

ET5410、 ET5411 Single channel DC electronic load User's Manual



Hangzhou ZHONG CHUANG Electronics Co., Ltd.

Safety precautions

In order to avoid personal injury and prevent product damage, please use this product in accordance with regulations. Don't go on until you fully understand and meet the following warnings.

- ◆ **Safe grounding.** Please ensure that the grounding terminal of the power line of this product is reliably connected with the protective grounding terminal, and insert the instrument into the grounded power socket.
- ◆ **Use suitable fuse.** To provide continuous fire protection, please use only the specified type and rated fuse.
- ◆ **If the product is abnormal, please do not use it.** Its protective measures may have been damaged, do not install replacement parts or unauthorized adjustment of products. Please return the product to repair or professional inspection to ensure its safety characteristics.
- ◆ **Never use this product in a flammable and explosive environment.**

Environmental considerations

This product conforms to the requirements of the WEEE directive (2002/96/EC). The label attached to the product (see below) indicates that the electronic/electrical equipment shall not be disposed of with household waste.



Some substances contained in this product may be harmful to the environment or human health. To avoid releasing harmful substances into the environment or endangering human health, it is recommended to recycle this product by appropriate methods to ensure that most of the materials can be reused or recycled correctly. For processing or recycling information, please contact the local authority.

Symbols on products

The following symbols may appear on the product:



Signal ground



Chassis Ground



High voltage electricity



Reference manual

ET54 Brief introduction of series products

The ET54 series is a DC programmable electronic load, providing 1mV/10mV, 1mA/10mA high resolution and precision, superior performance. Equipped with 12 common modes, complete testing functions, can be widely used in charger, switching power supply, linear power supply, battery and other industries production line testing.

Main features:

- **User friendly design:**
 - ◆ The 2.8 inch TFT LCD display is rich in content and supports both Chinese and English display.
 - ◆ The operation process is simple and convenient, with intuitive interface display system, easy to get started.
 - ◆ With key lock function to prevent misoperation.
- **High performance load:**
 - ◆ Provide basic measurement models for CC, CV, CR, CP, CC+CV and CR+CV.
 - ◆ Professional battery testing.
 - ◆ Provide professional LED testing.
 - ◆ Dynamic test mode, which can test the dynamic output performance of power supply.
 - ◆ Scanning test mode can test the continuity of power output in a certain range.
 - ◆ List mode, which can simulate multiple load status changes.
 - ◆ Short circuit test for simulating load short circuit.
 - ◆ Support external trigger input (select RS232).
 - ◆ Built in buzzer alarm.
 - ◆ Power off to maintain data storage function.
 - ◆ Remote operation can be done through USB and RS-232 (optional) interface.
 - ◆ With PS2 interface, support external keyboard to set data value.
- **Multiple security protection:**

- ◆ It has the functions of over-voltage, over-current, over-power and over-temperature protection. It can flexibly set the parameters of over-voltage and over-current, and effectively protect the load.
- ◆ With intelligent fan speed control function, effectively reduce fan noise at work.
- ◆ Reverse polarity protection with input polarity.

Catalog

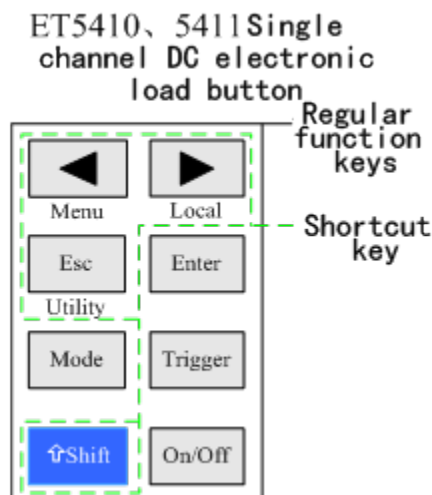
ET54Brief introduction of series products.....	- 1 -
Catalog - 2 -	
One、 quick get start.....	- 3 -
1.1 Front panel LCD display.....	- 3 -
1.2 Front panel key.....	- 3 -
1.3 Key description.....	- 4 -
Two、 Functional operation.....	- 4 -
2.1 Remote / local handover operation.....	- 4 -
2.2 System setup operation.....	- 4 -
2.3 Load setup operation.....	- 5 -
2.4 Basic mode operation.....	- 5 -
2.4.1 Constant current measurement mode.....	- 6 -
2.4.2 Constant voltage measurement mode.....	- 6 -
2.4.3 Constant resistance measurement mode.....	- 7 -
2.4.4 Constant power measurement mode.....	- 7 -
2.4.5 Constant current transfer voltage measurement mode.....	- 8 -
2.4.6 Constant voltage transfer voltage measurement mode.....	- 9 -
2.5 Dynamic test operation.....	- 9 -
2.6 List test operation.....	- 11 -
2.7 Scan test operation.....	- 14 -
2.8 Battery test operation.....	- 15 -
2.9 LED test operation.....	- 16 -
2.10 Short circuit test operation.....	- 17 -
2.12 Protection function.....	- 17 -
2.13 Trigger function.....	- 18 -
2.14 Qualification test operation.....	- 18 -
2.15 Other system settings.....	- 19 -
2.15.1 Keyboard lock function.....	- 19 -
2.15.2 External interface function.....	- 19 -
Four、 technical specifications.....	- 20 -

One、quick get start

1.1 Front panel LCD display



1.2 Front panel key



1.3 Key description

Regular function keys		Shortcut key	
Mode	Mode selection key	Shift+Menu	Parameter setting for non basic mode
On/Off	Channel opening key	Shift+Utility	System general settings
Esc	Return key	Shift+Local	Remote local handover
Trigger	Trigger key		
Enter	Confirmation key		
◀ ▶	Cursor around moving key		
Shift	Shift Reuse key		

Two、 Functional operation

In order to ensure the stability and safety of the load and the source to be tested, it is necessary to connect the load and the source to be tested according to the red positive and black, then turn on the power output first, then turn on the load.

2.1 Remote / local handover operation

When the load works in remote operation mode, the top bar of the interface will have the corresponding icon display. At this time, the interface is locked, and the state and operation of the instrument can be controlled by the instructions of the host computer, and the local operation mode can be switched back through the panel[Shift]+[▶](Local).

