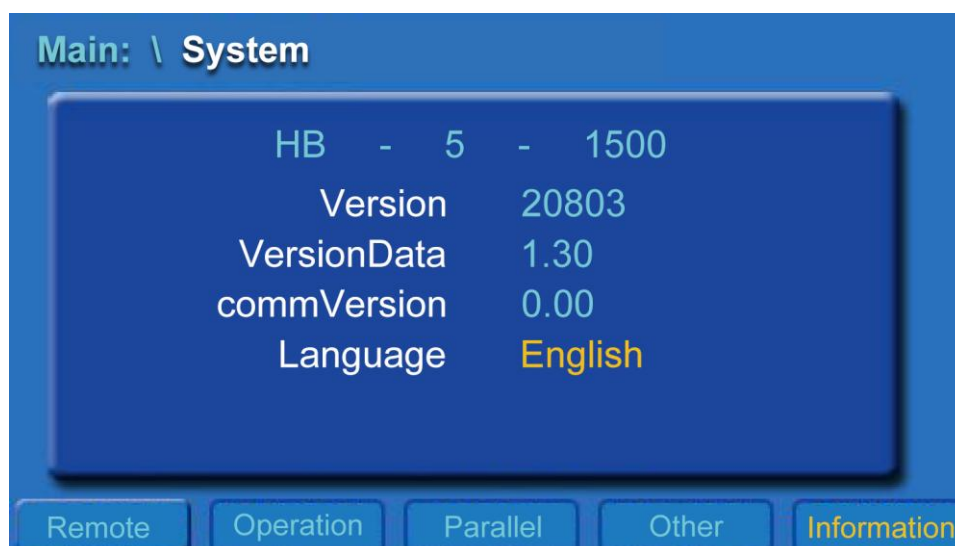


Figure 3-11-7 The system information interface

3.12. Alarm interface

When the power supply detects a module fault signal, a module overheating signal, or an external compensation terminal connection error signal, the power supply immediately stops

outputting, switches to the alarm interface, and simultaneously emits an alarm sound, as shown in Figure 3-9-1

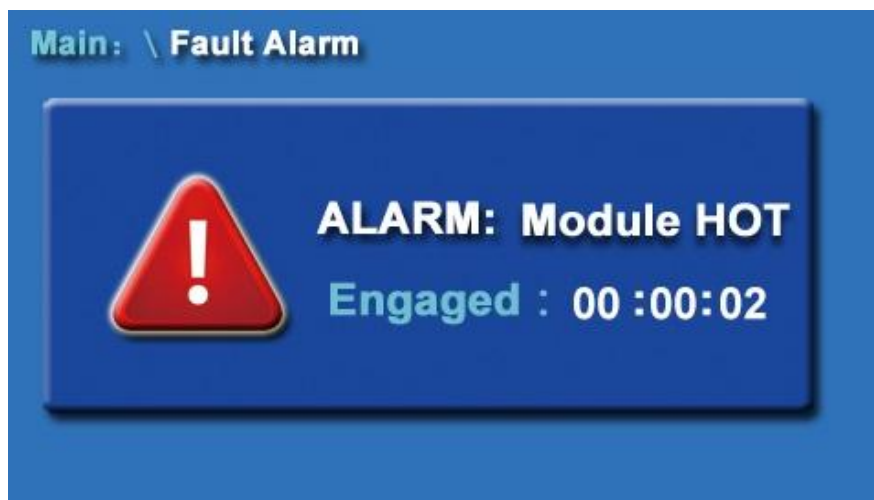


Figure 3-12-1 Module Overheating Alarm

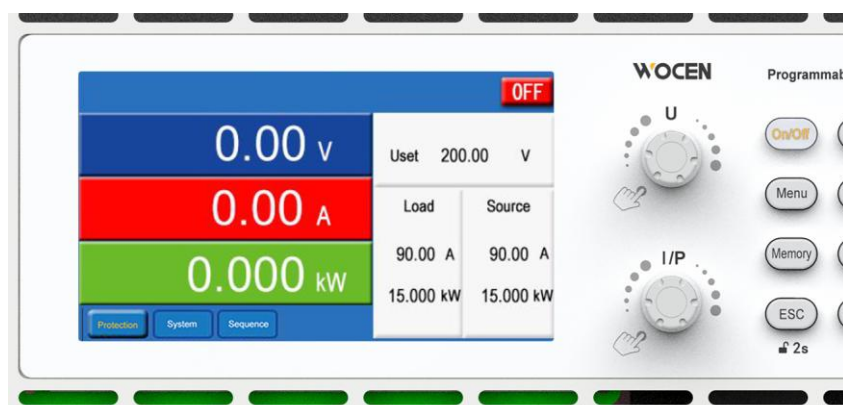
3.13 Parallel operation

3.13.1 Main-slave bus setup

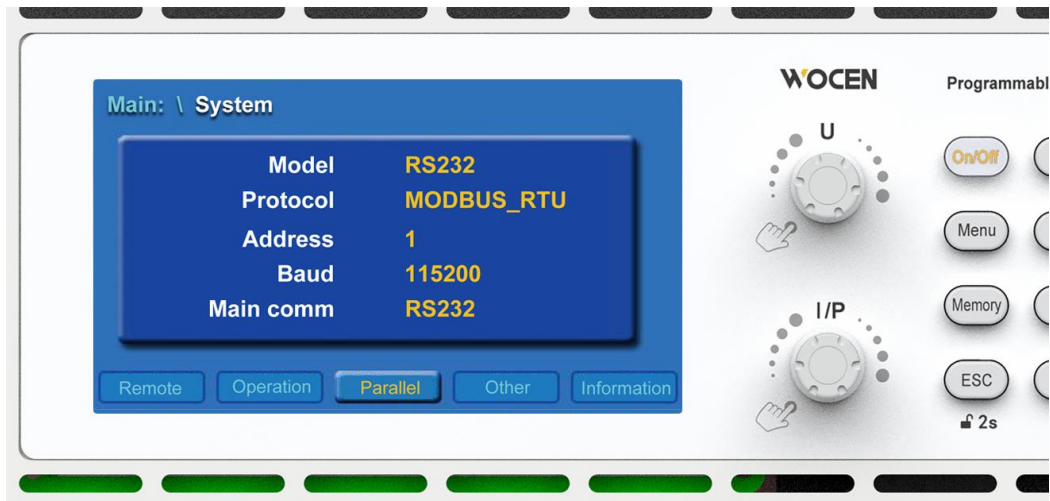
Before using the parallel mode, it is necessary to configure the master-slave system for each product. It is recommended to configure all slaves first, followed by the master.

➤ Configure all slaves:

1. The equipment switch is operated in the standby state;
2. Press the "MENU" button, turn the voltage adjustment knob clockwise to enter the "System" screen; press the voltage adjustment knob down to enter the system settings, turn the voltage adjustment knob clockwise to select "Parallel Settings", and press the voltage adjustment knob to enter the "Parallel Settings" interface;



Standby interface



System Setup Interface

3. Select whether to set the host/slave or its address by rotating the voltage knob. When it is necessary to set the host/slave, select it by rotating the current knob. When it is necessary to set the slave address, also select it by rotating the current knob. The actual number of slaves is N, set N. When three are connected in parallel, the number of slaves is 01, 02; when four are connected in parallel, the number of slaves is 01, 02, 03. After setting, press ENTER to confirm.



Parallel setting interface

➤ Configuration Host:

1. Set the power setting for the host to be consistent with the configuration of the slave. After setting the host, set the "slave quantity" to the actual value. After the setting is complete, press ENTER to confirm.



