Hantek

User's Manual

2024.06

Warranties and declarations

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Declare

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Product certification

Hantek certifies that the HDL2500+ series of electronic loads meets China's national industry standards and industrial standards, and is CE marked and UKCA certified.

Contact Us

If you have any questions or uncertainties while using the products of Qingdao Hantai Electronics Co:
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Website: http://www.hantek.com

Catalogues

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1. Safety requirement

1.1. Summary of routine security matters

Read the following safety precautions carefully to avoid injury and to prevent damage to this product or any product connected to this product. To avoid possible hazards, always use this product as specified.

- **Check the status of the electronic load's AC input changeover switch**

The electronic load supports 110V or 220V AC input, please be sure to check that the AC input switch state of the electronic load matches the supply voltage before switching on the power, otherwise the electronic load may be burnt.

- **Only authorised professionals should perform repairs.**
- **Use the correct power cord.**
- **Use only power cords approved for this product in your country.**
- **Ground the product.**

To avoid electric shock, this product is grounded through the grounding conductor of the power cord, which must be connected to ground Be sure to ground the product properly before connecting the inputs or outputs of the product.

- **View all terminal ratings.**

To avoid fire or excessive current surges, check all ratings and labelling instructions on the product. Consult the product manual for detailed information on ratings before connecting the product.

- **Use cords with appropriate load ratings.**

All load wires must be of a capacity to carry the maximum short-circuit output current of the power supply without overheating. If there are multiple loads, each pair of load wires must be able to safely carry the full load rated short circuit output current of the power supply.

- **To reduce the risk of fire and electric shock, ensure that the voltage fluctuation of the mains supply does not exceed 10% of the operating**

voltage range.

- **Do not operate with the lid open.**

Do not operate the product with the outer cover or panel open.

- **Avoid exposed circuits.**

Do not touch exposed connectors and components when the power is turned on.

- **Do not operate the product if you suspect it is malfunctioning.**

If you suspect this product has been damaged, disconnect the power cord and have it inspected by qualified service personnel.

- **Maintain proper ventilation.**
- **Do not operate in a humid environment.**
- **Do not operate in flammable or explosive environments.**
- **Please keep the surface of the product clean and dry.**
- **Do not install replacement parts on the instrument yourself or perform any unauthorised modifications.**

Warning:

Equipment that meets the requirements of Class A may not provide adequate protection for broadcast services in residential environments.

1.2. Safety terms and symbols

Safety terms in this manual:

Warning:

Indicates that you may be immediately harmed if you perform this action.

Warning:

Indicates that you may not be immediately harmed if you perform this action.

Note:

Indicates that you may cause damage to this product or other property if you do so.

Safety terminology on the product:

Warning:

Indicates that you may be potentially harmed if you do not perform this action.

Safety symbols on products:

Warning

Environmentally Friendly End-of-Life Marking

1.3. Measurement category

Measurement category

This instrument can perform measurements under measurement category I.

Warning:

This instrument is only permitted to be used in the specified measurement category.

Measurement category definitions

- **Measurement category I** refers to measurements on circuits that are not directly connected to the mains supply. For example, measurements are carried out on circuits that are not derived from the mains supply, in

particular circuits that are protected (internally) from the mains supply. In the latter case, the instantaneous stress changes. Therefore, the user should be aware of the instantaneous withstand capacity of the equipment.

- **Measurement category II** refers to measurements made on circuits directly connected to low-voltage equipment. Examples include measurements on household appliances, portable tools and similar equipment.
- **Measurement category III** refers to measurements made in construction equipment. For example, measurements are carried out in fixed installations on switchboards, circuit breakers, wiring (including cables, busbars, junction boxes, switches, sockets) as well as equipment for industrial use and certain other equipment (e.g. stationary motors permanently connected to fixtures).
- **Measurement category IV** refers to measurements on sources of low-voltage equipment. Examples are electricity meters, measurements at major overvoltage protection devices and measurements at pulse control units.

1.4. Ventilation requirements

To ensure adequate ventilation, when using the instrument in a bench or rack, make sure that there should be a clearance of at least 10 cm on the sides, above, and behind it.

Attention:

Poor ventilation can cause the temperature of the instrument to rise, which in turn can cause damage to the instrument. Good ventilation should be maintained

during use, and the air vents and fans should be checked regularly.

1.5. Work environment

The HDL2500+ series electronic loads are only permitted to be used indoors and in low condensation areas, the temperature and humidity described below show the general environmental requirements for this instrument.The fan speed of the HDL2500+ series electronic loads is intelligently adjusted in accordance with the operating status of the machine.

Operating temperature and humidity range

0°C - 40°C, 20% - 80% RH (no condensation)

Storage temperature range

-20°C ~ 70 °C

Warning:

To avoid the risk of short-circuiting the internal circuit of the instrument or electric shock, do not operate the instrument in a humid environment.

Altitude

Operating and non-operating: 2,000m or less.

Installation (overvoltage) category This product is supplied from a mains power supply that complies with installation (overvoltage) category II.

Warnings:

Make sure that no overvoltage (e.g. caused by lightning) reaches the product. Otherwise the operator may be at risk of electric shock.

Installation (overvoltage) category definition

The installation (overvoltage) category I refers to the signal level, which applies to the measuring terminals of the device connected to the source circuit, where measures have been taken to limit the transient voltage to a correspondingly low level.

Installation (overvoltage) category II refers to the local distribution level, which applies to equipment connected to the mains (AC supply).

Degree of contamination

Category 2

Definition of level of contamination

Pollution degree 1: No contamination, or only dry, non-conductive contamination occurs. This contamination level has no effect. Examples include clean rooms or office environments with air-conditioning controls.

Pollution degree 2: Only dry, non-conductive contamination generally occurs. Temporary conduction due to condensation may sometimes occur. Example: general indoor environment.

Contamination Level 3: Conductive contamination occurs, or dry, non-conductive contamination becomes conductive due to condensation. Example: outdoor environments with shelters.

Pollution Degree 4: Permanent conductive pollution through conductive dust, rain or snow. Example: outdoor sites.

Safety level

Class 1 - Grounding Products

1.6. Maintenance and cleaning

Maintenance:

When storing or placing the electronic load, do not expose the LCD monitor to direct sunlight for a long time.

Clean:

Check the electronic load and test leads as often as required by the operating conditions, and clean the external surfaces of the instrument as described below:

1) Use a lint-free rag to remove dust from the outside of the electronic load and test leads. Be careful to avoid scratching the glossy display filter material.

2) Clean the electronic load with a soft cloth dampened with water.

Note:

To avoid damaging the surface of the electronic load or test leads, do not use any corrosive reagents or chemical cleaning agents.

Warning:

Before re-energising, please make sure the instrument is dry to avoid electrical short circuit or even personal injury due to moisture.

1.7. Environmental Considerations

The following symbols indicate that this product complies with the requirements set out in WEEE Directive 2002/96/EC.

Equipment recycling:

The production of this equipment requires the extraction and use of natural resources. Some of the substances contained in this equipment may be harmful to the environment or human health if this product is not properly disposed of at end-of-life. To avoid the release of hazardous substances into the environment and to reduce the use of natural resources, it is recommended that this product be recycled using appropriate methods to ensure that the majority of the material can be reused correctly.

2. Product Features

Product Features

- 4.3-inch LED color display provides users with a clear and intuitive visual experience.
- Resolution up to 0.1mV/1mV/ 0.1mA to accurately test the performance of the device under test.
- Timing ControlList programming for accurate, high-speed simulation of complex changing currents.
- Equipped with USB/LAN/RS232 interfaces, supporting SCPI protocol, convenient for data interaction and remote control.
- OCP/OPP test, the instrument automatically captures the OCP and OPP points and determines whether the test result exceeds the set specifications.
- With voltage rise/fall time test function and ripple measurement function.
- Voltage and current measurement rate up to 100KHz.
- Remote measurement terminals are provided to compensate for voltage drop across the line and improve remote measurement accuracy.
- Four operating modes: constant voltage/current/resistance/power, easy to simulate a variety of characteristics of loads.
- With voltage rise/fall time test function and ripple measurement function.

The HDL2500+ series DC electronic loads cover a wide voltage and current range of 120-800V, 5A-240A, and 300W-4500W, with a resolution of 0.1mV/1mV/0.1mA to accurately test the performance of the equipment without missing any details. A variety of test functions in one, CC, CV, CR, CP, OPP, OCP, CR-LED, Battery, Tran, List, Short and other functions, to fully meet the diversified needs of users. Good low-voltage load characteristics have the unique advantage of loading current stably under low-voltage conditions, providing a strong guarantee for low-voltage equipment performance testing. Provide waveform display function, allowing you to intuitively and clearly observe the waveform changes of the electrical signal, provide convenient remote communication, equipped with USB/LAN/RS232 interfaces and support SCPI protocol, which realises seamless connection with the design and development and production line testing system, making the testing process smoother. Whether it is the testing of various batteries, or the performance testing of AC-DC/DC-DC modules, chargers and electronic components, the HDL2500+ series electronic loads can complete the test accurately and quickly.

3. Document Overview

This document is used to guide users to quickly understand the front and rear panels, user interface and basic operation methods of HDL2500+ series electronic loads.

Tip:

The latest version of this manual can be downloaded at

(http://www.hantek.com).

Document ID: 202405

Software Version:

Software upgrades may change or add features to the product, please check the

Hantek website for the latest version.

Document formatting conventions:

button or key (on a device)

Use 'square brackets + text (bold)' to indicate the front panel keys, e.g. **[Utility]**

for 'Utility' key.

Menu

Use 'menu text (bold) + blue' to indicate a menu option, such as **Sys. Set** indicates that clicking on the 'System Setting' option on the current operation interface of the instrument enters the 'System Setting' configuration menu. System Setting' means click the "System Setting" option on the current operation interface of the instrument to enter the "System Setting" configuration menu.

Procedure

The hyphen and the arrow **'->' indicate** the next step, e.g. **[Utility]-> IO Setting** means click **[Utility]** and then click the **IO Setting** function button.

Buttons

Marking	Buttons	Marking	Buttons
	arrow key		trigger key
	confirmation key		menu softkey

Table 3-1 Buttons

Document content conventions:

The HDL2500+ series of electronic loads contains the following models. Unless otherwise specified, this manual uses the HDL2512A++ as an example to illustrate the HDL2500+ series and its basic operation.

Model	Voltage	Current	Power	Accurate	Interface
HDL2512A+	150V	30A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB，RS232
HDL2512B+	500V	15A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB，RS232
HDL2512C+	120V	60A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB，RS232
HDL2512H+	800V	5A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB，RS232
HDL2512A++	150V	30A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB，RS232，LAN
HDL2512B++	500V	15A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB，RS232，LAN

Model	Voltage	Current	Power	Accurate	Interface
HDL2512C++	120V	60A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB, RS232, LAN
HDL2512H++	800V	5A	300W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB, RS232, LAN
HDL2513A+	150V	60A	600W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB, RS232, LAN
HDL2513B+	500V	30A	600W	0.02%+0.025 %FS/0.1% +0.1%FS	USB, RS232, LAN
HDL2513C+	120V	120A	600W	±(0.025%+0.025%FS)/ ±(0.05%+0.05%FS)	USB, RS232, LAN

Table 3-2 Models

4. Quick Start

4.1. General Inspection

Inspection of transport packaging

When the user receives the electronic load, please check the equipment according to the following steps: Check for any damage caused by transport: If you find that the packing carton or the foam protective pad is badly damaged, please keep it until the whole machine and the accessories have passed the electrical and mechanical tests.

Inspection Annexes

The details of the supplied accessories are described in 'Appendix A: Models and Accessories' at the end of this manual. If you find that an accessory is missing or damaged, please contact the dealer responsible for this service.

Check the whole machine

If you find that the appearance of the instrument is broken, the instrument does not work properly, or fails to pass the performance test, please contact the dealer responsible for this business.

Exterior Dimensions

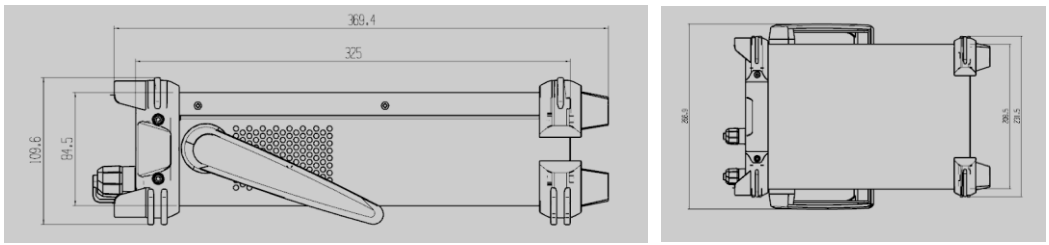

Figure 4-1 Exterior Dimension Drawing (300W)

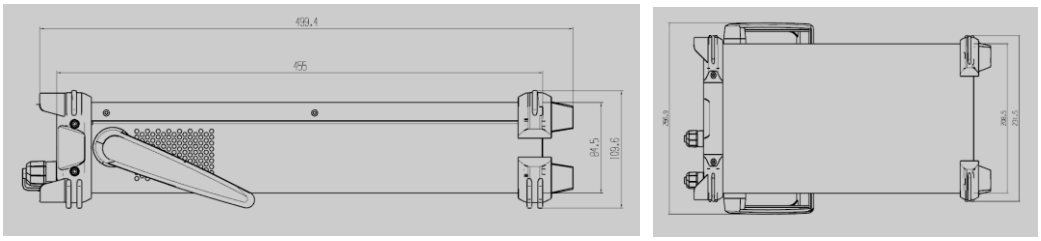

Figure 4-2 Exterior Dimension Drawing (600W)

4.2. Preparation for use

4.2.1. Connecting the power supply

This series of electronic loads can be input into the AC power source with specifications of 110V and 220V. users should check the AC voltage selector on the rear panel of the power supply before starting to use the electronic loads. Connect the electronic load to the power supply using the power cord provided with the accessory. Turn on the instrument by pressing the power switch at the lower left corner of the front panel. If the instrument is not switched on, make sure that the power cord is securely connected and that the instrument is connected to an energised power source.