2.2 System setup operation

Press the[Shift]+[Esc](Utility) key to enter the system menu interface as shown in Figure 2.2.1, you can rotate the knob to select and enter the corresponding sub-menu. In the system settings interface can complete the language, restore factory settings, boot settings and other operations, the settings system interface as shown in Figure 2.2.2.

Operation description: 1.Select the operation item by rotating the knob. 2.Press [Enter] to enter the sub menu interface or switch the contents of the operation item. 3.Press the[Esc] key to return to the next level.

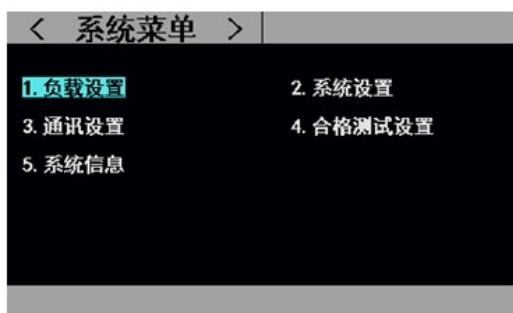


Fig. 2.2.1 system menu interface

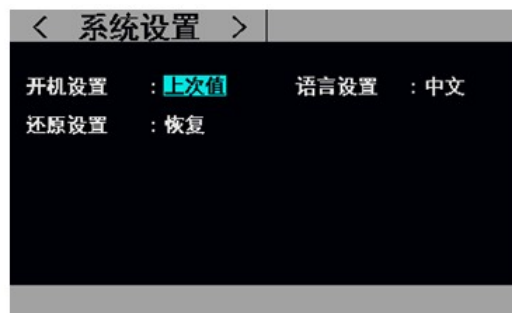


Figure 2.2.2 system interface diagram

2.3 Load setup operation

Through the system menu, you can enter the load setup interface, as shown in Figure 2.3. Under this interface, we can complete the relevant settings about the range, limit value and delay turn off of the load.

Operation description: 1.Select the operation item by rotating the knob. 2.Non numeric parameters switch settings according to[Enter]key. 3.Digital parameters, press the[Enter]key to enter editing mode, select the appropriate number of digits by the direction key, then rotate the knob to adjust the value,[Enter]key to confirm the input. 4.Return to the next level by[Esc].



Fig. 2.3 load setup interface diagram

2.4 Basic mode operation

Electronic load can work in the following basic measurement modes: constant current mode (CC), constant voltage mode (CV), constant resistance mode (CR), constant power mode (CP), constant current and constant voltage mode (CC + CV), constant resistance and constant voltage mode (CC + CR). The above six mode parameters can be set at the measurement interface. Among them, the arbitrary mode main interface can enter the mode selection interface according to the [Mode] key, as shown in Figure 2.4.

Operation description: 1.Select the operation item by rotating the knob. 2. press [Enter] key to confirm the selected mode. 3. press the [Esc] button to return to the next level interface.

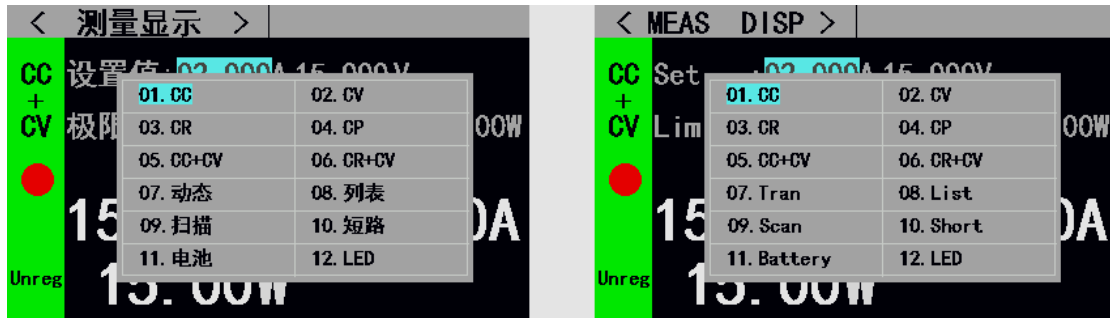


Fig. 2.4 mode selection interface

2.4.1 Constant current measurement mode

Under constant current mode, the electronic load consumes a constant current no matter whether the input voltage is changed or not.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction key, and then adjust the value by a rotary knob, [Enter] or [Esc] key to exit editing. 3. press the corresponding [On/Off] startup mode.

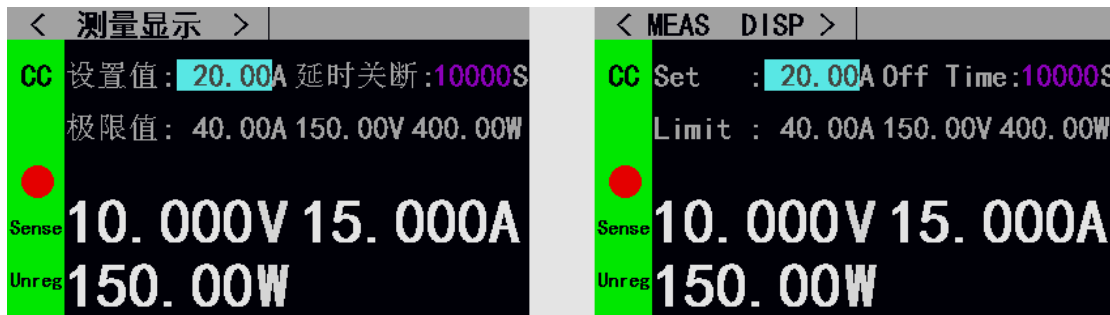


Fig. 2.4.1 mode of constant current measurement

2.4.2 Constant voltage measurement mode

In constant voltage mode, the electronic load will consume enough current to maintain the input voltage at the set voltage.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction key, and then adjust the value by a rotary knob, [Enter] or [Esc] key to exit editing. 3. press the corresponding [On/Off] startup mode.