Parallel setting interface

3.13.2 Power-on/off sequence in parallel operation mode

When using the parallel mode, the host needs to read real-time data from the slave. To avoid data reading errors that cause alarms, it is recommended to follow the power-on and power-off sequence shown in the following figure:

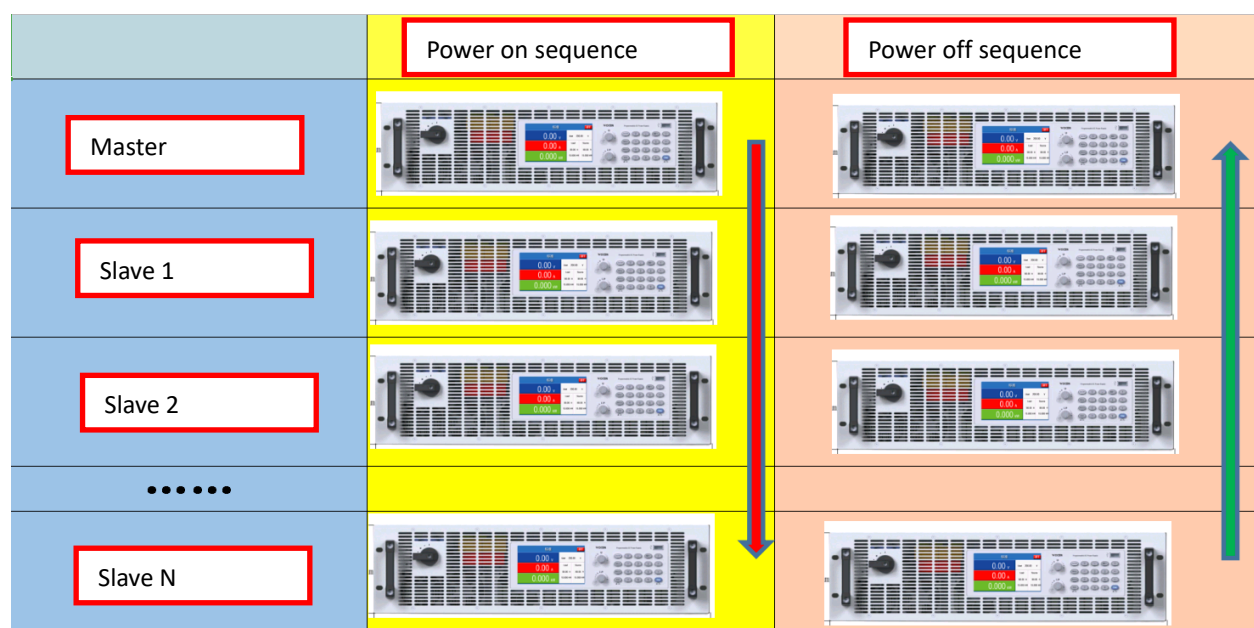


Diagram of Power-on/off sequence

Chapter 4 Fault detection and maintenance

Summary of this chapter:

- Maintenance
- Simple fault handling
- Storage and transportation

4.1 Maintenance

4.1.1 Periodic maintenance

If the equipment is not used for a long time, it should be powered on once a month for no less than 30 minutes.

4.1.2 Daily maintenance

It is recommended to do the following work at least once a year

(1) Regularly check whether the insulating sheaths of the instrument's input and output lines and terminal blocks are damaged. If they are damaged, replace them in time to avoid electric shock.

(2) Regularly check whether the input and output wiring is secure to prevent overheating caused by electrical looseness.

(3) Regularly check all warning signs on the instrument and replace any warning signs that are not easily visible.

(4) Visually inspect all exposed parts.

For outdoor power installation, we recommend:

(5) Check the rubber seal.

For mobile installed power supply:

(6) Check the wear and cracks of the tires.

(7) Check whether the air pressure is correct,

Note: We recommend checking the tire pressure regularly

4.1.3 Maintenance of users

It is forbidden to open the casing of the instrument without authorization to prevent accidental electric shocks; it is also not allowed to change the wiring or parts of the instrument without authorization. If any changes are made, the quality assurance commitment of the instrument will automatically expire. If the instrument is found to have been altered without authorization, our technical staff will restore it and charge a repair fee



Non-professionals are not allowed to open the instrument by themselves to avoid personal injury or equipment damage

4.1.4 Maintenance during long-term storage

(1) Pay attention to the storage environment for long-term storage of the instrument. See Section 2.4 for details.

(2) Please clean the dust on the surface of the instrument before starting the machine.

(3) Preparation for inspection before starting up is detailed in Section 3.2.

(4) Observe whether the instrument is operating normally after starting up. If there are any abnormalities or malfunctions, immediately stop using it, unplug the power cord or disconnect the power from the distribution box. Do not use the product until it has been repaired.

4.2 Simple fault handling



The equipment must be repaired and maintained by experienced professionals. If it is repaired and maintained by unqualified personnel, it may cause personal injury or death..

Fault phenomenon	Analysis of causes	The exclusion method
Hardware error alarm	1. Input voltage is too low 2. Internal functional module failure	1. Observe whether the three-phase power supply wiring is in good condition and measure whether the three-phase power supply meets the requirements. 2. If the alarm cannot be cleared, please contact our company
No display when starting up	1. Three-phase power supply is abnormal (phase loss, undervoltage)	1. Observe whether the three-phase power supply wiring is in good condition and measure whether

	2. Too low ambient temperature	the three-phase power supply meets the requirements. 2. Please leave it at room temperature for a while before starting it again
Overheat alarm	1. Too high ambient temperature 2. The temperature of the functional module is too high	1. Please leave it at room temperature for a while before starting it 2. Reduce the output power appropriately. If the alarm cannot be cleared, please contact our company
The actual output voltage error is large	1. Enter the constant current or constant power mode 2. The S terminal feedback line is connected incorrectly	1. Observe the U, I, and P indicators on the front panel 2. Connect the S terminal feedback line correctly to the DC output terminal or load; or disconnect the S terminal

4.3 Storage and transportation

4.3.1 Storage

Storage environment temperature: -25~65°C

Storage relative humidity: not more than 80% (high humidity environment storage, it is recommended to start up regularly for 20 minutes to avoid water vapor condensation).



Dust prevention measures should be taken during storage, and it is forbidden to stack any items on the instrument.

4.3.2 Transportation

4.3.2.1 Packaging

The instrument should be returned to the original packaging for repair or transportation. If the original packaging cannot be found, please be sure to follow the following requirements for packaging:

First, seal the instrument with a plastic bag;

Then place the equipment in a wooden box or multi-layered carton that can withstand a weight of 50kG;

It must be filled with shockproof material with a thickness of about 60mm, and the panel must be protected with thick plastic foam;

Properly seal the box and use eye-catching signs to indicate "Fragile Goods, Please

Handle Carefully".



When returning for repair, please be sure to pack all accessories such as power cords and test lines together with the instrument, and please indicate the fault symptom.

4.3.2.2 Transportation

- (1) The handle on the front panel of the product is not for carrying!
- (2) Due to the weight of the product, it should be avoided to handle it with bare hands. If it is unavoidable, it is necessary to hold the product shell rather than external components (such as handles, DC output terminals, knobs) for handling.
- (3) Do not handle the product when it is opened or connected to other equipment.
- (4) When the product usage location changes, it is recommended to use the original packaging materials.
- (5) This product should always be kept moving or placed horizontally.
- (6) When moving the product, please wear suitable protective clothing, especially protective shoes. Because the product is very heavy, falling down may cause serious consequences.
- (7) During transportation, it is necessary to avoid severe bumps, rough handling, rain, and inversion.

Chapter 5 Remote communication protocol

Summary of this chapter:

- Communicating protocol
- Communication interface instructions

5.1 USB / RS232 / RS485 Communication Settings

The frame format is: 1 start bit, 8 data bits, 1 stop bit, no parity bit.

Communication baud rate: The power system option settings support 9600/19200/38400/57600/115200/250K/500K, etc.