Warning:

1. **Before connecting the power cord, please check the 110V/220V changeover switch to ensure that the switching gear of the load matches the supply voltage, otherwise the instrument may be burnt.**
2. **Make sure the load's power switch is off before connecting the power cord.**
3. **To prevent electric shock, be sure to take protective grounding. Connect the power cord to a three-pronged socket with a protective earth terminal.**
4. **Do not use an extension power cord without a protective earth wire or the protection will fail.**
5. **Use an AC power outlet that matches the power cord supplied with the box and be sure to take protective grounding. Do not use this instrument if a suitable AC power cord cannot be used.**

4.2.2. Checking and replacing fuses

The instrument is shipped from the factory with a fuse of the specified size. Before use, check that the fuse type matches the AC voltage rating. If there is a mismatch or the fuse is blown, the fuse should be replaced according to specifications.

Fuse replacement procedure:

1. Switch off the power and unplug the power cord;
2. lift out the fuse holder;
3. Remove the bad fuse and install a new one;
4. Replace the fuse holder into the slot.

Figure 4-3 Fuse wire

4.2.3. Adjustment of the carrying handle

To adjust the instrument's carrying handle, hold the handle on each side of the instrument and pull outwards, then rotate the handle, which is secured in each position by the appropriate catch.

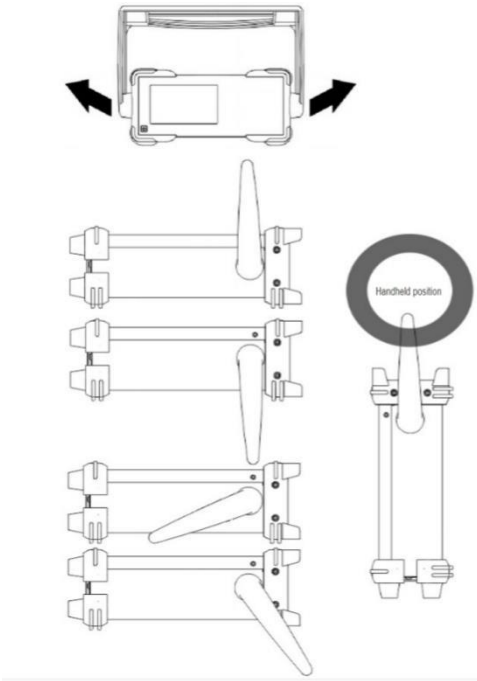

Figure 4-4 Adjustment of the carrying handle

4.2.4. Setting the system language

This electronic load supports Chinese and English menus and provides corresponding help information, prompt information and interface display.

Press **[Utility]** -> **Sys.Set** -> **Language** to select the desired language. When 'Chinese' or 'English' is selected, the menu, help information, prompt message and interface will be displayed in Chinese or English respectively.

4.2.5. Receive the test object

Before connecting the test object

To prevent electric shock and damage to the instrument, observe the following precautions.

Warning:

1. **Before connecting the test object, please disconnect the power supply of the test circuit to avoid the risk of electric shock during the connection process.**
2. **To prevent electric shock, check the rating of the test lead before measuring and do not measure a current higher than the rated value.**

Terminal block introduction

The front panel of the HDL2500+ series loads contains the following terminals and the maximum current rating of the terminal at position (A) is the maximum rated input current of the instrument, with all cables reliably tightened by hand tightening the terminals. A standard banana plug can also be inserted directly into the front of the connector, as shown in (B), and the maximum current rating of the terminal block at position (B) is 10 A.

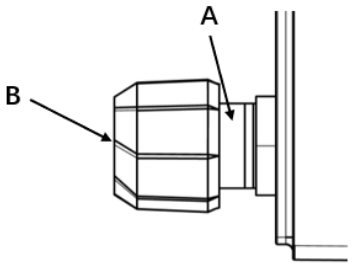

Figure 4-5 Schematic diagram of terminal block

Continuous Reception Measurement (Local Measurement)

1. Before connecting the test object, make sure that the power switch of the instrument is off.
2. Unscrew the screws on the input terminals and connect the red and black test leads to the input terminals before tightening the screws; alternatively, you can directly insert a standard banana plug into the front of the connector.
3. Unscrew the screws on the input terminals and connect the red and black test leads to the input terminals before tightening the screws; alternatively, you can directly insert a standard banana plug into the front of the connector.

Use multiple red and black test leads when the maximum current the test lead can

carry does not meet the current rating.
4. Install the load input terminal protection cover.
5. Connect the other end of the red and black test leads directly to the terminals of the object to be tested.

Connected to the object of measurement (remote measurement)

In CC, CV, CR, and CW modes, when the electronic load consumes a large current, it will generate a large voltage drop in the connection line from the DUT to the load terminals. To ensure the measurement accuracy, the electronic load provides a remote measurement terminal on the front panel, which can be used by the user to measure the output terminal voltage of the DUT.

SENSE (+) and SENSE (-) schematics:

Figure 4-6 Remote measuring terminal

SENSE (+) and SENSE (-) are remote input terminals. Before using the remote measurement function, you must set the load to remote measurement mode. The operation steps are as follows:

1. Remote measurement access, please refer to the following diagram for detailed wiring.

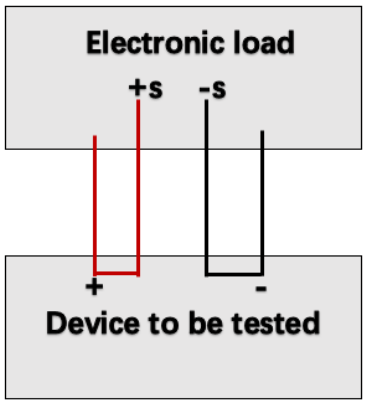

Figure 4-7 Remote Measurement Wiring Diagram

2. Click **[Utility]->Func. Set->Next->Sense->On** in order to turn on the remote measurement function.

Note: When the user does not use the remote measurement function, please disable this function.

Test and Sense wires should be as short as possible and Sense wires should be twisted together.

4.3. Product introduction

This chapter describes the front and rear panels and user interfaces of the electronic load.

4.3.1. Front Panel Introduction

Figure 4-8 Front Panel

1. Power On/Off key

2. Menu softkey

Corresponding to the menu above it, press any softkey to activate the corresponding menu.

3. Channel terminals

Channel input terminals: for connection to the device under test, input voltage and current.

4. Function key

[CC]: Constant current mode button. Click **Shift->7 (CC)** in sequence to enter CC constant current mode.
[CV]: Constant Voltage Mode button. Click **Shift->8 (CV)** in sequence to enter CV constant voltage mode.
[CR]: Constant Resistance mode button. Click **Shift->9 (CR)** in sequence to enter CR constant resistance mode.
[Utility (CP)]: auxiliary function key/constant resistance mode key. Press **[Utility]** to enter into the system auxiliary function menu; click **Shift-> Utility (CP)** in sequence to enter CP constant power mode.
[OCP]: OCP test function button. Click **Shift->4 (OCP)** in sequence to enter the overcurrent protection test interface.
[OPP]: OPP test function button. Click **Shift->5 (OPP)** in sequence to enter the over power protection test interface.

[CR-LED]: CR-LED test function button. Click **Shift->6 (CR-LED)** in sequence to enter the CR-LED test interface.
[Shift]: Shift composite key, used in conjunction with the number keys to achieve the function labelled above the number keys.
[Battery]: Battery test discharge function button. Click **Shift->1 (Battery)** to enter the battery test discharge function interface.
[Tran]: Dynamic test mode button. Click **Shift->2 (Tran)** in sequence to enter into the dynamic test mode interface.
[List]: List setting button. Click **Shift->1 (List)** in order to enter the list setting interface.
[Trig (Pause)]: In manual trigger mode, press this key to enable the trigger function; during dynamic testing, click **Shift->Trig (Pause)**, the machine stops reading data.
[Short]: Short circuit test function. Click **Shift->0 (Short)** in order to enter to the short circuit test function.
[Wave]: Waveform display function. **Click Shift->. (Wave)** to enter the waveform display function.
[Local]: Used to switch between local and remote operation. Click **Shift->(Local)** to switch from remote operation to local.
[ON/OFF (Lock)]: Switch on or off the input of the electronic load; click **Shift-> ON/OFF (Lock)** in sequence to enable the keyboard lock function.

5. Knob

Increases (clockwise) or decreases (counterclockwise) the value at the cursor; used to move the cursor position when setting the time.

6. Arrow keys (left/right) and confirmation keys

Left/Right Keys: Used to move the cursor position when setting parameters.
Enter key: Input confirmation after setting parameters.

7. TFT display

4.3-inch display for system status, input parameters, menu settings, and prompt messages.

8. Restore Default Settings Key

Used to restore the instrument state to factory defaults.

9. Help key

To get contextual help information for a front panel key or menu softkey, press the key and then the key whose help information you need.

10. USB HOST interface

External storage device (USB stick) can be accessed for saving or loading files, etc.

4.3.2. Rear Panel Introduction

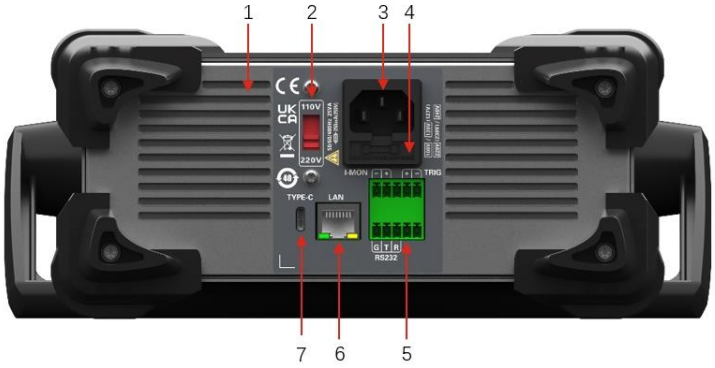

Figure 4-9 Rear Panel

1. Thermal window

Reduce the internal temperature of the instrument to ensure performance. When placing the instrument on a workbench or mounting it in a rack, make sure to leave at least 10 cm of space at the air vent to allow for air circulation.

2. AC Selector

Used to select the voltage specification that matches the actual AC input power. The electronic load supports two AC voltage specifications: 110 V and 220 V. Please select the correct voltage gear according to the AC power specification you are using. When the dip switch is in different positions, it indicates that different voltage specifications are selected. Toggle the switch upwards to select 110 V. Toggle the switch downwards to select 220 V.

3. Power Jack

AC power input connector, use the power cord provided with the accessory to connect AC power to the instrument through this connector.

4. Fuse holder

The instrument is shipped with a fuse that meets the standards of the country in which it is used.

5. Digital IO

Digital I/O interface supports I-MON, TRIG, and RS232 communication.

6. LAN Interface

This interface is used to connect the instrument to a LAN in order to control it remotely.

7. USB Interface

This interface is used to connect the machine to the computer and control it remotely.

4.3.3. User Interface Introduction

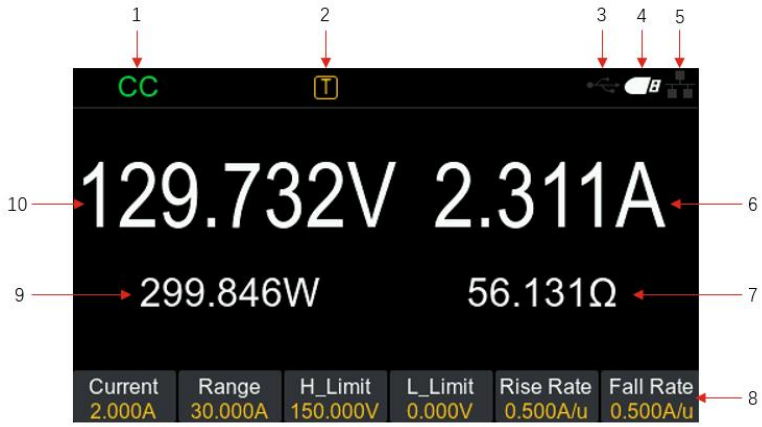

Figure 4-10 User

1. Functional status indicator

Real-time display of the current functional status of the electronic load.

2. Instrument working status

Real-time display of the current working status of the electronic load. S: electronic load off input; W: electronic load waiting for trigger signal; T: electronic load open input, has been triggered.

3. USB device icon display

The USB device icon lights up to allow remote control of the electronic load.

4. USB stick icon display

The USB memory stick icon lights up to indicate that the electronic load recognises the USB memory stick.

5. Network icon display

The network icon lights up to indicate that the network is connected and the electronic load can be remotely controlled.

6. Current value

The actual amount of current flowing through the electronic load.

7. Resistance value

Measurement of the calculated value of the resistance characteristic presented by the actual load under specific operating conditions.

8. Menu bar

Displays the menu for the current function, corresponding to the menu key below it. Pressing the menu key activates the corresponding menu.

9. Power value

The power consumed by an electronic load during operation.

10. Voltage value

The actual voltage applied to the terminals of an electronic load.

4.4. Setting parameter values

The parameter setting of this series of electronic loads supports digital keyboard input. Parameter setting can be done by numeric keyboard and knob. Click the menu softkey corresponding to the parameter, a white box will pop up above the parameter, you can use the numeric keyboard to input the desired value, or click the left and right arrow keys to move the cursor position, and modify the value by rotating the knob. After the values are set, click **[enter]** to save and exit.

4.5. Help system

To get the help information of the front panel keys or menu softkeys, in the measurement display interface, press the front panel **[?]** button on the front panel, then press the key you need to get help, the help information pops up on the screen, press any other key, the help information prompt box disappears, press **[?]** again to exit the help system. button again to exit the help system.
Note: To get help information for the number keys, press **[Shift]**, then press the number keys.

4.6. P key

Used to restore the instrument state to factory defaults.

4.7. Input control function

The user can control the input of the electronic load via the ON/OFF button on the front panel.

Click the **[ON/OFF]** softkey (ON/OFF key indicator light on), the interface will display the actual input voltage, current, power and resistance of the electronic load in real time.
Tap the **[ON/OFF]** soft key again (the ON/OFF key indicator goes out) and the load switches off the input.

4.8. Keyboard lock function

Click **[Shift]->[ON/OFF](Lock)** in sequence, the screen displays Lock, indicating that the keyboard is locked, in this functional state, in addition to the shift key and ON/OFF (Lock) other keys are invalid, press this compound key again to cancel the lock, the screen displays Lock disappears, the keyboard is unlocked.