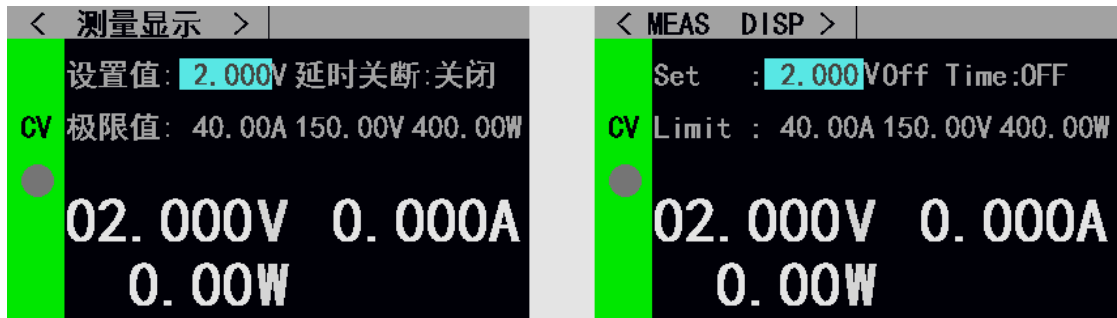


Fig. 2.4.2 mode of constant voltage measurement

2.4.3 Constant resistance measurement mode

In constant resistance mode, the load is equivalent to a constant resistance, and the load consumes a current that changes with the input voltage.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction key, then adjust the value by the rotary knob, and the [Enter] and [Esc] keys exit editing. 3. press the corresponding [On/Off] startup mode.

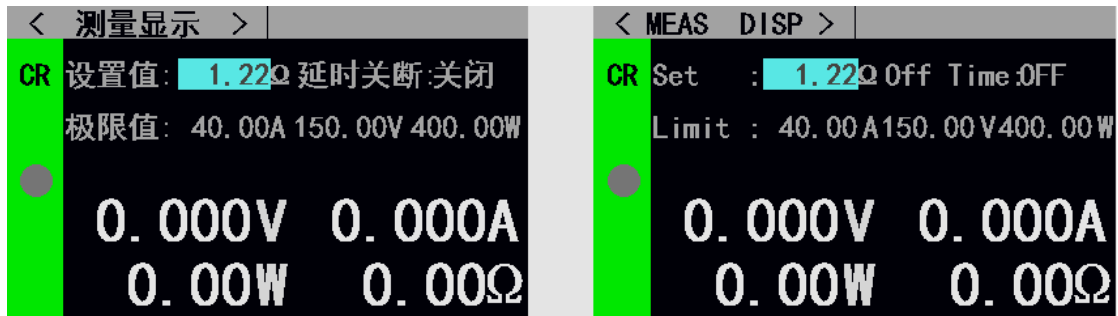


Fig. 2.4.3 measurement mode of constant resistance

2.4.4 Constant power measurement mode

In constant power mode, the load consumes a constant power. When the input voltage changes, the load maintains the power consumption at a set value by adjusting the corresponding current.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction

key, and then adjust the value by a rotary knob, [Enter] or [Esc] key to exit editing. 3. press the corresponding [On/Off] startup mode.

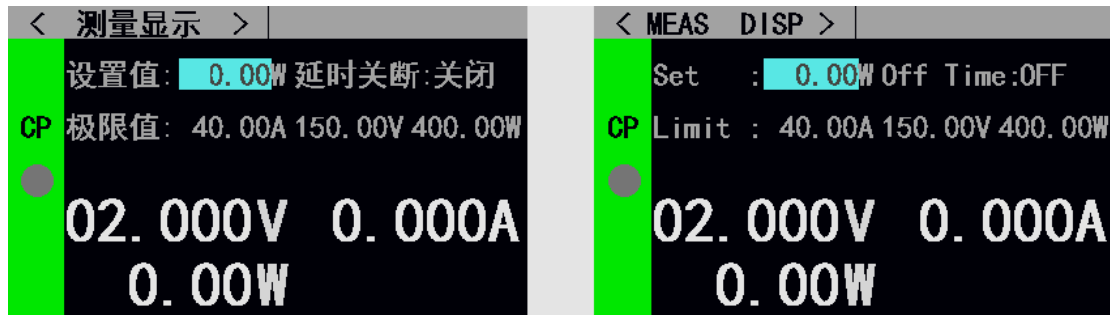


Fig. 2.4.4 mode of constant power measurement

2.4.5 Constant current transfer voltage measurement mode

Constant current transfer voltage measurement mode is designed to prevent damage caused by overcurrent discharge. In this mode, when the current value set by the load cannot be output by the source to be measured, the current mode will be automatically switched from the constant current mode to the constant voltage mode.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction key, and then adjust the value by a rotary knob, [Enter] or [Esc] key to exit editing. 3. press the corresponding [On/Off] startup mode.

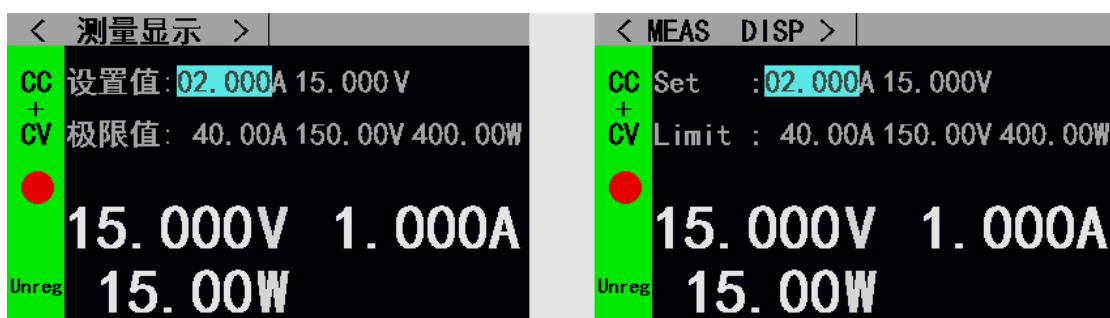


Fig. 2.4.5 constant current transfer voltage measurement mode

2.4.6 Constant voltage transfer voltage measurement mode

Constant voltage transfer voltage measurement mode is designed to prevent damage caused by overcurrent discharge. In this mode, when the source cannot output enough current to maintain t

he set resistance, the load will change from the constant resistance mode to the constant voltage mode.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction key, and then adjust the value by a rotary knob, [Enter] or [Esc] key to exit editing. 3. press the corresponding [On/Off] startup mode.

