



WPS-S Series Wide-range programmable DC Power Supply User Manual

MATRIX TECHNOLOGY INC.



Manual statement

Please read this manual carefully before using the WPS-S series power supply products. After reading, please place the manual near the product for reference at any time. When the product location changes, please attach the product manual in time.

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Although this manual has been carefully reviewed, it is likely that some parts are still unclear. If there are still questions in the use process, please contact our agent in time or call our customer service personnel directly.

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Safety instructions

Remind users to read this manual carefully before using the power supply product!

The safety precautions in this section and in this manual must be followed throughout the operation, maintenance, and servicing of this product. If these safety precautions are not followed, we declare that we are not responsible for the user's actions in violation of these requirements.

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

Symbol	Description		Symbol	Description
	Grounding			Switch on the power
				Disconnect the power
	PE	Protective conductor		Indicates a switch for turning on/off the power supply with the same operating member. Commonly used keys have two stable positions.
	Prohibition			High temperature: It means that the temperature here is higher than the acceptable range of human body. Do not touch it arbitrarily to avoid personal injury.
	Danger of high voltage			This sign indicates that this device cannot be mixed with other domestic waste for treatment. In order to prevent uncontrollable waste disposal from causing adverse ecological and health effects, devices should be recycled to improve the utilization of material resources.
	Indoor use			
	Pay attention to safety: to avoid personal injury or damage to the instrument, the operator must refer to the instructions in the manual.			Be careful of electric shock
	This sign indicates that there is a risk. If you do not follow the instructions, it may cause personal injury. Do not operate until you understand the instructions.			This symbol indicates the risk that personal injury or death may result if the operating instructions are not followed. This symbol reminds you of procedures, practices, conditions, etc.

2. Safety brief

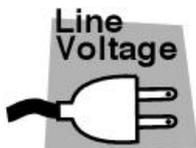
The following general safety precautions must be observed during operation or maintenance of this power supply. We will not be liable for any personal injury or machine damage that may result from the customer's failure to observe these precautions or any of the explicit warnings in this manual.



Please read this manual carefully before use and keep it properly.



Do not use the product in situations other than those described in the manual. The product can only be used in situations described in the product manual.



Before connecting the power supply, please check that the power supply conforms to the rated input value of the instrument, and confirm that the switch is off.



Protective grounding: Before turning on the power supply, be sure to connect the protective grounding to prevent electric shock.



Necessity of protective grounding: Do not cut off the internal or external protective grounding wire or interrupt the connection of the protective grounding terminal. This will cause a potential risk of electric shock and may cause harm to the human body.



Fuses: Use only fuses of the required rated current, voltage, and type (normal fuse, time delay, etc.). Do not use fuses or short circuit fuse holders of different specifications, otherwise it may cause electric shock or fire hazard.



Do not remove the instrument housing
The operator must not remove the instrument housing. Parts replacement and internal adjustments should only be performed by qualified service personnel.



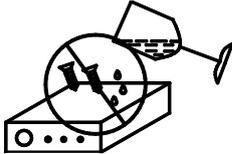
Do not operate in explosive or corrosive atmosphere.
Do not set the power supply to Under inflammable gas or gas or corrosive environment



When changing the position of the product, please turn off the power switch and disconnect all connections. Pick up Line.

Product weight greater than 20 Kg Time ? Two or more people are required to reset the position. You can find the product weight in the product manual. Please handle the product with care to avoid collision. High products are easy to fall down, so please operate with care.

Please include the product manual when the product is repositioned.



Do not allow water drops or metal objects to enter the interior of the product.



Please check the power supply input current It is consistent with the fuse specification, and there is no abnormality on the surface of the power cord. Make sure to disconnect the power cord or turn off the power switch before inspection.

If there is any abnormality or fault, please stop using immediately, disconnect the power cord or disconnect the power supply from the distribution box, and do not use the product until it is repaired.

Output or load Connect Please use the cable Carry current Cable with larger capacity.

Do not disassemble or change the product. If changes are necessary, contact Our company.



Damage to the power supply product caused by the use of the wrong grid input is not covered by the product warranty.



When the voltage and current are set and the output is started, the output terminal is a dangerous voltage, and any touch may cause electric shock and injury.

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Chapter 1 Overview

1.1 Product introduction

WPS-S Series Wide-range programmable DC Power Supply (or DC power supply for short) is a DC programmable power supply with beautiful appearance, small size, high performance, powerful function and simple operation. It is a single output DC high-power switching power supply with high performance and wide range. It is suitable for test systems in aerospace and defense, consumer electronics, computers and peripherals, communications, semiconductors, solar energy and automotive electronics industries.

The features of WPS-S Series Wide-range programmable DC Power Supply are as follows:

- High resolution and accuracy;
- Low ripple and low noise;
- Wide voltage range, 0 ~ 1000 V, multiple voltage levels to choose from;
- Support multiple modes, such as constant voltage (CV), constant current (CC) and constant power (CP);
- Fast transient response capability;
- Flexible operation interface, convenient for users to operate;
- It can realize parallel output and modular design, which is convenient for users to expand capacity;
- Flexible and powerful sequence test function;
- Complete protection, safety performance is guaranteed;
- Support OVP, OCP, OPP, input undervoltage protection and overtemperature protection of power supply;
- With analog control interface, control the power output separately through the external analog interface;
- Built-in USB/RS232/GPIB/LAN/CAN communication interface.

1.2 Product function introduction

The WPS-S Series Wide-range programmable DC Power Supply is only 2 U chassis, especially suitable for system testing and industrial control. The basic functions of the power supply are as follows:

- Constant voltage (CV) mode, constant current (CC) mode, constant power (CP) mode output

The output mode of DC test power supply is divided into constant voltage (CV) mode, constant current (CC) mode and constant power (CP) mode. The output mode depends on the set values of output voltage and current and the size of load resistance.

- Built-in input undervoltage, short circuit and overheat protection

Internal hardware input undervoltage, short circuit and overheat protection, which can stop output in the shortest time to protect the DC test power supply and the connected load.

- Power on self-test function

Every time the system is powered on, the system shall carry out self-check to check some internal circuits. If

it is abnormal, it cannot enter the normal standby state interface.

- 10 sets of non-volatile save and readback shortcut

In order to adapt to different test requirements, 10 groups of working modes are saved, and 10 groups of modes are stored in a non-volatile memory. It is not lost after power failure and can be called conveniently.

- Sequence test

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

- Local or remote control mode of operation

Switch to the local operation mode. The local mode can be operated by pressing the key, and the remote mode can only be operated through the communication port. Please refer to the appendix for the specific commands of the protocol used for external communication.

- Analog port remote control operation mode

With a variety of voltage, current, over-voltage given mode, and complete control and monitoring functions.

1.3 Introduction to the front panel

1.3.1 Introduction to Front Panel of 2U Model (1.5kw~3kw)



Figure 1-1 Front Panel Function Key Layout

No.	Function introduction	No.	Function introduction
1	Power switch button	5	Rotate the button to adjust the voltage
2	LCD screen	6	Start, stop output key and function key
3	Function soft keyboard	7	Numeric keys and escape key
4	Status indicator		

1.3.2 Introduction to Front Panel of 3U Model (5kw~18kw)



No.	Function introduction	No.	Function introduction
1	Left handle	2	Right handle
3	Power switch	4	LCD screen
5	Function soft keyboard	6	Numeric keys and escape key
7	Functional Settings Area	8	Voltage and current adjustment knob
9	Status indicator		

1.4 Introduction to key functions

The key area on the front panel is shown in the figure above. Press the key to set and control the output voltage and current, and display the output status through the LCD screen. The specific functions are as follows:

Key name	Functional description
Power Switch	Power on/off
F1~F4	The four keys have different functions in different interfaces, which is convenient for
Voltage and Current Rotate the button	In the setting interface, the CURRENT knob is used to adjust the position of the cursor, and the VOLTAGE knob is used to modify the value of the parameter corresponding to the cursor; in the power start output state, the VOLTAGE knob can be used to modify the voltage output value, and the CURRENT knob can modify the current output value.
ON/OFF	Start or stop setting voltage and current output
V-SET	Voltage setting key to set the output voltage value of the power supply
I-SET	Current setting key, set the output current value of the power supply

P-SET	Power value setting, used to set the output power of the power supply
MENU	Used to enter the main menu
▲/▼	The up and down movement key is used to select a menu item in a menu operation
Esc	Return key, return to the previous menu, the setting parameter is invalid
0-9 numeric key	Numeric input key
Enter	Confirm key to confirm the input number and operation

LED indicators: 4 indicators, indicating the corresponding state when lit.

- (1) CV: light indicates constant voltage output mode.
- (2) CC: light indicates constant current output mode.
- (3) CP: when the light is on, it indicates that it is in the constant power output mode.
- (4) REMOTE: light indicates remote mode.



When the switch is turned off, the external input voltage is not cut off, and there is still high voltage inside the chassis. The user should not open the chassis by himself. When the customer service personnel carry out maintenance, the input power line should be disconnected first.



Menu、VOLT、CURR、POWER There is no response in the sequence test execution, pause, single step execution, and constant power mode execution interfaces.

1.5 Introduction to rear panel

1.5.1 Introduction to Rear Panel of 2U Model (1.5kw~3kw)



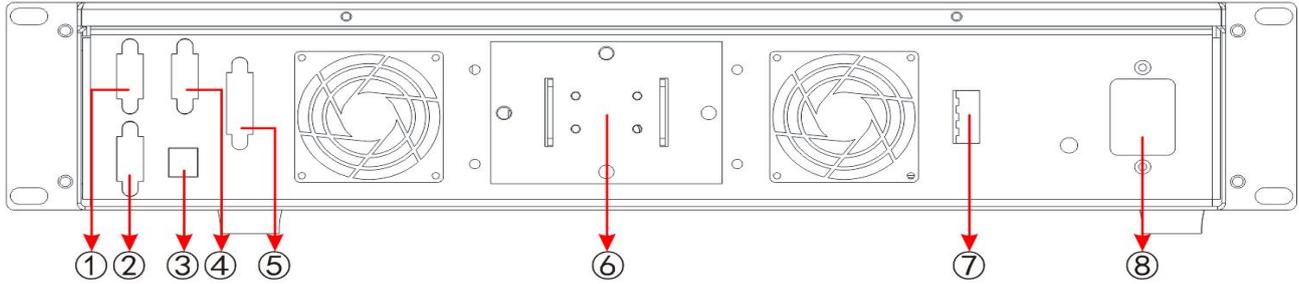
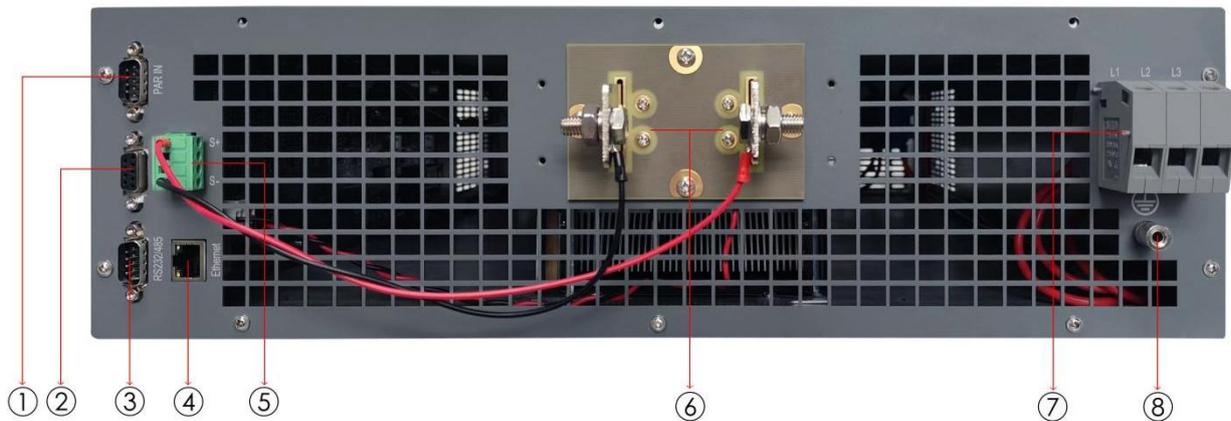


Figure 1-2 Schematic diagram of rear panel

No.	Function introduction	No.	Function introduction
1	Parallel input interface: as a slave	5	Remote Analog Control Interface (Optional)
2	Parallel output interface: as a host	6	Power supply output terminal
3	USB interface	7	Remote S Compensation Terminal
4	RS232/RS485/CAN interface	8	Power input

Analog control interface (optional), through which external analog signals are used to control the output of power supply, including voltage, current, power setting, start and stop, output and status monitoring.

1.5.2 Introduction to Rear Panel of 3U Model (5kw~18kw)



No.	Function introduction	No.	Function introduction
1	Parallel input interface: as a slave	5	Remote S Compensation Terminal
2	Parallel output interface: as a host	6	Power output terminal block
3	RS232/RS485	7	Power input terminal port (three-phase)
4	LAN	8	Power supply chassis grounding pole

1.6 Technical specifications

WPS-S series constant power DC test power supply includes models of 1.5KW, 3KW, 5KW, 6KW, 10KW, 12KW, 15KW and 18KW with output voltage 0 ~ 2250V and output current 0 ~ 510A, corresponding to different models. Voltage, current, and power can be continuously regulated from 0% to 100% with either local or remote control (analog or digital).

1.6.1 Technical parameters of 2U model (1.5kw~3kw)

AC input	
Voltage	220VAC±10%
Frequency	45~66Hz
Power factor	≥0.99
DC output	
Accuracy ± (% of output + offset)	Voltage: ≤ ± (0.05% + 0.04% FS)
	Current: ≤ ± (0.15% + 0.1% FS)
	Power: ≤ ± 0.8% FS
Load effect	Voltage: ≤ 0.05% FS (0-100% load regulation)
	Current: ≤ 0.15% FS (0-100% ΔUDC load regulation)
Source effect	Voltage: ≤ 0.02% FS (± 10% ΔUAC input)
	Current: ≤ 0.05% FS (± 10% ΔUAC input)
Dynamic response time	Load adjustment time: ≤ 2ms (load adjustment from 10-100%)
	Output voltage rise time: 30 ms maximum (10 to 90% of full scale)
Protection function	OTP,OVP,OCP,OPP,PF
DC Output to Enclosure (PE)	1000VDC
Analog interface	Built-in 15-pin D-Sub female plug, galvanic isolation
Signal range	0 ~ 5V or 0 ~ 10V (switchable)
U/I/P/R Accuracy	0~10V: ≤0.2% 0~5V: ≤0.4%
Communication interface	RS232/RS485/CAN/GPIB/USB/LAN and other communication
Parallel operation	It is possible to connect up to 10 products (via a shared bus) with true
Refrigeration mode	Temperature controlled fan
Operating temperature	0~50°C
Storage temperature	-20~70°C
Humidity	< 80%, no condensation
Working height	<2000m
Physical parameters	2 U model

Width	482mm
Length	455mm
Height	88mm
Weight	1.5kW:10.8kg 3kW:13.5kg

Table 1-1

1.6.1.1 2U Model Voltage and Current Specifications

Voltage	Power		Efficiency	Ripple and noise	
	1.5KW	3KW		RMS (20Hz-300KHz)	P-P (20Hz-20MHz)
	Electric current				
40	60	120	≤92%	10mVrms	100mVpp
80	60	120	≤92%	10mVrms	100mVpp
200	25	50	≤93%	20mVrms	175mVpp
360	15	30	≤93%	40mVrms	250mVpp
500	10	20	≤93%	50mVrms	325mVpp
750	6	12	≤93%	75mVrms	500mVpp
1000	5	10	≤93%	100mVrms	650mVpp

Table 1-2

* For VPP measurement, connect a 1 uF capacitor at the output, 1.8 m lead length, full load, standard input voltage.

* VRMS is measured directly at the output, full load, standard input voltage.