5. Static mode of operation

The electronic load contains the following four static modes of operation:

- Constant current operation mode (CC)
- Constant voltage operation mode (CV)
- Constant Resistance Mode of Operation (CR)
- Constant power operation mode (CP)

5.1. Constant current operation mode (CC)

CC mode: Constant current mode, in which the electronic load consumes a constant current regardless of whether the input voltage changes.

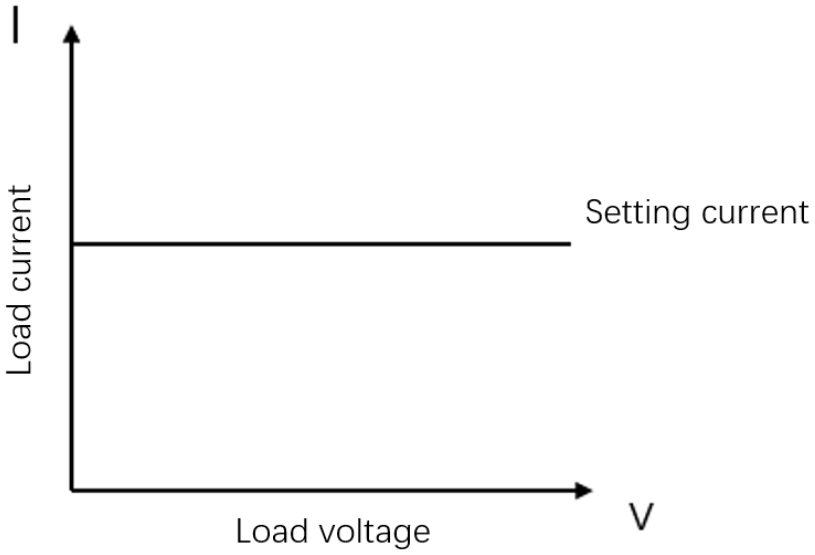

Figure 5-1 CC mode V-I relationship diagram

Constant Current Mode Setting Procedure

1. Click **[Shift]->[7](CC)** in turn to enter the interface of constant current setting. The parameters to be set in CC mode are current, gear, upper limit, lower limit, rising slope and falling slope, as shown in the figure.

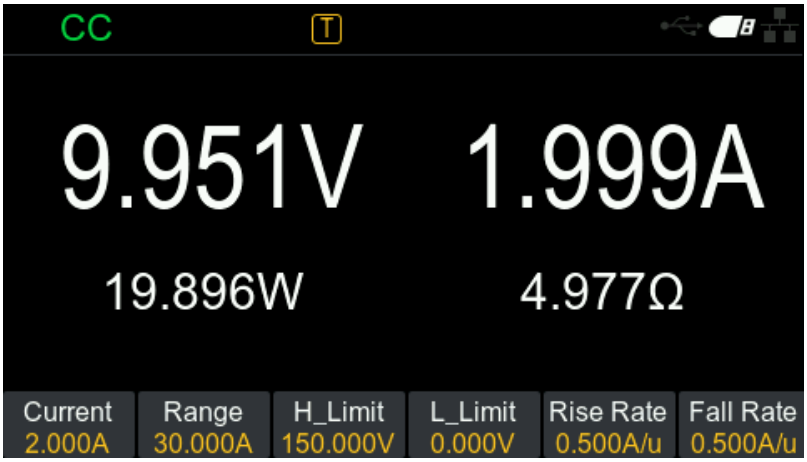

Figure 5-2 CC mode interface

2. Click on **Current** to set the constant current value, which refers to the amount of constant current absorbed by the electronic load from the connected power supply or circuit. Use the numeric keys or the knob to set the desired current value and press **Enter** to confirm. The unit is A.
3. Click on **Range** to set the current working range, which refers to the range of current magnitude that the electronic load can absorb. Use the numeric keys or the knob to set the desired current working range and press **Enter** to confirm. The unit is A.
4. Click the **H_Limit** to set the maximum working voltage of the electronic load. When the input voltage of the electronic load is greater than this upper limit, the load stops working. Use the numeric keys or knob to set the desired maximum operating voltage and press **Enter** to confirm. The unit is V.
5. Click **L_Limit** to set the minimum working voltage of the electronic load. When the input voltage of the electronic load is less than this lower limit, the load stops working. Use the numeric keys or knob to set the desired minimum operating voltage and press **Enter** to confirm. The unit is V.
6. Click **Rise Rate** to set the current rising slope, which refers to the rate at which the current rises per unit of time. Use the numeric keys or knob to set the current rise slope and press **Enter** to confirm. The unit is A/μs.
7. Click **Fall Rate** to set the current rising slope, which refers to the rate at which the current falls per unit of time. Use the numeric keys or the knob to set the current descent slope and press **Enter** to confirm. The unit is A/μs.

Note: The current gear is divided into large gear and small gear, 0-3A is small gear, resolution is 0.1mA; 0-30A is large gear, resolution is 1mA.

5.2. Constant voltage operation mode (CV)

CV mode: Constant voltage mode, in which the electronic load will consume enough current to maintain the input voltage at the set voltage.

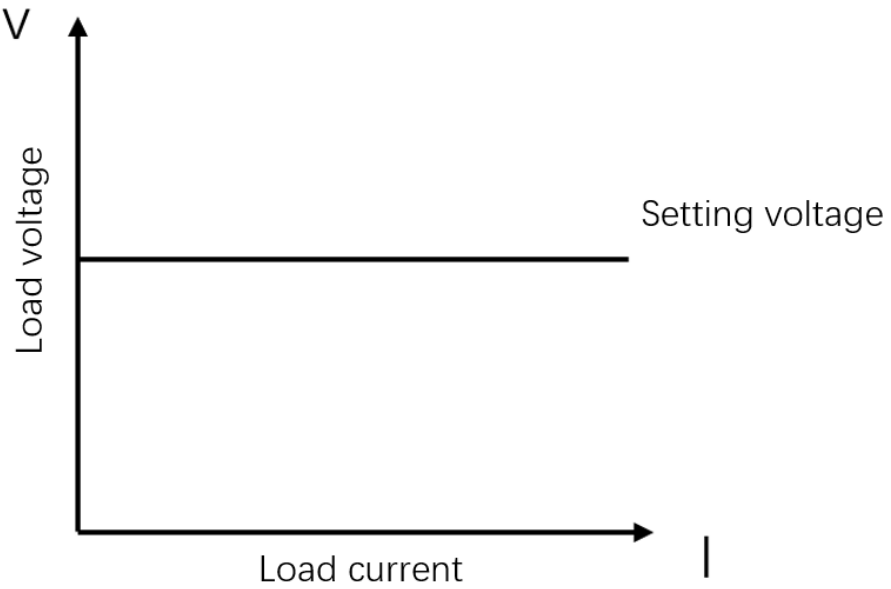

Figure 5-3 CV model I-V relationship diagram

Constant Voltage Mode Setting Procedure

1. Click **[Shift]->[8](CV)** to enter the Constant Voltage Setting page. The parameters to be set in the CV mode are voltage, level, upper limit and lower limit, as shown in the figure.

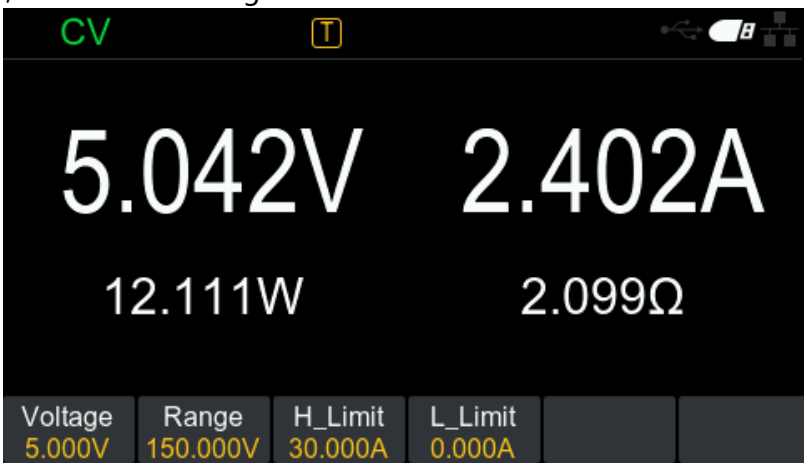

Figure 5-4 CV mode interface

2. Click on the **Voltage** menu softkey to set the constant voltage value, which refers to the value of the constant voltage maintained at both ends of the electronic load. Use the numeric keys or the knob to set the constant voltage value and press **Enter** to confirm. The unit is V.

3. Click on the **Range** softkey to set the voltage working range, which refers to the voltage range that can be withstood by both ends of the electronic load. Use the numeric keys or knob to set the voltage working range and press **Enter** to confirm. The unit is V.

4. Click the **H_Limit** menu softkey to set the maximum working current value, when the input current of the electronic load is greater than this upper limit value, the load stops working. Use the numeric keys or knob to set the maximum working current value and press **Enter** to confirm. The unit is A.

5. Click the **L_Limit** menu softkey to set the minimum working current value, when the input current of the electronic load is less than this upper limit value, the load stops working. Use the numeric keys or knob to set the minimum working current value and press **Enter** to confirm. The unit is A.
Note: Voltage gear is divided into large gear and small gear, 0-18V is small gear, resolution is 0.1mV; 0-150V is large gear, resolution is 1mV.

5.3. Constant Resistance Mode of Operation (CR)

CR mode: Constant resistance mode, in which the electronic load is equivalent to a constant resistance, the electronic load will change the current linearly as the input voltage changes. As shown in the figure.

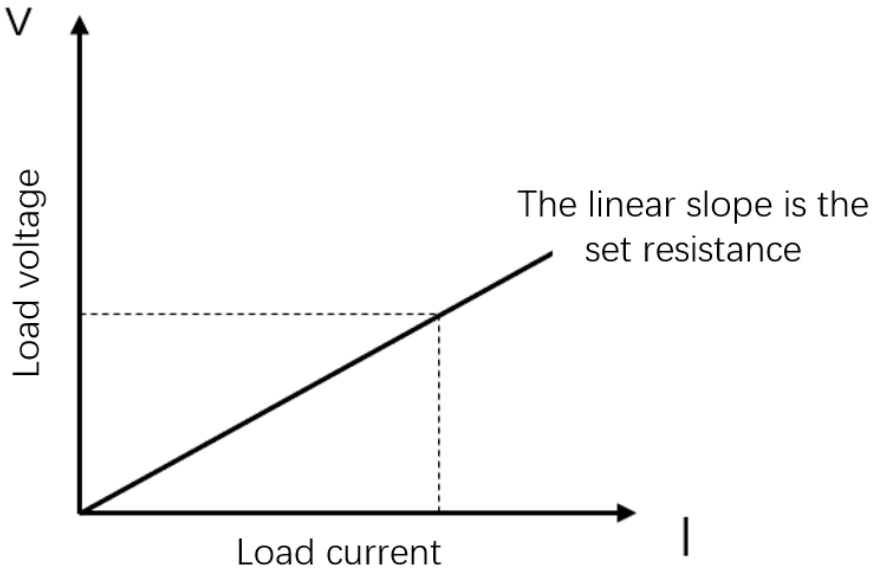

Figure 5-5 CR model I-V relationship diagram

Constant Resistance Mode Setting Procedure

1. Click **[Shift]->[9](CR)** to enter the page of constant resistance setting. The parameters to be set in the CR mode are resistance, gear, upper limit and lower limit, as shown in the figure.

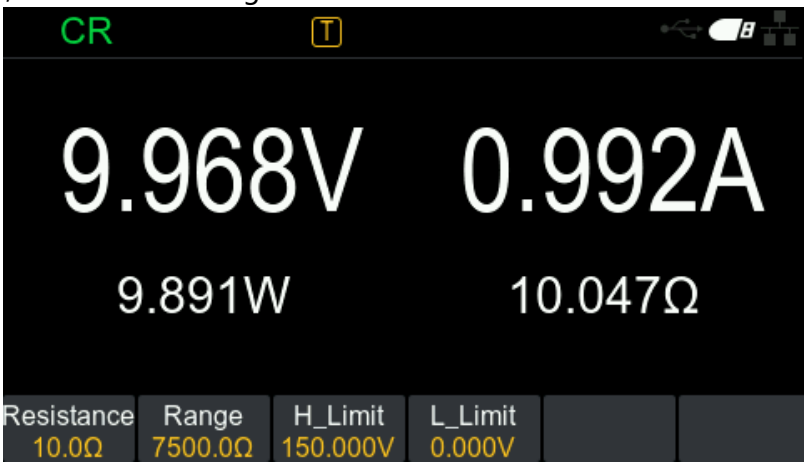

Figure 5-6 CR Mode Interface

2. Click on the **Resistance** menu softkey to set the constant resistance value, the electronic load will simulate the corresponding resistance characteristics according to this value. Use the numeric keys or knob to set the constant resistance value and press **Enter** to confirm. The unit is Ω.
3. Click the **Range** menu softkey to set the resistance working range, which refers to the resistance range that the electronic load can accurately measure and control. Use the numeric keys or knob to set the resistance working range and press **Enter** to confirm. The unit is Ω.
4. Click the **H_Limit** menu softkey to set the maximum working voltage value, when the input voltage of the electronic load is greater than this upper limit value, the load stops working. Use the numeric keys or knob to set the maximum working voltage and press **Enter** to confirm. The unit is V.
5. Click the **L_Limit** menu softkey to set the minimum working voltage value, when the input voltage of the electronic load is less than this lower limit value, the load stops working. Use the numeric keys or knob to set the minimum working voltage and press **Enter** to confirm. The unit is V.

5.4. Constant power mode (CP)

CP mode: Constant power mode, in which the electronic load will consume a constant power, the load current will be linearly adjusted as the input voltage changes to ensure that the power consumption is maintained at a constant value. As shown in the figure.

