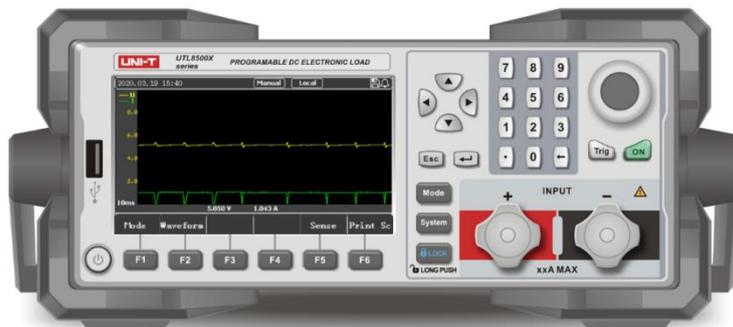


UNI-T®

UTL8500X Series Programmable DC Electronic Load User Manual



Preface

Thank you for purchasing this brand new product. In order to use this product safely and correctly, please read this manual thoroughly, especially the safety notes.

After reading this manual, it is recommended to keep the manual at an easily accessible place preferably close to the device, for future reference.

Copyright Information

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UNI-T is the registered trademark of Uni-Trend Technology (China) Co., Ltd.

UNI-T products are protected by patent rights in China and other countries, including issued and pending patents. Uni-Trend reserves the rights to any product specification and pricing changes.

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Warranty Service

The instrument has a warranty period of one year from the date of purchase. If the instrument is damaged due to improper operation by the user during the warranty period, the maintenance fee and the costs caused by the maintenance shall be borne by the user, and the instrument shall be maintained by the company for life.

If the original purchaser sells or transfers the product to a third party within one year from the date of purchase of the product, the warranty period of one year shall be from the date of the original purchase from UNI-T or an authorized UNI-T distributor. Power cords, accessories and fuses, etc. are not included in this warranty.

If the product is proved to be defective within the warranty period, UNI-T reserves the rights to either repair the defective product without charging of parts and labor, or exchange the defected product to a working equivalent product (determined by UNI-T). Replacement parts, modules and products may be brand new, or perform at the same specifications as brand new products. All original parts, modules, or products which were defective become the property of UNI-T.

The “customer” refers to the individual or entity that is declared in the guarantee. In order

to obtain the warranty service, "customer" must inform the defects within the applicable warranty period to UNI-T, and perform appropriate arrangements for the warranty service. The customer shall be responsible for packing and shipping the defective products to the designated maintenance center of UNI-T, pay the shipping cost, and provide a copy of the purchase receipt of the original purchaser. If the product is shipped domestically to the location of the UNI-T service center, UNI-T shall pay the return shipping fee. If the product is sent to any other location, the customer shall be responsible for all shipping, duties, taxes, and any other expenses.

Guarantee Limit

This warranty shall not apply to any defects, malfunction or damages caused by accidental, machine parts' wear and tear, using outside the product's specifications, improper use, and improper or lacking of maintenance. UNI-T under the provisions of this warranty has no obligation to provide the following services:

- a) Any repair damage caused by the installation, repair, or maintenance of the product by non UNI-T service representatives;
- b) Any damage caused by improper use or connection to an incompatible device;
- c) Any damage or malfunction caused by the use of a power source not provided by UNI-T;
- d) Any maintenance on altered or integrated products (if such alteration or integration leads to an increase in time or difficulty of product maintenance).

This warranty is written by UNI-T for this product and it is used to substitute any other express or implied warranties. UNI-T and its distributors do not offer any implied warranties for merchantability or applicability purposes. For violation of this guarantee, UNI-T is responsible for the repair or replacement of defective products as the only and complete remedy available to customers. Regardless of whether UNI-T and its distributors are informed that any indirect, special, incidental, or consequential damage may occur, the UNI-T and its distributors shall not be responsible for any of these damages.

Safety Information



Warning



Danger: To avoid electric shock and personal injury, please follow the following guidelines.

Disclaimer

Please read the following safety information carefully before using the instrument. UNI-T will not be liable for the personal injury and property losses caused by the user's failure to comply with the following terms.

Correct connection of ground wire

To avoid electric shock, please use the provided cable to connect and make sure that the product is properly grounded before use.

Operating voltage

Please ensure that the main supply does not exceed 10% of rated operating range to prevent product damage.

Use the correct power cord

Only use the dedicated UNI-T power cord to connect the measured power supply and the electronic load to ensure that there is no overheat by short-circuit current, otherwise electric shock may occur.

Input voltage

Please notice the product symbols before connecting. The instrument supports 2 kinds of AC input method: 110V and 220V. Please check if the switch of load matches with the input power source and if the fuse is correctly installed.

Please do not use the instrument in inflammable and explosive environment.

Do not use or store the instrument in high temperature, high humidity, flammable, explosive and strong magnetic field environments.

Do not open the housing of the product.

Non-professional maintenance personnel are not allowed to open the housing to repair the instrument. The undischarged charge still exists for a period of time after the instrument is turned off, which may cause electric shock.

Do not use the product if it operates abnormally.

Please contact UNI-T authorized service personnel for inspection. Please disconnect the power supply and stop using.

Never use the instrument beyond the dedicated range of instruction.

The provided protection will be weakened or invalid. It is forbidden to use this product in life-support system or other devices with safety requirements.

Only trained personnel can perform the maintenance program.

Any maintenance, adjustment, or replacement of parts must be performed by UNI-T authorized maintenance personnel.

Safety symbols

	Direct current		Alternating current		Direct and alternating current
	Three phase AC		Grounding		Protective grounding
	Signal grounding		Danger		Warning
	Neutral wire or central wire		Live wire		On (Power)
	Off (Power)		Backup power		Ground Terminal for Chassis

Environment-Friendly Use Period (EFUP)



This product contains certain hazardous substances and can be used safely during its environmental-friendly use period (EFUP) of 40 years, as shown in the symbol on the left. If the specified time is exceeded, the product should be recovered.

Waste Electrical and Electronic Equipment (WEEE) Instruction 2002/96/EC



Do not dispose the product and its accessories in trash bin.

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1. Product Overview

- Product Series
- Front Panel
- Rear Panel

1.1 Product Series

UTL8500X series DC electronic load contains 3 models: UTL8511S, UTL8512S and UTL8511C.

Model	Measurement range		
	Voltage	Current	Power
UTL8511S	0~150V	0~30A	0~150W
UTL8512S	0~150V	0~30A	0~300W
UTL8511C	0~150V	0~15A	0~150W

UTL8500X series DC electronic load comes with 4.3-inch LCD screen, wide power range and up to 0.1mV/0.1mA resolution. It supports multiple test modes: dynamic test, overload test, auto test, list test, battery test and CR-LED test, etc. The instrument is a great tool in areas of electronic performance test, battery set test, power supply test, new energy test, aerospace industries, high-power test, labs, R&D and production line, etc.

Equipped with standard RS232 communication interface and support more optional interfaces, UTL8500X series offer multiple solutions for users' different design and testing requirements.

UTL8500X series electronic load supports waveform display.

UTL8511C also supports automatic testing of fast charging sources.

1.1.1 Features

- Measurement range: 150W/300W,150V,15A/30A
- Four basic test modes: CC/CV/CR/CP
- Function of remote current monitoring and external triggering
- High resolution of 0.1mV/0.1mA
- Dynamic voltage/current test with up to 10k dynamic frequency
- Voltage/current sampling rate: 40kHz
- CR-LED test, power source rise/fall time test
- Protections of over-voltage/ under-voltage/ over-current/ over-power/ overheat/ anti-reverse connection
- The list mode comes with storage function, and supports the saving and applying of

the external U disk and the upgrade of the U disk system.

- Screenshot function with list storage & recall
- Equipped with standard RS232 interface and support more extension interfaces (USB or RS-485 converted by RS-232)
- Remote voltage compensation input function
- Configured with upper computer software for remote control and monitoring
- Waveform display
- Support automatic testing of fast charging sources (UTL8511C only)
- Three dual test modes: CR + CC, CV + CR, CV + CC
- OCP/OPP/OVP test and load effect test
- Intelligent cooling fan and power-down memory function
- Independent short-circuit test function (Only for CC/CV/CR/CP mode)
- List auto-power-on function and over-voltage short circuit
- Pause function in list mode

1.2 Front Panel

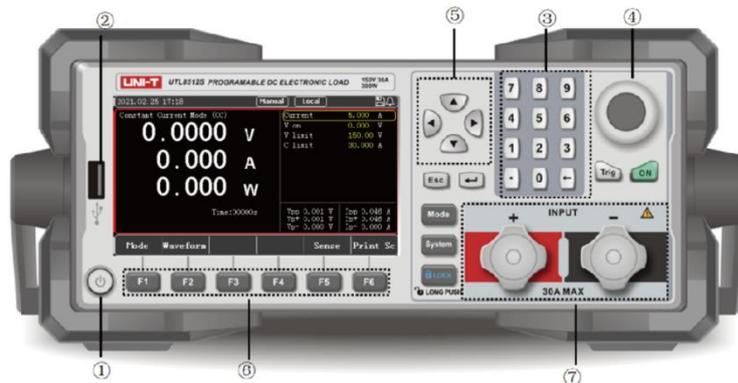


Figure 1-2-1 Front Panel (UTL8512S)

Table 1-2-1 Introduction of Front Panel

No.	Items	Description
①		Power button: press it to power on/off
②		USB interface: Users can save the test data and screenshots to U-disk. It can also be used in list test files storage/recalling and system upgrade.
③		Numeric keyboard: It is used to enter numbers and decimal points.
		Delete the input values
④		Pulse knob: It is used to adjust the parameters or move cursor in the menu.