1.6.2 Technical parameters of 3U model

1.6.2.1 80V specification

Model		WPS-5000S-80-170	WPS-10000S-80-340	WPS-15000S-80-510
AC Input	Phase	Three phase three wire+grounding		
	Voltage	380V AC $\pm 10\%$		
	Frequency	47 ~ 63Hz		
	Power factor	≥ 0.99		
DC Output	Voltage	DC 0 ~ 80V		
	Current	0 ~ 170 A	0 ~ 340 A	0 ~ 510 A
	Power	0 ~ 5 KW	0 ~ 10 KW	0 ~ 15 KW
	Efficiency	$\leq 93\%$		
Setting value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Readback value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Ripple&Noise	RMS 20Hz-300KHz	15mVrms		
	P-P 20Hz-20MHz	200mVpp		
Source effect	Voltage	$\leq 0.02\%FS(\pm 10\% \Delta UAC \text{ input})$		
	Current	$\leq 0.05\%FS(\pm 10\% \Delta UAC \text{ input})$		
Load effect	Voltage	$\leq 0.05\%FS(0-100\% \text{ load adjustment rate})$		
	Current	$\leq 0.15\%FS(0-100\% \Delta UDC \text{ load adjustment rate})$		
Analog interface	Specifications	Built in 15-pin D-Sub female plug, electrically isolated		
	Signal range	0~5V 或 0~10V (switchable)		
	U/I/P accuracy	0~10V: $\leq 0.2\%FS$; 0~5V: $\leq 0.2\%FS$		
Dynamic response time	Load adjustment time	$\leq 2ms(\text{load adjusted from 10 to 100\%})$		
	Output voltage rise time	50ms(10%-90% full scale)		
Functional protection		OTP,OVP,OCP,OPP,PF		
Interface		RS232/RS485/LAN		
Parallel operation		Realizable, can connect up to 10 products (via shared bus) through real master-slave operation		
Operating environment		Working temperature: 0-50 °C, humidity<80%, storage temperature -20~70 °C, altitude<2000m		
Isolation and withstand voltage		1000VDC		
Size (W*D*H)		482mm*660mm*132mm		
Weight		25kg	35kg	45kg

1.6.2.2 300V specification

Model		WPS-6000S-300-75	WPS-12000S-300-150	WPS-18000S-300-225
AC Input	Phase	Three phase three wire+grounding		
	Voltage	380V AC $\pm 10\%$		
	Frequency	47 ~ 63Hz		
	Power factor	≥ 0.99		
DC Output	Voltage	DC 0 ~ 80V		
	Current	0 ~ 75 A	0 ~ 150 A	0 ~ 225 A
	Power	0 ~ 6 KW	0 ~ 12 KW	0 ~ 18 KW
	Efficiency	$\leq 93\%$		
Setting value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Readback value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Ripple&Noise	RMS 20Hz-300KHz	40mVrms		
	P-P 20Hz-20MHz	200mVpp		
Source effect	Voltage	$\leq 0.02\%FS(\pm 10\% \Delta UAC \text{ input})$		
	Current	$\leq 0.05\%FS(\pm 10\% \Delta UAC \text{ input})$		
Load effect	Voltage	$\leq 0.05\%FS(0-100\% \text{ load adjustment rate})$		
	Current	$\leq 0.15\%FS(0-100\% \Delta UDC \text{ load adjustment rate})$		
Analog interface	Specifications	Built in 15-pin D-Sub female plug, electrically isolated		
	Signal range	0~5V 或 0~10V (switchable)		
	U/I/P accuracy	0~10V: $\leq 0.2\%FS$; 0~5V: $\leq 0.2\%FS$		
Dynamic response time	Load adjustment time	$\leq 2ms(\text{load adjusted from 10 to 100\%})$		
	Output voltage rise time	50ms(10%-90% full scale)		
Functional protection		OTP,OVP,OCP,OPP,PF		
Interface		RS232/RS485/LAN		
Parallel operation		Realizable, can connect up to 10 products (via shared bus) through real master-slave operation		
Operating environment		Working temperature: 0-50 °C, humidity<80%, storage temperature -20~70 °C, altitude<2000m		
Isolation and withstand voltage		1000VDC		
Size (W*D*H)		482mm*660mm*132mm		
Weight		25kg	35kg	45kg

1.6.2.3 500V specification

Model		WPS-6000S-500-40	WPS-12000S-500-80	WPS-18000S-500-120
AC Input	Phase	Three phase three wire+grounding		
	Voltage	380V AC $\pm 10\%$		
	Frequency	47 ~ 63Hz		
	Power factor	≥ 0.99		
DC Output	Voltage	DC 0 ~ 80V		
	Current	0 ~ 40 A	0 ~ 80 A	0 ~ 120 A
	Power	0 ~ 6 KW	0 ~ 12 KW	0 ~ 18 KW
	Efficiency	$\leq 93\%$		
Setting value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Readback value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Ripple&Noise	RMS 20Hz-300KHz	50mVrms		
	P-P 20Hz-20MHz	350mVpp		
Source effect	Voltage	$\leq 0.02\%FS(\pm 10\% \Delta UAC \text{ input})$		
	Current	$\leq 0.05\%FS(\pm 10\% \Delta UAC \text{ input})$		
Load effect	Voltage	$\leq 0.05\%FS(0-100\% \text{ load adjustment rate})$		
	Current	$\leq 0.15\%FS(0-100\% \Delta UDC \text{ load adjustment rate})$		
Analog interface	Specifications	Built in 15-pin D-Sub female plug, electrically isolated		
	Signal range	0~5V 或 0~10V (switchable)		
	U/I/P accuracy	0~10V: $\leq 0.2\%FS$; 0~5V: $\leq 0.2\%FS$		
Dynamic response time	Load adjustment time	$\leq 2ms(\text{load adjusted from 10 to 100\%})$		
	Output voltage rise time	50ms(10%-90% full scale)		
Functional protection		OTP,OVP,OCP,OPP,PF		
Interface		RS232/RS485/LAN		
Parallel operation		Realizable, can connect up to 10 products (via shared bus) through real master-slave operation		
Operating environment		Working temperature: 0-50 °C, humidity<80%, storage temperature -20~70 °C, altitude<2000m		
Isolation and withstand voltage		1000VDC		
Size (W*D*H)		482mm*660mm*132mm		
Weight		25kg	35kg	45kg

1.6.2.4 800V specification

Model		WPS-6000S-800-25	WPS-12000S-800-50	WPS-18000S-800-75
AC Input	Phase	Three phase three wire+grounding		
	Voltage	380V AC $\pm 10\%$		
	Frequency	47 ~ 63Hz		
	Power factor	≥ 0.99		
DC Output	Voltage	DC 0 ~ 80V		
	Current	0 ~ 25 A	0 ~ 50 A	0 ~ 75 A
	Power	0 ~ 6 KW	0 ~ 12 KW	0 ~ 18 KW
	Efficiency	$\leq 93\%$		
Setting value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Readback value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Ripple&Noise	RMS 20Hz-300KHz	75mVrms		
	P-P 20Hz-20MHz	550mVpp		
Source effect	Voltage	$\leq 0.02\%FS(\pm 10\% \Delta UAC \text{ input})$		
	Current	$\leq 0.05\%FS(\pm 10\% \Delta UAC \text{ input})$		
Load effect	Voltage	$\leq 0.05\%FS(0-100\% \text{ load adjustment rate})$		
	Current	$\leq 0.15\%FS(0-100\% \Delta UDC \text{ load adjustment rate})$		
Analog interface	Specifications	Built in 15-pin D-Sub female plug, electrically isolated		
	Signal range	0~5V 或 0~10V (switchable)		
	U/I/P accuracy	0~10V: $\leq 0.2\%FS$; 0~5V: $\leq 0.2\%FS$		
Dynamic response time	Load adjustment time	$\leq 2ms(\text{load adjusted from 10 to 100\%})$		
	Output voltage rise time	50ms(10%-90% full scale)		
Functional protection		OTP,OVP,OCP,OPP,PF		
Interface		RS232/RS485/LAN		
Parallel operation		Realizable, can connect up to 10 products (via shared bus) through real master-slave operation		
Operating environment		Working temperature: 0-50 °C, humidity<80%, storage temperature -20~70 °C, altitude<2000m		
Isolation and withstand voltage		1000VDC		
Size (W*D*H)		482mm*660mm*132mm		
Weight		25kg	35kg	45kg

1.6.2.5 1000V specification

Model		WPS-6000S-1000-15	WPS-12000S-1000-30	WPS-18000S-1000-45
AC Input	Phase	Three phase three wire+grounding		
	Voltage	380V AC $\pm 10\%$		
	Frequency	47 ~ 63Hz		
	Power factor	≥ 0.99		
DC Output	Voltage	DC 0 ~ 80V		
	Current	0 ~ 15 A	0 ~ 30 A	0 ~ 45 A
	Power	0 ~ 6 KW	0 ~ 12 KW	0 ~ 18 KW
	Efficiency	$\leq 93\%$		
Setting value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Readback value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Ripple&Noise	RMS 20Hz-300KHz	100mVrms		
	P-P 20Hz-20MHz	850mVpp		
Source effect	Voltage	$\leq 0.02\%FS(\pm 10\% \Delta UAC \text{ input})$		
	Current	$\leq 0.05\%FS(\pm 10\% \Delta UAC \text{ input})$		
Load effect	Voltage	$\leq 0.05\%FS(0-100\% \text{ load adjustment rate})$		
	Current	$\leq 0.15\%FS(0-100\% \Delta UDC \text{ load adjustment rate})$		
Analog interface	Specifications	Built in 15-pin D-Sub female plug, electrically isolated		
	Signal range	0~5V 或 0~10V (switchable)		
	U/I/P accuracy	0~10V: $\leq 0.2\%FS$; 0~5V: $\leq 0.2\%FS$		
Dynamic response time	Load adjustment time	$\leq 2ms(\text{load adjusted from 10 to 100\%})$		
	Output voltage rise time	50ms(10%-90% full scale)		
Functional protection		OTP,OVP,OCP,OPP,PF		
Interface		RS232/RS485/LAN		
Parallel operation		Realizable, can connect up to 10 products (via shared bus) through real master-slave operation		
Operating environment		Working temperature: 0-50 °C, humidity<80%, storage temperature -20~70 °C, altitude<2000m		
Isolation and withstand voltage		1000VDC		
Size (W*D*H)		482mm*660mm*132mm		
Weight		25kg	35kg	45kg

1.6.2.6 1500V/2250V specification

Model		WPS-12000S-1500-25	WPS-18000S-1500-40	WPS-18000S-2250-25
AC Input	Phase	Three phase three wire+grounding		
	Voltage	380V AC $\pm 10\%$		
	Frequency	47 ~ 63Hz		
	Power factor	≥ 0.99		
DC Output	Voltage	DC 0 ~ 80V		
	Current	0 ~ 25 A	0 ~ 40 A	0 ~ 25 A
	Power	0 ~ 12 KW	0 ~ 18 KW	0 ~ 18 KW
	Efficiency	$\leq 93\%$		
Setting value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Readback value accuracy	Voltage	$\leq \pm(0.05\%+0.04\%FS)$		
	Current	$\leq \pm(0.15\%+0.1\%FS)$		
	Power	$\leq \pm 0.8\%FS$		
Ripple&Noise	RMS 20Hz-300KHz	75mVrms		
	P-P 20Hz-20MHz	550mVpp		
Source effect	Voltage	$\leq 0.02\%FS(\pm 10\% \Delta UAC \text{ input})$		
	Current	$\leq 0.05\%FS(\pm 10\% \Delta UAC \text{ input})$		
Load effect	Voltage	$\leq 0.05\%FS(0-100\% \text{ load adjustment rate})$		
	Current	$\leq 0.15\%FS(0-100\% \Delta UDC \text{ load adjustment rate})$		
Analog interface	Specifications	Built in 15-pin D-Sub female plug, electrically isolated		
	Signal range	0~5V 或 0~10V (switchable)		
	U/I/P accuracy	0~10V: $\leq 0.2\%FS$; 0~5V: $\leq 0.2\%FS$		
Dynamic response time	Load adjustment time	$\leq 2ms(\text{load adjusted from 10 to 100\%})$		
	Output voltage rise time	50ms(10%-90% full scale)		
Functional protection		OTP,OVP,OCP,OPP,PF		
Interface		RS232/RS485/LAN		
Parallel operation		Realizable, can connect up to 10 products (via shared bus) through real master-slave operation		
Operating environment		Working temperature: 0-50 °C, humidity<80%, storage temperature -20~70 °C, altitude<2000m		
Isolation and withstand voltage		1000VDC		
Size (W*D*H)		482mm*660mm*132mm		
Weight		25kg	35kg	45kg

1.6.2.7 3U Models

Voltage (V)	Current (A)	Power(KW)	Model
80	170	5	WPS-5000S-80-170
80	340	10	WPS-10000S-80-340
80	510	15	WPS-15000S-80-510
300	75	6	WPS-6000S-300-75
300	150	12	WPS-12000S-300-150
300	225	18	WPS-18000S-300-225
500	40	6	WPS-6000S-500-40
500	80	12	WPS-12000S-500-80
500	120	18	WPS-18000S-500-120
800	25	6	WPS-6000S-800-25
800	50	12	WPS-12000S-800-50
800	75	18	WPS-18000S-800-75
1000	15	6	WPS-6000S-1000-15
1000	30	12	WPS-12000S-1000-30
1000	45	18	WPS-18000S-1000-45
1500	25	12	WPS-12000S-1500-25
1500	40	18	WPS-18000S-1500-40
2250	25	18	WPS-18000S-2250-25

Chapter 2 Unpacking and installation

2.1 Selected installation location

During installation, please select a position with good ventilation and heat dissipation. The distance between the air inlet (outlet) and the wall or shelter should be more than 30cm. Avoid placing it in the environment of direct sunlight, hot and humid, and corrosive substances. Rainwater is strictly prohibited.

2.1.1 Inspection before unpacking

Check whether the packing box is damaged. If any damage is found, inform the freight forwarder to inspect the goods and record the damage at the time of delivery. If there is no damage, open the box according to the following steps.

2.1.2 Unpacking

- (1) Unpack according to the requirements of the outer packing box of the equipment, and take out the power supply equipment.
- (2) First, check the product nameplate to make sure that the model is consistent with the order. Check the accessories in the packing box to make sure that they are consistent with the packing list. If the items in the packing box are inconsistent with those listed in the "packing list", please contact our customer service center.
- (3) Visually observe whether there is obvious damage such as metal scratches, scribbles, dents, etc. Check whether there is loose connection, whether the fasteners fall off, or other abnormal phenomena. If damage is found, please contact our customer service center immediately. The customer service center will deal with it for you immediately. Please do not return the product immediately without notifying our customer service center.
- (4) To prevent accidental electric shock, please do not open the upper cover of the instrument by yourself. If the instrument is abnormal, please seek our technical support.

2.2 Operating environment

- (1) The power supply shall be installed with good ventilation and heat dissipation. The distance between the air inlet (outlet) of the power supply and the wall or shelter shall be more than 30cm, and contact with corrosive substances is strictly prohibited.
- (2) Please confirm whether the AC power to be connected meets the specification requirements.
- (3) For ambient temperature and humidity, please refer to the specification parameters of each model.
- (4) After the power supply is installed and commissioned, it is recommended to keep the power supply in a power-on state, so as to provide the best operating conditions for the electronic components and avoid moisture for some important components. If it is not used for a long time, a visual inspection should be carried out first. If moisture is found in any part of the interior, it must be dried before it can be used.

General environmental conditions:

- Not for outdoor 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 temperature: 0 °C ~ + 50 °C

Storage temperature: -25 °C ~ + 65 °C

- Keep away from boilers, humidifiers, water sources, etc.

Operating relative humidity: 10 ~ 95% RH, no condensation, storage relative humidity: not more than 80% (for storage in high humidity environment, it is recommended to start the machine regularly for 20 minutes to avoid condensation of water vapor).

- Keep away from strong electromagnetic interference sources and obvious vibration and shock.
- The working environment shall be well ventilated and free of dust. Please keep the area within 30cm around the vent open and free from any debris.
- Sharp changes in temperature must be avoided, which will cause moisture to condense inside the machine. Do not use this power supply in the event of moisture condensation.
- The input AC supply voltage is floating at $\pm 10\%$ of the rated voltage.
- The product shall not be placed in a limited position where the plug is not easy to pull out or the input switch is not easy to disconnect, so as to prevent the dangerous situation that the input cannot be cut off.

2.3 Input wiring

Use the supplied power cord to connect the power supply to the mains. If you need to use a different AC cord, make sure that the cross section of the cord is at least 2.55. The default power input value for this series of power supplies is AC220V $\pm 10\%$, 16 A, 50 Hz.



Before wiring, please confirm that the input power supply has been disconnected. Due to the leakage current, the shell may be electrified. The grounding terminal should be well grounded to protect the safety of personnel.



A circuit breaker or fuse is required to be connected at the input end of the DC power supply, and its rated current shall be 1.25 times of the maximum input current of the power supply.

2.4 Output wiring

2.4.1 Wiring instructions

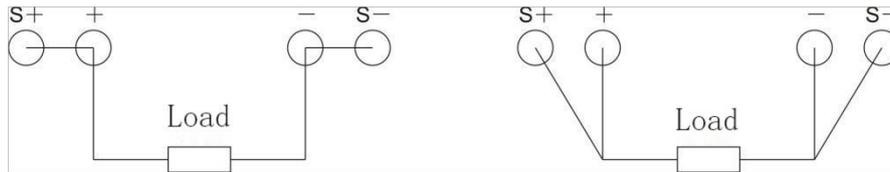
(1) Connection method when lead voltage drop compensation function is not used

Connect the output terminal to the load as shown in Figure 2-1 (a). Connect the positive output terminal to S + and the negative output terminal to S- with a short circuit. At this time, lead voltage drop is not

compensated. The displayed voltage value is the voltage at the output end of the power supply, not the voltage at both ends of the load.