Contact address: power system option settings 1-255

5.1.1 Modbus _ RTU information frame format

1) Read the register value, function code 0x03 or 0x04

Master request		From the machine response	
Slave address	1byte	Slave address	1byte
Function code 0x03 or 0x04	1byte	Function code 0x03 or 0x04	1byte
Starting address high bit	1byte	Data length (2 * number of registers)	1byte
Starting address low bit	1byte		
High number of registers	1byte	The first register data	2byte
Low number of registers	1byte		
The CRC checksum low bit	1byte	The CRC checksum low bit	1byte
The CRC checksum high bit	1byte	The CRC checksum high bit	1byte

2) Preset the single register value, function code 0x06

Master request		From the machine response	
Slave address	1byte	Slave address	1byte
Function code: 0x06	1byte	Function code: 0x06	1byte
Register address high bit	1byte	Register address high bit	1byte
Register address low bit	1byte	Register address low bit	1byte
Register data high bits	1byte	Register data high bits	1byte
Register data low bits	1byte	Register data low bits	1byte
The CRC checksum low bit	1byte	The CRC checksum low bit	1byte

The CRC checksum high bit	1byte	The CRC checksum high bit	1byte
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3) Preset multiple register values, function code 0x10

Master request		From the machine response	
Slave address	1byte	Slave address	1byte
Function code: 0x10	1byte	Function code: 0x10	1byte
Starting address high bit	1byte	Register address high bit	1byte
Starting address low bit	1byte	Register address low bit	1byte
Number of registers high bit	1byte	Number of registers high bit	1byte
Number of registers low bit	1byte	Number of registers low bit	1byte
Data Length (2*number of registers)	1byte	The CRC checksum low bit	1byte
First register data high bit	1byte	The CRC checksum high bit	1byte
First register data low bit	2byte		
.....			
The CRC checksum low bit	1byte		
The CRC checksum high bit	1byte		

4) Abnormal response

Exception Response	
Slave address	1byte
Function code (function code + 0x80)	1byte
Abnormal code (01,02,03)	1byte
The CRC checksum low bit	1byte
The CRC checksum high bit	1byte

5.1.2 Exception hanData lengthing

After receiving an abnormal or error data frame, the slave returns an abnormal response frame. The abnormal code is defined as follows.

Error code	Meaning	Remarks
------------	---------	---------

0x00	NA	
0x01	The function code does not support it	
0x02	The data address is not legal	
0x03	The data is not legal	The parameter is out of range
0x04	Error in data length	
0x08	Main control port error	
0x20	Protection alarm	Return to this code for control related commands and online adjustment commands when alarming
0x40	Crc verification error	

The read and write of data frames should not exceed 50 bytes, and at least 50ms of quiescent time should be reserved between two frames of data (9600 and above baud rates, if the baud rate is lower than 9600, please correspondingly extend the quiescent time, such as 4800 retaining 100ms, 2400 retaining 200ms), for judging the completion of data frame reception and command processing inside the power supply product.

5.1.3 Data format

All data formats are represented in hexadecimal numbers, and the word length of each register is 16 bits (2 bytes). Example:

1) The voltage value 115.00V, expressed in hexadecimal, corresponds to a high 16-bit value of 0x0000 and a low 16-bit value of 0x2CEC.

2) The current value is 800.00A, represented in hexadecimal, corresponding to 0x0001 for the high 16 bits and 0x3880 for the low 16 bits.

5.1.4 Fault code

Order Number	Code (16 Pc)	Alarm Meaning
1	0x0000	alarm free
2	0x0001	Hardware overheating
3	0x0002	Left module failure
4	0x0004	Medium module failure
5	0x0008	Right module fault
6	0x0010	Adverse anomaly
7	0x0020	From the machine fault

Fault	8	0x0040	Discharge resistance overheating	code 2
	9	0x0080	Set the limit	
	10	0x0100	software OV	
	11	0x0200	software POC	
	12	0x0400	software NOC	
	13	0x0800	And machine communication failure	
	14	0x 1000	Voltage rise step alarm	
	15	0x 2000	Voltage drop step alarm	
	16	0x 4000	software POP	
	17	0x 8000	software NOP	
Order Number	Code (16 Pc)		Alarm Meaning	
1	0x0000		No Alarm	
2	0x0001		Reserve	
3	0x0002		Reserve	
4	0x0004		Reserve	
5	0x0008		Reserve	
6	0x0010		Reserve	
7	0x0020		Reserve	
8	0x0040		Reserve	
9	0x0080		Reserve	
10	0x0100		Internal communication is abnormal	
11	0x0200		Reserve	
12	0x0400		Reserve	
13	0x0800		Reserve	
14	0x 1000		Reserve	
15	0x 2000		Reserve	
16	0x 4000		Reserve	
17	0x 8000		Reserve	

5.1.5 Register definition

The following is the address assignment. Write represents the host's data storage or preset operation on the slave, and read represents the host's query operation on the slave.

The address indicated by the bit is an empty address, and the returned data is zero.

Writing to a read-only address or reading from a write-only address returns an address error.

The address is divided by page. Among the 16-bit address, the upper 4 bits are the page address, and there are 16 pages in total. The lower 12 bits are the address.

Note: For 32-bit data, please set both the high 16 bits and the low 16 bits. If only the low 16 bits are set, the high 16 bits are set to default 0. If only the high 16 bits are set, the data cannot be set.

1) Status register (address area on page 0)

Address	Read / write	Information description	Remarks
0x0000	Read	Power output status: 0 means that the power is in the OFF state 1 indicates that the power supply is in the ON state 2 indicates power suspension (in sequence) 4 Sine 5-step jump 6 Triangles 7 rectangles 8 trapezoidal shapes 9 Arbitrary shape	
0x0001	Read	Power supply working mode: 1 Standard mode 2 Sequential pattern 3. Single-step mode of sequence 0 Other statuses (such as alarm status, setting system parameter interface, setting protection parameter interface, etc.) 4 voltage sine, 5, current sine 6. Voltage step 7. Current step 8. Voltage triangle, 9. Current triangle 10. Voltage square wave 11. Current square wave 12. Voltage trapezoid, 13. Current trapezoid 14. Arbitrary shape	
0x0002	Read	Power supply failure code 1 0 indicates no alarm, and non-0 is a fault code	
0x0003	Read	Power supply fault code 2 0 indicates no alarm, and non-0 is a fault code	
0x0004	Read	Output voltage is 16-bit high, 0.001v	
0x0005	Read	Output voltage low 16-bit 0.001v	
0x0006	Read	Output current is 16-bit high by 0.001a	Data type signed, negative value is the feed current and positive value is the output current
0x0007	Read	Output current low 16-bit 0.001a	
0x0008	Read	Output power 16 bit 0.1w	Data type signed, negative value is the feed power
0x0009	Read	Output power low 16 bits 0.1w	

			and positive value is the output power
0x000a	Read	Power supply output status: CV, CC, CP status 1 CV, 2 CC, 3CP, 0 non-starting status	
0x000b	Read	Reserve	
0x000c	Read	Reserve	
0x000d	Read	Reserve	
0x000e	Read	Ts running time is high 16-bit units of 1s, and the sequence running state is valid. Other states return 0	
0x000f	Read	The Ts running time is low 16-bit units of 1s, and the sequence running state is valid. Other states return 0	
0x0010	Read	Ts running time is high 16-bit units of 1s, and the sequence running state is valid. Other states return 0	
0x0011	Read	The Ts running time is low 16-bit units of 1s, and the sequence running state is valid. Other states return 0	
0x0012	Read	The current running group number is displayed when the sequence is in the running state, and the current sequence operation group number is displayed in other states	
0x0013	Read	The current running step number is displayed when the sequence is in the running state, and the current sequence operation step number is displayed in other states	
0x0014	Read	Set the voltage high 16-bit 0.001v	
0x0015	Read	Set the voltage low 16-bit 0.001v	
0x0016	Read	Set the positive current high 16 bit 0.001a	
0x0017	Read	Set the positive current low 16-bit 0.001a	
0x0018	Read	Set the positive power high 16 bit 0.1w	
0x0019	Read	Set the positive power low 16-bit 0.1w	
0x001a	Read	Reserve	
0x001b	Read	Reserve	
0x001c	Read	Set the negative current high 16 bit 0.001a	
0x001d	Read	Set the negative current low 16-bit 0.001a	
0x001e	Read	Set the negative power high 16-bit 0.1w	
0x001f	Read	Set the negative power low 16-bit 0.1w	
0x0020	Read	Power supply voltage class model (unit 1v)	
0x0021	Read	Power supply current level model (unit 1a)	
0x0022	Read	Power supply level model (unit 1kw)	
0x0023	Read	Reserve	
0x0024	Read	Lower computer software version (100 represents 1.00)	
0x0025	Read	Mid computer software version (100 represents 1.00)	
0x0026	Read	Factory code high 16 bits	
0x0027	Read	Factory code low 16 bits	