⑤		Direction keys: They are used to move cursor or adjust the selected value.
⑥		F1-F6 function keys: They are used to perform the function displayed on the screen.
⑦		Input terminals: They are used to connect power source. Please do not inversely connect to prevent damage.
		Mode shortcut key: Press to enter setting interface to select CC, CV, CR, CP and other modes.
		System configuration: It is used to set the system parameters, operating parameters, file operations and view the instrument information.
		In order to avoid misoperation, the instrument adds keyboard lock function. After pressing the lock key, other keys are disabled except the ON key. When the key light is on, the keyboard has been locked; long press for 1-2s to unlock.
		Manual trigger button: Press once to operate a manual trigger.
		Load input control: ON/OFF
		It is used for the test page to return to the initialization interface or the mode interface to return to the previous level or exit.
		This button is used to confirm/modify the selected items or parameters.



Figure 1-2-2 Terminals on Front Panel (UTL8511C)

NO.	Figure	Description
7-Left		The input terminal+ is used to connect to the on-load power supply. Please do not reverse connection to avoid damage to the instrument. Refer to Figure 1-2-3.
7-Right		The input terminal- is used to connect the on-load power supply, please do not reverse connection to avoid damage to the instrument. Refer to Figure 1-2-3.

<p>7- Middle</p>		<p>It is the male end of the quick-charging connector. These 4 pins are used to connect the 4 terminal holes of the female end of the quick-charging test board assembly, as shown in Figure 1-2-3. Note: This jack socket has a fool-proof design. You need to carefully align the direction before matching.</p>
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Figure 1-2-3 Connection of Terminal and Quick Charge Test Board (UTL8511C)

1.3 Rear Panel

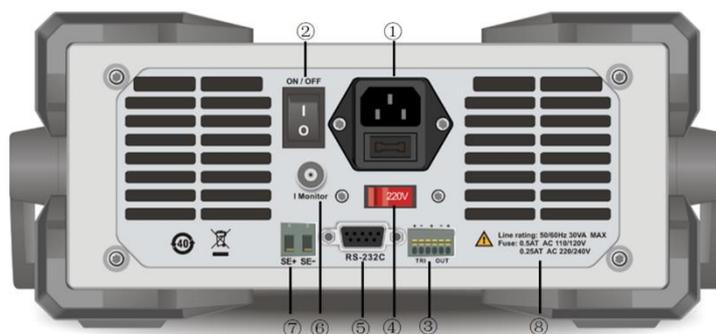


Figure 1-3-1 Rear Panel

Table 1-3-1 Introduction of Rear Panel

No.	Items	Description
①	AC220/110V socket	AC power input socket (with fuse)
②	ON/OFF power button	
③	Trigger signal terminal	Please refer to part 7.2 for details.
④	AC220/110V transfer switch	Voltage scale switch of AC power source

⑤	RS232 interface	External communication interface to realize the remote control with the load
⑥	Current monitor terminal	BNC current monitor output terminal
⑦	Sense (remote compensation) terminal	Remote voltage sampling for electrical load
⑧	Specification of fuse	250V/0.25A 250V/0.5A

2. Inspection and Installation

- Packing List
- Requirements of Power Supply
- Operating Environment
- Cleaning
- Handle of Instrument

2.1 Packing List

1. Check whether the appearance of the product is damaged, scratched or has other defects;
 2. Check whether the instrument accessories are missing according to the packing list.
- If it is damaged or the accessories are missing, please contact Uni-Trend Instrument Sales Department or the distributor immediately.

Items	Quantity	UTL8511S UTL8512S	UTL8511C	Remarks
Programmable DC electronic load	1pc	√	√	The model is subject to the actual order.
Power cord	1pc	√	√	Use only a specified power cord which is authorized in the country of use.
Spare fuse	2pcs	√	√	250V/0.5A
User manual	1pc	×	×	Users can download the manuals from UNI-T's

				official website.
Quick charging test board	1pc	×	√	

2.2 Requirements of Power Supply

UTL8500X series can only be used in following conditions:

Parameters	Requirements
Voltage	AC 220/110 ($\pm 10\%$)V
Frequency	50/60Hz
Power	50W
Fuse	AC220V input voltage: 250V/0.25A AC110V input voltage: 250V/0.5A

- Three-core power cord is provided. Please make sure that the ground wire of three-phase socket is properly grounded before use.
- The instrument comes with 220V/110V power transfer switch. Before connecting to the power supply, please check and ensure that the switch is in correct position.
- 250V/0.25A (5x20mm) fuse is selected and installed for the instrument (220V) with a spare fuse in the fuse case.
- In addition, 2 spare fuses of 250V/0.5A are provided for input voltage of AC 110V.
- When replacing the fuse, please remove the external power cord first, then open the fuse slot under the power interface, take out the old fuse and replace it with a new one, and install the fuse slot back after completion.



Warning: please do not use the damaged power cord to avoid danger. Use the 250V/0.5A fuse when 110V AC power is input.

2.3 Operating Environment

UTL8500X series can only be used in common-temperature and low-condensing zone. The general environment requirements are listed as follows. During the on-load process, the speed of the cooling fan will adjust based on the change of the cooling fin's temperature.

Environment	Requirements
Operating temperature	0°C~40°C
Operating humidity	20%~80% (Non-condensing)
Storage temperature	-10°C~60°C
Altitude	≤2000m
Degree of pollution	II

2.4 Cleaning

To avoid electric shock, please unplug the power cord before cleaning.

Clean the housing and the panel with a soft damp cloth, and make sure it is completely dry.

⚠Warning: Do not use solvents like alcohol and gasoline.

Do not block the cooling outlet and clean the housing regularly (Unplug the power supply before cleaning).

2.5 Handle of Instrument

The handle of UTL8500X is adjustable. Please hold the handle by both sides, pull outward, and rotate it as needed, as shown in figures below.

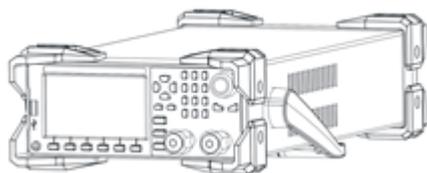


Figure 2-5-1 Original Handle Position
Measurement

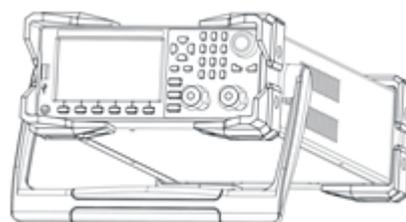


Figure 2-5-2 Handle Position during
Measurement

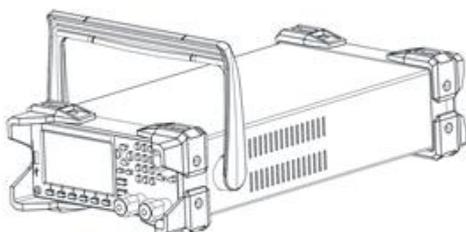


Figure 2-5-3 Removing Position



Figure 2-5-4 Lifting Position

3. Measurement Display Interface

- Power on and Run
- Introduction of Screen Display

3.1 Install Load Connection Wire

The electronic load is connected to the tested object through the "+" and "-" terminals on the front panel. When making input connections, users need to pay attention to whether the core diameter of the input wiring is appropriate and whether the positive and negative polarities correspond. The wire connecting to the load must be thick enough to reduce the voltage drop on the wire. When measuring large currents, a larger voltage drop will be generated, so it is recommended to use the Sense terminal of the electronic load for compensation to ensure measurement accuracy.



Note: Before the connection and test, be sure to check whether the polarity of the input terminal is connected correctly, otherwise the instrument may be damaged.

3.2 Power on and Run

The correct power-on and self-inspection processes of the electronic load are as follows:

1. To power the electronic load on, please connect the power cord correctly, adjust the ON/OFF switch on the rear panel to ON, and press the power button on the front panel. At this time, the power button is green. The electronic load screen will display the progress bar of current power-on and self-inspection, instrument information and other parameters.
2. After initialization, the current measuring status will be displayed on the screen. If the start-up mode has been set, the instrument will enter the preset measurement mode directly.

The completion of the correct power-on and self-inspection indicates that the electronic load meets the factory standards, and users can use it normally.

Turn off the power button on the front panel and adjust the ON/OFF switch on the rear panel to OFF when the instrument is not in use.



Note: Please read through the safety information in preface carefully before using the load.



Warning: Please make sure that the power supply voltage is consistent with the supply voltage before turning on the power, otherwise the instrument will be burnt out. Please be sure to connect the main power plug to a power socket with ground protection. Do not use a wiring board without ground protection.

3.3 Introduction of Screen Display

After entering into the test mode, the LCD screen will be divided into several areas to display different information.