(2) Connection method when lead voltage drop compensation function is used

Connect the output terminal to the load as shown in Figure 2-1 (B). The positive output terminal and S + are connected to one end of the load at the same time, and the negative output terminal and S- are connected to the other end of the load at the same time. At this time, the displayed voltage value is the actual voltage at both ends of the load to realize the function of lead voltage drop compensation.



Do not use the lead drop compensation function Use the lead drop compensation function
(a) (b)

Figure 2-1 Schematic diagram of output wiring



If the output terminal of the power supply is not wired to the load and only the SENSE line is connected, current will flow from the SENSE line and damage the internal components of the power supply.

2.4.2 Wiring description of battery load

The WPS-S Series Wide-range programmable DC Power Supply can be applied to battery loads, and the following precautions must be followed during use.

1. Wiring must be conducted as shown in Figure 2-2:

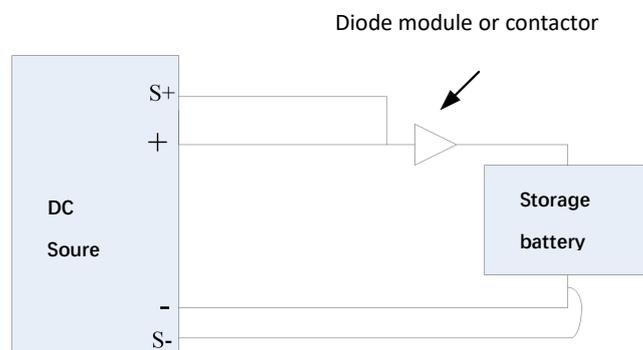


Fig. 2-2 Battery Load Wiring Mode

2. Connect a diode or DC contactor (diode module is recommended) in series between the DC power supply and the load (battery). Avoid damage to the DC power supply and the battery.
3. The diode shall be selected according to the following principles: the minimum reverse withstand voltage

shall be 2 ~ 3 times of the output voltage of the DC test power supply; the minimum forward conduction current shall be 1.5 times of the maximum output current of the DC source.

4. Operation mode of using contactor

First of all, when connecting the DC test power supply to the load, the contactor must be disconnected; Condly, after the DC test power supply is connected and the output is started, the contactor is closed; Finally, when stopping charging, the contactor must be disconnected before stopping the DC test power output.

2.4.3 Wiring description of inductive load

The WPS-S Series Wide-range programmable DC Power Supply can be applied to inductive loads, and the following precautions must be followed during use.

1. Wiring must be conducted as shown in Fig. 2-3:

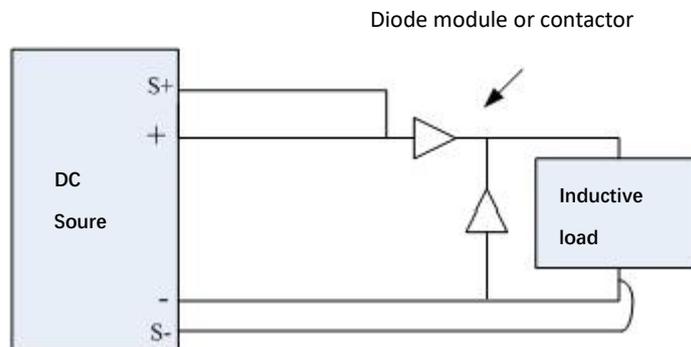


Figure 2-3 Wiring mode of inductive load

2. Connect diodes or DC contactors (diode module is recommended) in parallel or series between the DC power supply and the load (inductive). Avoid damage to the DC power supply and load.

3. The diode shall be selected according to the following principles: the minimum reverse withstand voltage shall be 2 ~ 3 times of the output voltage of the DC test power supply; the minimum forward conduction current shall be 1.5 times of the maximum output current of the DC source.

2.4.4 Wire diameter requirements

Electric current	Input lead wire diameter (including ground wire)	Output lead wire diameter
10A	BVR 2.5mm ²	BVR 2mm ²
15A		BVR 2mm ²
20A		BVR 2.5mm ²
30A		BVR 6mm ²
60A		BVR 16mm ²
120A		BVR 50mm ²

Table 2-1 Output Lead Wire Diameter



- 1) Do not use the wire with too thin diameter to avoid overheating of the connecting wire and causing danger.
- 2) It is recommended to use copper braided wire with single wire diameter not more than 0.15 mm for ground wire.

Chapter 3 Basic operation

3.1 Introduction

This chapter will describe in detail how to use the front panel of the power supply to realize the power supply function and the operation method of the power supply, as well as the preparation and inspection before the use of power supply:

- (1) Make sure that the power line and the input and output lines are connected correctly.
- (2) Please read the safety and warning signs posted on the instrument before use.

3.2 Startup

Check the power cord to ensure that it is correct, and then turn on the power switch. After the machine is turned on, the welcome interface is displayed as shown in the following figure.

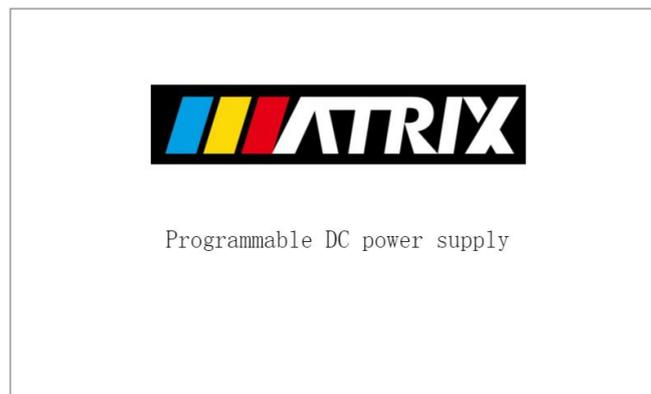


Figure 3-1 Startup interface

Under normal conditions, it will enter the standby interface for about 5-10s, otherwise the power supply will enter the corresponding alarm state according to the error found in the self-test. After the BIT is completed, enter the standby interface, as shown in the figure below:



Figure 3-2 Standby interface

The left side of the screen displays the values of voltage, current and power, the middle displays the setting values of voltage, current and power, and the right side displays the function soft keyboard.

3.3 Starting and Stopping

Press the button ON/OFF. If the startup is successful, the red indicator light in the ON/OFF button lights up, indicating that the output is in the working state. Meanwhile, the indicator light indicates that the current state is CV, CP or CC, as shown in the following figure.



Figure 3-3 Startup Interface

In the startup state, press the ON/OFF key to stop the output, and the output indicator goes out.

3.4 Set the output voltage, output current and output power values

In the standby interface, press the VOLT or CURR or power key to directly change the setting parameters, and there will be a white cursor line below the selected parameters. Press the number keys or use the knob to modify the selected values, as shown in the following figure.



Figure 3-4 Setting Mode Interface

3.5 Basic settings

In the comprehensive setting interface, you can mainly set the LCD screen brightness, key sound, language switching, keyboard locking and view the system information of the machine. Press F4 in the standby interface to enter the comprehensive setting interface, as shown in the figure below. Use the knob to adjust the brightness, press F1 to save, or press F4 to cancel the save and enter the standby interface; in the keyboard lock state, only press F4, and press F4 to enter the standby interface; use the knob to select the

information query, press F3 to display the model of the machine, and finally correct the date and software version.

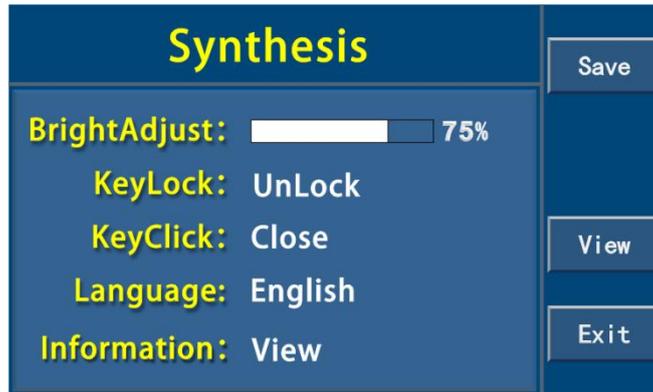


Figure 3-5 Comprehensive Setting Interface

3.6 Communication Settings

Press F2 in the standby interface to enter the communication setting interface. As shown in the figure below, the communication interface can be set as RS232/485/LAN/USB/CAN. Select the item to be set through ↑ and ↓, and use the knob to set the parameter value. Please refer to the appendix for specific communication commands, and the address range is 1-255.

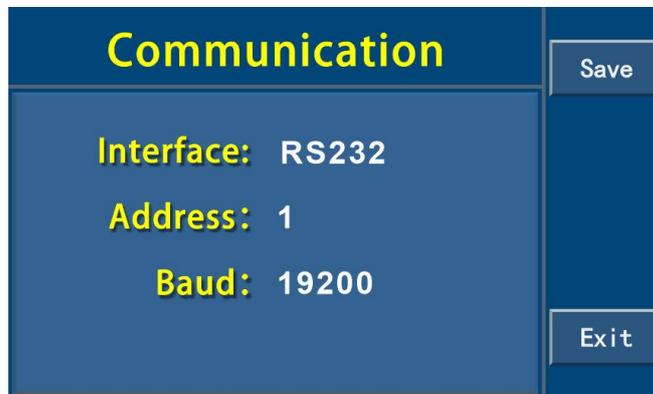


Figure 3-6 Communication Interface Settings

Press the LOCAL key to switch to local mode. The remote operation mode here is communication control, excluding the analog port control mode. When controlled via a communication interface such as RS232, the power supply automatically enters remote mode, in which the power supply will not respond to key functions.



When using remote operation, the power supply and the computer must be grounded at the same time, and hot swapping is prohibited to avoid damage to the power supply or the computer.

3.7 Alarm settings

This machine will give an alarm through the signal for a variety of abnormal or fault conditions, all alarm conditions will be displayed on the LCD screen, and there is an alarm sound prompt. According to the different types of alarm, the alarm conditions of the machine can be divided into hardware alarm and software alarm. The hardware alarm conditions include power failure alarm, over-temperature alarm and overload alarm. Software alarm conditions include voltage, current, power upper and lower limit alarm and master-slave protection alarm. The setting of software alarm is shown in the figure below.



Figure 3-7 Alarm Setting Interface

Alarm	Meaning	Description
PF	Power supply failure	AC supply overvoltage or undervoltage. Out-of-specification or loss of supply generates an alarm and shuts down the DC output.
BUCK	Hardware failure	Failure of the hardware power supply circuit will generate an alarm and the DC output will be turned off.
OT	Over temperature alarm	When the internal temperature of the product exceeds a certain limit, an alarm is triggered and the DC output is turned off.
MSP	Master/slave protection	This alarm will be triggered and the DC output will be turned off when the master under the initialized master-slave system is disconnected from any slave.
OVP	Upper voltage limit alarm	If the voltage at the DC output exceeds the set upper voltage limit, this alarm is triggered and the DC output is turned off.
OCP	Current upper limit alarm	If the current at the DC output exceeds the set upper current limit, this alarm is triggered and the DC output is turned off.
OPP	Upper power limit alarm	If the power at the DC output exceeds the set upper power limit, this alarm is triggered and the DC output is turned off.
UVP	Lower voltage limit alarm	If the voltage at the DC output falls below the set lower voltage limit, this alarm is triggered and the DC output is turned off.

UCP	Current lower limit alarm	If the current at the DC output falls below the set lower current limit, this alarm is triggered and the DC output is turned off.
UPP	Lower power limit alarm	If the power at the DC output is lower than the set lower power limit, this alarm is triggered and the DC output is turned off.



When the machine is turned off through the power switch, it cannot be distinguished from the power failure at the power supply end. Therefore, the PF alarm prompt will be given at each shutdown, which can be ignored at this time.

3.8 System settings

Press F4 in the standby interface to enter the system setting interface, as shown in the figure below. In the system setting interface, you can select the following functions through the knob or number keys.

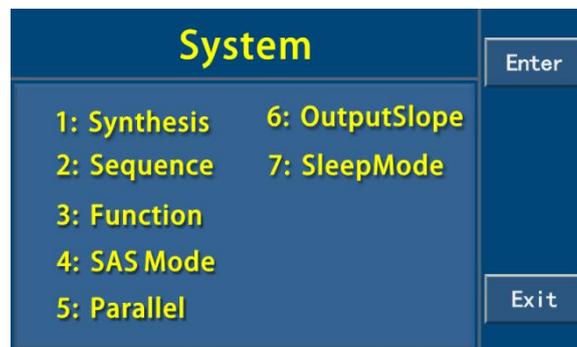


Figure 3-8 System Setting Interface

3.9 Shortcut group saving and calling

In the standby interface, according to the interface prompt, press F1 to enter the shortcut group interface, and then press F1 to enter the shortcut group editing interface as shown in the following figure, and set and save the shortcut group parameters.



Figure 3-9 Shortcut Group Interface

Select the VOLT voltage value, CURR current value and POWER power value through the knob or the ↑

and ↓ keys or the knob. There will be a white line below the selected parameter. Press the number key or use the knob to modify the selected value. After modification, press F1 to save the shortcut group and return to the shortcut group interface as shown in the figure above.



Read the parameter of group 0 as the default value after the power is turned on.

In the standby interface, according to the interface prompt, press F1 to enter the shortcut group calling interface to query and call the parameters in the shortcut group, as shown in the following figure.

Recall				Edit
→ 0	60.00 V	10.0 A	0.80 kW	Recall
1	0.00 V	0.0 A	0.00 kW	NextPage
2	0.00 V	0.0 A	0.00 kW	Exit
3	0.00 V	0.0 A	0.00 kW	
4	0.00 V	0.0 A	0.00 kW	

Figure 3-10 Parameter Calling Interface

Use the ↑ and ↓ keys to browse the parameters of groups 0-9, press F2 in the shortcut group calling interface to select the corresponding group, and press the Menu or CANCEL key to abort the calling and return to the standby interface.

3.10 Sequence testing

The sequence test function allows the user to set a series of voltage, current and power, and automatically output according to the set rules, so as to better meet the user's application of automatic testing and aging. A total of 50 sequences can be stored, each sequence contains 22 steps, the function of each step can be set independently, a total of 12 independent functions, including cycle control, slope mode output and other rich control functions.

3.10.1 Basic operation of sequence test

In the standby interface, press F2 to enter the main interface of sequence test, as shown in the figure below.



Figure 3-11 Main interface of sequence test

In this interface, you can select one of the 50 sequences by using the number keys or by using the knob. The sequence name format is XX, where XX stands for 00-49.

From the main interface of sequence test, you can start (F1) sequence test, single-step operation (F2), edit sequence (F3) and delete sequence (F4).



Do not use communication commands not related to the sequence test if the sequence test is operated by RS232. See Appendix A/B for details of communication commands. Do not use commands related to the sequence test if it is not operated by RS232.



When using sequential testing, avoid frequent voltage switching, which can cause damage to the power supply's internal components. The following principles shall be followed in use:

1. Preestimate the peak-to-peak value (VPP) of the frequency and voltage of the required sequence.
2. Then estimate the proportion of VPP to the total voltage output, that is, the VPP percentage. If the VPP of the design sequence is 10 V and the maximum voltage of the power supply is 100 V, write $\%VPP = 10/100 = 10\%$.
3. The relationship between frequency and VPP percentage should not exceed the following table.

Frequency	%VPP	Frequency	%VPP
10HZ	25%	50HZ	5.0%
100HZ	2.5%	150HZ	1.67%
200HZ	1.25%		

4. When setting the running time of each step, it is also necessary to consider the actual output rise or fall time. If the setting is improper, although it will not cause danger, the output waveform may be very different from the required one. This time is closely related to the actual load conditions. If you want to know more about it, please contact our technical support.

3.10.2 Startup Sequence Test

In the main interface of sequence test, press F1 to start the sequence test, enter the sequence test execution interface as shown in the figure below, and start to execute a sequence.



Figure 3-12 Sequence Test Execution Interface

The interface displays the currently running sequence number and step (such as SEQ00: 00, representing the step 0 of sequence 0), the function of the current step (such as Ramp V), voltage, current, power and the remaining execution time of the current step. The time format is SS. SSS (the last 3 digits represent milliseconds).

During the execution of the sequence test, press F1 to pause the test or F2 to stop the test. At this time, the output will maintain the output value of the current step. When the test is stopped, return to the main interface of the sequence test. While paused, press F1 to continue the test.



When the sequence test is executed, the output of the power supply is still controlled by the ON/OFF key, that is, after the sequence test is started, it is necessary to press ON/OFF to start the output. After the sequence test pauses or stops, press ON/OFF to stop the output.

3.10.3 Sequence Test Single Step Run

In the main interface of sequence test, press F2 to start single step operation, enter the single step execution interface of sequence test as shown in the figure below, and start single step operation of a sequence.