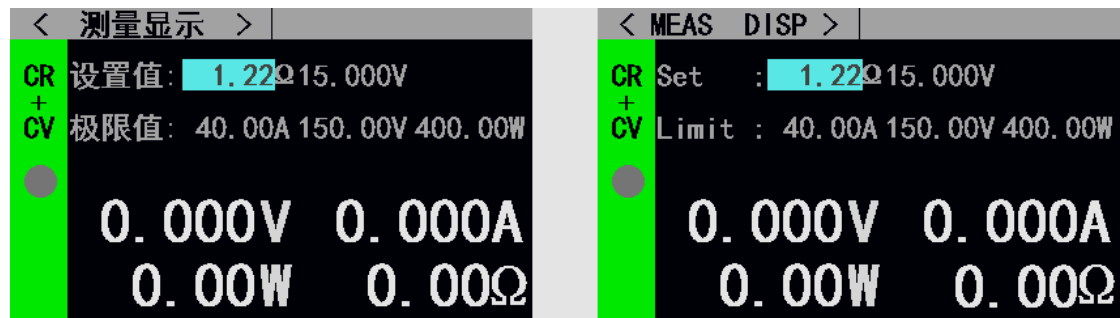


Fig. 2.4.5 voltage measurement mode with constant resistance

2.5 Dynamic test operation

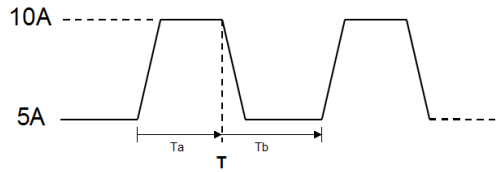
Dynamic test operation can be repeatedly switched between two kinds of load setting current or voltage, this function can be used to test the dynamic characteristics of power supply. Before starting the dynamic test operation, it is necessary to set the parameters related to the dynamic test. The specific parameters include: dynamic load state, A value, A value pulse width time, B value pulse width time and dynamic test mode. The setting interface and test interface are shown in Figures 2.5.1 and 2.5.2, respectively.

Parameter setting interface operation instructions: 1. After entering the main interface of dynamic testing by the [Mode] key, press [Shift]+ [◀] to enter the parameter setting interface of dynamic testing. 2. Select the operation by turning the knob; 3. Switch settings by pressing the [Enter] key for non-numeric parameters; 4. For numeric parameters, press the [Enter] key to enter editing mode, select the corresponding digits by the direction key, and then rotate the knob to adjust the value, [Enter] or [Esc] key to exit the editing; 5. Press the [Esc] to return to the next level. Interface

Test interface operation instructions: 1. Press [On/Off] to start or close mode.

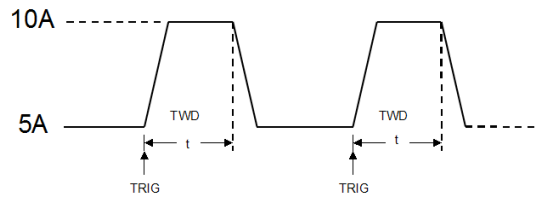
Among them, the dynamic test mode can be divided into continuous mode, pulse mode, trigger mode three, as follows:

- ◆ Continuous mode: in this mode, after starting the test, the load can continuously switch between the A value and the B value.



连续操作模式

- ◆ Pulse mode: In this mode, after starting the test, the load switches from A to B for each trigger signal it receives, and after maintaining the pulse duration of B, it switches back to A again.



脉冲操作模式

- ◆ Trigger mode: In this mode, after starting the test, the load switches between A and B values for each trigger signal it receives. In this mode, setting pulse width will not work.



触发操作模式



Figure 2.5.1 dynamic setting interface

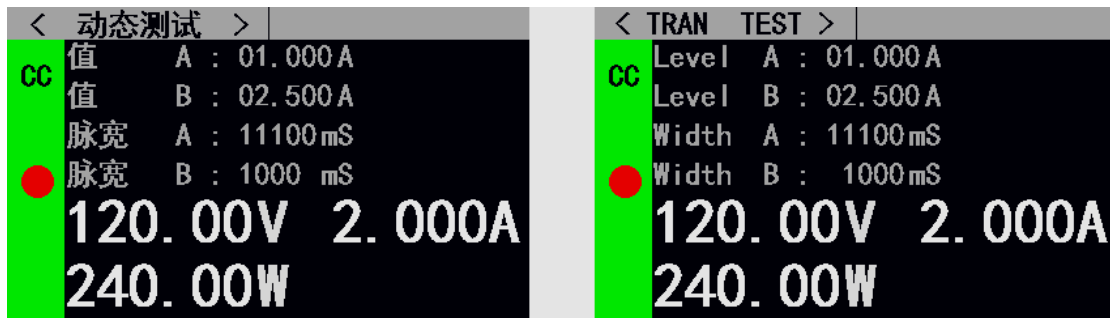


Fig. 2.5.2 dynamic test interface

2.6 List test operation

The list test function can conveniently test the working conditions of the source under different loading conditions, which is conducive to the automatic test of the production line. By pre-setting the steps of list testing, the testing steps and parameters of the source to be tested can be edited into a list and a series of tests can be completed in sequence. Specific settings include: setting the number of steps, step mode, cycle switch, each step load mode, load size, delay time, comparison switch, upper limit value, lower limit value

Press the [Shift]+ [◀] (Menu) key to enter the list menu interface under the list test main interface, adjust the knob to select the appropriate options, and press the [Enter] key to enter the corresponding submenu



Figure 2.6 list menu interface

The setup interface and test interface are shown in Figures 2.6.1 and 2.6.2, respectively, and the test result interface at the end of the test is shown in Figure 2.6.3.

List test setup interface operation instructions: 1. Select the operation item by turning the knob; 2. Edit the parameters by switching to edit state through the direction key; press the [Enter] key after selecting the previous page or the next page to turn over the page. Press the [Enter] key when the direction key is selected and saved to enter the list test parameter saving interface; 3. Non-digital parameters in editing state can be saved by pressing the [Enter] key. Press the [Enter] key to switch settings; 4. Press the [Enter] key to enter the editing mode, select the corresponding digits by the direction key, then rotate the knob to adjust the value, [Enter] or [Esc] key to exit the editing; 5. Press [Esc] to return to the upper interface;

Test interface operation instructions: Press [On/Off] to start or close mode.