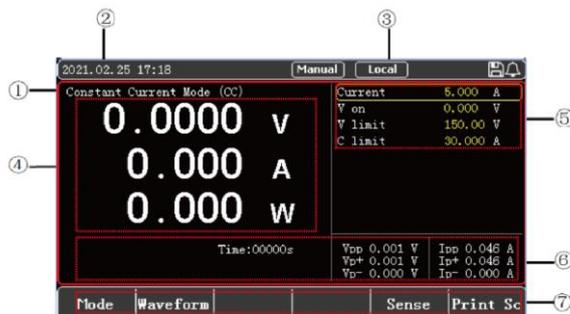


Figure 3-2 Interface of Measurement

3.3.1 Display of Measurement Interface

No.	Items	Description
1	Mode	Current measurement mode or status
2	Time	Current system time
3	System icon	Display the status of U disk, remote compensation, short-circuit test and trigger function
4	Parameters	Real-time voltage, current and power
5	Set value	Mode setting information, voltage and current value
6	Other parameters	Real-time running time, other processes and result data
7	Mode selection (soft keyboard)	Select the work mode and operate the corresponding functions at the bottom of the screen

3.3.2 Introduction of Status Bar

Status description	Display Status	Description
Measurement status	Status (Mode)	Current measurement status or work mode
Control mode	Local/Remote	Current operating mode: Local/Remote
Screenshot status	Waiting/OK/Fail	Saving the picture/saved successful/fail
Trigger mode	Manual/External	Current trigger mode: Manual/External
Remote compensation	Sense	Sense displays on the screen: remote compensation has been turned on

USB status		USB storage device has been connected
System time	0000.00.00 00:00	Current system time: Year/Month/Date /Hour/ Minute
Alarm		Audio alarm is on.
Trigger ready	Trig	Wait for trigger, the icon will disappear after triggering
Start-up delay	Delay	Wait for start-up delay, the icon will disappear when reaching the delay time, and then start up
Short-circuit	Short	In short-circuit test mode
Pause operation	Pause	In pause status

3.3.3 Running Indicator

UTL8500X series electronic load comes with running indicator on the ON button. In on-load mode, the indicator will light up, indicating that the load is in a loaded status. Pressing the ON button again can stop loading and the indicator will go out.

4. Measurement Settings

- Constant State Test Modes (CC/CV/CR/CP)
- More Modes (Dynamic, List, Dual, OCP/OPP, etc.)
- Parameter Input and Loading Measurement
- Waveform
- Trigger Method
- Sense
- Screenshot
- Saving and Applying of Configuration

4.1 Constant State Test Modes

There are four types of constant state test modes: constant current (CC), constant voltage (CV), constant resistance (CR) and constant power (CP). In the initialization interface, users can select [Mode] by pressing the soft key at the bottom of the screen, and then press [CC], [CV], [CR], [CP] to enter the corresponding mode.

Users can also press [More] to select other modes, see Table 4-1.

Table 4-1 Introduction of Constant State Test Modes

Name	Description
CC mode	The electronic load always consumes constant current regardless of the input voltage.
CV mode	The electronic load changes current consumption to keep the input voltage as the set value.
CR mode	The electronic load is equivalent to a resistor. It changes the input current as the voltage changes.
CP mode	The electronic load always consumes constant power. It reduces the current when the voltage rises to remain constant power.
More modes	There are many modes under this menu that can be selected by the cursor to meet diverse testing requirements.
V, A, W parameters	Present voltage, current and power value
Status bar	Current mode, time, status and other parameters

In constant state test modes, set current/voltage/resistance/power and other parameters will be displayed on the right side of screen. Input on-load parameters that need to be set by numeric keyboard or knob. In on-load status, Time, Vpp, Ipp and other parameters will be displayed at the bottom of the main screen.

4.1.1 Constant Current Test

In CC mode, the electronic load always consumes constant current regardless of the input voltage.

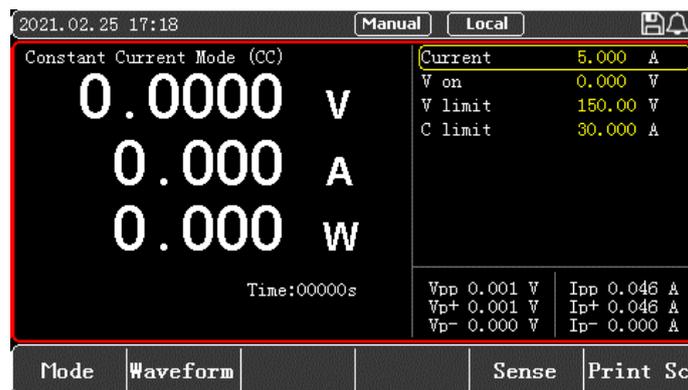


Figure 4-1-1-1 Setting Interface of CC Mode

Operation steps:

1. In initial interface, select [Mode], and then press [CC] to enter the setting interface of <Constant Current CC>.
2. Move the cursor to current setting by pulse knob, and press the Enter button  to change the current value (the value changes from yellow to white) by keyboard or pulse

- knob. Press the Enter button  again to confirm. At this time, the set current value changes from white to yellow.
- Other parameters can be modified in a similar way.
 - Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

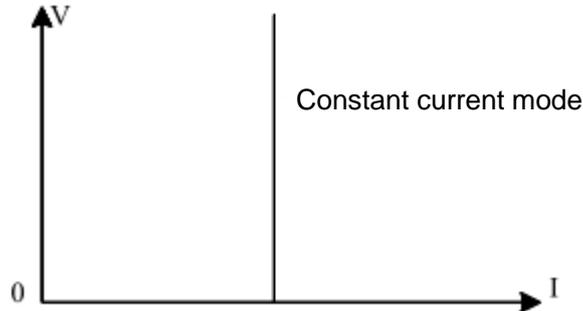


Figure 4-1-1-2 Relationship of Voltage and Current in CC Mode

4.1.2 Constant Voltage Test

In CV mode, the electronic load changes current consumption to keep the input voltage as set value.



Figure 4-1-2-1 Setting Interface of CV Mode

Operation steps:

- In initial interface, select [Mode], and then press [CV] to enter the setting interface of <Constant Voltage CV>.
- Move the cursor to voltage setting by pulse knob, and press the Enter button  to change the voltage value (the value changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set voltage value changes from white to yellow.
- Other parameters can be modified in a similar way.
- Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the

running indicator light goes out.

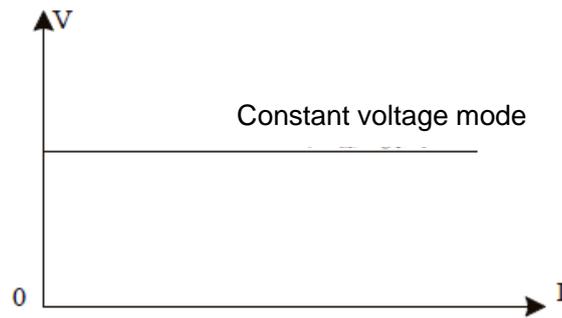


Figure 4-1-2-2 Relationship of Voltage and Current in CV Mode

4.1.3 Constant Resistance Test

In CR mode, the electronic load is equivalent to a resistor. It changes the input current as the voltage changes to maintain a constant resistance value.

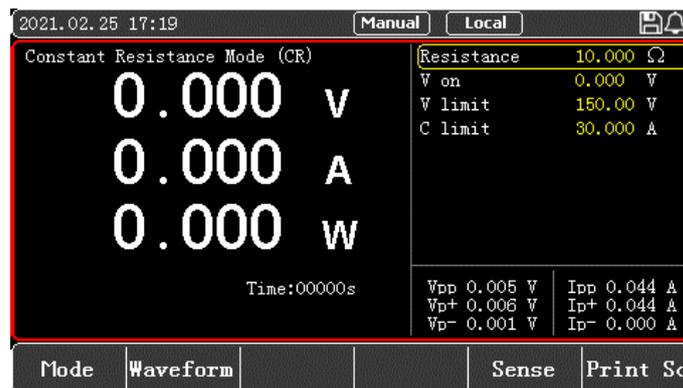


Figure 4-1-3-1 Setting Interface of CR Mode

Operation steps:

1. In initial interface, select [Mode], and then press [CR] to enter the setting interface of <Constant Resistance CR>.
2. Move the cursor to resistance setting by pulse knob, and press the Enter button  to change the resistance value (the value changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set resistance value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

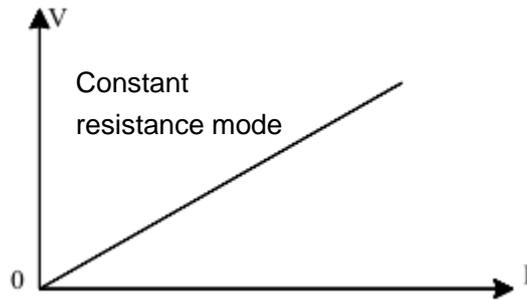


Figure 4-1-3-2 Relationship of Voltage and Current in CR Mode

4.1.4 Constant Power Test

In CP mode, the electronic load consumes constant power, and it will adjust the current according to the voltage change to maintain the set power value.