Figure 3-13 Sequence test single step operation interface

The interface displays the currently running serial number and step, the function of the current step, the voltage, current, power and the remaining execution time of the current step.

When the current step is complete, press F1 to continue to the next step. F2 Stop the test and return to the main interface of sequence test.

3.10.4 Sequence Parameter Editing

In the main interface of sequence test, press F3 to enter the sequence program editing interface. Display the currently edited serial number and step, the function of the current step and the corresponding parameters. There are 13 functions in total, which will be introduced one by one below.

The edit interface menu includes:

Copy (F1): Copy the parameters of the current step into the buffer.

Paste (F2): Pastes the parameters copied into the buffer to the current step.

Insert (F3): Insert a step before the current step, and move the following steps backward in sequence.

Delete (F4): Delete the current step.

Enter the sequence test editing interface, and the function selection position is displayed reversely. Use the knob to select any one of the 13 functions. After selecting the function, use the ↑ and ↓ keys to select the parameter to be edited, and use the number keys or the knob to set the parameter value. The main process of sequence editing is as follows:

- (1) After setting the function of the current step, select the parameter to be edited and set the parameter value.
- (2) After editing a step, locate the editing position on the step number at the top of the screen, and select the next step to be edited.
- (3) Repeat step 1.
- (4) After editing, press CANCEL to enter the sequence parameter saving interface, as shown in the following figure. Press F1 to save parameters and return to the main interface of sequence test. Press F4 to cancel saving and return to the main interface of sequence test, or press CANCEL to return to the sequence parameter editing interface.

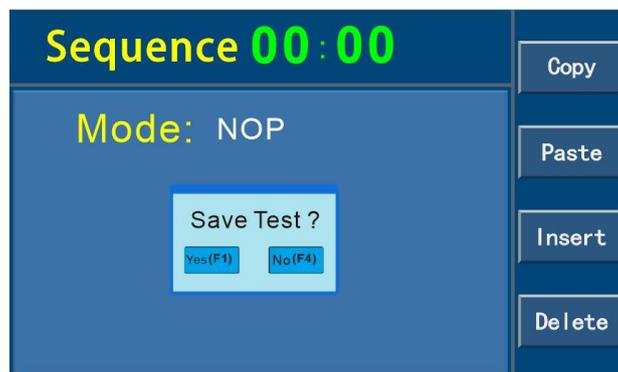


Figure 3-14 Saving of Sequence Parameters

Each function is described in detail below:

NOP-Null operation. Unused steps should be set to this mode and skipped directly in the sequence test. There is no effect on the output and settings, as shown in the following figure.

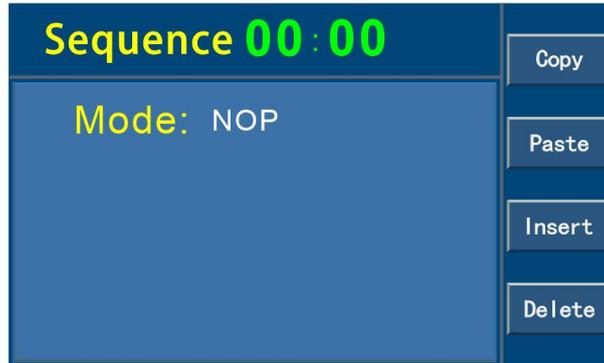


Figure 3-15 NOP Function

VI Mode-Voltage/current mode. This mode needs to set the voltage, current, power value and duration, and output the set voltage, current, power and duration, as shown in the figure below.

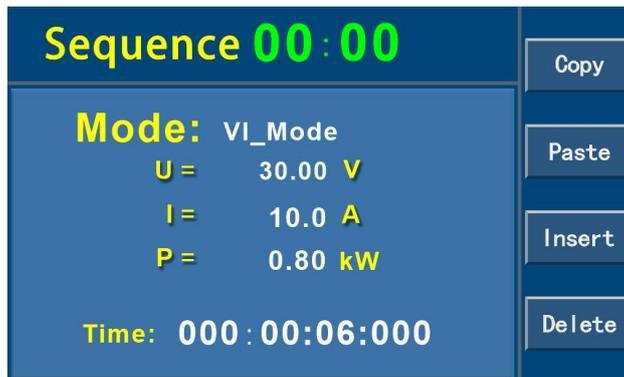


Figure 3-16 VI Mode

Ramp V-voltage slope mode, namely, the output voltage gradually reaches a set end value (Vf) from an initial value (Vi) in a slope mode within a set time, and in the execution process, an appropriate slope control function is automatically calculated inside the power supply according to Vi, Vf and the set time to drive the output of the power supply, Select Vi, Vf, current limit and duration by ↑ and ↓, and adjust the value of the parameters by the number keys or by using the knob, as shown in the figure below.

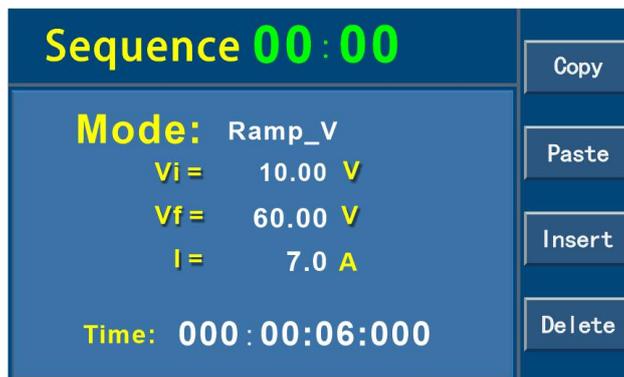


Figure 3-17 Voltage Slope Mode

Ramp I-current slope mode, that is, the output current gradually reaches the set end value (If) from the initial value (Ii) in a slope manner within the set time. Select Ii, If, voltage limit and duration through ↑ and ↓, and adjust the value of the parameter through the numeric keys or using the knob, as shown in the following figure.



Figure 3-18 Current Slope Mode

Repeat-returns to the start of the sequence (the start here may be the beginning of the current sequence or the beginning of another sequence, depending on the number of branches in the sequence execution and the use of the SubCall function). The previous steps of Repeat are executed again. If Repeat is encountered again, it will be skipped. Proceed to the next step and use the Loop function if you want to repeat more than one time. This function does not require parameters, as shown in the following figure.

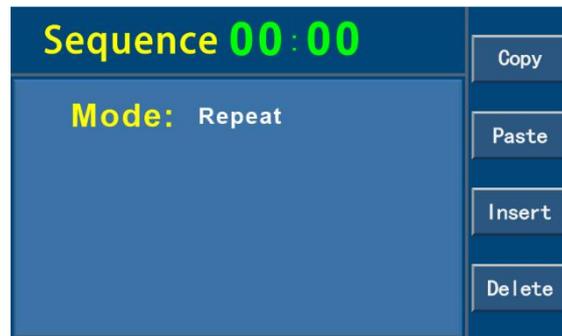


Figure 3-19 Repeat Function

Subcall — This command allows a call to another sequence to run as a sub-sequence during the execution of the sequence test. If the sub-sequence contains a Return command, it returns to the main sequence to continue with the steps following the Subcall command, as shown in the following figure.

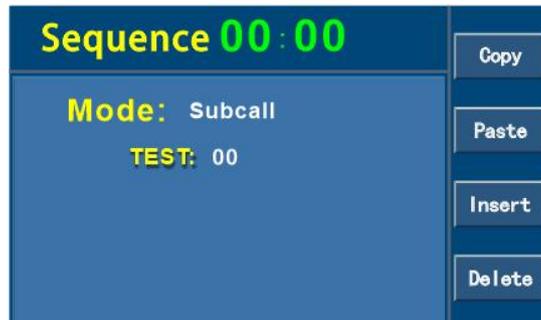


Figure 3-20 Subsequence Call Function

Return-This command allows you to immediately return to the sequence in which the Subcall command was called last time during the execution of the sequence test. If no Subcall has been called when executing the Return command, the sequence test will stop and return to the main sequence test interface. This command is often used in the last step of a sequence to return to the main calling sequence, as shown in the following figure.

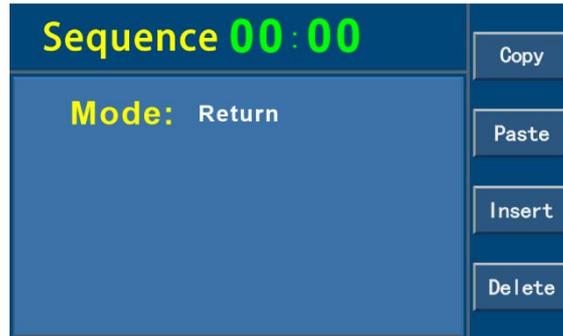


Figure 3-21 Return Function

Loop-The function of this command is to repeat all steps between the Loop command and the Next command for a set number of times, up to 999999. After the set number of times, continue to the next step after the Next command. Select the number of repetitions through ↑ and ↓, and adjust the value of the parameter through the number keys or by using the knob, as shown in the following figure.

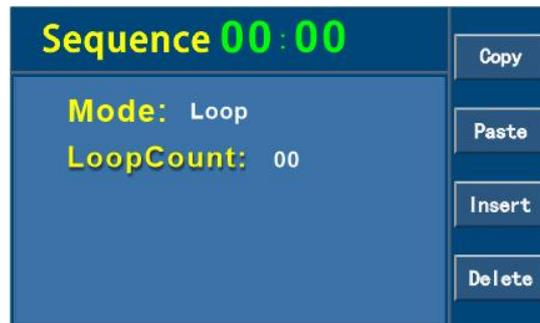


Figure 3-22 Circulation control function

Next-This command is used together with the Loop command. This command is placed after the last step of loop execution, indicating that the steps between Loop and Next are repeated. If there is no Loop command before Next when the sequence test is running, the sequence test will stop and return to the main interface of sequence test, as shown in the following figure.

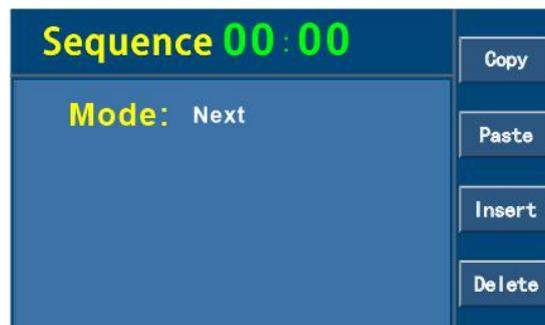


Figure 3-23 Cycle End Control

Stop-Stops the sequence test and returns to the main sequence test screen while maintaining the last output value. This command is often used in the last step of the sequence to stop the test, as shown in the following figure.

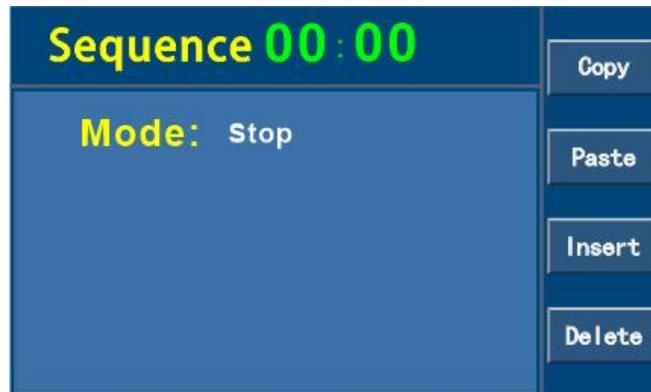


Figure 3-24 Stop Sequence Test

Goto-This command allows the user to exit the current sequence and start running another sequence at the same time. It is used to combine multiple sequences into a test. It is often used in the last step of the sequence. Select the serial number to be jumped by \uparrow and \downarrow . Adjust the value of the parameter by the number key or use the knob, as shown in the following figure.



Figure 3-25 Jump control function

Pause-This command pauses the sequence test, as shown in the following figure.



Figure 3-26 Pause Function

3.10.5 Sequence Parameter Deletion

In the main interface of sequence test, press F4 to enter the sequence deletion interface, as shown in the following figure.

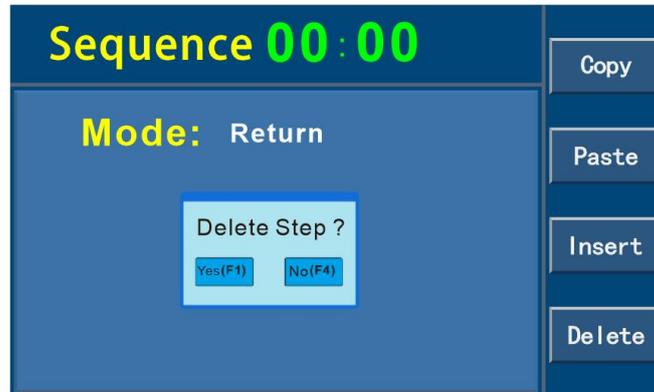


Figure 3-27 Sequence Deletion Interface

Press F1 to confirm deletion and return to the main interface of sequence test. This operation sets all steps in the currently selected sequence as NOP. F4 Cancel deletion and return to the main interface of sequence test.

3.10.6 Sequence Test Example

A typical aging test process is like this: first input voltage to the tested object with a certain slope, continue for a period of time, then suddenly rise to another voltage, continue for a period of time, and then increase the voltage again, continue for some time.. Finally, the voltage is ramped down to zero. In some cases, a voltage switching cycle test sequence is also required, as shown in the following figure, which shows a voltage waveform for the aging test.

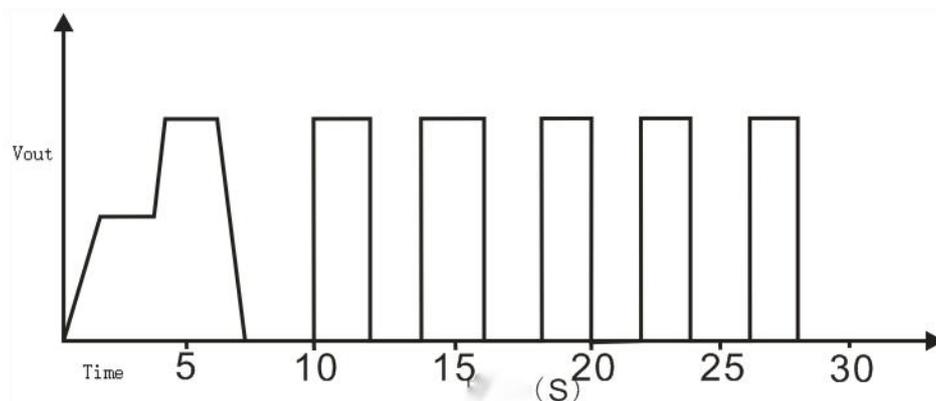


Figure 3-28 Sequence Test Example

To implement this waveform, you first need to know how to set up each step correctly. The above waveform needs two sequences to complete, one to realize the slope rise, sustain and fall of the voltage. The other realizes the output of the voltage and stops the cycle. The two sequences are connected to each other by a

Goto instruction.

Seq 1: TEST00

Step 1-Output from 0 V to 20 V in ramp mode for 1 S.

Step 2-Hold 20 V output 2S.

Step 3-Ramp up from 20 V to 40 V for 500mS.

Step 4-Hold 40V output for 2.5S.

Step 5-ramp down from 40V to 0V for 2 seconds.

Step 6-Hold 0 V output 2 S.

Step 7-Goto Sequence 2.

Sequence 2: TEST01

Step 1-Take the loop command and loop 5 times.

Step 2-Output 40 V for 2 S in voltage/current mode.

Step 3-Output 0 V for 2 S in voltage/current mode.

Step 4-Loop 5 times and execute the Next command.

Step 5-Stop the sequence test.

Follow these steps to edit the parameters of a sequence:

Sequence 1: In the standby interface, press F3 to enter the main interface of sequence test, use the number keys or knob to adjust the serial number, select TEST00, and then press F4 to delete TEST00. The deletion operation makes all steps of TEST00 set to NOP, so as to reset to a certain state. After deletion, press F3 to enter the sequence parameter editing interface.

Step 1-Output from 0 V to 20 V in ramp mode for 1 s

Select step 0 of sequence 0, namely, TEST00: 00, and then press the  key to display the selected position of the step function in reverse. Set the function to Ramp V mode, continue to select the parameters to be set through  and , and use the numeric keys or knobs to set V_i to 0 V, V_f to 20 V, and current limit (set according to the actual load condition, here it is assumed that the load is light. Set to 1A) and set the duration to 1 S (0:00:01:000). After editing, press F1 to copy the current step parameters to the buffer for later use.

Step 2-Hold 20 V output for 2S

 and  display the position of the step number in reverse, select the first step of sequence 0, that is, TEST00: 01, and then use the  key to display the position of the step function selection in reverse, set the function to VI Mode, continue to select the parameters to be set through the  and , and use the numeric keys or knobs to set V to 20 V, I to 1A, P to 1 kW, Set the duration to 2S (0:00:02:000).