Figure 2.6.1 list setup interface

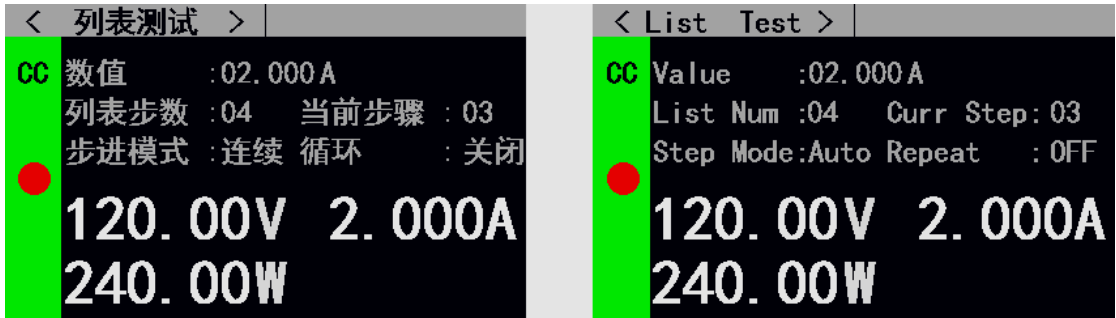


Figure 2.6.2 list test interface



Figure 2.6.3 list result interface

List test results save interface operation instructions.: 1. Select files by rotating the knob; 2. Edit files by switching the direction key to the editing state; 3. Select the previous page or the next page by pressing the [Enter] key to turn the page; 4. In editing state, select the operation of storing, reading, deleting files by rotating the knob, press the [Enter] key to enter the file name. Interface, calling files, deleting files; 5. returning to the next level by [Esc].

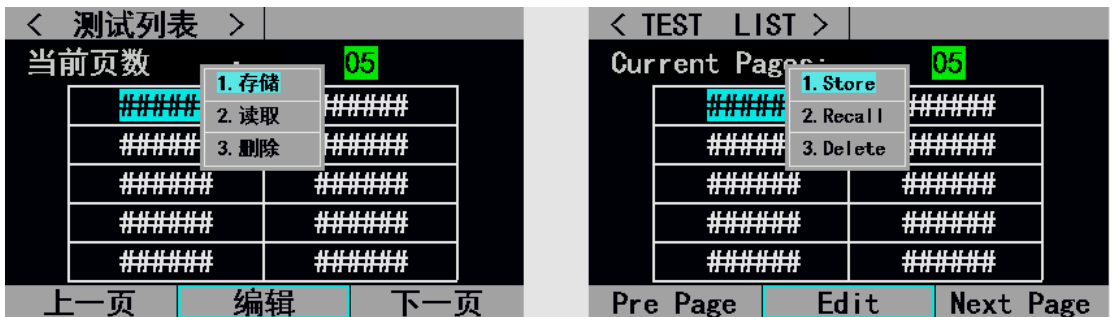


Figure 2.6.4 file list to set parameter save interface

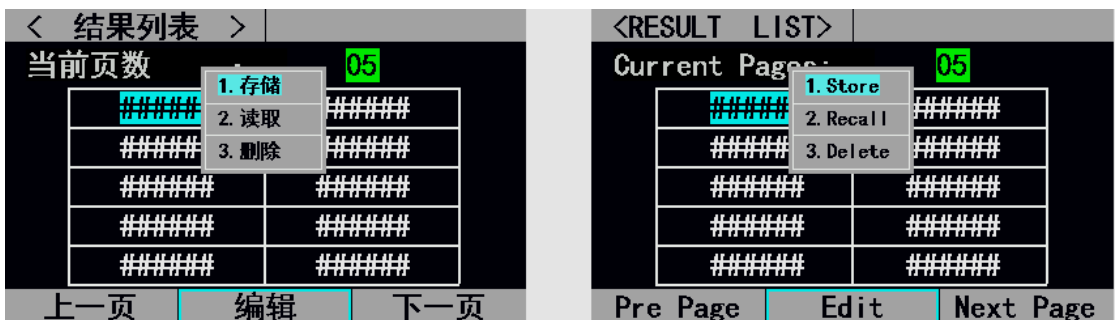


Figure 2.6.5 file list results save interface

File naming interface operation instructions: 1.The file can be edited by switching the direction key to the editing state, and then the file can be saved by pressing the [Enter] key, and an error will be reported if it is empty. 2. The character is selected by a rotary knob and the character is typed by pressing the [Enter] key. 3. Press [Esc] to return to the upper interface.

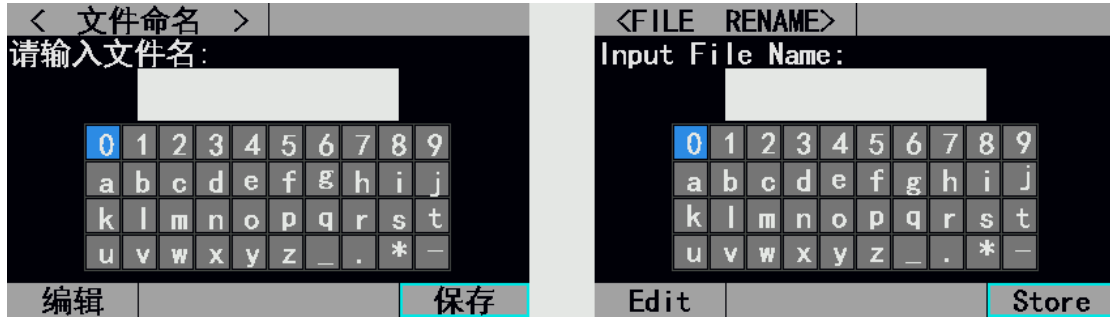


Figure 2.6.7 named naming interface

2.7 Scan test operation

Scanning test can be used to detect the continuous operation of the source to be measured in a certain range, and can easily capture the critical parameters of the source to be measured, such as protection current, turning voltage and so on. Users can set parameters such as starting point, end point, step quantity, step delay, threshold type, comparison type and so on. The end of the scan test shows that the test results are qualified or not.