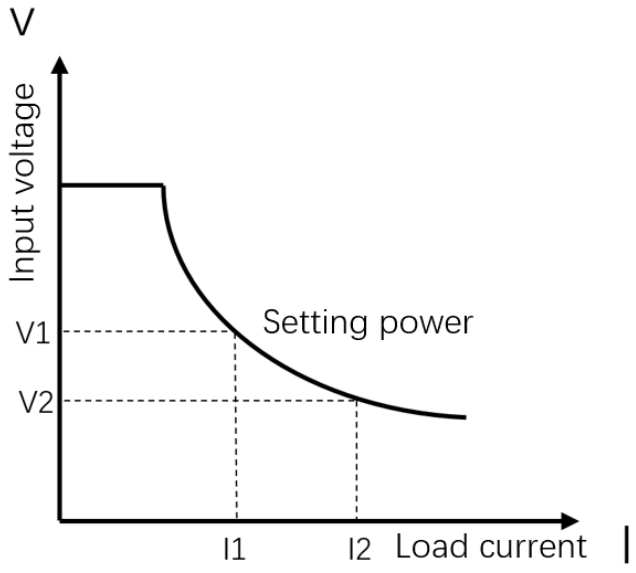

Figure 5-7 CR model I-V relationship diagram

Constant Power Mode Setting Procedure

1. Click **[Shift]->[Utility](CP)** to enter the power setting page. The parameters to be set in CP mode are power, gear, upper limit and lower limit, as shown in the

figure.

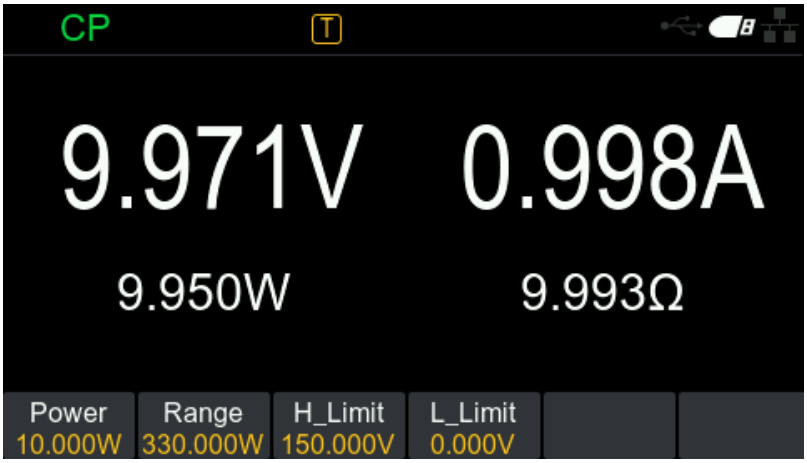

Figure 5-8 CP Mode Interface

2. Click on the **Power** menu softkey to set the constant power value, which refers to the constant power value consumed by the electronic load. Use the numeric keys or the knob to set the constant power value and press **Enter** to confirm. The unit is W.

3. Click the **Range** menu softkey to set the power working range, which refers to the power range that the electronic load can accurately measure and control. Use the numeric keys or knob to set the power working range and press **Enter** to confirm. The unit is W.

4. Click the **H_Limit** menu softkey to set the maximum working voltage value, when the input voltage of the electronic load is greater than this upper limit value, the load stops working. Use the numeric keys or knob to set the maximum working voltage value and press **Enter** to confirm. The unit is V.

5. Click the **L_Limit** menu softkey to set the minimum working voltage value, when the input voltage of the electronic load is less than this lower limit value, the load stops working. Use the numeric keys or knob to set the minimum working current value and press **Enter** to confirm. The unit is V.

6. Test Function

6.1. OCP Test Function

In OCP mode, when the input voltage reaches the loaded voltage, the load starts to pull load current after a time delay, and the current is incremented in steps every certain period of time, and at the same time, it is judged whether the input voltage of the electronic load is higher than the OCP voltage value. If it is higher than the OCP voltage value, the load will continue to run and the current will continue to increase in delayed time until it reaches the cut-off current.

If OCP protection occurs for the device under test, it is then judged whether the current under test is within the set maximum and minimum current ranges. If it is within the range, the OCP test passes and Pass is displayed in the upper right corner of the screen; if it is not within the range, the OCP test fails and Fail is displayed in the upper right corner of the screen.

Click the **[Shift]->4 (OCP)** softkey in turn to enter the OCP test function setting interface.

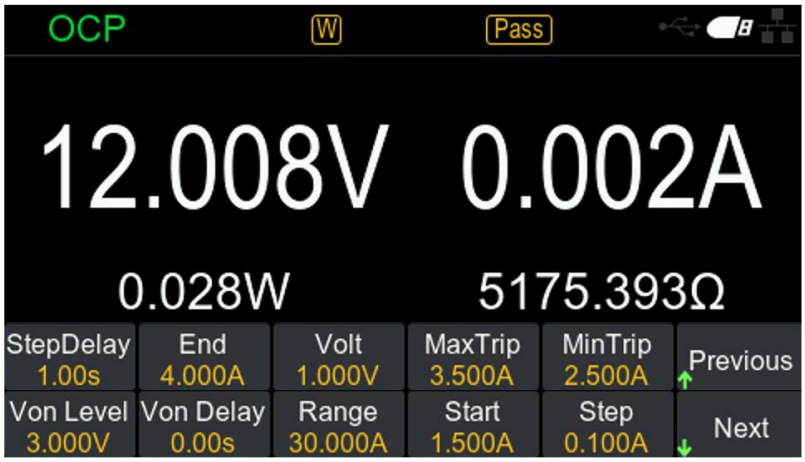

Figure 6-1 OCP test function

Click **Von Level** to set the on-load voltage value. On-load voltage refers to the starting voltage of the load. When the input voltage is higher than the set value of the starting voltage, the load begins to pull. Use the number keys or knob to enter the desired value and press **Enter** to confirm. For details, see Parameter Settings.

Click **Von Delay** to set the delay time. Voltage delay means that after the input voltage reaches the start voltage, the load starts pulling current after a delay time. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings' .

Click **Range** to set the current working gear, which refers to the current range that the electronic load can accurately measure and control. When setting a smaller

current, selecting a smaller gear has better resolution and accuracy, if the set current value exceeds the maximum value of the lower range, you must select a larger gear. Use the numeric keys or knob to input the desired value and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Start** to set the current value when the load starts scanning. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Step** to set the step current value, meaning that the current changes in specific steps or increments. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click on **Step Delay** to set the step delay time, which is the time delay that exists between each step current. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **End** set the current value when the load turns off scanning. Use the numeric keys or knob to input the desired value, and then press the **Enter** key to confirm. For details, please refer to the introduction in 'Parameter Specific Settings'.

Click on **Volt** to set the value of the protection voltage under the OCP test function. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Max Trip** to set the maximum value of the protection current under the OCP function. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click on **Min Trip** to set the minimum value for the protection current under the OCP function. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Note: Only when the input current is less than the cut-off current, the electronic load will make a Pass or Fail judgement.

6.2. OPP Test Function

In OPP mode, when the input voltage reaches the loaded voltage, with a time delay, the device under test starts to operate according to the initial power and increments in steps every certain period of time, while comparing the detected value of the measured voltage with the value of the OPP protection voltage. If it is higher than the protective voltage value, the operation continues and continues to be delayed and incremented until the operation reaches the cut-off power.

If OPP protection occurs for the device under test, then judge whether the power under test is within the set maximum power and minimum power range again. If it is within the range, the OPP test passes and Pass is displayed in the upper right corner of the screen; if it is not within the range, the OPP test fails and Fail is displayed in the upper right corner of the screen.

Click the **[Shift]->5 (OPP)** softkey in turn to enter the OPP test function setting interface.

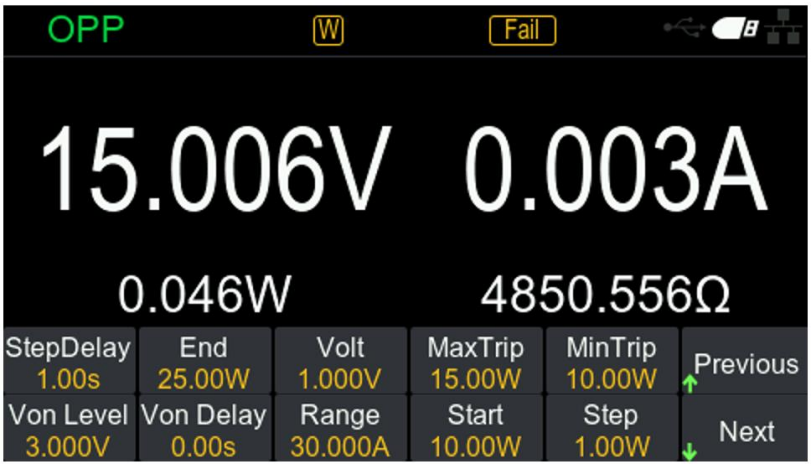

Figure 6-2 OPP Test Function

Click **Von Level** to set the load voltage value. The loaded voltage refers to the starting voltage of the load, when the input voltage is higher than the setting value of the starting voltage, the load starts to pull load. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Von Delay** to set the delay time. Voltage delay means that after the input voltage reaches the starting voltage, the load starts pulling current after a delay time. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to 'Parameter Specific Settings'.

Click **Range** to set the current working gear, which refers to the current range that the electronic load can accurately measure and control. When setting a smaller current, selecting a smaller gear has better resolution and accuracy, if the set current value exceeds the maximum value of the lower range, you must select a larger gear. Use the numeric keys or knob to input the desired value, press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Start** to set the power value when the load starts scanning. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Step** to set a step power value, meaning that the power changes in specific steps or increments. Use the numeric keys or knob to enter the desired value and press the **Enter** key to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Step Delay** to set the step delay time, which is the time delay that exists

between each step of power. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

Click on **End** to set the power value when the load is off scan. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

Click on **Max Trip** to set the value of the protection voltage under the OPP test function. Use the numeric keys or knob to input the desired value, and press enter to confirm. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

Click on **Min Trip** to set the minimum value for the protection power under the OPP function. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

Note: Only when the input power is less than the cut-off power, the electronic load will make a Pass or Fail judgement.

6.3. Battery function

Battery: In CC mode, the battery is discharged and tested. When the battery drops to the end of voltage, or has been discharged to the end of capacity, or reaches the end of time, it will automatically stop the test. During the test, the battery voltage, discharge time and discharged capacity can be observed. When only one or two of the conditions are required to terminate the discharge test, the other unused termination conditions should be set to the maximum value. However, when the test conditions reach the termination conditions, the test will also be terminated.

Click the **[Shift]->1 (Battery)** softkey in turn to enter the Battery test function setting interface.

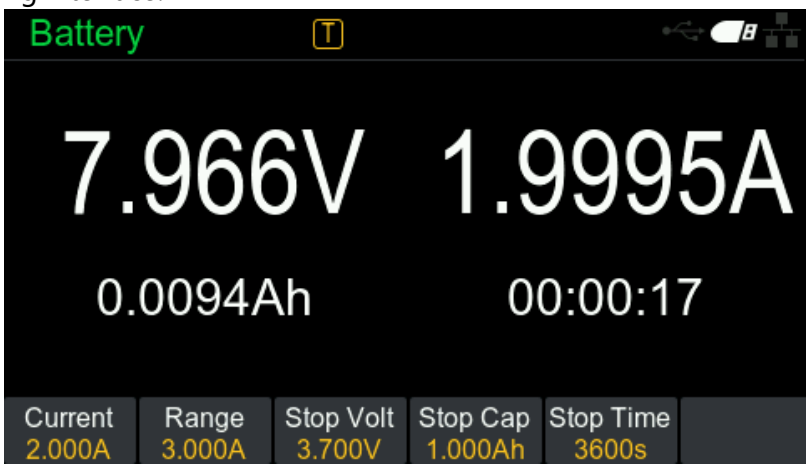

Figure 6-3 Battery Test Function

Click **Current** to set the discharge current. By setting different sizes of current, you

can simulate the discharge of the battery in various actual usage scenarios. Use the numeric keys or knob to input the desired current value. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

Click on **Range** to set the current operating range, which refers to the range of current that the electronic load can accurately measure and control. Use the numeric keys or knob to input the desired current working range. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’. When setting a small current, select the lower range for better resolution and accuracy, if the set current value exceeds the maximum value of the lower range, then the higher range must be selected.

Click on **Stop Volt** to set the discharge as-of-voltage. The test stops when the battery's voltage drops to the as-of voltage to prevent irreversible damage to the battery due to over-discharge. Use the numeric keys or knob to enter the desired voltage value. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

Click **Stop Cap** to set the discharge up to capacity. The test stops when the battery is discharging and its discharged capacity reaches the set cut-off capacity. Use the numeric keys or knob to enter the desired capacity value. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

Click **Stop Time** to set the discharge time. The test stops when the battery is in the process of discharging and its discharge time reaches the set cut-off time. Use the numeric keys or knob to enter the desired time. For specific settings, please refer to the introduction in ‘Parameter Specific Settings’.

6.4. CR-LED Test Function

This series of electronic load in the original CR mode, increased the diode on voltage setting. When the voltage added to both ends of the electronic load is greater than the diode's on-state voltage, the electronic load will work, which completely and realistically simulates the characteristics of the LED lights and measures the more realistic LED current ripple parameters.

The following figure shows the IV curve of the LED lamp. The traditional CR mode, the simulation of the diode's steady state operating point only reflects the static characteristics of the diode (blue part), and cannot verify the dynamic characteristics of the LED lamp, such as whether it can be switched on and off normally, and the current ripple condition.

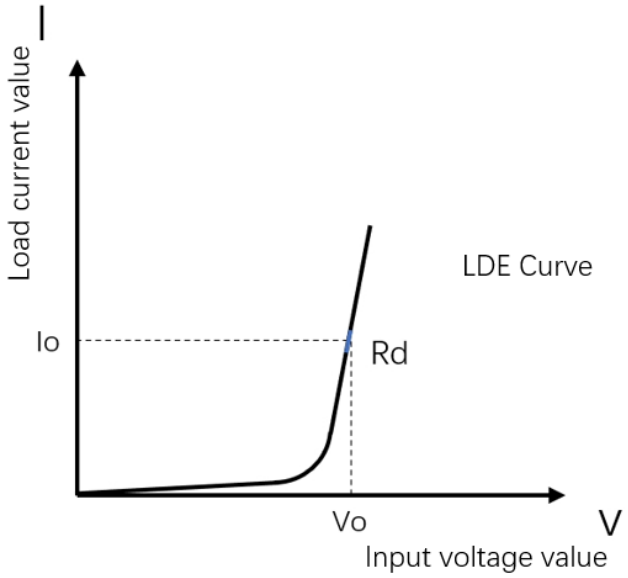

Figure 6-4 CR-LED mode I-V relationship diagram

Click the **[Shift]->6 (CR-LED)** softkey in turn to enter the CR-LED test function setting interface.