Step 3-ramp up 40 V from 20 V for 500ms.

  Invert the position of the step number, select the second step of sequence 0, that is, TEST00: 02, then press F2 to copy the parameters of TEST00: 00 to the current step, continue to select the parameters to be modified through , , and use the number keys or knobs to modify Vi to 20 V and Vf to 40 V. The modification duration is 500mS (0:00:00:500).

Step 4-Hold 40V output for 2.5s

 and  display the position of the step number in reverse, select the third step of sequence 0, that is, TEST00: 03, and then use the  key to display the position of the step function selection in reverse, set the function to VI Mode, continue to select the parameters to be set through the  and , and use the numeric keys or knobs to set V to 40 V, I to 1A, P to 1 kW, Set the duration to 2.5S (0:00:02:500).

Step 5-ramp down from 40V to 0V for 2 s

 and  display the position of the step number in reverse, select the fourth step of sequence 0, that is, TEST00: 04, then press F2 to copy the parameters of TEST00: 00 to the current step, continue to select the parameters to be modified through  and , and use the number keys or knobs to modify Vi to 40 V and Vf to 0 V. The modification duration is 2S (0:00:02:000).

Step 6-Hold 0 V output for 2S

 and  display the position of the step number in reverse, select the fifth step of sequence 0, that is, TEST00: 05, and then use the  key to display the position of the step function selection in reverse, set the function to VI Mode, continue to select the parameters to be set through the  and , and use the numeric keys or knobs to set V to 0 V, I to 1A, P to 1 kW, Set the duration to 2S (0:00:02:000).

Step 7-Jump to Sequence 2

 and  display the position of the step number in reverse, select the sixth step of the sequence 0, that is, TEST00: 06, and then use the  key to display the selected position of the step function in reverse, set

the function as Goto, select the parameter to be set through  and , and use the number keys or knobs to set the sequence to be jumped to as TEST01. Press CANCEL to enter the sequence parameter saving interface, prompt whether to save TEST00, and select F1 to save.

Sequence 2: In the standby interface, press F3 to enter the main interface of sequence test, use the number keys or knob to adjust the serial number, select TEST01, and then press F4 to delete TEST01. The deletion operation makes all steps of TEST01 set to NOP to reset to a certain state. After deletion, press F3 to enter the sequence parameter editing interface.

Step 1-Set the loop command to loop 5 times

Select step 0 of sequence 1, namely TEST01: 00, and then press  to display the selected position of step function in reverse. Set the function as Loop, press  to select the parameter to be set, and use the number keys or knob to set the number of loops as 5.

Step 2-Output 40 V for 2 s in voltage/current model

 and  display the position of the step number in reverse, select the first step of sequence 1, that is, TEST01: 01, and then use the  key to display the position of the step function selection in reverse. Use the number keys or knob to set the function to VI Mode, and continue to select the parameters to be set through  and . Set V to 40 V, I to 1A, P to 1 kW, Set the duration to 2S (0:00:02:000). Press F1 to copy the parameters of the current step into a buffer for later use.

Step 3-Hold 0 V output for 2S

,  Invert the position of the step number, select the second step of sequence 1, that is, TEST01: 02, then F2 paste the function of TEST01: 01 to the current step, and modify the voltage value V to 0 V.

Step 4-Loop 5 times and execute the Next command

,  Invert the position of the step number, select the third step of sequence 1, that is, TEST01: 03, and then use the  key to invert the position of the function selection, and use the number keys or knob to set the function to Next.

Step 5-Stop Sequence Test

↑, ↓ Invert the position of the step number, select the fourth step of sequence 1, that is, TEST01: 04, and then use the ↓ key to invert the position of the function selection, and use the number keys or knob to set the function to Stop. Press CANCEL to enter the sequence parameter saving interface, prompt whether to save TEST01, and select F1 to save.

This completes the editing of the entire program. Start the sequence test execution by pressing F1 on the main interface of sequence test, and the whole sequence takes about 30s.

3.11 Function Output

This series of power supply can output sine wave, rectangular wave, triangular wave and trapezoidal wave according to the set voltage or current, as shown in the figure below. When the output waveform type is set as sine wave, Para sets the output voltage or current. Amp: the amplitude generated by the signal. Offset: the offset based on zero point, not less than the assigned value. Freq: the frequency of the output signal. When the parameters are set and the load resistance is constant, the output voltage or current draws a sinusoidal waveform.

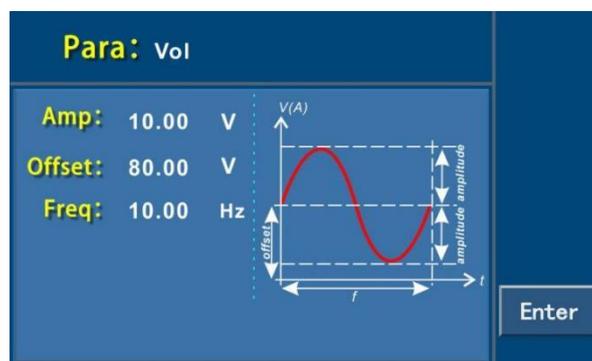


Figure 3-29 Output Sine Waveform

The following figure shows the triangle waveform parameter settings. Set the signal amplitude, the offset value based on the bottom of the triangle wave, the positive slope time of the triangle wave, and the negative slope time of the triangular wave. The sum of the positive slope time and the negative slope time is the cycle time, and its reciprocal is the frequency generated by the triangle wave.

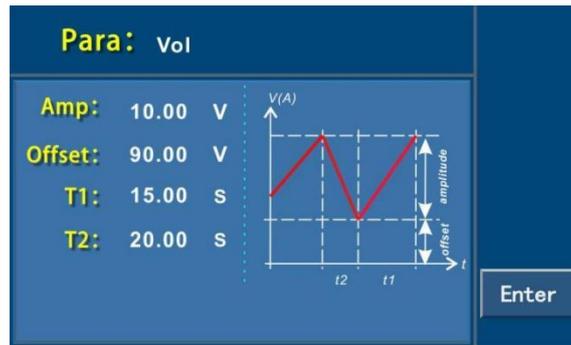


Figure 3-30 Output Triangle Waveform

The following figure shows the rectangular waveform parameter settings. Set the signal amplitude, offset value based on the bottom of the rectangular wave, rectangular wave peak time, and rectangular wave reference value time. The sum of the rectangular wave peak time and rectangular wave reference value time is the cycle time, and its reciprocal is the frequency generated by the triangular wave. The duty cycle can be defined as required.

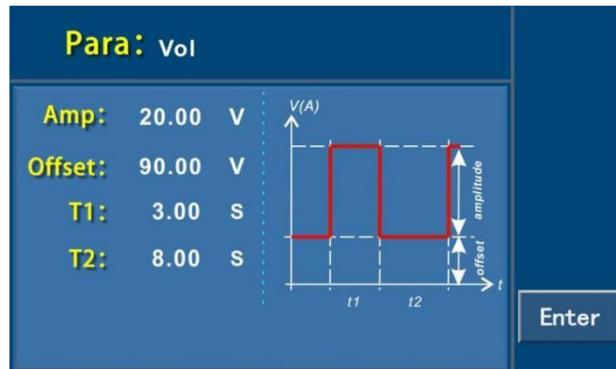


Figure 3-31 Output rectangular wave

The following figure shows the parameter setting of the trapezoidal waveform. Set the signal amplitude, the offset value based on the bottom of the trapezoidal waveform, the negative slope time, the top value time, the positive slope value time and the basic value time. Set different gain and attenuation times to form trapezoidal waveforms with different slopes. The cycle time and repetition frequency are determined by these four times.



Figure 3-32 Output Trapezoidal Wave

3.12 Solar array simulation function (optional)

The WPS-S Power supply has the function of solar array simulation. In addition to the output of CC/CV mode and EN50530 mode through the upper computer software, the single machine also has a built-in model to simulate the output curve of solar array. The model follows the formula:

$$I = I_{sc} \left[1 - C_1 \left(e^{\frac{V}{C_2 \cdot V_{oc}}} - 1 \right) \right]$$

Among

$$C_1 = \left(1 - \frac{I_{mp}}{I_{sc}} \right) \cdot e^{\frac{-V_{mp}}{C_2 \cdot V_{oc}}}$$

$$C_2 = \frac{\frac{V_{mp}}{V_{oc}} - 1}{\ln \left(1 - \frac{I_{mp}}{I_{sc}} \right)}$$

Voc: open circuit voltage;

Isc: short circuit current;

Vmp: maximum power point voltage;

Imp: maximum power point current;

The output curve is shown in the following figure:

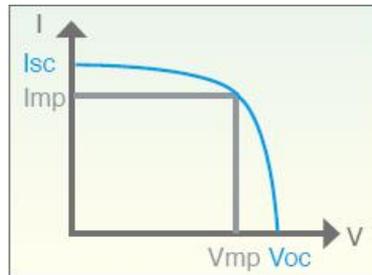


Figure 3-33 I-V Mode Output Curve

In addition, due to the factor of the model formula, the Vmp and Imp input by the user will be different from the Vmp and Imp of the maximum power point obtained by the formula, and the smaller the fill factor is, the greater the difference is.

Explain

1: Definition of fill factor (FF); $FF = \frac{V_{mp} I_{mp}}{V_{oc} I_{sc}}$

2: Voc, Isc, Vmp, Imp parameter setting limit:

$$V_{oc} > V_{mp} > 0 ;$$

$$I_{sc} > I_{mp} > 0 ;$$

$$V_{mp} > V_{oc} \left(1 - \frac{I_{mp}}{I_{sc}} \right).$$

Setting method:

Press F3 in the standby interface to enter the SAS function interface, as shown in the figure below. Select the parameter to be edited through and , and use the number keys or knob to change the value of the parameter.

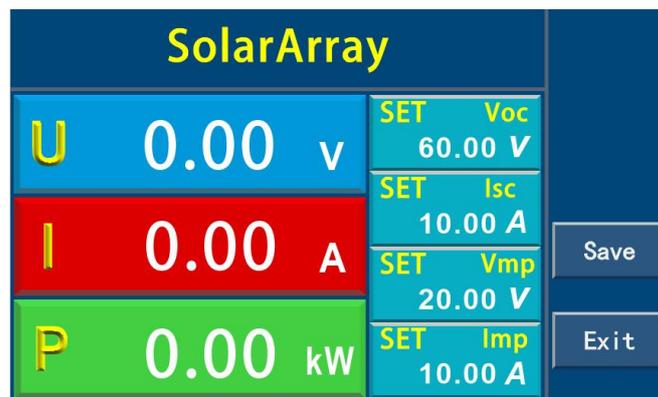


Figure 3-34 SAS function setting interface

When you have finished editing the parameters, use Enter or F3 to confirm. If the parameter setting exceeds the set limit, the system will display an error prompt on the interface and will not respond to the key operation, as shown in the following figure.

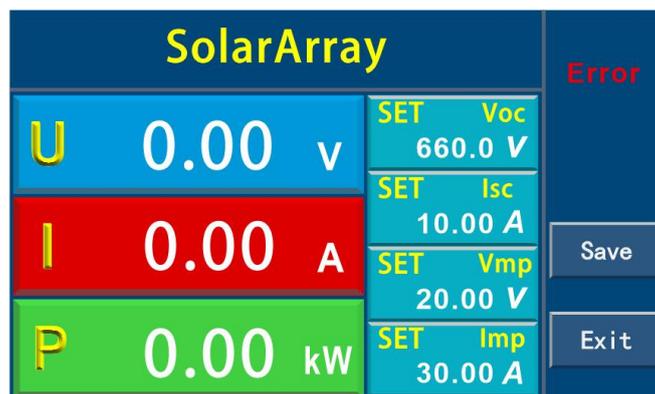


Figure 3-35 Parameter setting error

After editing the parameter and reporting an error, re-edit the parameter correctly to clear the error. When you have finished editing the parameters, use the ON/OFF key to start the output, as shown in the following figure.

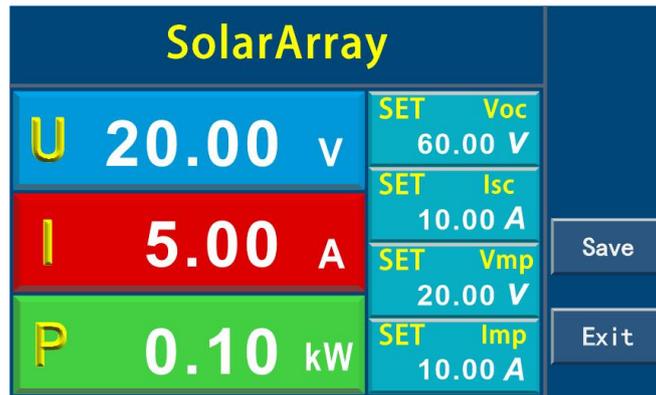


Figure 3-36 SAS Function Startup Output

After the function is started, all keys except the ON/OFF key are locked, and the operation is invalid. Press the ON/OFF key again to stop the output.

3.13 Parallel operation

WPS-S series power supply models with the same specifications can be used in parallel, which can increase the power output capacity and output current. In parallel connection, it is only necessary to connect the DC output terminals of each machine to each other. The diameter of the wire should be selected according to the maximum current, and the wire should be as short as possible. The master and slave connecting line terminals are built-in. Please connect them with the connecting lines in the accessories. Up to 10 power supplies of the same model can be connected in parallel. There are two 9-pin interfaces on the rear panel of the chassis, which are marked with "PAR OUT" and "PAR IN" respectively. Through these two interfaces, parallel connection can be realized by using the "Master/Slave" mode. Follow these steps:

1. First select a host (Master), which can be selected by the host user, and then connect the "PAR OUT" interface on the rear panel of the host to the "PAR IN" interface of another power supply (Slave 1) through the parallel signal cable.
2. Connect the "PARA OUT" interface of Slave1 to the "PAR IN" interface of the third power supply Slave 2 through the parallel signal line, and continue to connect up to 10 power supplies according to this step.
3. Connect the output positive poles of all power supplies together and connect them to the load.
4. Connect the output cathodes of all power supplies together and connect them to the load.
5. Check the connection to ensure that there is no short circuit between the positive and negative.
6. Connect the SENSE line. The SENSE lines of all slaves are directly connected to the positive and negative poles of their outputs. The Master has the following two connection modes: use the lead voltage drop compensation function: connect the SENSE line of the Master to both ends of the load. Lead voltage drop compensation is not used: the SENSE of the Master is directly connected to the positive and negative terminals of its output. All SENSE wires shall be twisted pair and shall be as short as possible. When the lead voltage drop compensation function is used, the voltage display of the Slave is slightly higher than that of

the Master.

The parallel machine setting interface can set the machine to stand-alone mode, master mode and slave mode.

(1) Stand-alone mode

When the machine is not used in parallel, it should be set to stand-alone mode.

(2) Host mode

Set the machine to the master mode as shown in the figure below. In the master mode, the master and slave systems must be initialized. The master will automatically search for the slave, and then configure the corresponding setting values and actual values for the machine. If one or more correctly configured slave machines are found, the number and address of the slave machines, as well as the integrated total current and total power will be displayed on the host screen. If no slaves are found or an incorrect number is displayed, check the wiring and settings between all slaves and the master, and then repeat the setup procedure.



Figure 3-37 Host Mode

(3) Slave mode

Set the machine to the slave mode as shown in the figure below. In the slave mode, it is necessary to set the slave address. When there are multiple slave machines, note that the slave address cannot be repeated.

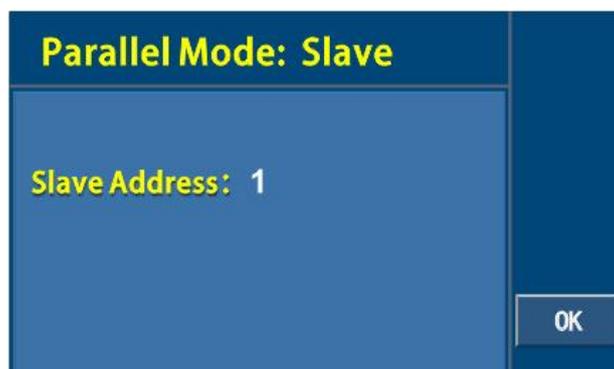


Figure 3-38 Slave Mode

After editing the mode, press the F4 key to save and return to the standby interface. If there is an alarm message on more than one slave, it will be displayed on the master, and it must be confirmed before the slave can continue to operate, because the alarm will cause the DC output to be turned off and need to be turned on again. If the wiring of any slave is loose, it will cause all DC outputs to be disconnected. For safety reasons, the master will report this state, and the system needs to be re-initialized.

3.14 Output Slope Settings

The WPS-S series power supplies have adjustable rising and falling edge speeds. The rising and falling time can be set in various modes (source CV, CC, CP), and the setting range is 0.01s ~ 600.00s. The rise and fall times of voltage, current, and power can be set by the user. The unit time is seconds (s). Each setting item can be selected by the up and down arrow keys. The rise time can be adjusted by means of the number keys or the rotary knob.