Parameter setting interface operation instructions: 1.Press the [Shift]+ [◀] (Menu) key to enter the scanning settings interface under the scanning test main interface; 2. Select the operation item by rotating the knob; 3. Switch the settings options by pressing the [Enter] key for non-numeric parameters; 4. For numeric parameters, press the [Enter] key to enter the editing mode, select the corresponding digits through the direction key, and then rotate the spin. Button adjustment value, [Enter] or [Esc] key out of editing; 5. return to the next level by [Esc].

Test interface operation instructions: 1.Press [On/Off] to start or close mode.



Figure 2.7.1 scan test setup interface

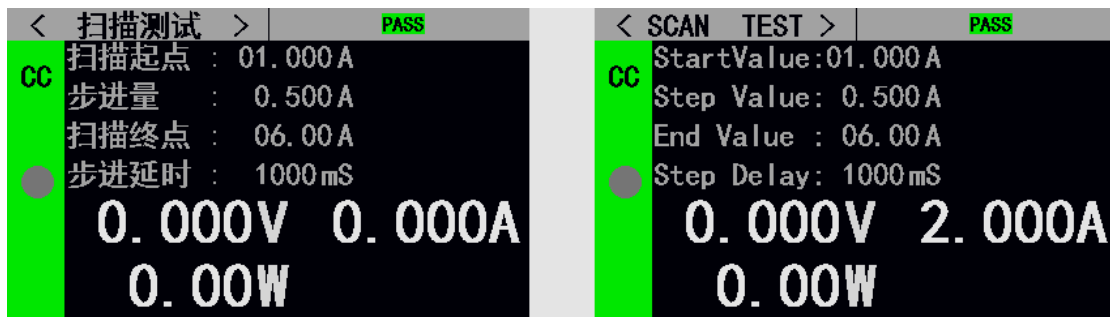


Fig. 2.7.2 scan test interface

2.8 Battery test operation

Battery test function is often used to test battery discharge performance, the electronic load can work in a constant current or resistance mode, can be convenient to determine the discharge capacity of the battery.

Parameter setting interface operation instructions: 1. Press the [Shift]+ [◀] (Menu) key to enter the battery settings interface under the battery test main interface; 2. Select the operation items by the rotary knob; 3. Switch the settings options by pressing the [Enter] key for non-digital parameters; 4. For digital parameters, press the [Enter] key to enter the editing mode, select the appropriate number of digits through the direction key, and then rotate the spin. Button adjustment value, [Enter], [Esc] key quit editing; 5. press [Esc] to return to the next level interface.

Test interface operation instructions: 1. Press [On/Off] to start or close mode.

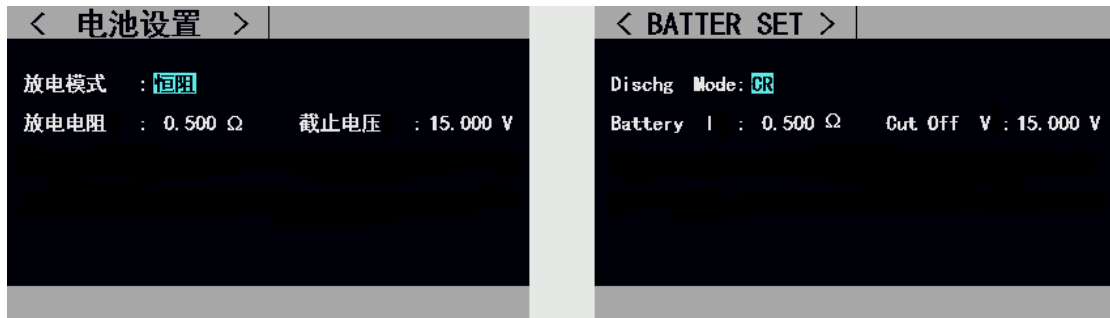


Fig. 2.8.1 battery test setup interface

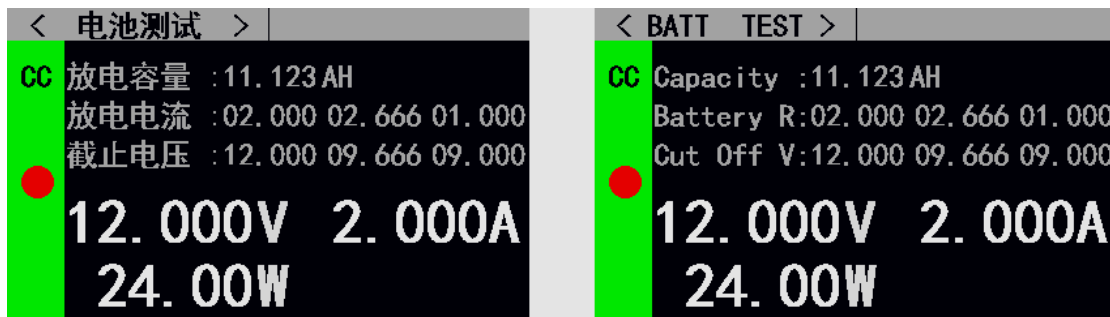


Fig. 2.8.2.1 battery test CC interface

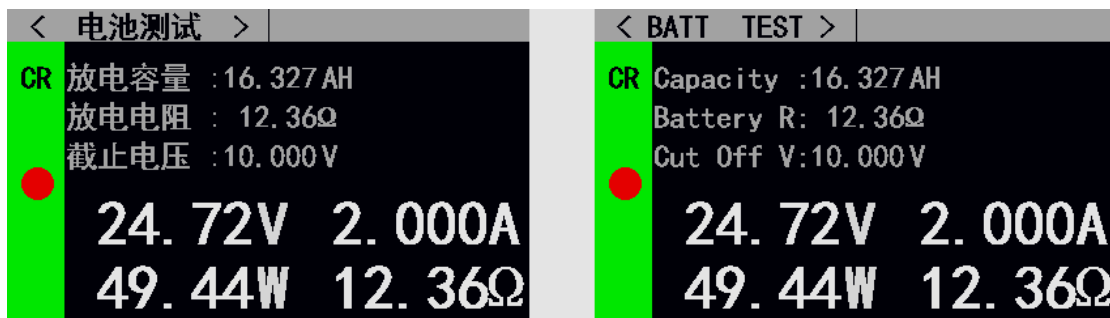


Fig. 2.8.2.2 battery test CR interface

2.9 LED test operation

CR-LED test can simulate the characteristics of the real LED lamp. By adding the diode on-voltage setting in the traditional CR mode, when the load input voltage exceeds the diode on-voltage, the load begins to work, which can truly reflect the load capacity of the LED driving power supply.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction

key, and then adjust the value by a rotary knob, [Enter] or [Esc] key to exit editing. 3. press [On/Off] to start or close mode.