2) Control register area (address area on page 1)

Note: This register area command can be read using 0x03/0x04, and can only be set using function code 0x06. It cannot be set using function code 0x10

Address	Read / write	Information description	Remarks
0x1000	Read / write	Reading 0 indicates that the power supply is in standby mode, and reading 1 indicates that the power supply is turned on (including the pause in the sequence mode) Write 0 to stop power output, write 1 to start power output	The paused state can stop output and cannot start output
0x1001	Read / write	Reading 0 indicates that the power supply is not suspended,	

		and reading 1 indicates that the power supply is suspended (serial mode) Write 0 to cancel the power suspension, and write 1 to suspend the power (in a workable mode)	
0x1002	Read / write	Power supply working mode: 1 Normal Mode 2. Sequence patterns 3. Single-step mode of sequence 0 Other statuses (such as alarm status, setting system parameter interface, setting protection parameter interface, etc. Other statuses can be read but not set)	Partial models Thermal battery mode or photovoltaic mode may not exist
0x1003	Read / write	Reading 0 indicates that the power supply is not in alarm, while reading 1 indicates that the power supply is in alarm Write 0 to stop alarm, write 1 for no operation	
0x1004	Read / write	Regular group: group number range 0-9 Read indicates the current default general group (not necessarily the current operation value) Write indicates that the xth set of parameters is set as the normal operation parameters	Running and standby state can be read and written
0x1005	Read / write	Sequence group: group number range 0-19 Read indicates the current operation sequence group Write indicates that the current operation sequence group is set to group x	The standby state can be written
0x1006	Read / write	Sequence step: step number range 0-49 Read indicates the current operation sequence step Write indicates that the current operation sequence step is set to step x	The standby state can be written

3) Set the register area: the conventional parameters (address area on page 2) are valid in the non-boot state and conventional boot state operations

Address	Read / write	Information description	Remarks
0x2000	Read / write	Set the voltage (current) high 16-bit unit 0.001V	
0x2001	Read / write	Set the voltage (current) low 16-bit unit at 0.001V	
0x2002	Read / write	Set positive current (current) high 16 bit unit 0.001A	
0x2003	Read / write	Set positive current (current) low 16 bit unit 0.001A	
0x2004	Read / write	Set negative current (current) high 16 bit unit 0.001A	
0x2005	Read / write	Set negative current (current) low 16 bit unit 0.001A	
0x2006	Read / write	Set the positive power (current) high 16-bit unit of 0. 1W	
0x2007	Read / write	Set the positive power (current) low 16-bit unit at 0.1W	
0x2008	Read / write	Set the negative power (current) high 16-bit unit at 0.1W	
0x2009	Read / write	Set the negative power (current) low 16-bit unit at 0.1W	
0x200A	Read / write	Reserve	
0x200B	Read / write	Reserve	
0x200C	Read / write	Quick Group Group 0: Set voltage high 16 bit unit 0.001V	
0x200D	Read / write	Quick Group Group 0: Set voltage low 16 bit unit 0.001V	
0x200E	Read / write	Quick Group Group 0: Set the positive current high 16 bit units 0.001A	
0x200F	Read / write	Quick group group 0: set the positive current low 16-bit unit 0.001A	

0x2010	Read / write	Quick Group Group 0: Set negative high 16 bit units 0.001A	
0x2011	Read / write	Quick group group 0: set negative current low 16 bit unit 0.001A	
0x2012	Read / write	Quick Group Group 0: Set positive power high 16-bit unit 0.1W	
0x2013	Read / write	Quick group group 0: set positive power low 16 bit unit 0.1W	
0x2014	Read / write	Quick group group 0: set negative power high 16 bit unit 0.1W	
0x2015	Read / write	Quick group Group 0: Set negative power low 16 bit unit 0.1W	
0x2016	Read / write	Reserve	
0x2017	Read / write	Reserve	
	...		
0x203C	Read / write	Quick group Group 4: Set voltage high 16 bit unit 0.01V	
0x203D	Read / write	Quick group Group 4: set voltage low 16 bits at 0.01V	
0x203E	Read / write	Quick group Group 4: Set positive current high 16 bits 0.001A	
0x203F	Read / write	Quick group Group 4: Set positive current low 16 bits 0.001A	
0x2040	Read / write	Quick Group Group 4: Set negative current high 16-bit units 0.001A	
0x2041	Read / write	Quick Group Group 4: Set negative current low 16 bit unit 0.001A	
0x2042	Read / write	Quick Group Group 4: Set positive power high 16 bit unit 0.1W	
0x2043	Read / write	Quick Group Group 4: Set the positive power low 16-bit unit at 0.1W	
0x2044	Read / write	Quick group group 4: set negative power high 16 bit unit 0.1W	
0x2045	Read / write	Quick group Group 4: Set negative power low 16 bit unit 0.1W	
0x2046	Read / write	Reserve	
0x2047	Read / write	Reserve	

Note: After the device is power-on, the register address can be read after issuing the data.

4) Set the register area: system / protection parameters (address area on page 3)

Address	Read / write	Information description	Remarks
0x3000	Read / write	OV over-voltage alarm value high 16 bit unit 0.001V	
0x3001	Read / write	OV over-voltage alarm value low 16 bit unit 0.001V	
0x3002	Read / write	OV delay time high 16 bits range from 0 to 99999 ms unit 1ms	
0x3003	Read / write	OV delay time low 16 bits range from 0 to 99999 ms unit 1ms	
0x3004	Read / write	OV alarm mode 0 Alarm 1 Ignoring 2 Tips	
0x3005	Read / write	NOC over-current alarm value high 16 bit unit 0.001A	
0x3006	Read / write	NOC over-current alarm value low 16 bit units 0.001A	
0x3007	Read / write	NOC delay time high 16 bits range from 0 to 99999 ms unit 1ms	
0x3008	Read / write	NOC delay time low 16 bits range from 0 to 99999 ms unit 1ms	
0x3009	Read / write	The NOC alarm mode 0 Alarm 1 Ignoring 2 Tips	