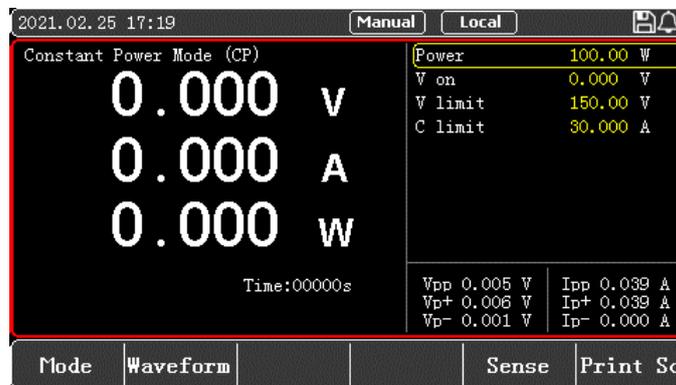


Figure 4-1-4-1 Setting Interface of CP Mode

Operation steps:

1. In initial interface, select [Mode], and then press [CP] to enter the setting interface of <Constant Power CP>.
2. Move the cursor to power setting by pulse knob, and press the Enter button  to change the power value (the value changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set power value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

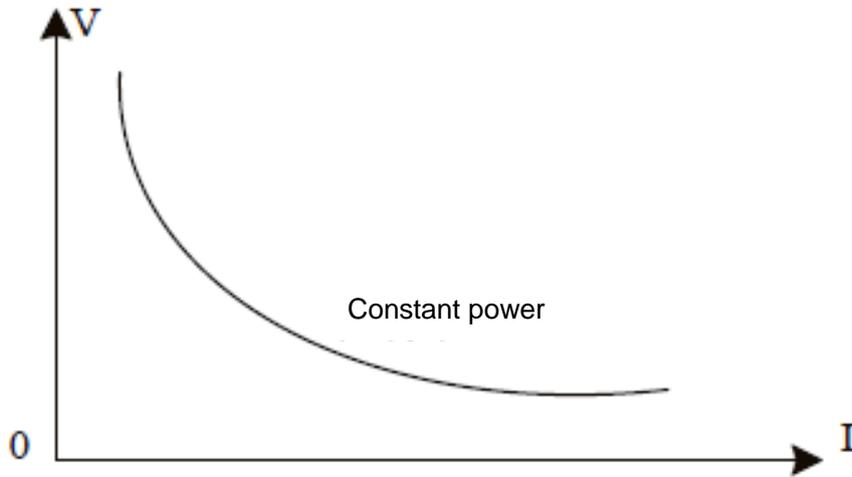


Figure 4-1-4-2 Relationship of Voltage and Current in CP Mode

4.2 More Modes

To meet various test requirements, UTL8500X series electronic load offers more test modes for choice, including Dynamic, List, Dual, OCP/OPP, CR-LED, Battery, Load Effect, OVP, Short Circuit, Time and more, as shown in Table 4-2.

Table 4-2 Introduction of More Modes

More modes	Description
Dynamic	Two different voltage/current values are set. The load will switch between these two values when testing.
List	Up to 16-step different loading modes can be set. It can customize the stepping mode and the upper and lower limits of test and judgment, and have the function of saving and memorizing for each group of test modes.
Dual	Two constant test modes combine to form a dual on-load mode, including CR+CC, CV+CR and CV+CC.
OCP/OPP	Set the overload current/power/voltage value to identify whether the protection function of the tested object is normal. The load continuously increases the set load value during the test, and detects the value of the tested object when performing the protection function.
CR-LED	The test mode is for LED power supply, which can simulate the operating parameters (voltage/current and LED coefficient) to measure the performance of LED power supply.
Battery	Discharge the measured battery by CC/CR/CP mode. The test will end automatically when reaching the ending value. The battery capacity and the discharge graph will also be display.

Load effect	Load according to three different loads of the set value to calculate ΔV and Reg (load regulation).
OVP	Set the overload current/power/voltage value to identify whether the protection function of the tested object is normal. The load continuously increases the set load value during the test, and detects the value of the tested object when performing the protection function.
Short circuit	A short-circuited circuit will be simulated in input terminal to test if the protection function of measured object can work normally when its output terminal is short-circuited.
Time	For the start/drop time test of the switching power supply, set the start value and end value of the load. After the voltage of the tested object is stabilized, the time it takes for the process to rise to the stable voltage is detected.

4.2.1 Dynamic Mode

UTL8500X series electronic load has two dynamic loading modes: CC and CV. In the dynamic mode, users can set two fixed-value parameters for corresponding constant state modes. Through the set operation mode, the load is switched back and forth between the two values.

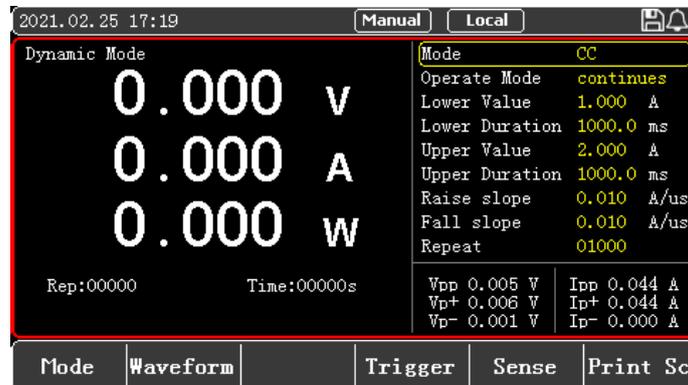


Figure 4-2-1-1 Interface of Dynamic Mode

Parameters of dynamic mode:

Dynamic test	Description of parameters
Mode	Dynamic on-load mode: CC/CV
Operate mode	Continues: The load will automatically and continuously switch between two set high/low values till the operation reaches the set repeating times, and then the test ends.
	Pulse: Lower parameters will be on-loaded at first, and then the load

	will switch to an upper value each time when it receives a trigger signal, and it will switch back to the lower value at the end of the set time. In pulse mode, lower timing is not necessary because the reverse action will be triggered only once when one trigger signal is received.
	Reverse: Each trigger will lead to the switching of current on-load status, and upper/lower timing is not necessary at this time.
Lower value	Set the lower parameter value
Lower duration	Set the lower on-loading time
Upper value	Set the upper parameter value
Upper duration	Set the upper on-loading time
Rise slope	Set the rise slope
Fall slope	Set the fall slope
Repeat	Set the time of repetition cycles for an operation

For example, in the dynamic CC mode in the figure below, users set the lower and upper current value, and the load will continuously switch the current value back and forth between these two values.

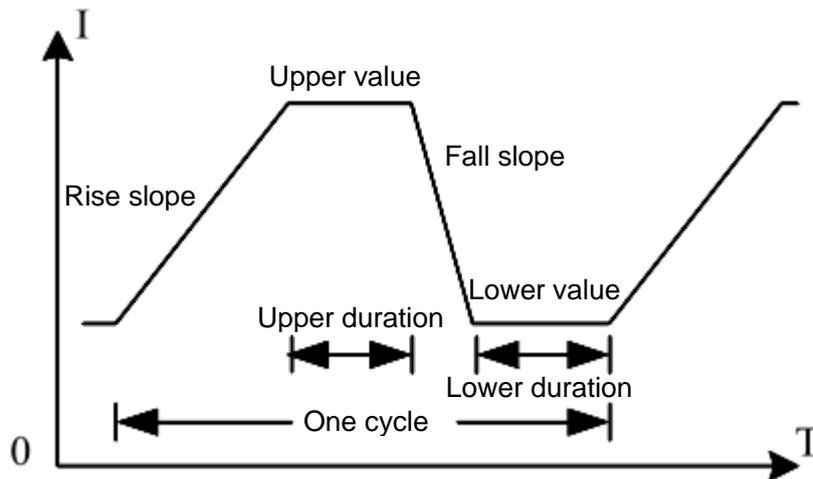


Figure 4-2-1-2 Dynamic Mode

Operation steps:

1. In initial interface, select [Mode], and then press [Dynamic] to enter the setting interface of <Dynamic Mode>.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.

3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

4.2.2 List Mode

The list test function can switch between different modes according to the set parameters. For power products and charger devices, through multi-parameter mixed test, users can have a more comprehensive and in-depth understanding of the operating characteristics of the tested product in actual applications. The setting interface of list mode is shown in Figure 4-2-2 below.