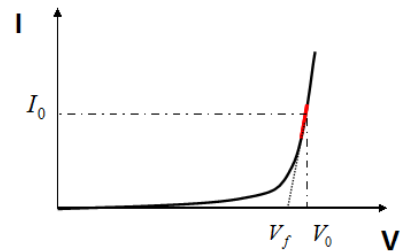
选项说明:

Option description	Option content	Option description
LED Vo:	0---Vmax	LED Stable working voltage of constant current source carrying LED lamp
LED Io:	0---Imax	LED Constant current source output current
LED Coeff:	0.01—1	The ratio of the voltage on the Rd to the total voltage in the loop.

The above parameters can be used as follows: (1) (2) The conduction voltage and the impedance of the LED can be obtained by two formulas. Vf is defined as the diode conduction voltage and Rd as the Led impedance.

$$R_d = (V_o / I_o) * \text{Coeff} \quad (1)$$

$$V_f = V_o * (1 - \text{Coeff}) \quad (2)$$



LED characteristic curve

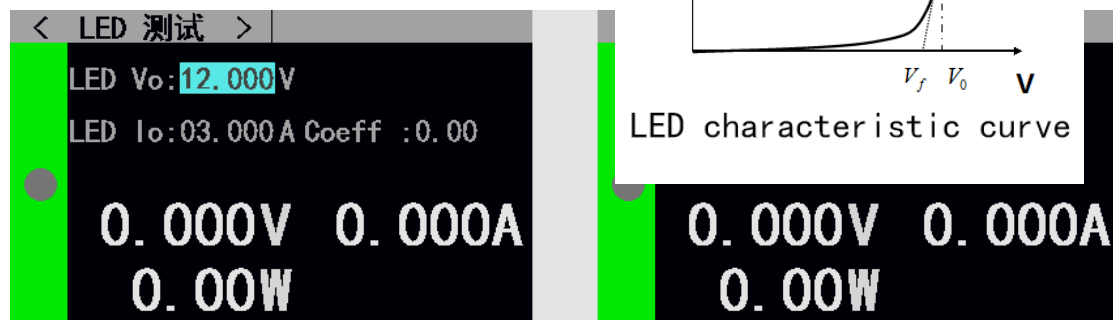


Fig. 2.9 LED test interface

2.10 Short circuit test operation

The load can simulate a short-circuit circuit at the input end. Under short-circuit test, the actual value of the load short circuit depends on the maximum output of the power supply.

Operation description: 1. Select the operation item by rotating the knob. 2. set parameters. Press the [Enter] key to enter editing mode, select the appropriate number of digits by the direction key, and then adjust the value by a rotary knob, [Enter] or [Esc] key to exit editing. 3. press [On/Off] to start or close mode.

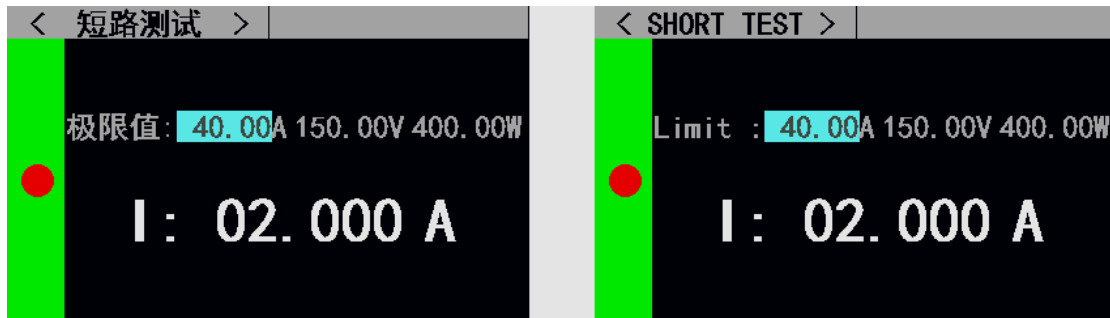


Fig. 2.10 short circuit test interface

2.12 Protection function

The load provides overcurrent, overvoltage, overpower, overtemperature, and polarity reversal protection (prompt information is based on physical drawings).



2.13 Trigger function

Load has trigger function. It is mainly used in dynamic and list testing, and is used to start the next transformation. Load supports three triggering modes: 1. manual (through the front panel [Trigger] button trigger). 2. external (triggered by rear panel trigger port). 3. bus (triggered by program controlled instruction through RS-232 bus interface).

2.14 Qualification test operation

Qualification test is an additional function of the basic measurement mode CC/CV/CR/CP. After opening the qualification test function, it can real-time detect whether the current test is within the set limit and display Pass/Fail in the main interface of the basic measurement mode.

Parameter setting interface operation instructions: 1. Select the operation by turning the knob; 2. Switch settings by pressing the Enter key for non-numeric parameters; 3. For numeric parameters, press the Enter key to enter editing mode, select the corresponding digits by the direction key, then rotate the knob to adjust the value, [Enter] or [Esc] key to exit the editing; 4. Press the [Esc] to return to the next level Interface.