0x300A	Read / write	Reserve	
0x300B	Read / write	Reserve	
0x300C	Read / write	POC over-current alarm value high 16 bit unit 0.001A	
0x300D	Read / write	POC over-current alarm value low 16 bit units 0.001A	
0x300E	Read / write	The POC delay time high 16 bits range from 0 to 99999 ms unit 1ms	
0x300F	Read / write	POC delay time low 16 bits range from 0 to 99999 ms unit 1ms	
0x3010	Read / write	The POC alarm mode 0 Alarm 1 Ignoring 2 Tips	
0x3011	Read / write	NOP undercurrent alarm value high 16 bit units 0.1W	
0x3012	Read / write	NOP undercurrent alarm value low 16 bit 0.1W	
0x3013	Read / write	NOP delay time high 16 bits range from 0 to 99999 ms unit 1ms	
0x3014	Read / write	NOP delay time low 16 bits range from 0 to 99999 ms unit 1ms	
0x3015	Read / write	The NOP alarm mode 0 Alarm 1 Ignoring 2 Tips	
0x3016	Read / write	POP over-power alarm value high 16 bit unit 0.1W	
0x3017	Read / write	POP over-power alarm value low 16 bit unit 0.1W	
0x3018	Read / write	POP delay time high 16 bits range from 0 to 99999 ms unit 1ms	
0x3019	Read / write	POP delay time low 16 bits range from 0 to 99999 ms unit 1ms	
0x301A	Read / write	The POP alarm mode 0 Alarm 1 Ignoring 2 Tips	
0x301B	Read / write	Step response monitoring type 0 Voltage	
0x301C	Read / write	Step response error range high 16 bits: Voltage unit is 0.001V	
0x301D	Read / write	Step response error range low 16 bits: Voltage unit is 0.001V	
0x301E	Read / write	The step response rise alarm time high 16 bits Range from 0 to 99999 ms units of 1ms	
0x301F	Read / write	The step response rise alarm time low 16 bits Range from 0 to 99999 ms units of 1ms	
0x3020	Read / write	The step response drop alarm time high 16 bits Range from 0 to 99999 ms units of 1ms	
0x3021	Read / write	The step response drop alarm time low 16 bits Range from 0 to 99999 ms units of 1ms	
0x3022	Read / write	Step-up response to the alarm mode 0 Alarm 1 Ignoring 2 Tips	
0x3023	Read / write	Adjustable range voltage ceiling high 16 bit unit 0.001V	
0x3024	Read / write	Adjustable range voltage ceiling low 16 bit 0.001V	
0x3025	Read / write	Adjusting range voltage limit 16 bit unit 0.001V	
0x3026	Read / write	Adjusting range voltage low 16 bit unit 0.001V	
0x3027	Read / write	Adjustable range source current limit high 16 bit unit 0.001A	
0x3028	Read / write	Adjustable range source current limit low 16 bit 0.001A	
0x3029	Read / write	Adjustable range load current limit high 16 bit unit 0.001A	
0x302A	Read / write	Adjustable range load current ceiling low 16 bit 0.001A	
0x302B	Read / write	Adjustable range source power high 16 bits unit 0.1W	
0x302C	Read / write	Adjustable range source power limit low 16 bit unit 0.1W	

0x302D	Read / write	Adjustable range load power high 16 bits unit 0.1W	
0x302E	Read / write	Adjustable range load power low 16 bits unit 0.1W	
0x302F	Read / write	Reserve	
0x3030	Read / write	Reserve	
0x3031	Read / write	Reserve	
0x3032	Read / write	Reserve	
0x3033	Read / write	After starting up, the output status is 0: off 1: restore	
0x3034	Read / write	Output status after remote control: 0: off, 1: restore	
0x3035	Read / write	Reserve	
0x3036	Read / write	System settings - voltage slope: 0~Umax*10 unit: 0.001	unit V/ms
0x3037	Read / write	System settings - current slope: 0-100 units: 0.001	unit A/ms
0x3038	Read / write	Reserve	
0x3039	Read / write	Reserve	
0x303A	Read / write	Reserve	

5) Set the register area: Sequence parameters (address area on page 4-7)

Address	Read / write	Information description	Remarks
0x4000	Read / write	0 Set of 0 steps to enable	
0x4001	Read / write	0 Group 0 step function 0 No 1 The cycle starts 2 The cycle ends 3 Stop 4 Pause	
0x4002	Read / write	0 group 0 step cycle times (function is valid at the beginning of the cycle) 0~65535	
0x4003	Read / write	0 group 0 step link 0~19 sequence, 0~19 groups 0xFFFF Next	
0x4004	Read / write	0 group 0 step time high 16 bits Range: 10ms~3599999999ms, unit: 1ms	
0x4005	Read / write	0 group 0 step time low 16 bits Range: 10ms~3599999999ms, unit: 1m	
0x4006	Read / write	0 group 0 step sequence type 0 step 1 Voltage ramp 2 Standby 3. Standby 4. Sinusoidal voltage 5 Standby	
0x4007	Read / write	Voltage of group 0 step 0 is high, 16-bit unit 0.001V	When the sequence type is voltage ramp, set the voltage to the starting voltage setting value; for step mode, set the voltage to the current execution voltage; for other modes, set the voltage to the output voltage setting value.
0x4008	Read / write	Voltage of 0 group 0 step is low, 16-bit unit is 0.001V	

0x4009	Read / write	0 group 0 step source current high 16-bit unit 0.001A	1. When the sequence type is current ramp, set the current to the current starting value (data type is int32, negative value is the starting value of the feed, positive value is the output starting current) with 16 bits lower, unit is 0.001A; 2. When the sequence type is current sine, set the current to the current offset (the data type is int32, negative values are negative current offsets, and positive values are positive current offsets); 3. Set the current to a positive value for other modes, and the data type to unsigned int.
0x400A	Read / write	0 group 0 step source current low 16-bit unit 0.001A	
0x400B	Read / write	0 group 0 step current carrying high 16-bit unit 0.001A	
0x400C	Read / write	0 step, 0 group, low current carrying capacity, 16-bit unit, 0.001A	
0x400D	Read / write	0 group 0 step source power high 16-bit unit 0.1W	When the sequence type is power ramp, it is the starting value of power, and the data type is int32. Negative values represent negative power starting, and positive values represent positive power starting. 2. Other modes are positive power, and the data type is unsigned int.
0x400E	Read / write	0 step source power is low in 0 group, 16-bit unit, 0.1W	
0x400F	Read / write	0-group 0-step load power is 16-bit unit 0.1W	
0x4010	Read / write	0 group 0 step low load power 16-bit unit 0.1W	
0x4011	Read / write	The frequency of 0 steps in group 0 is 0.1Hz~1000Hz, and the sequence type is voltage sine or current sine. It is valid	
0x4012	Read / write	High 16-bit parameter of group 0 step 0 When the sequence type is voltage ramp, the unit is U_f 0.001V When the sequence type is current ramp, the unit is I_f 0.001A When the sequence type is power ramp, the unit is P_f 0.1W When the sequence type is voltage sine, it is U_a with a unit of 0.001V When the sequence type is current sine, it is I_a with a unit of 0.001A	
0x4013	Read / write	Low 16 bits of 0 group 0 step parameter When the sequence type is voltage ramp, the unit is U_f , which is 0.001V When the sequence type is current ramp, the unit is I_f 0.001A When the sequence type is power ramp, the unit is P_f 0.1W When the sequence type is voltage sine, it is U_a with a unit of 0.001V When the sequence type is current sine, it is I_a with a unit of 0.001A	

0x4014	Read / write	0 Group 1 step enabling	
.....			
.....			
0x432F	Read / write	Group 0, 49 steps, parameter high 16 bits When the sequence type is voltage ramp, it is U_f , with a unit of 0.001V When the sequence type is current ramp, the unit is I_f 0.001A When the sequence type is power ramp, the unit is P_f 0.1W When the sequence type is voltage sine, it is U_a unit 0.001V When the sequence type is current sine, it is I_a with a unit of 0.001A	
0x4330	Read / write	One set of 0 steps to enable	
...	...		
0x8E1F	Read / write	19 groups of 49 parameters with 16 bits high When the sequence type is voltage ramp, the unit is U_f , which is 0.001V When the sequence type is current ramp, the unit is I_f , 0.001A When the sequence type is power ramp, the unit is P_f 0.1W When the sequence type is voltage sine, it is U_a with a unit of 0.001V When the sequence type is current sine, it is I_a with a unit of 0.001A	

Note: After the device is power-on, the register address can be read after issuing the data.