V-Rise/V-Fall: Voltage Rise and Fall slopes.

I-Rise/I-Fall: current rise and fall slopes.

P-Rise/P-Fall: Power Rise and Fall slopes.

The rise/fall time is the time for one voltage point to rise/fall to another voltage point when the power supply output is On. If you observe the falling slope of a voltage falling to 0 V, you need to set 0 V through [V-set], and press [Enter] to confirm that the voltage starts to fall at the set falling speed.

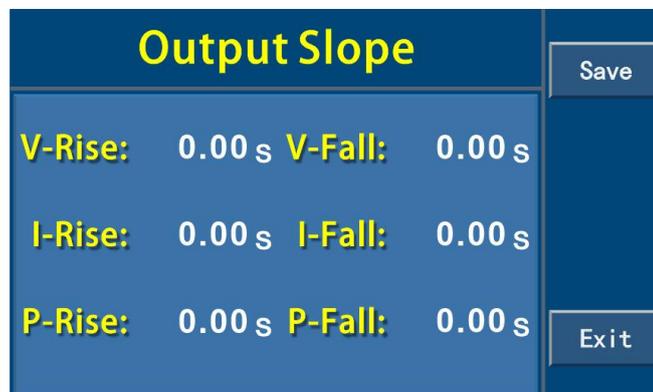


Figure 3-39 Output Slope Settings

3.15 Analog Interface Control (Optional)

Note: Before use, pin 15 and pin 2 must be short-circuited to activate the analog control function, otherwise this function will not work properly.

There is a built-in 15-pin analog interface on the back panel of the product, and the isolation withstand voltage is up to 1000V DC. It has the following functions:

- (1) Remote control of voltage, current and power;
- (2) Remote monitoring operation status (CC/CP, CV);

- (3) Remote monitoring alarm status (OT, OVP);
- (4) Remote monitoring of actual voltage and current output values;
- (5) Remotely open or close DC output.

The setting of the three resistance values of voltage, current and power through the analog interface generally occurs synchronously. The voltage cannot be set through the analog control interface, but the current and power can be set through the front panel knob, and vice versa. The OVP setpoint, as well as other monitored events and alarm limits, cannot be set via the analog control interface. The analog control interface operates on a common voltage range of 0 to 5 V and 0 to 10 V, which correspond to 0 to 100% of the rated value. The voltage range is selectable. When the input value exceeds the set value, it will be replaced by 100% of the set value.

Attention shall be paid to the following points when using the analog interface:

- (1) The analog remote control must first be activated with the "Remote" pin;
- (2) Before connecting the hardware of the analog control interface, make sure that it does not output a voltage higher than the specified value to the pin;
- (3) The set value input pin cannot be suspended;
- (4) It is required to provide three sets of settings each time.

3.15.1 Description of analog control interface

The analog interface control function allows the user to control the power supply through external analog signals, including the setting of voltage, current and power, start and stop, etc. These functions will be described in detail in the following content. When setting the voltage, current, and power values through the analog interface, what really matters is the sum of the values set through the analog interface and the front-panel values. Therefore, if you want to control the power supply through only the analog interface, you need to set the front-panel values to 0.

In addition, an isolated analog control interface can be selected to completely isolate the ground of the external control signal from the ground of the power supply. In this case, some signals of the analog control interface are not available, and the analog interface pin definitions are shown in the following table.

Table 3-1 for functions and definitions of specific pins:

Pin	Symbol	Description	Default level	Electrical characteristics
1	R_ACTIV E	Resistive mode switch		
2	DGND	Digitally		For control and status signal
3	AGND	Analog ground		Analog signal ground
4	AN_URE F	Reference Voltage	10 V or 5V	The error is less than 0.2%, and the short-circuit protection is AGND.
5	I_MON	Actual current	0-10V or 0-5V Corresponding to 0-100%	Accuracy less than 0.2%, input impedance greater than 40 K

			INom	
6	I_PROG	Set the current	0-10V or 0-5V Corresponding to 0-100% INom	Accuracy less than 0.2%, input impedance greater than 40 K
7	U_MON	Actual voltage	0-10V or 0-5V Corresponding to 0 ~ 100% UNom	Accuracy less than 0.2%, input impedance greater than 40 K
8	U_PROG	Set the voltage	0-10V or 0-5V Corresponding to 0 ~ 100% UNom	Accuracy less than 0.2%, input impedance greater than 40 K
9	P_PROG	Set the power	0-10V or 0-5V Corresponding to 0-100% PNom	Accuracy less than 0.2%, input impedance greater than 40 K
10	CV	Constant voltage adjustment is active	Constant voltage adjustment is active	Short circuit protection to DGND
11	R_PROG	Set the internal resistance value	0-10V or 0-5V Corresponding to 0 ~ 100% RNom	Accuracy less than 0.2%, input impedance greater than 40 K
12	OVP	Overvoltage alarm	Overvoltage alarm	Short circuit protection to DGND
13	OT	Overheating or power failure Fault alarm	Overheat or power failure alarm	Short circuit protection to DGND
14	RSD	Power supply start/stop	DC output OFF: HIGH is greater than 4 V, or suspended; DC output ON: LOW is less than 1V	Voltage range: 0 ~ 30 V, sender: open collector to DGND
15	REMOTE	Open internal control/remote control	Remote: LOW less than 1V Internal control: HIGH > 4 V	Voltage range: 0 ~ 30 V, sender: open collector to DGND

Table 3-1 Analog Interface Pin Configuration

- 1) When an isolated analog control interface is selected, the ground of the control signal is isolated from the ground of the power supply.
- 2) This signal is not available when the isolated analog control interface is selected.



If a standard analog control interface is used, note that common ground is equipotential with the negative pole of the power supply output. Improper connections may cause backflow and therefore damage the power supply internal circuitry.

3.15.2 Setting the output voltage, current and power values

The voltage, current and power values of the power supply can be set through the analog control interface. The power supply can be set by externally connecting a resistor or a voltage signal to the analog interface. When using the analog interface control, in order to minimize the noise interference to the signal, it is recommended to use shielded twisted pair. This function enables the voltage output to be changed by an external analog signal by connecting an external DC voltage to pins 6, 8, 9 (voltage mode) Or an external resistor (resistor mode). To enable this function, the output control must be in external analog control mode. The external voltage range used to control the full-scale output voltage can be selected from 0 to 5 V/0 to 10 V or a resistor of 10 K Ω . The following figure shows the wiring diagram of the external voltage source and the external resistor.

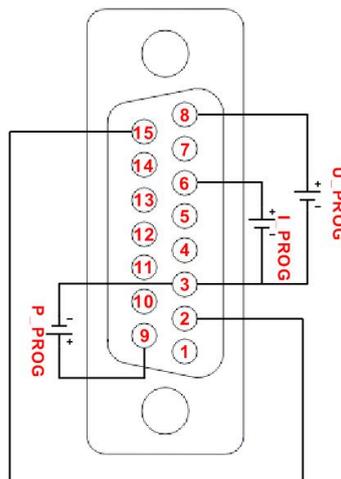


Figure 3-40 Setting the Voltage, Current, and Power Values from an External Voltage Source

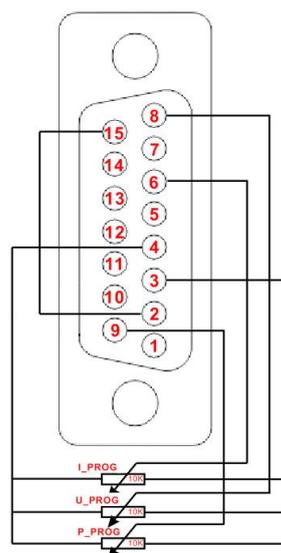


Figure 3-41 Setting the Output Voltage, Current, and Power Values with Resistors

3.15.3 Read the actual value of voltage and current

This feature enables the voltage and current outputs to be monitored using pins 5, 7 and the ground pin (pin 3), which can be connected to a digital voltmeter (DVM). The monitoring range of the output voltage (reflecting the output voltage and current of the power supply from zero to full scale) can be selected between 0 ~ 10 V or 0 ~ 5V. The wiring mode is shown in the figure below.

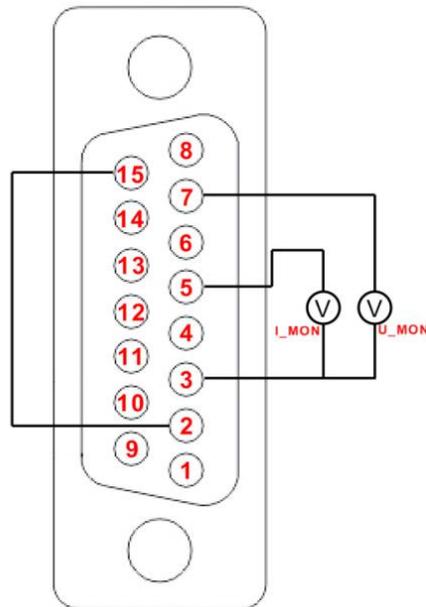


Figure 3-42 Monitoring Output Voltage and Current Value

Chapter 4 Fault detection and maintenance

4.1 Maintenance and service

4.1.1 Regular maintenance

If the equipment is not used for a long time, it shall be electrified once a month, and the electrification time shall not be less than 30 minutes.

4.1.2 Routine maintenance

It is recommended to carry out the following work at least in one year

- (1) Regularly check whether the insulation sheaths of the input and output lines and terminals of the instrument are damaged. If damaged, replace them in time to avoid electric shock.
- (2) Regularly check whether the input and output wiring is firm to prevent overheating caused by electrical looseness.
- (3) Regularly check all warning signs on the instrument, and timely replace all warning signs that are not easy to see.
- (4) Visually inspect all exposed parts.

4.1.3 Maintenance of users

It is forbidden to open the enclosure of the power supply without authorization to prevent accidental electric shock. It is not allowed to change the circuit or parts of the instrument without authorization. If there is any change, the warranty commitment of the instrument will automatically become invalid. If the instrument is found to have been altered without authorization, our technicians will restore the instrument and charge the maintenance 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 parking

- (1) Pay attention to the storage environment when storing the instrument for a long time. See Section 2.2 for details.
- (2) Please simply clean the dust on the surface of the instrument before starting the machine.
- (3) See Section 3.2 for details of preparation inspection before startup.
- (4) Check whether the instrument operates normally after starting up. If there is any abnormality or fault, please stop using it immediately, unplug the power cord or disconnect the power supply from the

distribution box. Do not use it before the product is repaired.

4.2 Simple troubleshooting



The equipment must be repaired and maintained by experienced professionals. If it is not repaired and maintained by qualified personnel, it may cause personal injury or death.

Fault symptom	Cause analysis	Exclusion method
Overvoltage and overcurrent alarm	The actual output value is greater than the alarm setting value	Reset the value in the alarm settings
Power failure alarm	<ol style="list-style-type: none"> Overheating inside the machine Failure of internal function module 	<ol style="list-style-type: none"> Clear the alarm and check whether the ambient temperature is too high. If the alarm cannot be cleared, please contact our after-sales service or local dealer
No display when starting up	<ol style="list-style-type: none"> Abnormal AC power supply (overvoltage and undervoltage) Ambient temperature too low 	<ol style="list-style-type: none"> Observe whether the power supply wiring is in good condition and measure whether the power supply meets the requirements. Please leave it at room temperature for a while before starting it.
Large error of actual output voltage	<ol style="list-style-type: none"> Enter the current limit mode Unconnected S terminal feedback line 	<ol style="list-style-type: none"> Observe the front panel CV/CC indicator Connect the S terminal feedback line to the DC output terminal or the load.

4.3 Storage and transportation

4.3.1 Storage

Storage temperature: -25 ~ 65 °C

Relative humidity of storage: not more than 80% (for storage in high humidity environment, it is recommended to start the machine regularly for 20 minutes to avoid condensation of water vapor).



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

4.3.2 Transportation

4.3.2.1 Packaging

The original packaging shall be used when the power supply product is repaired or transported. If the original packaging cannot be found, please be sure to pack according to the following requirements:

- (1) Seal the instrument with a plastic bag;
- (2) The equipment shall be placed in a wooden box or multi-wall carton that can bear the weight of 50 kG;
- (3) It must be filled with shockproof material with a thickness of about 60mm, and the panel must be protected with thick plastic foam;
- (4) The box shall be sealed properly and marked with "Fragile, please handle carefully".



When repairing, please be sure to pack all accessories such as power line and test line together with the instrument, and please indicate the fault phenomenon.

4.3.2.2 Transportation

During transportation, severe jolt, rough handling, rain and inversion shall be avoided.

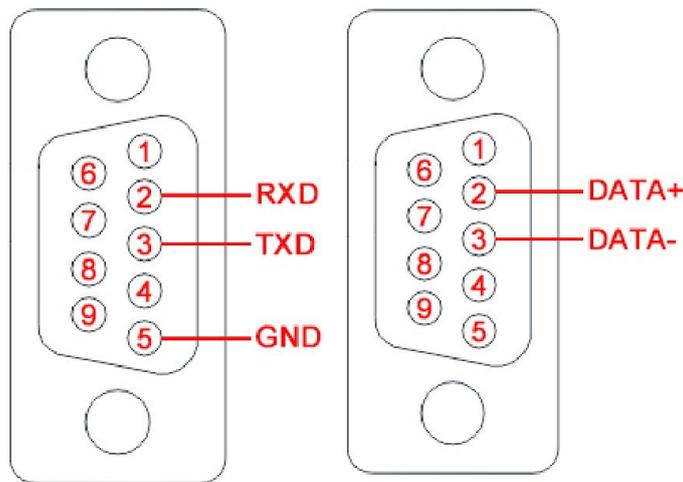
Annex A DC Test Power Supply Communication Protocol

1. Communication protocol command format

1.1 Communication mode: RS232 or RS485, the default is RS232. The PC is the master by default, and the standard unit is the slave. The master-slave response mode is adopted. When the address does not match, the slave does not send data to the master.



When using remote operation, the power supply and the computer must be grounded at the same time, and hot swapping is prohibited to avoid damage to the power supply or the computer.



RS232 interface definition RS485 interface definition

1.2 Baud rate: 9600, 19200, 38400, default is 38400.

1.3 Address range: 001 ~ 255.

1.4 Data frame format: 1start bit, 1 data bit and 1stop bit.

1.5 The format of the received data frame is as follows:

Frame header	Total number of bytes	Slave address	Command			Checksum	Frame trailer
			Type	Command word	Parameter		
0x7B	XX	X	X	X		X	0x7D

Notes: 1. Each X represents a number of bytes.

2. The number of sections of the command parameter varies depending on the length of the parameter carried by the specific command.

(1) Frame header: 1 byte, fixed as 0 × 7B, i.e. ASCII code of '{'.

(2) Total number of bytes: 2 bytes, the value is the sum of frame header + total number of bytes + slave address + command type + command word + command parameter + checksum + number of bytes at the end of the frame, with the high byte before and the low byte after.

(3) Slave address: 1 byte

0x00 is used as a special address for system broadcast. All devices in the 0x01 ~ 0xFF address range can receive broadcast commands, but can only execute other types of instructions except query instructions, and do not return responses to the control, setting and debugging instructions of the address.

(4) Command:

A) Type: The commands are divided into the following categories according to the different functions of the communication commands:

A) Control class: 0x0F, including all control operation commands of the slave. Such commands shall not have any parameters.

B) Query class: 0xF0, including all commands of the slave machine for query operations without parameters. That is, query the measured value and query the BIT status command class.

C) Query setting class: 0xA5, including all commands of query setting parameter operation of slave.

D) Setting class: 0x5A, including commands for all setting operations of the slave.

B) Command word: 1 byte, representing a specific command in a command type, and performing specific operations according to the command type and the command word.

C) Parameters: Refer to the specific command. It is required that all the digital quantities are represented by hexadecimal numbers (the parameter string does not contain units), and the units are unified as the corresponding units of the minimum resolution of the corresponding parameters. When a parameter needs to be represented by multiple bytes, the high byte is in the front and the low byte is in the back.

(5) Checksum: 1 byte (hexadecimal number), which is the result of checking the sent data. The horizontal check is used, that is, the sum of the total number of bytes + the slave address + the command, and the lower byte is taken as the checksum.

(6) Frame trailer: 1 byte, fixed to 0 × 7D, that is, ASCII code of '}'.