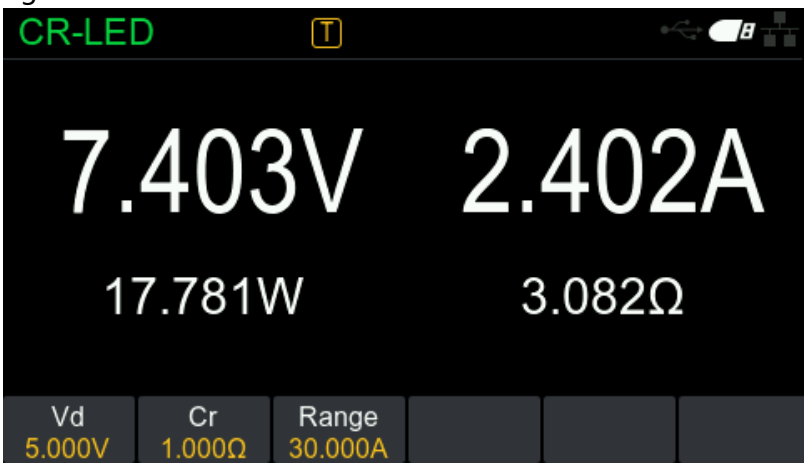

Figure 6-5 CR-LED test function

Click **Vd** to set the on voltage, which refers to the diode on voltage threshold at which the electronic load begins to operate. Use the numeric keys or knob to input the desired voltage value. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

Click **Cr** to set the fixed resistance value. Use the numeric keys or knob to input the desired resistance value. For details, refer to 'Parameter Specific Settings'.

Click **Range** to set the current operating range, which refers to the range of current that the electronic load can accurately measure and control. Use the numeric keys or knob to input the desired current working range. For specific settings, please refer to the introduction in 'Parameter Specific Settings'. When setting a small current, selecting a small range has better resolution and accuracy, if the set current value exceeds the maximum value of the low range, you must select a large range.

6.5. List Setting Function

With the List function, the load can accurately simulate complex patterns of arbitrary current variations at high speeds to complete precision tests with multiple quasi-positional loads. Multiple complex sequences can be generated by editing the current value, slope and duration of a single step to meet complex test requirements.

Click the **[Shift]->3 (List)** softkey in turn to enter the List test function setting interface.

Figure 6-6 List Setting Screen

Output List Setting Procedure

Under List function, click **List Set** to enter the List Setting interface.

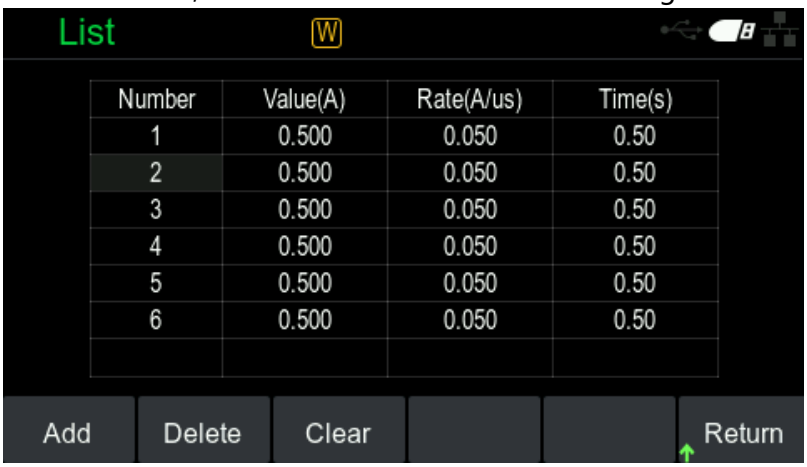

Figure 6-7 List

1. Creating Lists

The list is preset with two rows of data.

Click **Add** to add a row to the original sequence.

Click **Delete** to reduce one line from the original sequence.

Click **Clear** to clear all added data.

2. Setting List Parameters

The list parameters are Number, Value(A), Rate(A/μs), and Time(s).

Number: Indicates the number of rows where the current data is located. Setting

is done by clicking on the Add and Remove menu softbuttons and does not need to be set manually.

Value(A): Set the current value. Use the arrow keys or knob to move the cursor position, use the numeric keypad to enter the value, and press **Enter** to save.

Rate(A/μs): Set the slope of current rise/fall. Use the arrow keys or knob to move the cursor position, use the numeric keyboard to input the value and press **Enter** to save.

Time(s): set the duration of the current. Use the arrow keys or knob to move the cursor position, use the numeric keypad to enter the value, and press **Enter** to save.

3. Setting the number of repetitions

The number of times the load is repeated according to a preset list.

Click on the **Repeat**, use the numeric keys or the knob to enter the desired value, and press **Enter** to confirm.

4. Other settings

Click **Sync** to apply list settings, gear settings, and number of repetitions.

Click **Save** to save the current list settings, gear settings, and number of repetitions, which will be automatically recalled at the next power-up.

6.6. Tran Function

Dynamic test operation enables the electronic load to switch between two set parameters (A and B values) according to set rules, and this function can be used to test the dynamic characteristics of the device under test. Dynamic test modes can be categorised into continuous mode, pulse mode and flip-flop mode.

6.6.1. Continue Mode

In Continuous Mode, when the Dynamic Test operation is enabled, the load will continuously switch between A and B values.

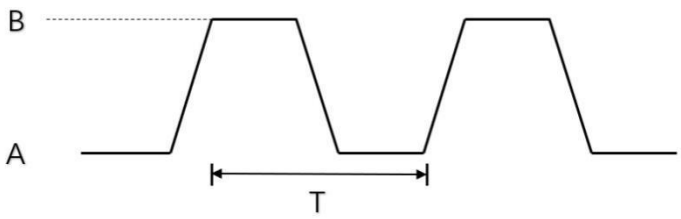

Figure 6-8 Continuous mode

The dynamic test modes support constant current, constant voltage, constant group and constant power modes. This manual is written in constant current mode (only the constant current mode has a rising/falling slope parameter), and the other modes operate similarly.

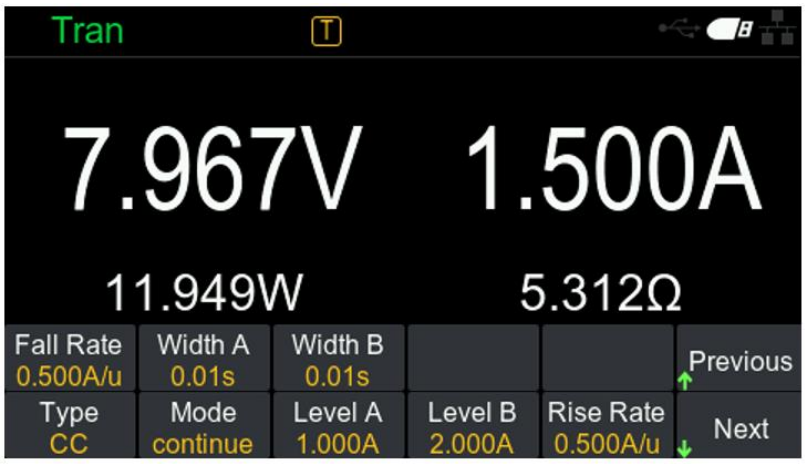

Figure 6-9 Continuous mode setting interface

Constant Current Continuous Mode Example

Click the **[Shift]->2 (Tran)** softkeys in turn to enter the Dynamic Test function setting interface.

1. Setting type

Click **Type** and the types available are Constant Current, Constant Voltage, Constant Resistance and Constant Power. Click **CC** to set it to the constant current type.

2. Setting Mode

Click **Mode** and the modes available are Continuous, Pulse and Flip. Click **Continue** to set to continuous mode.

3. Parameters for setting the pull-load current

Click on the **Level A** and use the numeric keys or knob to enter the desired current value.

Click on the **Level B** and use the numeric keys or knob to enter the desired current value.

4. Setting the slope

Click **Rise Rate** to set the slope of the rising edge of the pull current as it rises from a low current value to a high current value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

Click **Fall Rate** to set the slope of the falling edge of the pull current as it rises from a low current value to a high current value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

5. Setting the width

Click on **Width A** to set the amount of time the pull current will remain at A-value after switching to A-value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

Click on the **Width B** to set the amount of time the pull current will remain at the B value after switching to the B value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

Pulse Mode

6.6.2. Pulse Mode

In pulse mode, when the dynamic test operation is enabled, the load switches to the B value every time a trigger signal is received, and switches back to the A value after maintaining the B pulse width for a period of time.

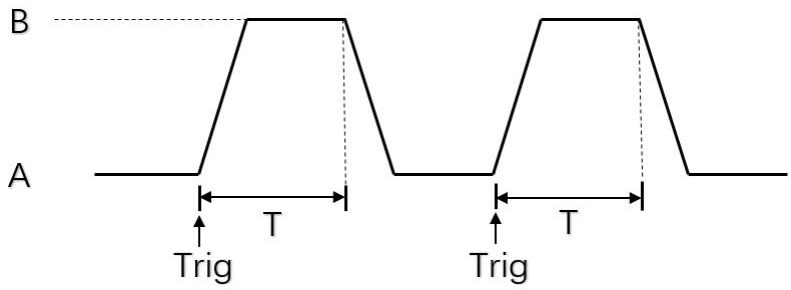

Figure 6-10 Pulse Mode

The dynamic test modes support constant current, constant voltage, constant group and constant power modes. This manual is written in constant current mode, and the other modes operate similarly.

Constant Current Pulse Mode Example

Click the **[Shift]->2 (Tran)** softkeys in turn to enter the Dynamic Test function setting interface.

1. Setting type

Click **Type** and the types available are Constant Current, Constant Voltage, Constant Resistance and Constant Power. Click **CC** to set it to the constant current type.

2. Setting Mode

Click **Mode** and the modes that can be selected are Continuous, Pulse and Flip. Click **Pulse** to set to pulse mode.

3. Parameters for setting the pull-load current

Click on the **Level A** and use the numeric keys or knob to enter the desired current value.

Click on the **Level B** and use the numeric keys or knob to enter the desired current value.

4. Setting the slope

Click **Rise Rate** to set the slope of the rising edge of the pull current as it rises from a low current value to a high current value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

Click **Fall Rate** to set the slope of the falling edge of the pull current as it rises from a low current value to a high current value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

5. Setting the width

Click on the **Width** to set the amount of time the pull current is maintained at the B value after switching to the B value. Use the numeric keys or knob to enter the

desired value and press **Enter** to confirm.

6.6.3. Toggle Mode

In pulse mode, when the dynamic test operation is enabled, the load current switches between the A and B values once for every trigger signal received.

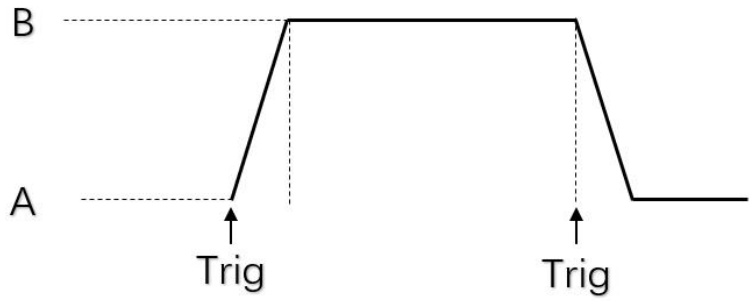

Figure 6-11 Toggle Mode

The dynamic test modes support constant current, constant voltage, constant group and constant power modes. This manual is written in constant current mode, and the other modes operate similarly.

Example of constant current flip-flop mode

Click the **[Shift]->2 (Tran)** softkeys in turn to enter the Dynamic Test function setting interface.

1. Setting type

Click **Type** and the types available are Constant Current, Constant Voltage, Constant Resistance and Constant Power. Click **CC** to set it to the constant current type.

2. Setting Mode

Click **Mode** and the modes available are Continuous, Pulse and Flip. Click **Toggle** to set to Flip mode.

3. Parameters for setting the pull-load current

Click on the **Level A** and use the numeric keys or knob to enter the desired current value.

Click on the **Level B** and use the numeric keys or knob to enter the desired current value.

4. Setting the slope

Click **Rise Rate** to set the slope of the rising edge of the pull current as it rises from a low current value to a high current value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

Click **Fall Rate** to set the slope of the falling edge of the pull current as it rises from a low current value to a high current value. Use the numeric keys or knob to enter the desired value and press **Enter** to confirm.

7. Short Circuit Simulation Function

Short-circuit simulation function: In this function, the input of the electronic load simulates a short-circuit circuit, which is used to test whether the protection function of the object to be tested can operate normally when a short-circuit occurs at the output terminal of the object to be tested.

By clicking **[Shift]->[0](Short)** in sequence **,** the electronic load enters into the short circuit mode. In short circuit mode, the actual current value consumed by the electronic load depends on the current operating mode and current range of the load. Click **[Shift] and** press the number keys except 0 to exit the short mode.

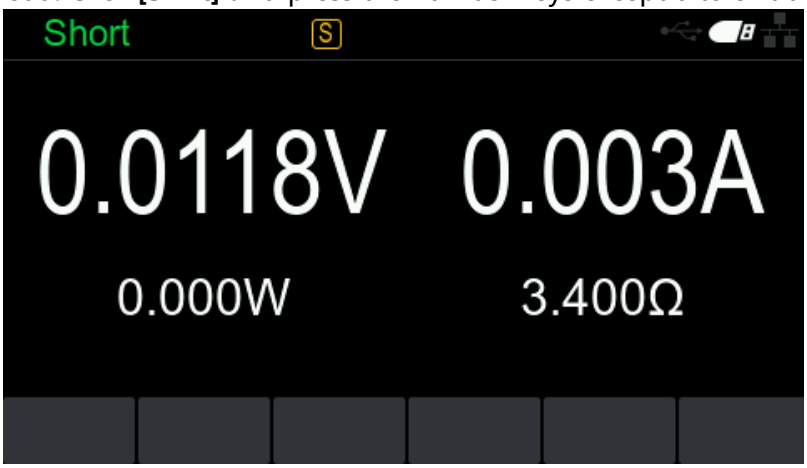

Figure 7-1 Short mode interface

8. Wave Function

The electronic load provides waveform display function and supports recording and playback of waveforms, which is convenient for users to observe the change trend of parameters through dynamic waveforms. The waveform display function is applicable to CC/CV/CR/CP/Continuous/Pulse/Rollover/Battery/OCP/OPP modes.