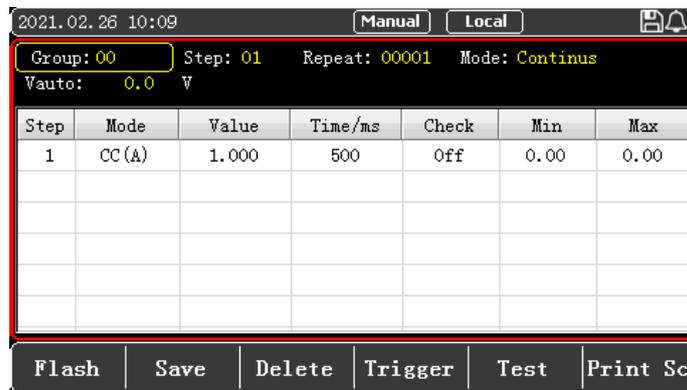


Figure 4-2-2 Setting Interface of List Mode

	List value	Description
Protocol	QC2.0/QC3.0/QC4.0 /PD3.0/BC1.2	Select the quick charge charger protocol supported by the tested power supply. Protocol BC1.2 and single mode DPDN are the same function. (UTL8511C)
QC value	Set the voltage point supported by the quick charge charger	The quick charge charger supports different protocols, and the supported voltage range is different. The system will limit when setting the value. (UTL8511C)
Mode	CC/CV/CR/CP/Open /Short	Select the load mode of current steps
Value	Set the fixed value of the set mode	Set the fixed value of the mode, the default value of Open/Short is 1
Time	200~999999ms	Set the load execution time of each step, any time between 200~999999ms can be selected
Check	Off/Curr/Volt/Power/	Select check items

	VPP/IPP/D+/D-	
Min	Lower limit of check items	Set the lower limit of check items
Max	Upper limit of check items	Set the upper limit of check items

4.2.2.1 Parameter Setting in List Mode

In the setting interface of list mode, the upper area is used to set the list group number and other parameters, as shown in the following table 4-2-2-1.

Table 4-2-2-1 Parameter Setting in List Mode

List mode	Parameters	Description
Group	1~60	Set the group number of the list test parameters for easy calling.
Step	1~16	Set the step of the list test.
Repeat	0~99999	Set the number of repetitions of each measurement in the current mode.
Mode	Continus/Trig/Con+Err/Trig+Err	Set the switching method of each step and the stopping method.

<Group>

The Flash of the electronic load can save 60 groups of list modes. When setting the list parameters, please set a reasonable group number first.

1. Press function key to enter [List] mode, move the cursor to [Group] by rotating the knob, and press the Enter key  or the knob to change the group number value from yellow to white. Input the appropriate group number value through the numeric keyboard, and then press the Enter key  after setting the value. Used/unuse will be displayed behind the number, indicating whether the group number has been used.
2. If the set group number is already in use, used will be displayed, and the original group number parameters will be overwritten when the test file is saved.
3. If the group number has not been used, unuse will be displayed. It will create a new list file after the setting.
4. Select the storage location (Flash memory/U disk) before saving and press the save button to finish saving; record the set group number so that it can be called next time.

<Step>

After setting the group number, rotate the knob to move the cursor to [Step] to set the number of steps for the list test, up to 16 steps can be set.

<Repeat>

Rotate the knob to move the cursor to [Repeat] to set the number of repetitions for each measurement in the current mode. Users can set up to 99999 times.

<Mode>

Rotate the knob to move the cursor to [Mode] to set the current operating mode. Err means that the load will automatically stop loading if there is an abnormality during operation.

There are four options for setting the operating mode: Continues/Trig/Continues +Err/Trig+Err.

Continues: The load will continue to the next step after executing one step until the end of the operation.

Trig: The load will pause after executing a step, and wait for the trigger signal before continuing to the next step.

Err: The test will automatically stop when an overrun or other error occurs during the load operation.

4.2.2.2 Mode Parameter Setting

After setting Group, Step and Mode parameters, the mode parameters for the set step will appear in the list below, as shown in Table 4-2-2-2. Modify the parameters according to the required mode.

Table 4-2-2-2 Mode Parameter Setting

	List value	Description
Mode	CC/CV/CR/CP/Open/Short	Load operation mode
Value	Set constant value	Open/short default value is 1.
Time/ms	200~999999ms	Set the load execution time of each step between 200~999999ms.
Check	Off/Curr/Volt/Power	Select check item
Min	Minimum value of the check item	Set minimum value of the check item
Max	Maximum value of the check item	Set maximum value of the check item

Operation steps:

1. Use the knob or arrow key to move the cursor to a specific line.
2. First select the modes of each step, and press  or the knob to change the current mode. Stop when the desired mode appears, and switch the cursor to set the next parameter by rotating the knob or pressing direction keys
3. The constant value setting only needs to input the number directly after the cursor is selected, and then move the cursor to the next parameter that needs to be changed by

- rotating the knob or pressing direction keys after completion.
- Follow step 3 to set Time, Check, Min and Max. (Note: When the parameter input is not within the correct upper and lower limits, the cursor will not be able to move. Users need to use the delete button to clear the parameter or change it to the correct value.)
 - Other parameters can be modified in a similar way.
 - After setting, press the function key [Test] to enter the <List Mode> test page, as shown in Figure 4-2-2-2.



Figure 4-2-2-2 Test Page of List Mode

- Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users want to suspend the test, they can press the [Pause] button. If they need to stop the load, press the ON button again, and the running indicator light goes out.
- After the test is completed, users can press [Result] to view the test results. If the test result is within the upper and lower limits, Pass will be displayed, otherwise Fail will be displayed instead. Users can check whether each item is passed and save the test record by taking a screenshot.

⚠ Note: The input data should not exceed the upper and lower limits of the current parameters. When the data exceeds the parameter limits, they will not be saved, and the cursor will stay in the grid. At this time, users need to clear or re-enter the appropriate range of parameters. When users need to change the numbers in the list, click Delete to clear the data in the table. After completing each parameter setting in the list, click the Save button for easy calling next time.

4.2.3 Dual Mode

In order to meet more test requirements, the electronic load provides three dual modes: CR+CC, CV+CR and CV+CC. Users can choose the appropriate mode according to the actual situation. CR+CC can be used for power-on test, CV+CR can be used for setting the Von point, and CV+CC can be used for battery discharge test.

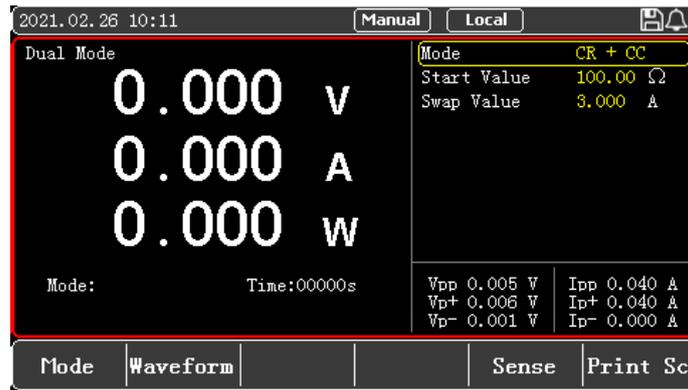


Figure 4-2-3-1 Interface of Dual Mode

Parameter setting in dual mode:

Parameter	Description
Mode	CR+CC/CV+CR/CV+CC
Start value	Set the start value of the dual mode
Swap value	Set the swap value of the dual mode

To use the dual mode, first select the needed mode, and then set the fixed values of the two corresponding modes. When the load starts to load, first start the load according to the fixed value of the first mode, and when the external input changes so that the parameter reaches the set switching value, the load switches to the second load mode.

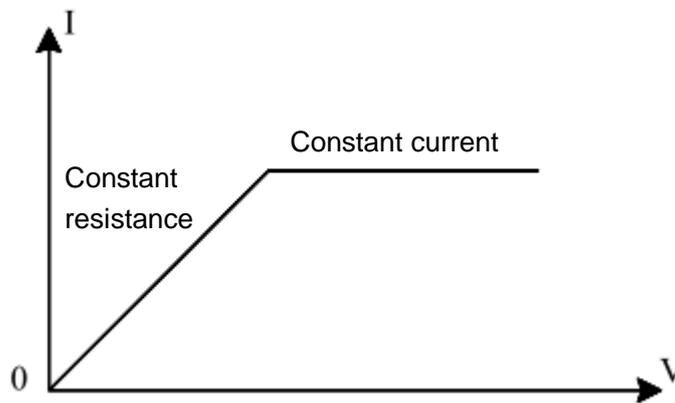


Figure 4-2-3-2 Dual Mode

Description of dual mode:

When using dual mode, it is necessary to set reasonable starting and switching parameters to ensure that the set switching value can be reached during the test.

Operation steps:

1. In initial interface, select [Mode], [More], and then press [Dual] to enter the setting interface.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter

button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.

3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

4.2.4 OCP/OPP Mode

This mode is used to detect the protection function of the tested power supply under overload conditions. UTL8500X series electronic load has two test modes: OCP/OPP.

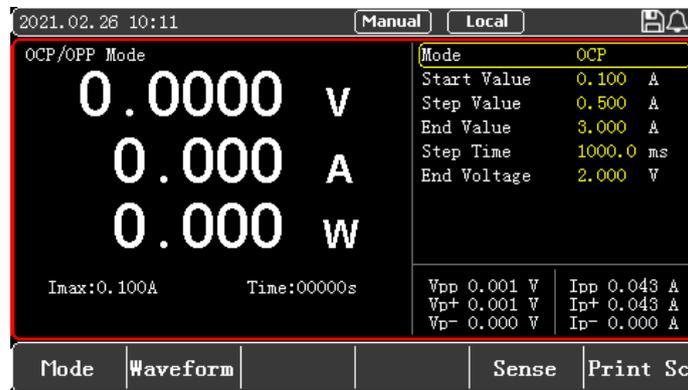


Figure 4-2-4-1 Interface of OCP/OPP Mode

Parameter setting in OCP/OPP mode:

Parameter	Description
Mode	OCP/OPP
Start value	Set the initial value of the test mode
Step value	Set the step value in every step time
End value	Set the maximum end value of the test mode
Step time	Set the time interval of every step
End voltage	Set the minimum end voltage

In OCP/OPP mode, users continuously increase the load value by setting the start value, step value and step time until the end value is reached or the protection point of the measured object is detected, and the test stops.