5.1.6 Communication sample

Stop command

Sent: 01 06 10 00 00 00 8d 0a

Normal return: 01 06 10 00 00 00 8d 0a

Start command

Sent: 01 06 10 00 00 01 4c ca

Normal return: 01 06 10 00 00 01 4c ca

Reset

Sent: 01 06 10 03 00 00 7d 0a

Normal return: 01 06 10 03 00 00 7d 0a

Read the power supply status, operating mode, and alarm status / code

Sent: 01 03 00 00 00 03 05 cb

Return example: 01 03 06 00 01 00 01 00 00 4d 75

Example: Return power status code 0001 (start status), working mode 0001 (standard mode), alarm status / code 0000 (no alarm)

Read the output sampling value: Voltage, current, and power

Sent: 01 03 00 04 00 06 84 09

Return to an example: 01 03 0e 00 00 07 c7 00 00 00 00 00 00 00 00 00 00 Function code a9

Example: Return voltage value 000007c7 (191v), current value 00000000(0.000a), power value 00000000(0.0w)

Read order group and step number (return current running group step number on startup and return pending operation group step number on standby)

01 03 00 0f 00 02 f4 08

Set the normal working mode / sequence

Set to the normal working mode: 01 06 10 02 00 01 ed 0a

Set to sequence mode: 01 06 10 02 00 02 ad 0b

Set group 1 as regular operands

01 06 10 04 00 01 0d 0b

Set sequence group 1

01 06 10 05 00 01 5c cb

Set the sequence step of 10

01 06 10 06 00 0a ed 0c

The standard mode voltage is 12v, the source current is 20a, the load current is 17.44a, and the source load power is 1kw

01 10 20 00 00 0a 14 00 00 2e e0 00 00 4e 20 00 00 44 20 00 00 27 10 00 00 27 10 62 e7

Set the OV 1650v (1650000) 99.999s (99999ms) note

01 10 30 00 00 05 0a 00 19 2d 50 00 01 86 9f 00 02 a0 9f

5.2 LAN communication settings

Address: Power system option set 1~255

IP address range: 1~223.0~255 .0~155 .0~255

Port number range: 1 to 65535

5.2.1 MODBUS _ TCP information _ frame format

Transaction logo	Agreement identification	Data Length	Device address	Function code	Data field
2 bytes	2 bytes	2 bytes	1 bytes	1 bytes	Use up to 90 bytes

Transaction identification marks the transfer of a modbus query / response, generated by the client and copying the value when the server replies.

The protocol identity 0 = modbus tcp protocol, generated by the client and copied when the server replies.

The data length includes the total number of bytes of the device address, function code, and modbus data.

Device address: Device address code.

Function code MODBUS function code.

Data area effective MODBUS data in the data area, including register address, register offset parameters or control parameters, write data, etc.

5.2.2 Function code

Grade	Function Code	Explain
1	0x03	Read multiple register values (read mode out status)
2	0x06	Preset a single register value (forced single-channel mode output)
3	0x10	Pre-set multiple register values (forced multi-output)

1、Function code 0x03 message format

Send messages:

Work Characteristic	Protocol Characteristic	Data Length	Equipment Address	Function code	Register Start address	Register Address offset
00 00	00 00	00 06	01	03	00 00	00 02

Receive messages:

Transaction logo	Agreement identification	Data length	Device address	Function code	Return Number of data	Return data
00 00	00 00	00 07	01	03	0x04	C0 2e a8 2e

2、Function code 0x06 message format

Send messages:

Transaction logo	Agreement identification	Data Length	Equipment Address	Function code	Register start address	Data
00 00	00 00	00 06	01	06	10 00	C0 2e

Received message: Consistent with the message sent.

Transaction logo	Agreement identification	Data Length	Equipment Address	Function code	Register Start address	Data
00 00	00 00	00 06	01	06	10 00	C0 2e

3、Function code 0x10 (forced multi-channel mode out) message format

Send messages:

Work Chara cterist ic	Agree ment identif ication	Data length	Equipm ent Address	Func tion code	Register start address	Register address offset	Byte numb er	Data
00 00	00 00	00 11	01	10	00 00	00 02	4	C0 2e a8 2e

Receive messages:

Transaction logo	Agreement identification	Data Length	Equipment Address	Function code	Register Start address	Register Address offset
00 00	00 00	00 06	01	10	00 00	00 02

4、Exception response

Send messages:

Work Characteristic	Protocol Characteristic	Data Length	Equipment Address	Function code	Register Start address	Register Address offset
00 00	00 00	00 06	01	Code	00 00	00 11

Receive messages:

Work Characteristic	Protocol Characteristic	Data Length	Equipment Address	Function code	Register Start address	Register Address offset
00 00	00 00	00 06	01	Code+0x80	00 00	00 11

5.2.3 communication sample

Modbus_TCP IP: 192.168.1.30 Port number: 18002 Slave address 1

1. 0x06 function code support instructions

(1) Fault reset

Receipt: 00 00 00 00 00 06 01 06 10 03 00 00

Reply: 00 00 00 00 00 06 01 06 10 03 00 00

(2) Equipment start and stop 1 stop, 2 start

Receive: 00 00 00 00 00 06 01 06 10 00 00 01 equipment shutdown

Reply: 00 00 00 00 00 06 01 06 10 00 00 01

Receive: 00 00 00 00 00 06 01 06 10 00 00 02 equipment start-up

Reply: 00 00 00 00 00 06 01 06 10 00 00 02

2. Instructions supported by the 0x10 function code

For example: The standard mode voltage is 12v, the source current is 20a, the load current is 17.44a, and the source load power is 1kw

Receipt: 00 00 00 00 00 18 01 10 20 00 00 0a 14 00 00 2e e 0 00 00 07 d0 00 00 08 d0 00 00 27 10 00 00 37 10

Reply: 000000000000601102000000 a

3. 0x03 function code support instructions

Example: Read the output voltage of 100.00V

Receipt: 00 00 00 00 00 06 01 03 00 04 00 02

Reply: 00 00 00 00 00 07 01 03 04 00 00 27 10

5.2.4 Register definition

The register definition is the same as "5.1.5 Register definition".

5.3 The CAN communication settings

CAN wave rate support: 10 kbps, 20 kbps, 50 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps and 1mbps can be set;

Basic id, broadcast id, loop setting id and loop read id: 1~9999 can be set;

Status quantity, actual value 1, actual value 2, sequence setting 1, sequence setting 2 and power supply model periodic upload: Off / 20~5000ms;

Intel format; extended frame format;

5.3.1 Agreement content

The CAN2.0B communication protocol supports two scenarios: periodically uploading device status information (the period can be set) and remotely setting device parameters on the host computer.

5.3.2 Agreement description

1) The ID is read cyclically to upload device status information periodically. The information that can be uploaded includes status quantity, actual value 1, actual value 2, sequence setting 1, sequence setting 2, and power supply model. Each piece of information can be selected for upload, and the upload cycle time can be set from 20 to 5000ms when selected for upload.

Status quantity (cyclic read id + 0)

Move State	/	Work pattern	Fault code 1 low 8 bits	Fault code 1 high 8 bits	Fault code 2 low 8 bits	Fault code 2 high 8 bits	Heartbeat
0: Stop 1: Run 2: Pause (not in standard mode)	/	0: No 1: Standard 2: Sequence 3: A single step	Fault code 1		Fault code 2		Circulating accumulation
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Note 1

Bit definition of the fault code 1

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Set the limit	/	Output over- voltage	/	Right module fault	Medium module failure	Left module failure	The module is overheated
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Software NOP	Software POP	Voltage drop step	Voltage rises step by step	/	Software NOC	Software POC	Software OV

Description: Bit=1, with fault; bit=0, no fault.

Note 2

Bit definition of the fault code 2

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
/	/	/	/	/	/	/	/
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Internal communication	The main control port error	/	/	/	/	/	/

is abnormal							
-------------	--	--	--	--	--	--	--

Description: Bit=1, with fault; bit=0, no fault.

① Internal communication abnormality: Communication board and lower computer communication abnormality

② Error in master port: Only one of RS485, LAN, and CAN can be selected as the master port. If the CAN port is selected as the master port but no commands are issued through it, an error message will be displayed indicating an error in the master port.

Note 3

The heartbeat data is added by 1 each time it is uploaded, with a data range of 0-255. When it reaches 255, the next message is sent with a value of 0. The heartbeat data can be used by the PC to determine whether the device is online.