Click the **[Shift]->. (Wave)** soft key to enter to the waveform display function.

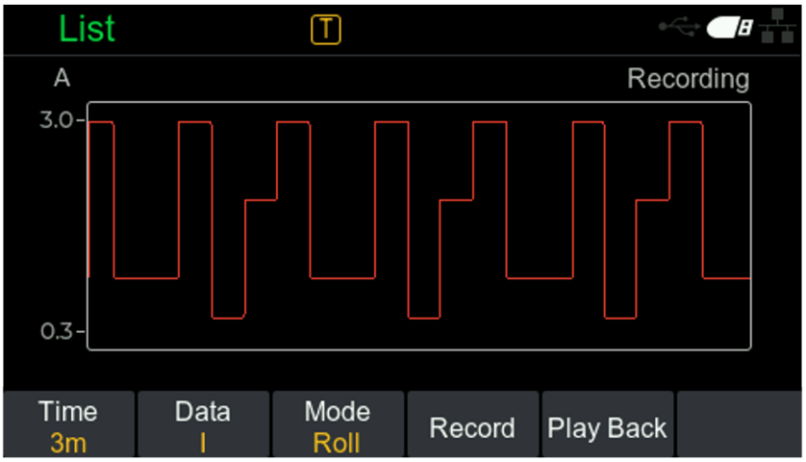

Figure 8-1 Short mode interface

Click on **Time** to refer to the time required to record the entire window, you can use the numeric keys or knob to enter the desired value and press enter to confirm.

Click on **Data** to switch the content of the vertical axis display, i.e., different parameter waveforms are displayed, and the selectable parameters are current, voltage, resistance and power.

Click **Mode** to switch the waveform output mode, you can choose roll, fast.

Roll: Display the trend of parameter change in a scrolling manner, suitable for waveforms with low rate of change. The unit is min.

Fast: displays the trend of parameter changes with high-speed sampling, suitable for waveforms with high rates of change. The unit is ms.

Record

After inserting the USB memory stick, press the **Record** menu softkey and 'Recording' will be displayed on the top right of the interface, indicating that recording is in progress. Press the **Record** softkey again to stop recording and the 'Recording' logo disappears.

When recorded, the file automatically generates a filename and is saved in CSV format to an external USB stick.

Play back

After inserting the USB memory stick, press the **Playback** Menu softkey, use the knob to select the .CSV file to be played back, 'Play Back' is displayed at the top of the interface, indicating that playback is in progress. Press the **Playback**

softkey again to stop the playback and the ‘Play Back’ logo disappears.

9. System Auxiliary Functions

Click the **[Utility]** softkey to enter the system auxiliary function setting interface, the information and auxiliary functions that can be viewed and set are: [Sys. Info], [Sys. Set], [Func. Set], [I/O Set], [S/R] and [Capture]. The following describes the functions and setting methods of these system configurations.

9.1. System Information

Click the **[Utility]-> Sys. Info** softbutton in turn to view information about the device (e.g. Model, Firmware, Serial, and Hardware).

9.2. System setting

Click **[Utility]-> Sys. Info.** The system Settings screen is displayed. System Settings include language, sound, backlight, and Time Set.
Click the **Language** menu softkey. Press the corresponding menu softkey to select 'chinese' or 'english', when the language is set to Chinese, the menu, help information, prompt messages and interface are displayed in Chinese.
Click on the **Sound** menu softkey. Press the appropriate menu softkey to set the buzzer to sound, the options that can be set are 'On' and 'Off'.
Click the **Backlight** menu softkey. Press the corresponding menu softkey to set the screen brightness, the available options are 'dimmed', 'normal' and 'high'.
Click the **Time Set** Menu softkey to enter the Clock Setting interface. Toggle the box by rotating the knob, click the left arrow key/right arrow key to toggle the position of the cursor, use the numeric keypad to enter the value, and use the knob to position the box to OK to apply the current time setting.

9.3. Function Setting

Click the **[Utility]->Func.Setting** softbutton in turn to enter the function setting interface. Function settings include [Max.Power], [V_ Range], [A_ Limit], [P_ Limit], [load time], [Filter], [Sense], [Trig Sour], [Measure] and [VON].

9.3.1. Max. Power

Click **Max.Power** to set the maximum input power value of the load. When the input power is lower than the maximum power, the current input power is displayed on the screen, when the input power is higher than the maximum

power, the input power will be limited to the maximum power value. Use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

9.3.2. Voltage Range

Click on the **V_Range** to set it to 'Fix' or 'Auto'.
Fix: The voltage step of the electronic load is always large, regardless of the change in input voltage.
Auto: The electronic load automatically switches voltage steps according to the input voltage.

9.3.3. Protection current

The A_ Limit is the maximum working current value of the load. When the input current is greater than the protection current value, the load is automatically switched off.

Protective current setting procedure

1. Click **A_ Limit** to go to the Protective Current Setting menu.
2. Click **Enable** to choose whether to switch the current protection on or off.
3. To set the value of protection current, click **A_ Limit**, use the numeric keys or knob to input the desired value, and press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.
4. Click **A_ Delay** to set the delay time. When the input current reaches the protection current value and exceeds the delay time, the load is automatically switched off. Use the numeric keys or knob to input the desired value and press enter to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

9.3.4. Protection power

The P_ Limit is the maximum value of the protection power of the load. When the input power is greater than the value of the protection power, the load is automatically switched off.

Protected Power Setting Procedure

1. Click **P_ Limit** to go to the Protect Power Settings menu.
2. Click **Enable** to switch the power protection on or off.
3. To set the **P_ Limit**, click protection power, use the numeric keys or knob to input the desired value, and press enter to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

4. Click on **P_ Delay**, use the numeric keys or knob to enter the desired value and press **Enter** to confirm. When the input power reaches the protection power value and exceeds the delay time, the load will be turned off automatically. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

9.3.5. Load time

Carrying time is the length of time that the electronic load is carrying a load.

Resistive Load Setting Procedure

1. Click **Enable** to choose to turn the feature on or off.
2. Click the **Load Time**, use the numeric keys or knob to input the desired value, and then press **Enter** to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

9.3.6. Sampling Rate

Click **Filter** and the available gears are: Slow, Middle and Fast. The lower the sampling rate, the higher the test accuracy.

9.3.7. Remote Compensation

Click **Sense** to select to turn the function on or off. When the load consumes large current, turn on this function to compensate the voltage drop lost on the line and improve the test accuracy.

9.3.8. Trigger Source

Trigger operation is mainly applied to test function. The load provides three types of triggering methods. Before the trigger operation, users are requested to set the type of trigger source. The letter T displayed on the screen indicates that the load is in the triggering state.

By clicking on **Trig Sour**, you can select 'EXT', 'MAN' and 'BUS' trigger methods.

EXT: The digital I/O connector on the rear panel of the load can receive an external trigger signal. When the external trigger method is active, the machine triggers once every time the positive and negative Trig pins are shorted.

MAN: In Manual Trigger operation mode, pressing the Trig key on the front panel will perform a trigger operation.

Bus: When Bus Trigger is active, the load will perform a trigger operation when it receives a remote trigger command from the interface.

9.3.9. Measure

HDL2500+ series electronic loads are equipped with voltage rise/fall time test function and ripple measurement function.
Click on **Measure** to go to the Measurement Settings menu.
Voltage Rise/Fall Time Test Function Setting Procedure
1. Click **Time-V1** and use the numeric keys or knob to input the desired voltage value. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.
2. Click **Time-V2** and use the numeric keys or knob to input the desired voltage value. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.
3. Click **Rise Fall->On** in order to open the time measurement function.
4. Connect a DC power supply to the input of the electronic load, the output voltage of the power supply should be greater than the high point voltage, keep the output of the power supply OFF.
5. Set a constant current value on the electronic load and turn the load input on.
6. Switch the output of the power supply on. The time shown on the screen at this point is the voltage rise time.
7. Turn the output of the power supply off and the voltage drop time will be displayed on the screen.
Ripple Measurement Function Setting Procedure
1. Click **Ripple->On** in order to open the ripple measurement function.
2. Connect the DC power supply to the input of the electronic load, set the output voltage and output current of the power supply, and turn on the power supply output.
3. Switch on the electronic load and the voltage peak-to-peak (Vpk) is displayed on the screen.

9.3.10. Carrying Voltage

When testing certain voltages that rise slowly, if the input of the electronic load is turned on first and then the power supply is turned on, the power supply may pull protection. For this reason, the user can set the loaded voltage so that the electronic load only starts to pull when the power supply voltage is higher than this value.
Click **VON** to enter the Carrying Voltage setting interface.
Click on **Type** and select Living or Latch
Click to **Living**, when the power supply voltage to be measured is greater than the loaded voltage, the load starts to pull load; when the power supply voltage to be measured is less than the loaded voltage, the load is unloaded.

Click **Latch**, when the power supply voltage to be measured is greater than the loaded voltage, the load starts to pull load; when the power supply voltage to be measured is less than the loaded voltage, the load still keeps pulling load.
Click the **VON Point**, use the numeric keys or knob to input the desired value, and then press the **Enter** key to confirm. For specific settings, please refer to the introduction in 'Parameter Specific Settings'.

9.4. IO setting

Click the **[Utility]->I/O Set** softbutton in turn to enter the IO Setting interface.The IO setting includes network port and RS232.

9.4.1. LAN Setting

Click **LAN** to enter the network port setting interface. The menu bar of this interface has Network Port Settings, Network Port Status, and Applications.
Click **Lan Set** to configure the network parameters, you can choose DHCP mode or Manual IP mode.
DHCP mode: If there is a DHCP server in the LAN, you can turn on the DHCP function, and the instrument will get the IP and other information from the DHCP server automatically without manual setting.
Manual IP Mode: In Manual IP mode, use the numeric keys or knob to set network parameters. The network parameters that can be set include: IP address, subnet mask, and gateway.
Click **Lan Status** to view the load's current network parameters.
Click **Apply** to save and use the currently set network parameters.

9.4.2. RS232

Click **RS232->Baud Rate** in order, the selectable baud rates are 4800, 9600, 19200, 38400, 57600, 115200 and 230400.

9.5. Save/Recall

The electronic load can save commonly used parameter configurations to non-volatile memory in the form of files, and read calls to the saved files when needed.
Steps for saving settings
For example, the voltage value 5V of an electronic load operating in constant voltage (CV) mode is stored in position 1 and called for.
1. In the CV screen, set the constant voltage value to 5V.
2. Press **[Utility]** and click **S/R->Save** in turn to enter the Save Settings screen.

3. Click **Save pos** and select State 1.
4 Click **Set PwrOn** to select No or. Select Yes: to set the parameter profile to On.
5. Click **Save**, the interface pops up ‘Save success!’. It means that the current configuration parameters are successfully stored in the form of a file.

Steps for recalling settings

1. Press **[Utility]** and click **S/R->Recall** in turn to enter the Call-Out Settings screen.
2. Click **Recall pos** and select State 1.
3. Click **Recall**, the interface will pops up ‘Recall success!’.

9.5.1. Power On

Click on **Power On** and the available statuses are State 1, State 2, State 3, State 4, State 5 and Default.
Statuses 1-5: are parameter profiles that are stored into the machine internally.
Default: The default settings are automatically called up when the electronic load is switched on.
Click **Set PwrOn**: Indicates that the parameter profile for the current location is set to On.

9.5.2. Default

Click **Default** to bring up the instrument's factory default settings.

10. Remote control

The electronic load can be remotely controlled in the following three ways.

- USB Remote Control
- LAN remote control
- RS232 remote control

The user can program and control the instrument through standard SCPI (Standard Commands for Programmable Instruments) commands. Refer to the HDL2500+ Programming Manual for a detailed description of commands and programming.

10.1. USB Remote Control

Use a USB cable to connect the computer's USB port to the USB port on the rear panel of the electronic load. At this point, the USB Connected logo is displayed in the upper right corner of the electronic load interface.

Download and install the IO software from the following address:

https://www.keysight.com/main/software.jspx?ckey=2175637&lc=chi&cc=CN&nid=-11143.0.00&i d=2175637

Open the IO software, find the device, send a command to see if it communicates normally, after obtaining normal communication, you can use SCPI commands to remotely control the electronic load.

Example:

```
CC:CURRent:RANGe 1.5     /*Set the load current range to 1.5A*./
    CC:CURRent:RANGe?        /*Query returns 1.5*/
```

10.2. LAN Remote Control

Connect the network port on the rear of the computer to the network port on the rear panel of the electronic load with a LAN cable.

Click **[Utility]->I/O Set->LAN** in order to set the electronic load LAN parameters.

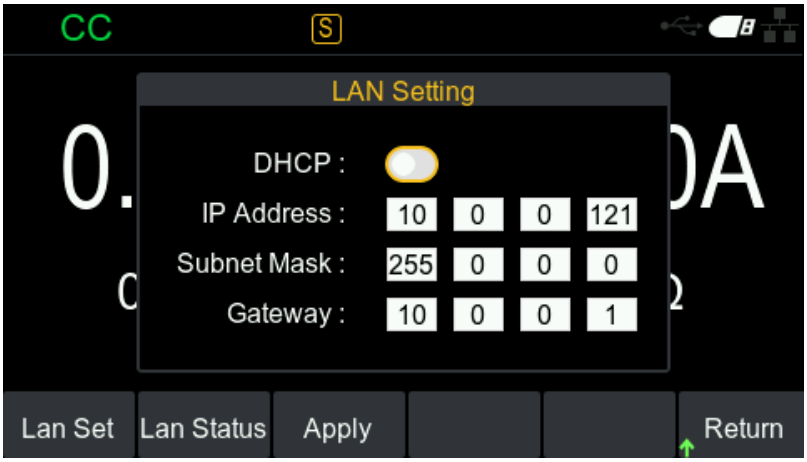

Figure 10-1 LAN network settings

Manually configure the computer's IP and other information to set the computer's Ethernet properties:

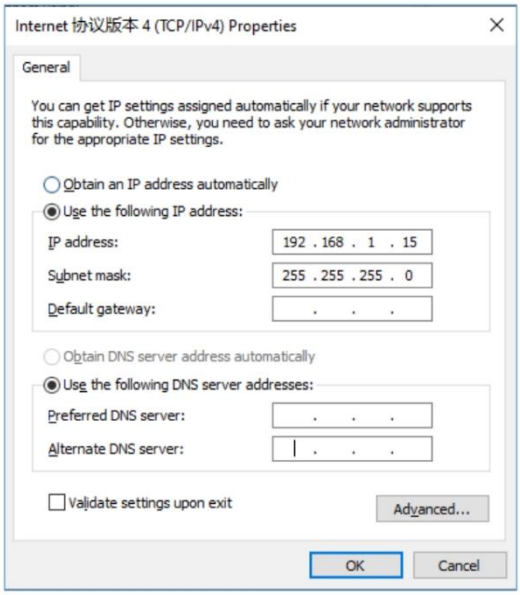

Figure 10-2 Setting Computer Ethernet Properties

Open the IO software and the device will appear in the LAN list after successful connection. If the device does not appear, you can add the device manually by entering the IP address and protocol of the device, testing the VISA address, and clicking OK to add the new device.