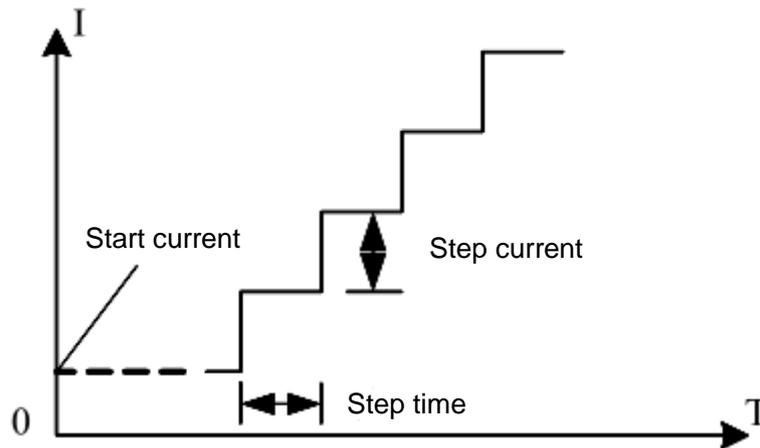


Figure 4-2-4-2 OCP/OPP Mode

Description of OCP/OPP mode:

Since OCP/OPP mode will continuously increase the output power of the tested object, please input reasonable load parameters during the test to avoid damage to the tested object. After the test is over, the electronic load will display the time of this test and the current/power value of the peak point.

Test results of OCP/OPP mode:

When the protection value of the test result is less than the end value, it is Pass; when it exceeds the end value, it is Fail. On the software framework, there are only two pop-ups for passing and failing the test, and no judgment pop-ups. Therefore, when the selected mode does not have a judgment item, that is, the pass pop-up pops up, but it is not used as judgment, but only as a test end prompt.

Operation steps:

1. In initial interface, select [Mode], [More], and then press [OCP/OPP] to enter the setting interface.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

4.2.5 CR-LED Mode

The CR-LED mode is a test mode for the LED power supply. By simulating the conduction voltage and working current of the light-emitting diode, the working principle of the LED is

truly simulated, so that the test voltage and current are between a normal and stable value, avoiding oscillations and other unstable conditions produced by constant resistor discharge, so as to better check the actual loading of the LED drive power supply.

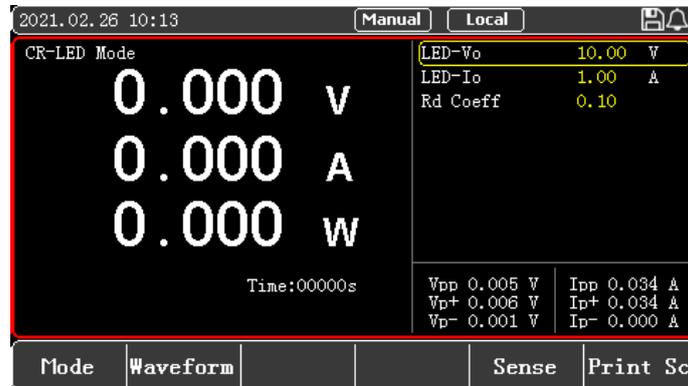


Figure 4-2-5-1 Interface of CR-LED Mode

Parameter setting in CR-LED mode:

Parameter	Description
LED-Vo	The operating voltage at the rated current of the LED power supply
LED-Io	Rated output current of LED power supply
Rd Coeff	Rd coefficient of the LED (setting range: 0.1~0.4)

Operation steps:

1. In initial interface, select [Mode], [More], and then press [CR-LED] to enter the setting interface.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

4.2.6 Battery Mode

Battery mode is used to detect the battery capacity. Battery capacity is an important indicator of the battery which reflects battery life and reliability. The voltage will decrease as the discharge time increases when testing the battery capacity, so the stop voltage should be set. When the stop voltage is reached, the test ends. Users can click and view the curve of battery discharge.

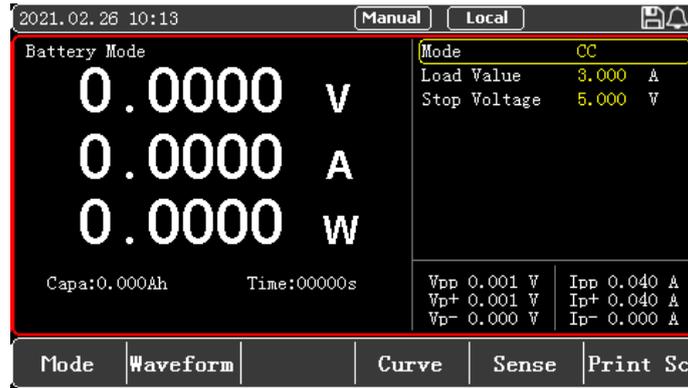


Figure 4-2-6-1 Interface of Battery Mode

Parameter setting in battery mode:

Parameter	Description
Mode	Battery discharge mode: CC/CR/CP
Load value	Set loading value
Stop voltage	Set the lower limit voltage of stopping discharge

In the battery mode, select any discharge mode as needed, and set the load parameters and stop voltage of this mode. When the battery is discharged to the stop voltage, the electronic load automatically stops loading.

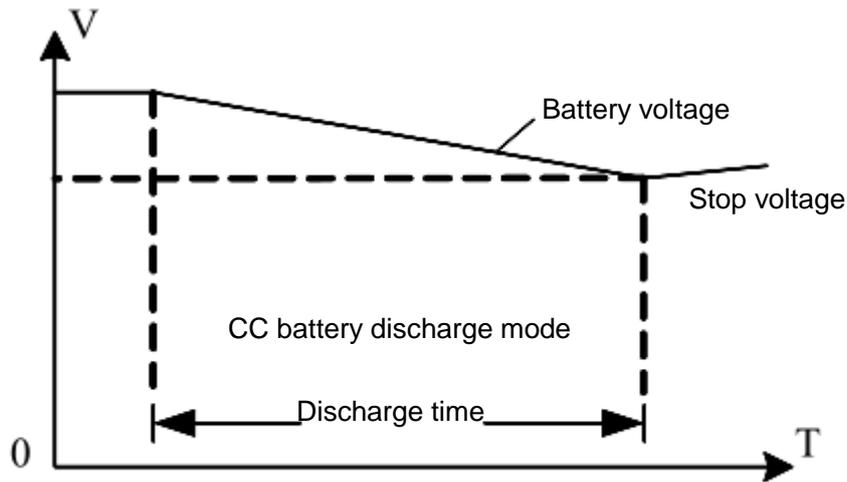


Figure 4-2-6-2 Battery Mode

Description of battery mode:

In the actual test process, users can check the battery voltage, discharge current and discharged capacity at any time. After the test, users can choose to display the discharge curve for reference.

Operation steps:

1. In initial interface, select [Mode], [More], and then press [Battery] to enter the setting

interface.

2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.
5. Press [Curve] to view the curve of battery discharge when the test is over. (Note: Users can't view the curve during the test.)

4.2.7 Load Effect

The load effect mode can carry out loading under 3 different load conditions (10%, 50%, and 100%), and continue the load for a preset time (5s), and then record the voltage under different loads. Finally, calculate the load regulation rate, ΔV and other values according to the formula.

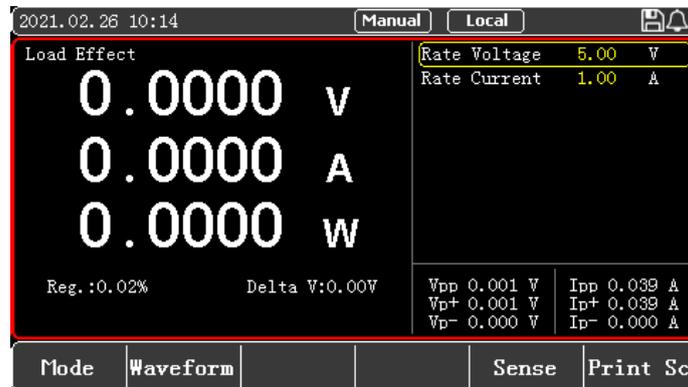


Figure 4-2-7-1 Interface of Load Effect Mode

Parameter setting in load effect mode:

Parameter	Description
Rate voltage	Set the rated voltage of the load
Rate current	Set the rated current of the load

Formula: $V_{max}=V_{dc}@I_{min}$, $V_{min}=V_{dc}@I_{max}$, $\Delta V=V_{max}-V_{min}$, $Regulation=\Delta V/V_{set}$
 Before the load effect test, input the rated voltage and rated current, and then press ON to enter the test. At this time, the load will be loaded according to 3 different loads in turn, and the values of ΔV and Reg will be detected. During the test, the ON button can be used to control the load switch.

Operation steps:

1. In initial interface, select [Mode], [More], [More], and then press [Load Effect] to enter the setting interface.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

4.2.8 OVP Mode

The OVP (overvoltage protection) test function can capture the peak point of the input voltage and the entire fall process after protection. When the voltage drops to the set trigger voltage, the load will record the time from the peak point to the trigger point. This recorded time is the over-voltage protection time of the tested power supply.