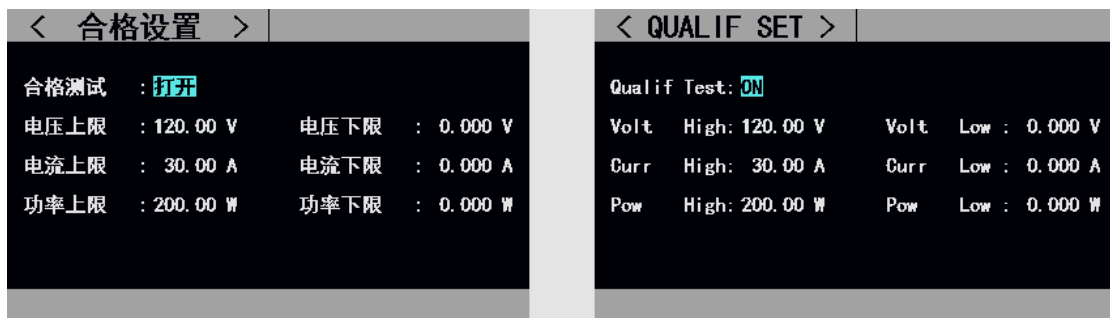


Figure 2.14.1 qualification test setup interface

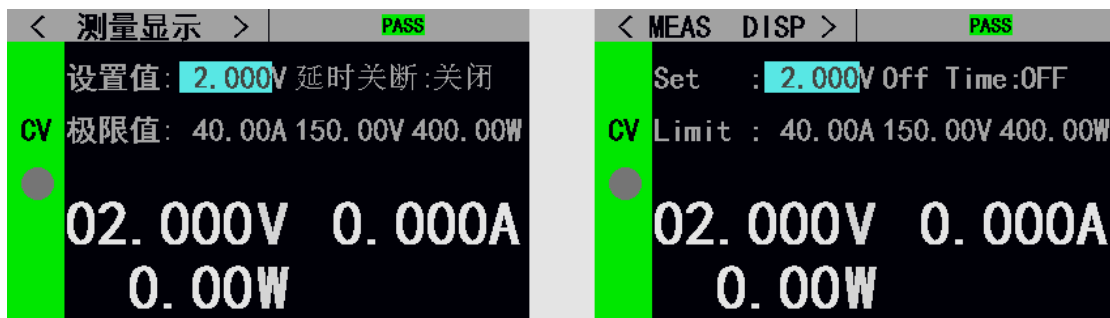


Fig. 2.14.2 opening the interface after qualification test

2.15 Other system settings

2.15.1 Keyboard lock function

In order to prevent user misoperation, the load also adds locking function. The title bar displays the lock identification. In the locked state, all keys, including knobs, are locked except for the [On/Off], [Enter,] [Shift]+ [▶] keys. In addition, in the lock state, the lock bar will appear in the icon bar, and the icon will disappear when the lock is unlocked. Long press [Enter] key 3S can switch in lock and unlock state.

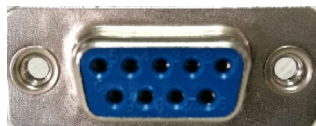
2.15.2 External interface function

ET54 series is equipped with RS232 and USB communication interface, users can choose any one interface to complete the communication with the computer.

◆ USB interface:

After connecting the load and PC through USB public connection line, the PC can communicate with the load by serial port software or PC, configure and communicate with RS232 interface mode.

◆ RS232 interface:



Interface	Pin	Pin definition	Explain
RS232	2	RXD	RS232 interface
	3	TXD	RS232 interface
	5/6	GND	
Indicator interface	4	PASS	Test result level output
	7	NTRI	External trigger input
	8	FAIL	Test result level output
	9	RUN	Operation state level output

Communication interface specification: RS-232 interface supports SCPI protocol, and can be programmed using SCPI command. When using RS232 interface for data communication, it is necessary to configure the communication parameters on PC and load side. For example, the communication parameters of load can be configured in the communication settings interface, as shown in Figure 2.5.2 communication settings interface.

Indicate interface specification: The output of the test result and the indication of the running state are valid. The low level output is valid. The default output is high level 3.3V. For external trigger input pins, the falling edge is effective, and the two falling edge interval should be greater than 10ms.



Figure 2.15.2 communication setup interface

Four、technical specifications

Model	ET5410	ET5420	ET5411
Number of channels	single channel	Double channel	single channel
Rated input	power	400W	400W
	input voltage	0-150V	0-150V
	Input current	0-40A	0-40A(Each channel20A)
Constant voltage mode	range	0.1~19.999V 0.1~150.00V	
	Resolving power	1mV 10mV	
	Accuracy	$\pm(0.05\%+0.02\%FS)$	
Constant current mode	range	0~3.000A 0~40.00A	0~3.000A 0~20.00A
	Resolving power	1mA 10mA	
	Accuracy	$\pm(0.05\%+0.05\%FS)(0\sim30A)$ $\pm(0.08\%+0.1\%FS)(30\sim40A)$	$\pm(0.05\%+0.05\%FS)$
Constant resistance mode	range	0.05~4.5k Ω	
	Resolving power	16bit	
	Accuracy	$\pm(0.1\%+0.5\%FS)$	
Constant power mode	range	0~400W	0~200W
	Resolving power	10mW	
	Accuracy	$\pm(0.1\%+0.5\%FS)$	
Dynamic test function	Pattern	CC	
	T1&T2	1ms~3600s; Resolving power: 1ms	
	Accuracy	0.1%+1mS	
Battery test function	Voltage range	0~120V	
	discharge capacity	240Ah	

	Resolving power	1mA		
	Test time	1s~16h		
measuring range				
Voltage readback value	range	0~19.999V 0~150.00V	0~19.999V 0~500.00V	
	Resolving power	1mV 10mV		
	Accuracy	±(0.05%+0.1%FS)		
Current readback value	range	0~3.000A 0~40.00A	0~3.000A 0~20.00A	0~3.000A 0~15.00A
	Resolving power	1mA 10mA		
	Accuracy	±(0.05%+0.1%FS)(0~30A) ±(0.08%+0.1%FS)(30~40A)	±(0.05%+0.1%FS)	
Power readback value	range	400W	200W	400W
	Resolving power	10mW		
	Accuracy	±(0.1%+0.5%FS)		
Scope of protection				
Overvoltage protection		Overvoltage protection greater than 155V		Overvoltage protection greater than 520V
Overcurrent protection		More than 45A cut off input	More than 22A cut off input	More than 16A cut off input
Over power protection		420W	220W	420W
Overtemperature protection		85℃		