2. Communication protocol command summary table

Command class	Command			Functional meaning
	Type	Command word	Parameter	
Control class	0x0F	0x00		Stop
		0x01		Start up
		0x03		Disarm the alarm
Query class	0xF0	0x10		Voltage output value
		0x11		Current output value
		0x12		Power output value
		0x80		Query voltage, current and power output values
Query settings class	0xA5	0x00		Query the set voltage value
		0x01		Query the set current value
		0x02		Query the set power value
Set the	0x5A	0x00	XX	Set the voltage value

class	0x01	XX	Set the current value
	0x02	XX	Set the power value
	0x40	XXXX	Set SAS data (Voc, Isc, Vmp, Imp)
	0x51	XX	Set the current group sequence number
	0x52	XX	Set the current group voltage values
	0x53	XX	Set the current group current values
	0x54	XX	Sets the power value for the current group

3. Communication protocol command description

(1) Control commands (0 x0F)

A) Command word: 00H

Command action: stop output

Command format: 0 x7B XX X 0x0F 0 x00 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 0F 00 18 7D

Return format: 0 x7B XX X 0x0F 0 x00 0 x00 X 0x7D

Return length: 9

Format description: no parameter

Example of return command: 7B 00 09 01 0F 00 00 19 7D

B) Command word: 01H

Command Action: Start Output

Command format: 0 x7B XX X 0x0F 0 x01 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 0F 01 19 7D

Return format: 0 x7B XX X 0x0F 0 x01 0 x00 X 0x7D

Return length: 9

Format description: no parameter

Example of return command: 7B 00 09 01 0F 01 00 1A 7D

C) Command word: 03H

Command function: when in the alarm state, restore to the standby state

Command format: 0 x7B XX X 0x0F 0x03 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 0F 03 1B 7D

Return format: 0 x7B XX X 0x0F 0x03 0 x00 X 0x7D

Return length: 9

Format description: no parameter

Example of return command: 7B 00 09 01 0F 03 00 1C 7D

(2) Query class command (0 xF 0)

A) Command word: 10H

Command function: query the voltage output value

Command format: 0 x7B XX X 0xF0 0x10 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 F0 10 09 7D

Return format: 0x7B XX X 0xF0 0x10 XXX X 0x7D

Return length: 11

Format description: 3-byte 1 parameter, the parameter is the hexadecimal value of the voltage output value, and the value is the decimal point value of the data.

Example of return command: 7B 00 0B 01 F0 10 00 06 FD 0F 7D

Return command description: output voltage is 17.89 V

B) Command word: 11H

Command function: query current output value

Command format: 0 x7B XX X 0xF0 0x11 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 F0 11 0A 7D

Return format: 0 x7B XX X 0xF0 0x11 XX X 0x7D

Return length: 10

Format description: 2-byte 1 parameter, the parameter is the hexadecimal value of the current output value, and the value is the value of the data minus the decimal point

Return command example: 7B 00 0A 01 F0 11 00 45 51 7D

Return command description: output current is 0.69 A

C) Command word: 12H

Command function: query the power output value

Command format: 0 x7B XX X 0xF0 0x12 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 F0 12 0B 7D

Return format: 0 x7B XX X 0xF0 0x12 XX X 0x7D

Return length: 10

Format description: 2-byte 1 parameter, the parameter is the hexadecimal value of the current output value, and the value is the value of the data minus the decimal point

Example of return command: 7B 00 0A 01 F0 12 00 01 0E 7D

Return command description: output power is 1W

D) Command word: 80 H

Command function: query voltage, current and power output values

Command format: 0 x7B XX X 0xF0 0x80 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 F0 80 79 7D

Return format: 0x7B XX X 0xF0 0x80 XXX XX XX X 0x7D

Return Length: 15

Format description: 7 bytes, 3 parameters, voltage, current and power respectively.

Example of return command: 7B 00 0F 01 F0 80 00 06 FD 00 45 00 01 C9 7D

Return command description: 17.89 V, 0.69 A, 1W.

(3) Query setting class command (0 xA5)

A) Command word: 00H

Command function: query the set voltage value

Command format: 0 x7B XX X 0xA5 0x00 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 A5 00 AE 7D

Return format: 0x7B XX X 0xA5 0x00 XXX X 0x7D

Return length: 11

Format description: 3-byte 1 parameter, the parameter is the hexadecimal value of the voltage setting value, and the value is the value of the data minus the decimal point

Example of return command: 7B 00 0B 01 A5 00 00 0A 14 CF 7D

Return to command description: 0A14: 2580, indicating that the current setting value is 25.80 V

B) Command word: 01H

Command function: query the set current value

Command format: 0 x7B XX X 0xA5 0x01 X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 A5 01 AF 7D

Return format: 0 x7B XX X 0xA5 0x01 XX X 0x7D

Return length: 10

Format description: 2 bytes 1 parameter, the parameter is the hexadecimal value of the current setting value, and the value is the decimal value of the data. Return command example: 7B 00 0A 01 A5 01 00 EF A0 7D

Return command description: Current setting value: 2.39 A

C) Command word: 02H

Command function: query the set power value

Command format: 0 x7B XX X 0xA5 0x02X 0x7D

Command length: 8

Format description: no parameter

Command example: 7B 00 08 01 A5 02 B0 7D

Return format: 0x7B XX X 0xA5 0x02 XX X 0x7D

Return length: 10

Format description: 2 bytes 1 parameter, the parameter is the hexadecimal value of the power value, and the value is the value of the data minus the decimal point

Example of return command: 7B 00 0A 01 A5 02 00 0A 1A 7D

Return command description: Power setting value is 10 W

(5) Set class command (0 x5A)

A) Command word: 00H

Command function: set voltage value

Command format: 0x7B XX X 0x5A 0x00 XXX X 0x7D

Command length: 11

Format description: 3-byte 1 parameter, the parameter is the hexadecimal value of the voltage setting value, and the value is the value of the data minus the decimal point

Command example: 7B 00 0 B 01 5A 00 00 0 B B8 29 7D

For example, set the output voltage to 30.00 V

B) Command word: 01H

Command function: set current value

Command format: 0x7B XX X 0x5A 0x01 XX X 0x7D

Command length: 10

Format description: 2-byte 1 parameter, the parameter is the hexadecimal value of the current setting value,

and the value is the value of the data minus the decimal point.

Command example: 7B 00 0 A 01 5A 01 00 EF 55 7D

For example: set the output current to 2.39 A

C) Command word: 02H

Command function: set the power value

Command format: 0x7B XX X 0x5A 0x02 XX X 0x7D

Command length: 10

Format description: 2 bytes 1 parameter, the parameter is the hexadecimal value of the power setting value, and the value is the value of the data minus the decimal point.

Command example: 7B 00 0A 01 5A 02 00 64 CB 7D

Example: Set the power value to 100 W

D) Command word: 51H

Command function: Set the sequence number of the storage group

Command format: 0x7B XX X 0x5A 0x51 XX X 0x7D

Command length: 10

Format description: 2 bytes 1 parameter,

Command example: 7B 00 0A 01 5A 51 00 02 B8 7D

Command description: The current step number is set to 2

E) Command word: 52H

Command function: Set the voltage of the storage group

Command format: 0x7B XX X 0x5A 0x52 XXX X 0x7D

Command length: 11

Format description: 3 bytes 1 parameter,

Command example: 7B 00 0B 01 5A 52 00 09 C4 85 7D

Command description: The current step voltage is set to 25.00 V

F) Command word: 53H

Command function: set the current of the storage group

Command format: 0x7B XX X 0x5A 0x53 XX X 0x7D

Command length: 10

Format description: 2 bytes 1 parameter,

Command example: 7B 00 0A 01 5A 53 00 C4 7C 7D

Command description: The current step current is set to 1.96 A.

G) Command word: 54H

Command function: Set the power value of the storage group

Command format: 0x7B XX X 0x5A 0x54 XX X 0x7D

Command length: 10

Format description: 2 bytes 1 parameter,

Command example: 7B 00 0 A 01 5A 54 00 64 1D 7D

Command description: The current step power is set to 100 W

Appendix B Modbus Protocol for DC Test Power Supply

1. Communication protocol command format

1.1 Communication mode: RS232 or RS485, the default is RS232. The PC is the master by default, and the power supply is the slave by default. The master-slave response mode is used. When the address does not match, the slave does not send data to the master.



When using remote operation, the power supply and computer must be grounded at the same time, and hot swapping is prohibited to avoid damage to the power supply or computer.

1.2 Baud rate: 9600, 19200, 38400, default is 38400.

1.3 Address range: 001 ~ 255.

1.4 The format of the received data frame is as follows:

1.4.1 Coil instruction

a). Write command sending format:

Instrument address	Function code	Address high order bit	Address low order	Output value (0x0000 or 0xFF00)	CRC is low	CRC is high
--------------------	---------------	------------------------	-------------------	---------------------------------	------------	-------------

Return format: (consistent with the write command)

Instrument address	Function code	Address high order bit	Address low order	Output value (0x0000 or 0xFF00)	CRC is low	CRC is high
--------------------	---------------	------------------------	-------------------	---------------------------------	------------	-------------

b). Read command sending format:

Instrument address	Function code	Address high order bit	Address low order	Coil count high	Coil count low	CRC is low	CRC is high
--------------------	---------------	------------------------	-------------------	-----------------	----------------	------------	-------------

Return format:

Instrument address	Function code	Total number of bytes	Coil status	CRC is low	CRC is high
--------------------	---------------	-----------------------	-------------	------------	-------------

1.4.2 Register Instruction

a). Write command sending format:

Instrument Address	Function Code	Address High position	Address Low position	Register number high order	Number of registers low order	Byte Total number	Data byte 1	Data byte n	CRC is low	CRC is high
--------------------	---------------	-----------------------	----------------------	----------------------------	-------------------------------	-------------------	-------------	-------	-------------	------------	-------------

Return format:

Instrument	Function	Address	Address	Register	Number of	CRC is low	CRC is high
------------	----------	---------	---------	----------	-----------	------------	-------------

b). Read command sending format:

Instrument address	Address high order bit	Address low order	Register number high order	Number of registers low order	CRC is low	CRC is high
--------------------	------------------------	-------------------	----------------------------	-------------------------------	------------	-------------

Return format:

Instrument	Function	Total	Data byte 1	Data byte n	CRC is low	CRC is high
------------	----------	-------	-------------	-------	-------------	------------	-------------

1.4.3 Supplementary explanation

Instrument address: refers to the local address of the instrument, which can be set in the communication setting interface of the instrument, and the value range is: 1 ~ 32

Function code: The function code is single-byte hexadecimal data. Currently, only the following four function modes are available

Function Code	Explain
0x01	Read coil, read data by bit addressing
0x05	Write coil, write data by bit addressing
0x03	Read register, read data by word addressing
0x10	Write register, write data by word addressing

Address high order and address low order: refer to the storage address of data in the instrument. The address can be the real storage address or the mapping address.

Total Bytes: Indicates the total number of bytes written in this operation

Number of Registers High and Register Low: Indicates the number of registers written in this operation.

Each register is 2 bytes in size.

Coil count high and coil count low: indicate the number of coils written in this operation.

Data byte 1 to data byte n is to write these data contents into the instrument.

Note: Float type data is 4 bytes in total, and 2 registers are required; 1 register is required for 2 bytes of U16 type data.

CRC low and CRC high, CRC 16-bit check, we use the look-up table method for CRC check, see Appendix 1 for details.

Note: a. In some command frames, the data is of fixed length, but in other frames, the data is of unfixed length. Following the Modbus protocol, the hexadecimal data in the data field, as well as the floating point number, is preceded by the high byte and followed by the low byte.

b. In the output value of the write coil, the data must be 0 x0000 and 0xFF00, where 0 x0000 is position zero and 0 xFF00 is position 1. All other values are illegal and have no effect on the coil.

c. When reading the coil status, if the returned number of coils is not a multiple of 8, use 0 instead at the end of the last data byte.

2. Description of coil and register address assignment

2.1 The coil address command is as follows

MODBUS command			Functional description
Command coil	Bit	Read/write	
0x0001	1	W/R	Local control/remote control, local when 0, remote
0x0002	1	W	Stop output/start output, stop when 0, start when 1
0x0003	1	W	Clear alarm status, clear alarm when it is 0

2.2 The register address command is as follows:

MODBUS command				Functional description
Register address	Number of bytes	Parameter type	Read/write	
0x000A	4	Float	W/R	Voltage value setting
0x000B	4	Float	W/R	Current value setting
0x000C	4	Float	W/R	Power value setting
0x000D	4	Float	W/R	Minimum voltage setting
0x000E	4	Float	W/R	Maximum voltage setting
0x000F	4	Float	W/R	Minimum current setting
0x0010	4	Float	W/R	Maximum current setting
0x0011	4	Float	W/R	Minimum power setpoint
0x0012	4	Float	W/R	Maximum power setpoint
0x0013	4	Float	W/R	Voltage rise time
0x0014	4	Float	W/R	Voltage fall time
0x0015	4	Float	W/R	Current rise time
0x0016	4	Float	W/R	Current fall time
0x0017	4	Float	W/R	Power rise time
0x0018	4	Float	W/R	Power down time
0x0019	4	Float	R	Voltage output value
0x001A	4	Float	R	Current output value
0x001B	4	Float	R	Power output value

0x001C	2	U16	R	Current status of the power supply
--------	---	-----	---	---

The following parameters are the current operating status of the power supply, and the specific meanings are as follows:

00FF	Standby state	0004	BUCK alarm	0009	Alarm for voltage exceeding the lower limit
0000	CC state	0005	OT Over Temperature Alarm	000A	Alarm when the current exceeds the lower limit
0001	CV state	0006	Alarm for voltage exceeding the upper limit	000B	Power over lower limit alarm
0002	CP state	0007	Alarm for current exceeding the upper limit	000C	MSP parallel communication failure
0003	PF alarm	0008	Power over upper limit alarm		

3. Communication protocol command description

3.1 Read coil 0x01:

For example, if the communication address of power supply is 1, read the control status of power supply.

Check the table to know that the coil address is 0x0001

Then send the request: 01 01 00 01 00 01 XX XX (XX represents the check code, and the instruction check code is: AC 0A)

01: Power supply address

01: Function code, reading coil

00 01: Coil address 0x0001, indicating local control/remote control

00 01: indicates the number of coils, 1

XX XX: check code

Get normal reply: 01 XX (check code: 51 88)

01: Power supply address

01: Function code, reading coil

01: Total number of bytes, 1

01: is the data read back, and the lowest bit is 1, indicating that the power supply is in the remote control state

XX XX: check code

3.2 Write coil 0x05:

For example: the communication address of the power supply is 1, the control power supply is remote control, and the coil address is 0x0001 by looking up the table

Then send the request: 01 05 00 01 FF 00 XX XX (XX XX represents the check code, and the instruction check code is DD FA)

01: Power supply address

05: Function code, write coil

00 01: Coil address 0x0001, indicating local control/remote control

FF 00: Indicates remote control is set

XX XX: check code

Get normal reply: 01 05 00 01 FF 00 XX XX (check code: DD FA)

For example, if the communication address of the power supply is 1, the power supply startup output is set, and the coil address is 0 x0002 by looking up the table, the request is sent:

Command: 01 05 00 02 FF 00 XX XX (Detection code: 2D FA) -- Power start command

Reply: 01 05 00 02 FF 00 XX XX (detection code: 2D FA)

For example, if the communication address of the power supply is 1, the power supply is set to stop outputting, and the coil address is 0 x0002 by looking up the table, the request is sent:

Command: 01 05 00 02 00 00 XX XX (Detection code: 6C 0A) -- Power supply stop command

Reply: 01 05 00 02 00 00 XX XX (detection code: 6C 0A)

Example 3: If the power communication address is 1, the power alarm elimination command is set, and the coil address is 0x0003, the request is sent:

Command: 01 05 00 03 FF 00 XX XX (detection code: 7C 3A) -- Power supply alarm elimination command

Reply: 01 05 00 03 FF 00 XX XX (detection code: 7C 3A)

3.3 Read Register 0x03:

For example, if the communication address of the power supply is 1, the current output voltage value is read, and the address of the voltage output value register is 0x001 9, then

Send request: 01 03 00 19 00 02 XX XX (check code: 15 CC)

01: Power supply address

03: Function code, read register

00 19: Register address of voltage output value

00 02: Number of registers 2 (each register is 2 bytes in size)

XX XX: check code

Get normal reply: 01 03 04 40 1B 85 1F XX XX (check code: BC AC)

01: Power supply address

03: Function code, read register;

04: Total number of data bytes in register, 4 bytes

40 1B 85 1F: is the voltage value read back, representing the floating point number 2.43 V

XX XX: check code

For example, if the communication address of the power supply is 1, the current output current value is read, and the current output value register address is 0 × 001A,

Send request: 01 03 00 1A 00 02 XX XX (check code: E5 CC)

01: Power supply address

03: Function code, read register

00 1A: Register address of current output values

00 02: Number of registers 2 (each register is 2 bytes in size)

XX XX: check code

Get normal reply: 01 03 04 40 AD 1E B8 XX XX (check code: 77 C0)

01: Power supply address

03: Function code, read register;

04: Total number of data bytes in register, 4 bytes

40 AD 1E B8: is the current value read back, representing the floating point number 5.41 A

XX XX: check code

For example, if the power communication address is 1, the current output power value is read, and the output power value register address is 0x001B, then