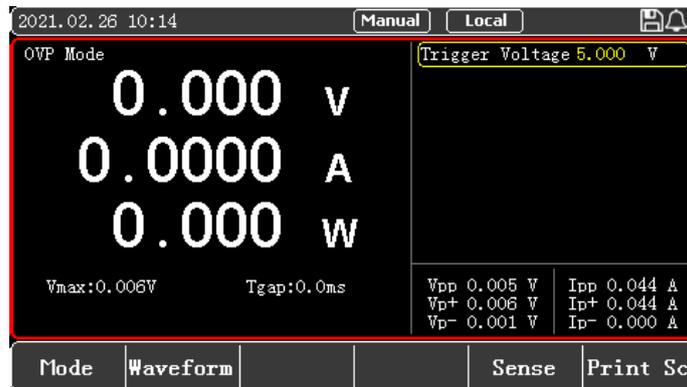


Figure 4-2-8-1 Interface of OVP Mode

Parameter setting in OVP mode:

Parameter	Description
Trigger voltage	Set the voltage of the trigger point

If users want to perform OVP test, they can press More in the menu to select the OVP test mode, set the voltage of the trigger point, and then press the ON button to start loading. The overvoltage protection function of the power supply is triggered by increasing the output voltage of the power supply under test. After the load captures the peak and falling edge of the voltage, it starts timing and triggers at the set trigger voltage. The load records the voltage at the peak point, and calculates the time from the peak point to the trigger point. After the measurement, the load will display the tested V_{max} (peak voltage) and

Tgap (protection time). The measurement accuracy of the protection time is 1mS.

Operation steps:

1. In initial interface, select [Mode], [More], [More], and then press [OVP] to enter the setting interface.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

4.2.9 Short-Circuit Mode

The electronic load can simulate a short-circuited circuit at the input terminal to test whether the protection function of the measured object can operate normally when the output terminal of is short-circuited.

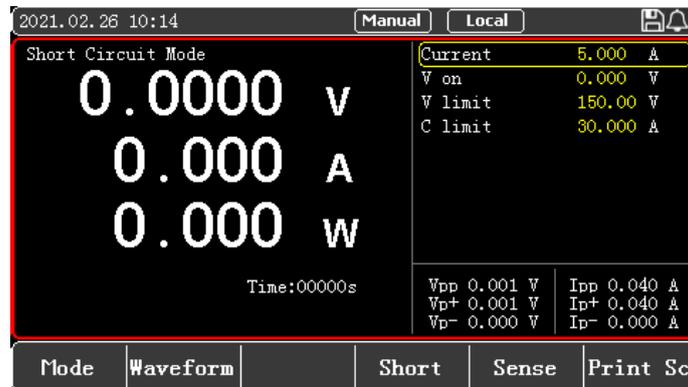


Figure 4-2-9-1 Interface of Short-Circuit Mode

Parameter setting in short-circuit mode:

Parameter	Description
Current	Load current value in normal status
V on	Set the starting voltage
V Limit	Constant value of overvoltage protection
C Limit	Constant value of overcurrent protection

When the set short-circuit time is reached (refer to chapter 6.2 for the short-circuit time setting), the electronic load returns to the original working status.

The actual current value consumed by the electronic load in the short-circuit mode depends

on the current load working mode and current range. During the short circuit test, the electronic load is loaded with the full range. When one of the current/power reaches the upper limit first, the load is loaded according to the full range of this upper limit.

⚠️ Note: The short-circuit mode is effective only in CC, CV, CR and CP mode.

Operation steps:

1. In initial interface, select [Mode], [More], [More], and then press [Short Cir] to enter the setting interface.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.
5. Press the function key [Short Cir] to enter the short circuit mode. When the short circuit mode takes effect, the status bar will display the word Short. When the short-circuit mode ends, the word Short disappears.
6. Note: Step 4 and Step 5 can be interchanged. If step 4 is before, after pressing the ON button to start, first load according to the current setting value, and then enter the short circuit mode; if step 5 is before, press the ON button to start and enter the short circuit mode directly.

4.2.10 Time Mode

The time mode is to detect the time for the power supply under test to rise/fall from one voltage point to another voltage point under preset conditions. After the test is completed, the load will display the interval between the two time points, and the accuracy of the time measurement is 1ms.

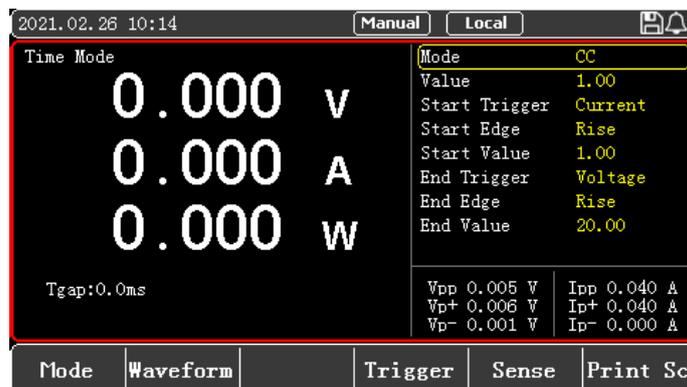


Figure 4-2-10-1 Interface of Time Mode

Parameter setting in time mode:

Parameter	Description
Mode	Set the load mode (CC/CV/CR/CP/Open)
Value	Set the load value of the current mode
Start trigger	Set the start condition (voltage/current/external)
End trigger	Set the end condition (voltage/current/external)
Start edge	Start trigger mode: Rise/Fall
End edge	End trigger mode: Rise/Fall
Start value	Set the start trigger value
End value	Set the end trigger value

First set the loading mode and loading value, then set the start and end conditions and trigger mode, and then set the start and end values. After the time test starts, the electronic load is loaded according to the set mode and value. When the load captures that the initial trigger condition is met, it starts timing; after running to the end trigger condition, the load ends timing and the time measured is displayed on the screen.

The time mode simulates the test of the rising voltage speed of the oscilloscope, and can be widely used in the field of startup time test of switch and power supply.

Operation steps:

1. In initial interface, select [Mode], [More], [More], and then press [Time] to enter the setting interface.
2. Move the cursor to the needed setting position by pulse knob, and press the Enter button  to change the parameter (the parameter changes from yellow to white) by keyboard or pulse knob. Press the Enter button  again to confirm. At this time, the set value changes from white to yellow.
3. Other parameters can be modified in a similar way.
4. Press the ON button, the electronic load starts to load, and the indicator light below the button lights up. If users need to stop the load, press the ON button again, and the running indicator light goes out.

4.3 Parameter Input and Loading Measurement

There are two ways to input parameter. Users can rotate knob or press the numeric key to enter and change parameter. When running with load, press the ON key on the front panel to control the input switch of the electronic load. See the following chapters for details.

4.3.1 Numeric Key

Move the cursor to current value setting by pulse knob, press the numeric key to enter parameter and then press the Enter button  to confirm. Please enter value within valid range. If the value is out of valid range, the setting cannot be saved and the cursor will jump to the first number.

4.3.2 Pulse Knob

Before inputting parameters, there will be a default value at the cursor position. Users can use the knob to adjust the number at the cursor position, and then move the cursor until the number on each digit is set to the needed value. Users should press Enter button  again to complete the parameter setting.



Note: When the set parameters reach the upper and lower limits, the number at the corresponding position cannot continue to scroll.

4.3.3 Ripple Measurement

UTL8500X series electronic load supports voltage ripple (Vpp) and current ripple (Ipp) measurement and real-time display. In the test interface, users can see these parameters: Vpp/Vp+/Vp-, Ipp/Ip+/Ip-, and can alternately view the required parameters by using the "Page" soft key at the bottom right.

Different from the measurement method of the traditional oscilloscope, the ripple measurement of the electronic load has good flatness and accuracy in a certain measurement range and bandwidth. At the same time, the ripple generally includes two types with different frequency: power frequency ripple and switching ripple. The ripple test result is affected by the combination and superposition of these two ripples.

4.3.4 Input Control

After the electronic load is powered on, it is in an unloaded state. Users can control the input switch of the load by pressing the ON button on the front panel.

If the indicator light of the ON button is on, it means that the input is turned on, and the real-time voltage, current and power in the current loop will be displayed on the LCD screen. If the indicator light is off, it means that the input is closed, and the current voltage across the load will be displayed on the LCD screen.

4.4 Waveform

The UTL8500X series electronic load has a waveform display function. Users can view the voltage and current waveforms by pressing the function key [Waveform], as shown in Figure 4-4.

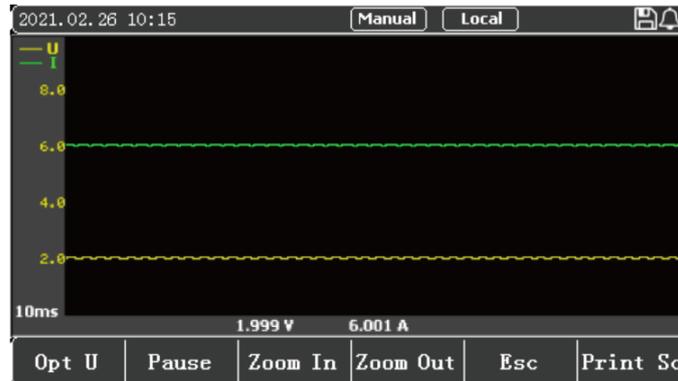


Figure 4-4 Current and Voltage Waveform Display in CV Mode

Opt U/Opt I/Opt U+I: respectively represent voltage waveform/ current waveform/voltage and current waveform display simultaneously.