Actual value 1 (Loop read ID + 1)

Actual value 2 (Loop read ID+ 2)

Output voltage low		Output voltage		Output current low		Output current	
16 bits		high 16 bits		16 bits		high 16 bits	
Output power low		Output power high		Running			
Low 8		Low 8		state			
High 8		High 8		Low 8		High 8	
Low 8		Low 8		1: C _p		Proportion: 0.001 offset: 0a	
High 8		High 8		2: C _c		Data type: Signed int	
Proportion: 0.001 offset: 0v		Proportion: 0.1 offset: 0w		Bytes 4		Bytes 5	
Byte 0		Bytes 2		Bytes 3		Bytes 6	
Bytes 1		Bytes 3		Bytes 4		Bytes 7	
Bytes 0		Bytes 1		Bytes 2		Bytes 3	
Bytes 4		Bytes 5		Bytes 6		Bytes 7	

Sequence setup 1 (Loop read ID+ 3)

Sequence run time ts low 16 bits	Sequence run time ts high 16 bits	Total sequence runtime ta low 16 bits	Total sequence run time ta high 16 bits
-------------------------------------	--------------------------------------	---	--

Low 8	High 8	Low 8	High 8	Low 8	High 8	Low 8	High 8
Scale: 1 offset: 0s Data type: Unsigned				Scale: 1 offset: 0s Data type: Unsigned			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence set-up 2 (Loop read ID+ 4)

The current running group number of the sequence		The current running step number of the sequence		/	/	/	/
Low 8	High 8	Low 8	High 8	/	/	/	/
Scale: 1 offset: 0 Data type: Unsigned		Scale: 1 offset: 0 Data type: Unsigned		/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Power supply model (Loop read ID + 5)

Model voltage low 8 bits	Model voltage high 8 bits	Model current low 8 bits	Model current high 8 bits	Model power low 8 bits	Model power high 8 bits	/	
Unit: 1v Data type: Unsigned		Unit: 1a Data type: Unsigned		Unit: 1kw Data type: Unsigned			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5		

2) Basic ID, which can realize the power supply start and stop, reset, parameter setting

and other functions.

Reset function (Basic ID + 0)

Reset	/	/	/	/	/	/	/
0: Invalid	/	/	/	/	/	/	/
1: Reset	/	/	/	/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Start-stop function (Basic ID + 1)

Start and stop	/	/	/	/	/	/	/
0: Stop	/	/	/	/	/	/	/
1: Start	/	/	/	/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence pause and run functionality (Basic ID + 2)

Suspend	/	/	/	/	/	/	/
0: Suspension	/	/	/	/	/	/	/
1: Cancel the suspension	/	/	/	/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Quick group selection (Basic ID + 0x10)

Quick group selection	/	/	/	/	/	/	/
0~9	/	/	/	/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence group selection (Basic ID + 0x11)

Sequence group selection	/	/	/	/	/	/	/
0~19	/	/	/	/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence step selection (Basic ID + 0x12)

Sequence step selection	/	/	/	/	/	/	/
0~49	/	/	/	/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Working mode selection (Basic ID + 0x100)

Work mode selection	/	/	/	/	/	/	/
Step 1: General step 2: Sequence step	/	/	/	/	/	/	/

3: Single step by step 5: Pv							
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Set voltage (Basic ID + 0x101)

Set the voltage low 16 bits		Set the voltage high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.001 offset: 0v Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Set the positive current (Basic ID + 0x102)

Set the current low 16 bits		Set the current high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.001 offset: 0a Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Setting the negative current (Basic ID + 0x103)

Set the negative current low 16 bits		Set the negative current high 16 bits		/		/	
Low 8	High 8	Low 8	6 high 8	/	/	/	/
Proportion: 0.001 offset: 0a Data type: Unsigned				/			

Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7
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Set the positive power (Basic ID + 0x104)

Set the power low 16 bits		Set to a power high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.1 offset: 0w Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Setting the negative power (Basic ID + 0x105)

Set the negative power low 16 bits		Set the negative power high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.1 offset: 0w Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Set the voltage slope (Basic ID + 0x107)

Voltage slope		/		/	/	/	/
Low 8	High 8	/	/	/	/	/	/
Proportion: 0.001 Unit: V/ms Data type: Unsigned		/		/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Setting the current slope (Basic ID + 0x108)

Current slope		/		/	/	/	/
Low 8	High 8	/	/	/	/	/	/
Proportion: 0.001 Unit:A/ms Data type: Unsigned		/		/	/	/	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

(Basic ID + 0x110 + groups * 6)

Set the voltage low 16 bits		Set the voltage high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.001 offset: 0v Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

0~4 group shortcut group current settings (Basic ID + 0x111 + group * 5)

Set the current low 16 bits		Set the current high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.001 offset: 0a Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

0~4 group shortcut group power settings (Basic ID + 0x112 + group * 5)

Set the power low 16 bits		Set to a power high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.1 offset: 0w Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

0~4 shortcut sets (Basic ID + 0x113 + group * 5)

Set the negative current low 16 bits		Set the negative current high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.001 offset: 0a Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

0~4 shortcut sets (Basic ID + 0x114 + group * 5)

Set the negative power low 16 bits		Set the negative power high 16 bits		/		/	
Low 8	High 8	Low 8	High 8	/	/	/	/
Proportion: 0.1 bias: 0w unit: W Data type: Unsigned				/			
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence setting parameter 1 (Basic ID + 0x150)

Number of sequence groups	Sequence step number	Enable / prohibit	Function	Cycle index	Inter-linkage
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0~19	0~49	0: Prohibit 1: Enable	0: No 1: Cycle begins 2: The cycle ends 3: Stop 4: Suspension	0~65535		0 to 19 sequence groups 0 to 19 0xffff for the next step	
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence setting parameter 2 (Basic ID + 0x151)

Number of sequence groups	Sequence step number	Set time low16 bits		Set the time high 16 bits		Sequence type	/
0~19	0~49	Proportion: 1 offset: 0ms; Range 10ms~3599999999m s Data type: Unsigned				Step 0 jump 1 voltage ramp 2 standby 3 standby 4 voltage sine 5 standby	/
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence setting parameter 3 (Basic ID + 0x152)

Note: When the sequence type is voltage ramp, set the voltage to the starting voltage setting value; when the step mode is current execution voltage; when other modes are output voltage setting values.

Number of sequence groups	Sequence step number	Set the voltage low 16 bits	Set the voltage high 16 bits	/
0~19	0~49	Proportion: 0.001 offset: 0v Data type: Unsigned		/

Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7
--------	---------	---------	---------	---------	---------	---------	---------

Sequence setting parameter 4 (Basic ID + 0x153)

Remarks:

When the sequence type is current ramp, set the current to the current starting value (data type is **int32**, negative value is the starting value of the feed, positive value is the output starting current) low 16 bits, unit 0.001A;

When the sequence type is current sine, set the current to the current offset (the data type is **int32**, negative values are negative current offsets, and positive values are positive current offsets);

6. Set the current to a positive value for other modes, and the data type to **unsigned int**.

Number of sequence groups	Sequence step number	Set the current low 16 bits		Set the current high 16 bits		/	
0~19	0~49	Proportion: 0.001 offset: 0a				/	
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Set the sequence parameter 5 (base id + 0x154) negative current

Number of sequence groups	Sequence step number	Set the current low 16 bits		Set the current high 16 bits		/	
0~19	0~49	Proportion: 0.001 offset: 0a Data type: Unsigned int				/	
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

The sequence setting parameter 6 (Basic ID + 0x155) positive power

Note:

1. When the sequence type is power ramp, it is the starting value of power, and the data type is int32. Negative values represent negative power starting, and positive values represent positive power starting.