Send request: 01 03 00 1B 00 02 XX XX (Check code: B4 0C)

01: Power supply address

03: Function code, read register

00 1B: Register address of power output value

00 02: Number of registers 2 (each register is 2 bytes in size)

XX XX: check code

Normal reply: 01 03 04 3C 54 FD F4 XX XX (check code: F6 A4)

01: Power supply address

03: Function code, read register;

04: Total number of data bytes in register, 4 bytes

3C 54 FD F4: is the power value read back, representing a floating point number of 0.013 KW

XX XX: check code

For example, if the communication address of the power supply is 1, the current state of the power supply is read, and the register address of the state of the supply is 0 × 001C, then

Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

01: Power supply address

03: Function code, read register

00 1C: Register address of the current state of the power supply

00 01: Number of registers 1 (each register is 2 bytes in size)

XX XX: check code

Get normal reply: 01 03 02 00 FF XX XX (detection code: F8 04)

01: Power supply address

03: Function code, read register

02: Total number of data bytes in register, 2 bytes

00FF: is the power status read back, indicating the standby state

XX XX: check code

Other status commands:

1) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 XX XX (detection code: B8 44) -- 00 -CC status -- constant current output status of power supply

2) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 01 XX XX (detection code: 79 84) -- 00 01-CV status -- constant voltage output status of power supply

3) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 02 XX XX (detection code: 39 85) -- 00 02-CP status -- constant power output status of power supply

4) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 06 XX XX (detection code: 38 46) -- 00 06-OVP power supply voltage exceeds the upper limit alarm (output overvoltage)

5) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 09 XX XX (detection code: 78 42) -- 00 09-UVP power supply voltage exceeds the lower limit alarm (output undervoltage)

6) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 07 XX XX (detection code: F9 86) -- 00 07-OCP current exceeding upper limit alarm status

7) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 0A XX XX (detection code: 38 43) -- 00 0A-UCP current exceeds the lower limit alarm status

8) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 08 XX XX (detection code: B9 82) -- 00 08-OPP power exceeding upper limit alarm status

9) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Normal reply: 01 03 02 00 0B XX XX (detection code: F9 83) -- 00 0B-UPP power exceeding lower limit alarm status

10) Send request: 01 03 00 1C 00 01 XX XX (detection code: 45 CC)

Get normal reply: 01 03 02 00 03 XX XX (detection code: F8 45) -- 00 03-Power PF alarm

3.4 Write Register 0x10:

For example, if the communication address of the power supply is 1, the set voltage is 155.0 V, and the register address of the set voltage value is 0 x000 A, then

Send request: 01 10 00 0A 00 02 04 43 1B 00 00 XX XX (Check code: 16 53)

01: Power supply address

10: Function code, write register

00 0 A: Set voltage value register address

00 02: Number of registers required 2

04: Total number of data bytes in register, 4 bytes

41 20 00 00: 155.0V for floating point number

XX XX: check code

Get normal reply: 01 10 00 0A 00 02 XX XX (check code: 68 00)

01: Power supply address

10: Function code, write register

00 0 A: Set voltage value register address

00 02: Number of registers required 2

XX XX: check code

Example: Set the maximum voltage to 550 V and the minimum voltage to 0 V when the power communication address is 1

- 1) Set the upper limit of the power supply voltage to 550V, send: 01 10 00 0E 00 02 04 44 09 80 00 XX XX (detection code: D7 11)

Reply: 01 10 00 0E 00 02 XX XX (detection code: 4F 00)

- 2) Set the lower limit of power supply voltage to 0 V, send: 01 10 00 0D 00 02 04 00 XX (detection code: 32 36)

Reply: 01 10 00 0D 00 02 XX XX (detection code: 31 00)

For example, if the power communication address is 1, set the current to 25.0 A.

According to the table, the address of the setting current value register is 0x000 B.

Then send request: 01 10 00 0B 00 02 04 41 C8 00 00 XX XX (check code: 27 DE)

01: Power supply address

10: Function code, write register

00 0 B: Set current value register address

00 02: Number of registers required 2

04: Total number of data bytes in register, 4 bytes

41 C8 00 00: 25.0 A for floating point

XX XX: check code

Get normal reply: 01 10 00 0B 00 02 XX XX (check code: A7 00)

01: Power supply address

10: Function code, write register

00 0 B: Set current value register address

00 02: Number of registers required 2

XX XX: check code

For example, if the power communication address is 1, set the maximum current to 99 A and the minimum current to 0 A.

3) Set the upper limit value of power supply current 99.0 A, send: 01 10 00 10 00 02 04 42 C6 00 00 XX XX (detection code: 06 E6)

Reply: 01 10 00 10 00 02 XX XX (detection code: 13 00)

4) Set the lower limit of power supply current to 0.0 A, send: 01 10 00 0F 00 02 04 00 XX (detection code: B3 EF)

Reply: 01 10 00 0F 00 02 XX XX (detection code: FD 00)

For example, the communication address of the power supply is 1, and the set power is 11.45KW.

The address of the setting current value register is 0x000C by looking up the table,

Then send request: 01 10 00 0C 00 02 04 41 37 33 33 XX XX (check code: 27 DE)

01: Power supply address

10: Function code, write register

00 0 C: Power value setting register address

00 02: Number of registers required 2

04: Total number of data bytes in register, 4 bytes

41 37 33 33: 11.45 KW for floating point number

XX XX: check code

Get normal reply: 01 10 00 0C 00 02 XX XX (check code: A7 00)

01: Power supply address

10: Function code, write register

00 0 C: Power value setting register address

00 02: Number of registers required 2

XX XX: check code

For example, if the power communication address is 1, set the upper power limit to 16.5K W, and set the lower power limit to 0 KW.

5) Set the power value of 8.634 KW, send: 01 10 00 0C 00 02 04 41 0A 24 DD XX XX (detection code: 1C 9D)

Reply: 01 10 00 0C 00 02 XX XX (detection code: A6 00)

6) Set the upper limit value of power supply 16.5KW, send: 01 10 00 12 00 02 04 41 84 00 00 XX XX (detection code: 27 6F)

Reply: 01 10 00 12 00 02 XX XX (detection code: 4A 00)

7) Set the lower limit of the power supply to 0.0 KW, send: 01 10 00 11 00 02 04 00 XX (detection code: 336 F)

Reply: 01 10 00 11 00 02 XX XX (detection code: 4A 00)

For example, if the power communication address is 1, set the voltage rise time to 3.64s and the voltage fall time to 11.22s, and look up the table to set the value register address to 0x0013 and 0x0014.

8) Set voltage rise time, send: 01 10 00 13 00 02 04 40 68 F5 C3 XX XX (detection code: 21 AB)

Reply: 01 10 00 13 00 02 XX XX (detection code: 70 00)

9) Set the voltage drop time, send: 01 10 00 14 00 02 04 41 33 85 1F XX XX (detection code: 34 3B)

Reply: 01 10 00 14 00 02 XX XX (detection code: 18 00)

For example, if the power communication address is 1, set the current rise time to 6.55s and the current fall time to 18.64s, and look up the table to set the value register address to 0x0015 and 0x0016. The specific settings are as follows:

10) Set current rise time, send: 01 10 00 15 00 02 04 40 D1 99 9A XX XX (detection code: 9D 5E)

Reply: 01 10 00 15 00 02 XX XX (detection code: B1 00)

11) Set the current falling time, send: 01 10 00 16 00 02 04 41 95 1E B8 XX XX (detection code: 7F 4B)

Reply: 01 10 00 16 00 02 XX XX (detection code: 8F 00)

For example, if the power communication address is 1, set the power rise time to 5.34s and the power fall time to 3.89 s, and look up the table to set the value register address to 0x0017 and 0x0018. The specific settings are as follows:

12) Set power rise time, send: 01 10 00 17 00 02 04 40 AA E1 48 XX XX (detection code: CE C3)

Reply: 01 10 00 17 00 02 XX XX (detection code: D5 00)


```
0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC,  
0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,  
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32,  
0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D,  
0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A, 0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38,  
0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF,  
0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,  
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1,  
0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4,  
0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB,  
0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA,  
0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,  
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0,  
0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97,  
0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E,  
0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89,  
0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,  
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83,  
0x41, 0x81, 0x80, 0x40  
};
```

2. And then calculate

```
WORD CRC16(BYTE* pchMsg, WORD wDataLen)  
{  
    BYTE chCRCHi = 0xFF; //high CRC byte initialization  
    BYTE chCRCLo = 0xFF; //low CRC byte initialization  
    WORD wIndex;  
    //index in CRC loop  
    while (wDataLen--)  
    {  
        //Calculate CRC  
        wIndex = chCRCLo ^ *pchMsg++;  
        chCRCLo = chCRCHi ^ chCRCHTalbe[wIndex];  
        chCRCHi = chCRCLTalbe[wIndex];  
    }  
    return ((chCRCHi << 8) | chCRCLo);  
}
```

Appendix C SCPI Protocol for DC Test Power Supply

1. Basic command

(1) Clear the alarm information

*CLS

This command is used to clear the alarm information

Command syntax: * CLS

Parameter: None

(2) Reset factory settings

*RST

This command resets the power supply to the factory set state.

Command syntax: * RST

Parameter: None

2. Inquire the measured value

(1) Inquire voltage output value

MEASure:VOLTage[:DC]?

This command is used to read the latest supply voltage DC value.

Command syntax: MEASure: VOLTage [: DC]?

Parameter: None

Return parameter: < NRf >

Return parameter unit: V

Example: MEASure: VOLTage?

(2) Query the current output value

MEASure:CURRent[:DC]?

This command is used to read the most recent DC value of the supply current.

Command syntax: MEASure: CURRent [: DC]?

Parameter: None

Return parameter: < NRf >

Return parameter unit: A

Example: MEASure: CURRent?

(3) Inquire the power output value

MEASure:POWer[:DC]?

This command is used to read the output power of the latest power supply.

Command syntax: MEASure [: SCALar]: POWer [: DC]?

Parameter: None

Return parameter: < NRf >

Return parameter unit: kW

Example: MEASure: POWer?

(4) Inquire voltage, current and power output values

MEASure?

This command is used to obtain the latest measured values (voltage, current, power).

Return parameter unit: V, A, kW

Command syntax: MEASure?

Return parameters: < NRf >, < NRf >, < NRf >

3. Query and set the output setting value

(1) Query and set the output voltage value

[SOURce:]VOLTage

This command sets the value of the power supply voltage.

Command syntax: [SOURce:] VOLTage < NRf >

Parameter: NRf

Unit: V

Reset value: 0.0

Example: SOURce: VOLTage 60.0

Query command: [SOURce:] VOLTage?

Return parameter: NRf

(2) Query and set the output current value

[SOURce:]CURRent

This command is used to set the power supply current value.

Command syntax: [SOURce:] CURRent < NRf >

Parameter: NRf

Unit: A

Reset value: 0.0

Example: SOURce: CURRent 2.0

Query command: SOURce: CURRent?

Return parameter: NRf

(3) Query and set the output power value

[SOURce:]POWer

This command is used to set the power supply output power.

Command syntax: [SOURce:] POWer < NRf >

Parameter: NRf

Unit: kW

Reset value: 0.0

Example: [SOURce:] POWer 1.0

Query command: [SOURce:] POWer?

Return parameter: NRf

(4) Set the power output status

[SOURce:]OUTPut

This command is used to turn the power supply output on or off.

Command syntax: [SOURce:] OUTPut < bool >

Parameters: 0 | 1 | OFF | ON

Reset value: 0

Example: SOURce: OUTPut 1

Query command: [SOURce:] OUTPut?

Return parameter: 0 | 1

(5) Set the minimum voltage value of the power supply

[SOURce:]VOLTage:MINimum

This command sets the minimum voltage value for the power supply.

Command syntax: [SOURce:] VOLTage: MINimum < NRf >

Parameter: NRf

Unit: V

Reset value: MINimum

Example: [SOURce:] VOLTage: MINimum 2.0

Query command: [SOURce:] VOLTage: MINimum?

Return parameter: NRf

(6) Set the maximum voltage value of the power supply

[SOURce:]VOLTage:MAXimum

This command sets the maximum voltage value of the power supply.

Command syntax: [SOURce:] VOLTage: MAXimum < NRf >

Parameter: NRf

Unit: V

Reset value: MAXimum

Example: [SOURce:] VOLTage: MAXimum 24.0

Query command: [SOURce:] VOLTage: MAXimum?

Return parameter: NRf

(7) Set the minimum current value of the power supply

[SOURce:]CURRent:MINimum

This command sets the minimum current value for the power supply.

Command syntax: [SOURce:] CURRent: MINimum < NRf >

Parameter: NRf

Unit: A

Reset value: 0.0

Example: [SOURce:] CURRent: MINimum 0.0

Query command: [SOURce:] CURRent: MINimum?

Return parameter: NRf

(8) Set the maximum current value of the power supply

[SOURce:]CURRent:MAXimum

This command sets the maximum current value of the power supply.

Command syntax: [SOURce:] CURRent: MAXimum < NRf >

Parameter: NRf

Unit: A

Reset value: MAXimum

Example: [SOURce:] CURRent: MAXimum 120.0

Query command: [SOURce:] CURRent: MAXimum?

Return parameter: NRf

(9) Set the minimum power value of the power supply

[SOURce:]POWER:MINimum

This command is used to set the minimum power of the power supply.

Command syntax: [SOURce:] POWER: MINimum < NRf >

Parameter: NRf

Unit: kW

Reset value: 0.00

Example: [SOURce:] POWER: MINimum 0.00

Query command: [SOURce:] POWER: MINimum?

Return parameter: NRf

(10) Set the maximum power value of the power supply

[SOURce:]POWER:MAXimum

This command sets the maximum power of the power supply.

Command syntax: [SOURce:] POWER: MAXimum < NRf >

Parameter: NRf

Unit: kW

Reset value: MAXimum

Example: [SOURce:] POWER: MAXimum 1.00

Query command: [SOURce:] POWER: MAXimum?

Return parameter: NRf

(11) Set the rise time of the power supply voltage

[SOURce:]VOLTage:RISE

This command sets the supply voltage rise time.

Command syntax: [SOURce:] VOLTage: RISE < NRf >

Parameter: NRf

Unit: S

Example: [SOURce:] VOLTage: RISE 5.0

Query command: [SOURce:] VOLTage: RISE?

Return parameter: NRf

(12) Set down time of power supply voltage

[SOURce:]VOLTage:FALL

This command is used to set the supply voltage fall time.

Command syntax: [SOURce:] VOLTage: FALL < NRf >

Parameter: NRf

Unit: S

Reset value: 0.0

Example: [SOURce:] VOLTage: FALL 2.0

Query command: [SOURce:] VOLTage: FALL?

Return value: NRf

(13) Set the rising time of power supply current

[SOURce:]CURRent:RISE

This command sets the supply current rise time.

Command syntax: [SOURce:] CURRent: RISE < NRf >

Parameter: NRf

Unit: S

Reset value: 0.0

Example: [SOURce:] CURRent: RISE 10.0

Query command: [SOURce:] CURRent: RISE?

Return parameter: NRf

(14) Set the falling time of power supply current

[SOURce:]CURRent:FALL

This command sets the supply current fall time.

Command syntax: [SOURce:] CURRent: FALL < NRf >

Parameter: NRf

Unit: S

Reset value: 0.0

Example: [SOURce:] CURRent: FALL 2.0

Query command: [SOURce:] CURRent: FALL?

Return parameter: NRf

(15) Set the rising time of power supply

[SOURce:]POWer:RISE

This command is used to set the power supply rise time.

Command syntax: [SOURce:] POWer: RISE < NRf >

Parameter: NRf

Unit: S

Example: [SOURce:] POWer: RISE 5.0

Query command: [SOURce:] POWer: RISE?

Return parameter: NRf

(16) Set down time of power supply power

[SOURce:]POWer:FALL

This command is used to set the power down times

Command syntax: [SOURce:] POWer: FALL < NRf >

Parameter: NRf

Unit: S

Reset value: 0.0

Example: [SOURce:] POWer: FALL 3.0

Query command: [SOURce:] POWer: FALL?

Return parameter: NRf



Warranty Card

What the warranty covered:

If the machine break down due to its defectiveness, MATRIX will provide free maintenance during warranty period. If the machine break down due to wrong operation or carelessness, then Matrix provide paid service within warranty period.

How long does this warranty last:

This warranty lasts for 1 year from the date of original purchase of all MATRIX branded products.

Who is covered:

This warranty covers only the original purchaser of this product. This warranty is not transferable to subsequent owners or purchasers of this product.

What do customers need to do to get repairs/service under the warranty policy?

If the machine get problem, please contact our local distributor. If you cannot find the local distributor, you can contact us directly, our email is service@szmatrix.com, our telephone No. is 0086 755 2836 4276.

What information do customers need to supply?

Model No.	
Serial No.	
Problem description	
Picture	
Video if necessary	