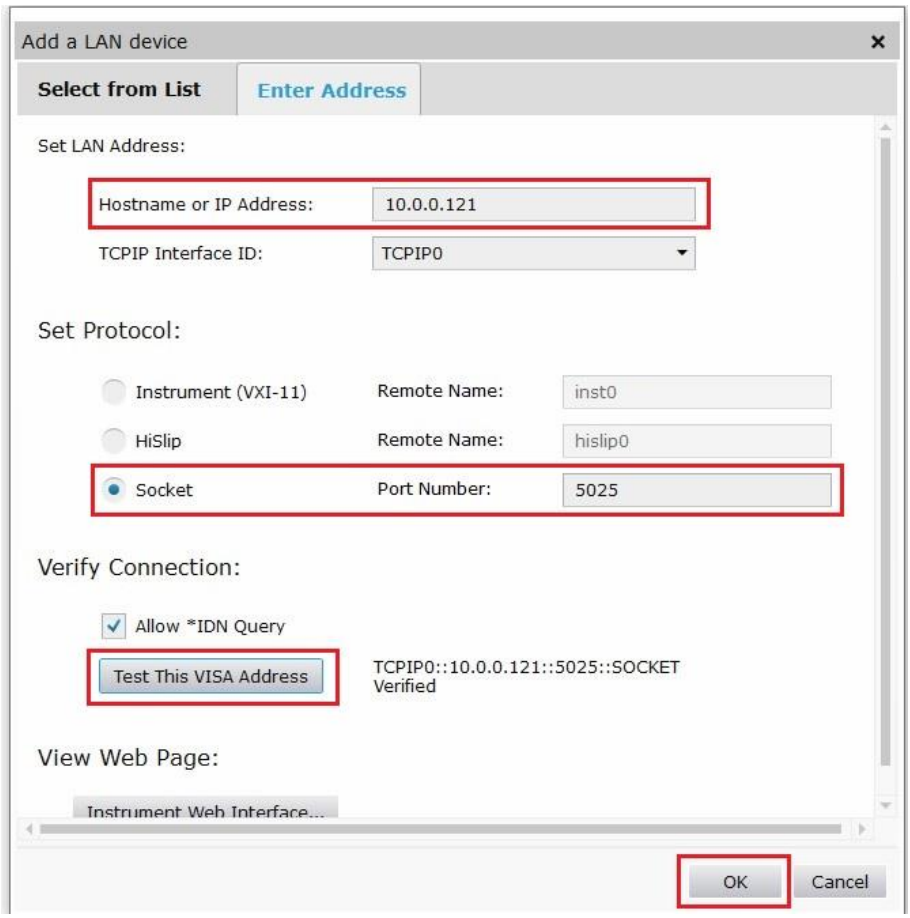

Figure 10-3 Network Port IO Settings

After successful connection, the network port icon lights up in the upper right corner of the machine's measurement display.

Same as USB remote control, after obtaining normal communication, you can use SCPI command to control the power output.

If there is a DHCP server in the LAN, you can turn on the DHCP function, and the instrument will get the IP and other information from the DHCP server automatically, no need to set it manually.

Note: There is no DHCP server on the LAN, so you must configure the IP and other information manually.

10.3. RS232 Remote Control

RS232 Remote Connection Setup Procedure

1. On-line

Use DuPont cables to connect the T pin of the instrument's rear panel RS232 to the T pin of the RS232 connector, the R pin of the instrument's rear panel RS232

to the R pin of the RS232 connector, and the G pin of the instrument's rear panel RS232 to the GND pin of the RS232 connector.

2. Setting the baud rate

Click **[Utility]->I/O Set->RS232->Baud Rate** in order, the selectable baud rates are 4800, 9600, 19200, 38400, 57600, 115200 and 230400.

3. IO setting

Open the IO software, select Add Device, select the corresponding COM port and baud rate, test the VISA address, and click OK to add a new device. Like USB remote control, after getting normal communication, you can use SCPI command to control the electronic load remotely.

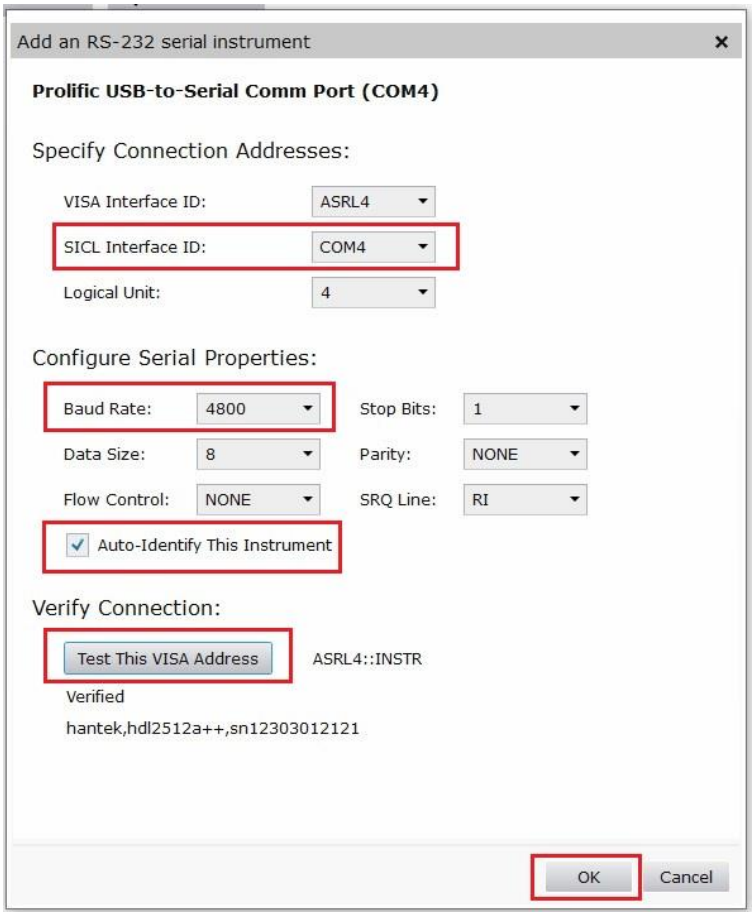

Figure 10-4 RS232 IO Setting

11. Digital IO Port (DIP)

The digital IO port integrates three functions: current monitoring (I-MON), external triggering, and RS232 remote control.

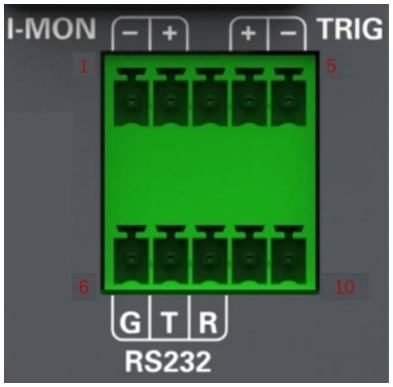

Figure 11-1 digital IO port (DIP)

The function of each pin of the digital IO is as follows:

Needle number	Signal Name
1	I-MON(-)
2	I-MON(+)
3	NC
4	TRIG(+)
5	TRIG(+)
6	GND
7	RS232_TX
8	RS232_RX
9	NC
10	NC

Figure 11-2 Digital IO pin numbering

Current Monitor

11.1. Current Monitor

The current monitoring output terminal represents the rated input current of the channel to which the terminal belongs from 0 to full with a 0 to 10V analogue output signal. An external voltmeter or oscilloscope can be connected to display changes in input current.

11.2. External trigger

When the instrument's trigger is set to external trigger, the machine triggers once for every time the Trig's positive and negative pins are shorted.

11.3. RS232 remote control

RE232 remote control via the RS232 function of the digital IO port. Please refer to section RS232 for more details .

12. Trouble Shooting

Pressing the power button the instrument still has a black screen and cannot be switched on.

a. Check that the power connector is connected.

b. Check that the power button is pressed firmly.

c. Check if the fuse is blown. If you need to replace the fuse, use a fuse that meets the specifications of this product.

d. After doing the above checks, restart the instrument.

e.If the product still does not work properly, please contact Hantek.

Invalid key input.

a. Check that the keys are locked.

b. Whether external remote control is used.

c. If the product still does not work properly, please contact Hantek.

Constant current pull load is not normal.

a. Check that the connecting wires between the instrument and the device under test are properly connected.

b. Check whether the value of the pull-load current exceeds the value of the protection current, resulting in overcurrent protection of the instrument.

c. Check that the input voltage and the value of the current pulling the load do not exceed the protection power of the instrument, resulting in overpower protection of the instrument.

d. Check that the range of the load current is appropriate.

e. If the product still does not work properly, contact Hantek.

Constant voltage input not normal

a. Check that the connecting wires between the instrument and the device under test are properly connected.

b. Check that the maximum output voltage of the device under test is less than the voltage set by the electronic load.

c. If the product still does not work properly, please contact Hantek.

The constant resistance input is not normal.

a. Check whether the output of the device under test is normal, for example, if the device appears to oscillate.

b. If the problem still cannot be solved, please contact Hantek.

Constant power input is not normal.

a. Check that the connecting wires between the instrument and the device under test are properly connected.

b. Check whether the output of the device under test is normal, such as oscillation of the power supply.

c. Check that the maximum output power of the device under test is less than the power set by the electronic load.

d. If the product still does not work properly, please contact Hantek. d. If the product still does not work properly, please contact Hantek.

Dynamic characteristic test is not normal.

a. Check that the connecting wires between the instrument and the device under test are properly connected.

b. The connection line between the device under test and the instrument should be as short as possible, otherwise it will result in a slower slope.

c. If the product still does not work properly, please contact Hantek.

13. Performance indicators

Model		HDL2512A+	
Rated value (0～40 ℃)	Input Voltage	0~150V	
	Input Current	0~3A	0~30A
	Input Power	300W	
	Minimum operating voltage	0.14V at 3A	1.4V at 30A
Constant Voltage mode	Range	0.1~18V	0.1~150V
	Resolution	1mV	10mV
	Accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
Constant current mode	Range	0~3A	0~30A
	Resolution	1mA	10mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	0.1Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	1mW	
	Accuracy	± （0.1%+0.1%FS）	
Dynamic mode (CC mode)			
T1＆T2		20μS~3600S /Res:1 μS	
Accuracy		2μS±100ppm	
Rise/Fall rate *4		0.0001~0.2A/μS	0.001~1.5A/μS
Minimum rise time *5		≒10uS	≒10uS
Measurement range			
Voltage readback value	Range	0~18V	0~150V
	Resolution	0.1 mV	1 mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~3A	0~30A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	
Power readback value	Range	300W	
	Resolution	1mW	
	Accuracy	±(0.1%+0.1%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒3.3A	≒33A
Specification			
Short circuit	Current (CC)	≒3.3/3A	≒33/30A
	Voltage (CV)	0V	0V

	Resistance (CR)	≒40mΩ	≒40mΩ
Input terminal impedance	500KΩ		
Interface	USB,RS232		
Dimension	208.5mm*84.5mm*325mm		

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2512B+	
Rated value (0～40 ℃)	Input Voltage	0~500V	
	Input Current	0~1.5A	0~15A
	Input Power	300W	
	Minimum operating voltage	0.3V at 1.5A	3V at 15A
Constant Voltage mode	Range	0.1~50V	0.1~500V
	Resolution	10mV	100mV
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant current mode	Range	0~1.5A	0~15A
	Resolution	1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	0.3Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	10mW	
	Accuracy	0.1%+0.2%	
Dynamic mode			
Dynamic mode	**CC mode**		
	T1＆T2	20μS~3600S /Res:1 μS	
	Accuracy	2μS±100ppm	
	Rise/Fall rate ***4**	0.0001~0.2A/μS	0.001~0.8A/μS
	Minimum rise time ***5**	≒10uS	≒10uS
Measurement range			
Voltage readback value	Range	0~50V	0~500V
	Resolution	1 mV	10mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
	Range	0~1.5A	0~15A
	Resolution	0.1mA	1mA

Current readback value	Accuracy	±(0.05%+0.05%FS)	
Power readback value	Range	300W	
	Resolution	10mW	
	Accuracy	±(0.1%+0.2%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒1.6A	≒16A
Specification			
Short circuit	Current (CC)	≒1.6/1.5A	≒16/15A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒180mΩ	≒180mΩ
Input terminal impedance	500KΩ		
Interface	USB,RS232		
Dimension	208.5mm*84.5mm*325mm		

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2512C+	
Rated value (0～40 ℃)	Input Voltage	0~120V	
	Input Current	0~6A	0~60A
	Input Power	300W	
	Minimum operating voltage	0.25V at 6A	2.5V at 60A
Constant Voltage mode	Input Voltage	0.1~15V	0.1~120V
	Input Current	1mV	10mV
	Input Power	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Constant current mode	Input Voltage	0~6A	0~60A
	Input Current	1mA	10mA
	Input Power	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Constant resistance mode *1	Range	0.1Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	1mW	
	Accuracy	±(0.1%+0.3%FS)	
Dynamic mode			

Dynamic mode	CC mode		
	T1＆T2	20μS~3600S /Res:1 μS	
	Accuracy	2μS±100ppm	
	Rise/Fall rate ***4**	0.0001~0.3A/μS	0.001~3A/μS
	Minimum rise time ***5**	≒10uS	≒10uS
Measurement range			
Voltage readback value	Range	0~15V	0~120V
	Resolution	0.1 mV	1mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~6A	0~60A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Power readback value	Range	300W	
	Resolution	1mW	
	Accuracy	±(0.1%+0.3%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒6.5A	≒65A
Specification			
Short circuit	Current (CC)	≒6.5/6A	≒65/60A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒40mΩ	≒40mΩ
Input terminal impedance	500KΩ		
Interface	USB,RS232		
Dimension	208.5mm*84.5mm*325mm		