2. Other modes are positive power, and the data type is unsigned int.

Number of sequence groups	Sequence step number	Set the power low 16 bits		Set to a power high 16 bits		/	
0~19	0~49	Proportion: 0.1 offset: 0w Data type: Unsigned int				/	
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence setting parameter 7 (Basic ID + 0x156) negative power

Number of sequence groups	Sequence step number	Set the power low 16 bits		Set to a power high 16 bits		/	
0~19	0~49	Proportion: 0.1 offset: 0w Data type: Unsigned				/	
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Sequence settings parameter 8 (Basic ID + 0x157)

Number of sequence groups	Sequence step number	Frequency	Electrical parameter 2				
0~19	0~49	1~1000	See the note				

		(proportion: 0.1)					
		Unit hz					
		Data type: Unsigned					
Byte 0	Bytes 1	Bytes 2	Bytes 3	Bytes 4	Bytes 5	Bytes 6	Bytes 7

Comment:

① When the sequence is set to voltage ramp, electrical parameter 2 is the final ramp voltage; scale: 0.001

② When the sequence is set to current ramp, electrical parameter 2 is the final ramp current; scale: 0.01

③ When the sequence is set to power ramp, electrical parameter 2 is the final ramp power; scale: 0.1

④ When the sequence is set to voltage sinusoid, the electrical parameter 2 is the effective value of voltage sinusoid; the scale is 0.001

When the sequence is set to current sinusoid, the electrical parameter 2 is the effective value of current sinusoid; scale: 0.01

3) Broadcast ID broadcast function standby

4) Cycle setting ID Cycle setting function is standby

5.4 SCPI Protocol

Function	Syntax and programming instructions	Functional descriptions and instruction abbreviations	Remarks
Query device information	*IDN	WOCEN HB -015-80	
Set the output voltage value	SOURCE:VOLTAGE %F	SOUR:VOLT 80	Unit of v (volt)
Query the output voltage setting value	SOURCE:VOLTAGE?	VOLT?	Unit of v (volt)
Set the output voltage change rate	SOURCE:VOLTAGE :SLEW %F SOURCE:VOLTAGE :SLEW :%F	SOUR:VOLT:SLEW %F SOUR:VOLT:SLEW :%F	Unit of v / ms (volts / millisecond)

Set the adjustable range of voltage	SOURCE:VOLTAGE:LIMIT:HIGH %F SOURCE:VOLTAGE:LIMIT:LOW %F	SOUR:VOLT:LIM:HIGH %F SOUR:VOLT:LIMIT:LOW %F	Unit of v (volt)
Set output current value	SOURCE:CURRENT %F	SOUR:CURR %F	Unit a (ampere)
Query the output current setting value	SOURCE:CURRENT?	CURR?	Unit a (ampere)
Set the output current change rate (the source slope is controlled by this parameter)	SOURCE:CURREN T :SLEW %F SOURCE:CURREN T :SLEW :%F	SOUR:CURR:SLEW %F SOUR:CURR:SLEW :%F	Unit a/ms (ampere / ms)
Set the upper limit of source/load current	SOURCE:CURRENT:LIMIT:HIGH %F SINK :CURRENT:LIMIT:HIGH %F	SOUR:CURR:LIM:HIGH %F SINK :CURR:LIM:HIGH %F	Unit a (ampere)
Set the source software overvoltage OV	SOURCE:VOLTAGE:PROTECT:HIGH %F	SOUR:VOLT :PROT:HIGH %F	Unit of v (volt)
Set the OC of the source software overcurrent	SOURCE:CURRENT:PROTECT:HIGH %F	SOUR:CURR :PROT:HIGH %F	Unit a (ampere)
Set source software overload OP	SOURCE:POWER:PROTECT:HIGH %F	SOUR:POW:PROT:HIGH %F	Unit kw (kw)
Set the software overcurrent NOC	SINK :CURRENT:PROTECT:HIGH %F	SINK :CURR :PROT:HIGH %F	Unit a (ampere)
Set the software overload NOP	SINK :POWER:PROTECT:HIGH %F	SINK :POW:PROT:HIGH %F	Unit kw (kw)
Set output power value	SOURCE:POWER %F	SOUR:POW %F	Unit kw (kw)
Query the output power setting value	SOURCE:POWER?	SOUR:POW?	Unit kw (kw)
Set the upper limit of source/load power	SOURCE:POWER:LIMIT:HIGH %F SINK :POWER:LIMIT:HIGH %F	SOUR:POW:LIM:HIGH %F SINK :POW:LIM:HIGH %F	Unit kw (kw)
Set output status (ON/OFF)	CONFIGURE:OUTPUT OFF/ON	ABBREVIATIONS: CONF: OUTP OFF / ON	
Query all output values	MEASURE:ARRAY?	MEAS:ARR?	Voltage (v) / current (a) / power (kw)
Query the output voltage value	MEASURE:VOLTAGE?	ABBREVIATE: MEAS: VOLT?	Unit of v (volt)
Query the output current value	MEASURE:CURRENT?	ABBREVIATE: MEAS: CURR?	Unit a (ampere)
Query the output power value	MEASURE:POWER?	ABBREVIATE: A MEAS: A POW?	Unit kw (kw)
Query power output status	MEASURE:CONDITION?	STOP/CV/CC/CP	
Clear alarms	*CLS	REMOVE FAULT ALARM	
Querying fault information	SYSTEM :ERROR?	SYST :ERR?	See schedule 1
Set the output current value	SINK :CURRENT %F	SINK :CURR %F	Unit a (ampere)

Query the current value set in the carrier	SINK :CURRENT?	SINK :CURR?	Unit a (ampere)
Set the output power value	SINK :POWER %F	SINK :POW %F	Unit kw (kw)
Query the set power value	SINK :POWER?	SINK :POW?	Unit kw (kw)

5.4.1 SCPI, Protocol instruction

5.4.2 Agreement description

1. SCPI commands are not case sensitive and abbreviated commands can be used.
2. The commands for measuring the output voltage value, measuring the output current value, and measuring the output power value have returned data, while others have not.

5.4.3 Test Examples

1. Set the voltage SOUR:VOLT 50.95 and query the set voltage SOUR:VOLT? or VOLT

Set the current SOUR:CURR to 20.18, and query the current SOUR:CURR or CURR?

3. Set the power SOUR:POW 0.18. Query the set power SOUR:POW? or POW

4. Query the output voltage MEAS:VOLT? with or without a question mark

5. Query output current MEAS:CURR? with or without question mark

6. Query output power MEAS:POW? with or without question mark

7. Query all parameters MEAS:ARR

8. Query the output status MEAS:COND?

9. Set the output state CONFIGure:OUTPut OFF/ON or CONFIGure:OUTPut 0/1

Start: CONFIGure:OUTPut ON or CONFIGure:OUTPut 1

Stop: CONFIGure:OUTPut OFF or CONFIGure:OUTPut 0

10. Clear the alarm *CLS

11. Query device information *IDN Wocen HB-015-80

12. Set software OV SOURce:VOLTage:PROTect:HIGH %f

13. Set source software OC Source: Current: Protection: High %f

Set software NOC SINK:CURRent:PROTect:HIGH %f

14. Set source software OP Source:Power:Protection:High %f

Set software NOP SINK:POWER:PROTect:HIGH %f

15. Set voltage slope SOURce:VOLTage:SLEW %f**16. Set current slope SOURce: CURRent:SLEW %f****17. Set the adjustable range of voltage**

Set adjustable voltage range upper limit SOURce:VOLTage:LIMIt:HIGH%f

Set adjustable voltage range lower limit SOURce:VOLTage:LIMIt:LOW %f

19. Set the upper limit of source current

Set source current upper limit SOURce:CURRent:LIMIt:HIGH %f

Set the upper limit of the current sink SINK:CURRent:LIMIt:HIGH %f

20. Set the upper limit of source load power

Set the source power limit SOURce:POWer:LIMIt:HIGH %f

Set the upper limit of power consumption SINK: POWER:LIMIt:HIGH %f

Schedule-1

Order number	Code	Alarm Meaning
1	0x0000	No alarm
2	0x0001	Hardware overheating
3	0x0002	Left module fault
4	0x0004	Modular module fault
5	0x0008	Right module fault
6	0x0010	Abnormal reverse connection
7	0x0020	Slave malfunction
8	0x0040	Overheating of discharge resistance
9	0x0080	Set limit violation
10	0x0100	Software OV
11	0x0200	Software POC
12	0x0400	Software NOC
13	0x0800	Parallel communication fault

14	0x 1000	Step alarm of voltage rise
15	0x 2000	Step alarm for voltage drop
16	0x 4000	Software POP
17	0x 8000	Software NOP