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2512H+	
Rated value (0～40 ℃)	Input Voltage	0~800V	
	Input Current	0~0.5A	0~5A
	Input Power	300W	
	Minimum operating voltage	0.7V at 0.5A	7V at 5A
Constant Voltage mode	Range	0.1~80V	0.1~800V
	Resolution	10mV	100mV
	Accuracy	±(0.05%+0.1%FS)	±(0.05%+0.05%FS)

Constant current mode	Range	0~0.5A	0~5A
	Resolution	1mA	1mA
	Accuracy	±(0.05%+0.1%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	2Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	10mW	
	Accuracy	0.2%+0.2%FS)	
Dynamic mode			
Dynamic mode	CC mode		
	T1＆T2	20μS~3600S /Res:1 μS	
	Accuracy	2μS±100ppm	
	Rise/Fall rate ***4**	0.0001~0.04A/μS	0.001~0.2A/μS
	Minimum rise time ***5**	≒20uS	≒20uS
Measurement range			
Voltage readback value	Range	0~80V	0~800V
	Resolution	1 mV	10mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~0.5A	0~5A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	
Power readback value	Range	300W	
	Resolution	10mW	
	Accuracy	±(0.2%+0.2%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒0.55A	≒5.5A
Specification			
Short circuit	Current (CC)	≒0.55/0.5A	≒5.5/5A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒1.4Ω	
Input terminal impedance	500KΩ		
Interface	USB,RS232		
Dimension	208.5mm*84.5mm*325mm		

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2512A++	
Rated value (0～40 ℃)	Input Voltage	0~150V	
	Input Current	0~3A	0~30A
	Input Power	300W	
	Minimum operating voltage	0.14V at 3A	1.4V at 30A
Constant Voltage mode	Range	0.1~18V	0.1~150V
	Resolution	1mV	1mV
	Accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
Constant current mode	Range	0~3A	0~30A
	Resolution	1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	0.1Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	1mW	
	Accuracy	± (0.1%+0.1%FS)	
Dynamic mode (CC mode)			
T1＆T2		20μS~3600S /Res:1 μS	
Accuracy		2μS±100ppm	
Rise/Fall rate *4		0.0001~0.2A/μS	0.001~1.5A/μS
Minimum rise time *5		≒10uS	≒10uS
Measurement range			
Voltage readback value	Range	0~18V	0~150V
	Resolution	0.1 mV	1 mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~3A	0~30A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	
Power readback value	Range	300W	
	Resolution	1mW	
	Accuracy	±(0.1%+0.1%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒3.3A	≒33A
Specification			
Short circuit	Current (CC)	≒3.3/3A	≒33/30A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒40mΩ	≒40mΩ

Input terminal impedance	500KΩ
Interface	USB,RS232,LAN
Dimension	208.5mm*84.5mm*325mm

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2512B++	
Rated value (0～40 ℃)	Input Voltage	0~500V	
	Input Current	0~1.5A	0~15A
	Input Power	300W	
	Minimum operating voltage	0.3V at 1.5A	3V at 15A
Constant Voltage mode	Range	0.1~50V	0.1~500V
	Resolution	1mV	10mV
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant current mode	Range	0~1.5A	0~15A
	Resolution	1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	0.3Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	10mW	
	Accuracy	0.1%+0.2%	
Dynamic mode			
Dynamic mode	CC mode		
	T1＆T2	20μS~3600S /Res:1 μS	
	Accuracy	2μS±100ppm	
	Rise/Fall rate ***4**	0.0001~0.2A/μS	0.001~0.8A/μS
	Minimum rise time ***5**	≒10uS	≒10uS
Measurement range			
Voltage readback value	Range	0~50V	0~500V
	Resolution	1 mV	10mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~1.5A	0~15A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	

Power readback value	Range	300W	
	Resolution	10mW	
	Accuracy	±(0.1%+0.2%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒1.6A	≒16A
Specification			
Short circuit	Current (CC)	≒1.6/1.5A	≒16/15A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒180mΩ	≒180mΩ
Input terminal impedance	500KΩ		
Interface	USB,RS232,LAN		
Dimension	208.5mm*84.5mm*325mm		

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2512C++	
Rated value (0～40 ℃)	Input Voltage	0~120V	
	Input Current	0~6A	0~60A
	Input Power	300W	
	Minimum operating voltage	0.25V at 6A	2.5V at 60A
Constant Voltage mode	Range	0.1~18V	0.1~120V
	Resolution	1mV	1mV
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Constant current mode	Range	0~6A	0~60A
	Resolution	b1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Constant resistance mode *1	Range	0.1Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	1mW	
	Accuracy	±(0.1%+0.3%FS)	
Dynamic mode			
Dynamic mode	CC mode		
	T1＆T2	20μS~3600S /Res:1 μS	

	Accuracy	2μS±100ppm	
	Rise/Fall rate *4	0.0001~0.3A/μS	0.001~3A/μS
	Minimum rise time *5	≒10uS	≒10uS
Measurement range			
Voltage readback value	Range	0~18V	0~120V
	Resolution	0.1 mV	1mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~6A	0~60A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Power readback value	Range	300W	
	Resolution	1mW	
	Accuracy	±(0.1%+0.3%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒6.5A	≒65A
Specification			
Short circuit	Current (CC)	≒6.5/6A	≒65/60A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒40mΩ	≒40mΩ
Input terminal impedance	500KΩ		
Interface	USB,RS232,LAN		
Dimension	208.5mm*84.5mm*325mm		

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2512H++	
Rated value (0 ~ 40 ℃)	Input Voltage	0~800V	
	Input Current	0~0.5A	0~5A
	Input Power	300W	
	Minimum operating voltage	0.7V at 0.5A	7V at 5A
Constant Voltage mode	Range	0.1~80V	0.1~800V
	Resolution	1mV	10mV
	Accuracy	±(0.05%+0.1%FS)	±(0.05%+0.05%FS)
Constant current mode	Range	0~0.5A	0~5A
	Resolution	0.1mA	1mA

	Accuracy	±(0.05%+0.1%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	2Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2***	0.01%+0.0008S
Constant power mode *3	Range	300W	
	Resolution	10mW	
	Accuracy	(0.2%+0.2%FS)	
Dynamic mode			
Dynamic mode	CC mode		
	T1＆T2	20μS~3600S /Res:1 μS	
	Accuracy	2μS±100ppm	
	Rise/Fall rate *4	0.0001~0.04A/μS	0.001~0.2A/μS
	Minimum rise time *5	≒20uS	≒20uS
Measurement range			
Voltage readback value	Range	0~80V	0~800V
	Resolution	1 mV	10mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~0.5A	0~5A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	
Power readback value	Range	300W	
	Resolution	10mW	
	Accuracy	±(0.2%+0.2%FS)	
Protection range			
Overpower protection		≒320W	
Overcurrent protection		≒0.55A	≒5.5A
Specification			
Short circuit	Current (CC)	≒0.55/0.5A	≒5.5/5A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒1.4Ω	
Input terminal impedance	500KΩ		
Interface	USB,RS232,LAN		
Dimension	208.5mm*84.5mm*325mm		

1 Voltage/current input value not less than 10% FS (FS is full scale)

2 Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

3 Voltage/current input not less than 10% FS

4 Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

5 Minimum rise time: 10% to 90% of current rise time

Model		HDL2513A+	
Rated value (0～40 ℃)	Input Voltage	0~150V	
	Input Current	0~6A	0~60A
	Input Power	600W	
	Minimum operating voltage	0.25V at 6A	2.5V at 60A
Constant Voltage mode	Range	0.1~18V	0.1~150V
	Resolution	1mV	1mV
	Accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
Constant current mode	Range	0~6A	0~60A
	Resolution	1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	0.1Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S *2	0.01%+0.0008S
Constant power mode *3	Range	600W	
	Resolution	1mW	
	Accuracy	±(0.2%+0.2%FS)	
Dynamic mode			
Dynamic mode	CC mode		
	T1＆T2	100μS~3600S /Res:1 μS	
	Accuracy	10μS±100ppm	
	Rise/Fall rate *4	0.001~0.15A/μS	0.01~1A/μS
	Minimum rise time *5	≒50uS	≒60uS
Measurement range			
Voltage readback value	Range	0~18V	0~150V
	Resolution	0.1 mV	1mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~6A	0~60A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	
Power readback value	Range	600W	
	Resolution	1mW	
	Accuracy	±(0.2%+0.2%FS)	
Protection range			
Overpower protection		≒620W	
Overcurrent protection		≒6.6A	≒66A
Specification			
Short circuit	Current (CC)	≒6.6/6A	≒66/60A
	Voltage (CV)	≒0V	

	Resistance (CR)	≒30mΩ
Input terminal impedance	500KΩ	
Interface	USB,RS232,LAN	
Dimension	208.5mm*84.5mm*455mm	

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2513B+	
Rated value (0～40 ℃)	Input Voltage	0~500V	
	Input Current	0~3A	0~30A
	Input Power	600W	
	Minimum operating voltage	0.3V at 3A	3V at 30A
Constant Voltage mode	Range	0.1~50V	0.1~500V
	Resolution	1mV	10mV
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant current mode	Range	0~3A	0~30A
	Resolution	1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
Constant resistance mode *1	Range	0.1Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.02%+0.08S ***2**	0.02%+0.0008S
Constant power mode *3	Range	600W	
	Resolution	10mW	
	Accuracy	±(0.2%+0.2%FS)	
Dynamic mode			
Dynamic mode	CC mode		
	T1＆T2	100μS~3600S /Res:1 μS	
	Accuracy	10μS±100ppm	
	Rise/Fall rate ***4**	0.001~0.05A/μS	0.01~0.5A/μS
	Minimum rise time ***5**	≒60uS	≒60uS
Measurement range			
Voltage readback value	Range	0~50V	0~500V
	Resolution	1 mV	10mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current	Range	0~6A	0~60A

readback value	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	
Power readback value	Range	600W	
	Resolution	10mW	
	Accuracy	±(0.2%+0.2%FS)	
Protection range			
Overpower protection		≒650W	
Overcurrent protection		≒3,3A	≒33A
Specification			
Short circuit	Current (CC)	≒3.4/3A	≒34/30A
	Voltage (CV)	0V	
	Resistance (CR)	≒100mΩ	
Input terminal impedance		500KΩ	
Interface		USB,RS232,LAN	
Dimension		208.5mm*84.5mm*455mm	

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

Model		HDL2513C+	
Rated value (0～40 ℃)	Input Voltage	0~120V	
	Input Current	0~12A	0~120A
	Input Power	600W	
	Minimum operating voltage	0.2V at 12A	2V at 120A
Constant Voltage mode	Range	0.1~18V	0.1~120V
	Resolution	1mV	1mV
	Accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
Constant current mode	Range	0~12A	0~120A
	Resolution	1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Constant resistance mode *1	Range	0.1Ω~10Ω	10Ω~7500Ω
	Resolution	16bit	
	Accuracy	0.01%+0.08S ***2**	0.01%+0.0008S
Constant power mode *3	Range	600W	
	Resolution	10mW	
	Accuracy	± (0.2%+0.2%FS)	
Dynamic mode			
	CC mode		

Dynamic mode	T1＆T2	100μS~3600S /Res:1 μS	
	Accuracy	10μS±100ppm	
	Rise/Fall rate ***4**	0.001~0.2A/μS	0.01~1.6A/μS
	Minimum rise time ***5**	≒60uS	≒60uS
Measurement range			
Voltage readback value	Range	0~18V	0~120V
	Resolution	0.1 mV	1mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Current readback value	Range	0~12A	0~120A
	Resolution	0.1mA	1mA
	Accuracy	±(0.05%+0.05%FS)	±(0.05%+0.1%FS)
Power readback value	Range	600W	
	Resolution	10mW	
	Accuracy	±(0.2%+0.2%FS)	
Protection range			
Overpower protection		≒620W	
Overcurrent protection		≒13A	≒130A
Specification			
Short circuit	Current (CC)	≒13/12A	≒130/120A
	Voltage (CV)	0V	0V
	Resistance (CR)	≒15mΩ	≒15mΩ
Input terminal impedance	500KΩ		
Interface	USB,RS232,LAN		
Dimension	208.5mm*84.5mm*455mm		

***1** Voltage/current input value not less than 10% FS (FS is full scale)

***2** Range of resistance readback value: (1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))

***3** Voltage/current input not less than 10% FS

***4** Rising/falling slope: Rising slope for 10% to 90% of current from 0 to maximum current

***5** Minimum rise time: 10% to 90% of current rise time

14. Appendice

14.1. Appendix A: Models and Accessories

Ordering Information	Part Number
Host Model	
300W，USB, RS232, LAN	HDL2512A++
300W，USB, RS232, LAN	HDL2512B++
300W，USB, RS232, LAN	HDL2512C++
300W，USB, RS232, LAN	HDL2512H++
300W，USB, RS232, LAN	HDL2512A++
600W，USB, RS232, LAN	HDL2512B++
600W，USB, RS232, LAN	HDL2512C++
600W，USB, RS232, LAN	HDL2512H++
300W，USB, RS232	HDL2512A+
300W，USB, RS232	HDL2512B+
300W，USB, RS232	HDL2512C+

Table 14-1 Model

Ordering Information	Part Number
Standard accessories	
Power cords in accordance with the standards of the country in which they are used	——

Ordering Information	Part Number
Packing list	— —

Table 14-2 Attachment

14.2. Appendix B: Warranty Summary

Qingdao Hantek Electronics Co., Ltd (hereinafter referred to as Hantek) warrants that the main unit and accessories of its manufactured instruments will be free from defects in material and workmanship during the product warranty period. If the product proves to be defective during the warranty period, Hantek will repair or replace it free of charge for the user. For detailed warranty regulations, please refer to Hantek's official website or the description on the product warranty card. To obtain repair services or the full text of the warranty description, please contact a Hantek repair centre or local office.

Other than the warranties provided in this summary or other applicable warranty cards, Hantek disclaims all other warranties, express or implied, including but not limited to any implied warranties of merchantability and fitness for a particular purpose. in no event shall hantek be liable for indirect, special or consequential damages.

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