Pause: pause the waveform display.

Zoom in: each time users press the zoom in key, the sampling period is reduced. For example, the shortest sampling period is 10ms.

Zoom out: each time users press the zoom out key, the sampling period increases, for example, the longest sampling period is 80ms once.

The sampling time will be displayed at the bottom left of the screen.

Esc: Exit the waveform display.

Note: Users can adjust the Y coordinate to display the waveform by turning the knob left and right or up and down keys.

4.5 Trigger Method

When using Dynamic, List or Time mode, the trigger function of the electronic load may be used. Users can choose manual trigger (Manual) or external trigger (External).

Operation steps:

1. In the Dynamic, List or Time mode page, users can quickly modify the trigger mode by selecting [Trigger] through the function keys at the bottom of the screen, and the words "Manual" or "External" will appear at the top of the screen;
2. When the external trigger is selected, the trigger signal is connected through the trigger terminal on the rear panel to control every action of the electronic load;
3. When the manual trigger is selected, use the [Trig] button on the panel to trigger. Each time users press [Trig] button, a corresponding trigger operation will be executed.

4.6 Sense

When the electronic load is loaded with a relatively large current, it will produce a large voltage drop on the connection lead between the load and the measured object. In order to ensure the measurement accuracy, the electronic load has a pair of remote measurement terminals on the rear panel. Through the terminals, users can have a sampling measurement on the precise voltage at the output terminal of the instrument under test.

Operation steps:

1. On each test mode page, select [Sense] via the function key at the bottom of the screen. When the "Sense" icon appears at the top of the screen, it means that the remote sense function has been turned on. At this time, the remote sampling voltage measured on the back terminal is the actual voltage detected.
2. Press the function key [Sense] again to turn off the remote sense function. At this time, the voltage measured on the main terminal on the front panel is the actual voltage detected.



Note: When wiring, be sure to connect the object under test and the positive and negative poles of the terminals correctly; the Sense switch cannot be switched in the running state.

4.7 Screenshot

After inserting the U disk in the front panel, the electronic load will automatically recognize it and display the USB symbol  on the upper right corner of the screen, indicating that the U disk has been connected to the device.

When users need to use the screenshot function, press the [Print Sc] button, and the load will save the current screen image to the U disk. During the saving process, "Wait..." will be displayed at the top of the screen to indicate that the image is being saved. Displaying "Ok" means that the picture has been saved. If the picture is not saved successfully, the screen will display "Fail". Screenshots can only be saved to a U disk because they take up a lot of space. After the screenshots are taken, the images stored in the U disk can be viewed on the computer.

4.8 Saving and Applying of Configuration

After detecting the connection of a U disk, the electronic load will automatically create a folder named "UTL8500X" in the root directory. This directory is used to save the

screenshots and list test files. Press the "System" button on the front panel to enter the SYSTEM CONFIG interface, and then press the [File] key at the bottom of the screen to enter the file operation interface to delete, copy, and apply files.

The screenshot BMP file name saved by the electronic load is 12 digits composed of date and time. The first six digits are the year, month and date, and the last six digits are the hour, minute and second. The format of list file name is in LIST000.txt, and the last two numbers indicate the group number of the test mode.

UTL8500 series electronic load can save commonly used test files in U disk or internal Flash. Flash can save 60 groups of test files.

 **Note:** The U disk used to save files must use the FAT32 file system. The allocation unit size cannot be greater than 4096 bytes, and the maximum capacity is 32G. Please format it in advance when using it, otherwise it may cause file storage failure. It is recommended to use a branded U disk.

5. Quick charge Test (UTL8511C)

5.1 QC2.0 Test

Steps to enter the QC2.0 test interface:

1. Press the power button to turn on the electronic load. In the main measurement interface (the default main measurement interface is CC mode when the instrument is turned on), press the soft key [QC2.0] at the bottom of the screen to enter the <QC2.0> display interface. If it is not on the main measurement interface, users can press the button [Mode], then select the soft key [Quick charge] to enter the quick charge horizontal bar selection interface, and finally enter the <QC2.0> display interface by pressing the soft key [QC2.0].
2. After entering the QC2.0 mode interface, the electronic load will automatically have a handshake with the measured object:
During the handshake/operating process, the indicator at the top right of the screen is red, otherwise it is white.
If the handshake is successful, the status will be displayed as [OK], as shown in the upper right corner of Figure 5-1-1, otherwise it will be displayed as [Err].

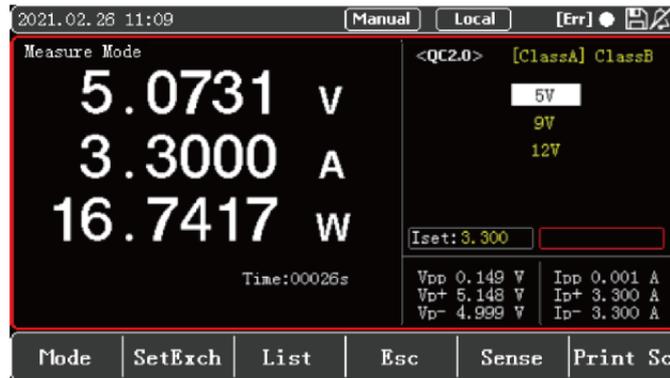


Figure 5-1-1 <QC2.0> Setting and Display Interface

QC2.0 test interface setting steps:

1. After entering the setting interface, press the soft key [Setting Switch] to switch the selected box to carry out load setting or quick charge setting.
2. If users select the left box, they can input the load value with the keyboard, press the Enter key  to confirm the input value, and then press the ON button on the panel. The system will load according to the initial voltage on the screen and the input load value. It is also possible not to load immediately, and to load after performing step 3.
3. Select the box on the right through [Setting Switch] to set the parameters of the quick charge test. Press the  key to enter the Class selection area, use the knob and left/right keys to select Class A (5V/9V/12V voltage can be set) or Class B (5V/9V/12V/20V voltage can be set). Then press  key to enter the voltage setting area, use the knob and up/down keys to select the voltage to be triggered, and press the enter key  to trigger. If the trigger is successful, the voltage display value will change accordingly, and then press the ON button on the panel to load. If the load is successful, the ON button indicator light will be green, the correct voltage and load value will be displayed on the screen, and the OK symbol will be displayed at the upper right of the screen, as shown in Figure 5-1-1, which is the interface after the successful 5V/3.300A load. If Err appears on the upper right of the screen during the loading process, users need to check whether the loaded value and the test parameter value exceed the specification range of the loaded object and need to be reset.
4. The instrument defaults to CC mode as the main measurement interface. Users can also use the soft key [Mode] to select other load modes (CV, CR or CP) and load fixed value settings (such as Vset, Rset or Pset). After setting and entering the test, press the ON button on the panel to load.

Take the CV interface as an example, the steps are as follows:

Enter the CV measurement interface by pressing the soft key [Mode] at the bottom of the screen or the panel button [Mode], press the soft key [Quick charge], and then press [QC2.0] to enter the QC2.0 quick charge page under the CV main measurement interface, as

shown in Figure 5-1-2.

Follow steps 1-3 to set the load value and test parameters, and perform the load test after setting.

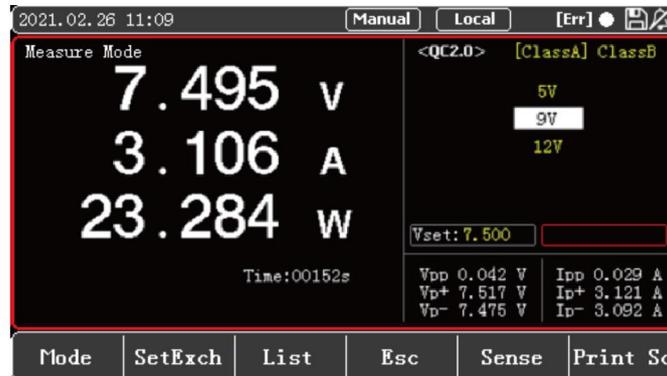


Figure 5-1-2 QC2.0 Measurement Interface in CV mode

⚠ Note: The maximum value of Vset cannot be greater than the voltage value of the quick charge test parameter on the right, otherwise the load will fail. As shown in Figure 5-1-2, it is the 7.500V load success interface (the maximum value of Vset in the left box should be slightly less than 9V to load successfully).

- In the test operating interface, users can see the operating process and result data, such as Time, Vpp, etc.
- After pressing the ON button on the panel, press the [EXIT] button to exit the quick charge mode and return to the main measurement interface.

5.2 QC3.0 Test

Steps to enter the QC3.0 test interface:

- Press the power button to turn on the electronic load. In the main measurement interface (the default main measurement interface is CC mode when the instrument is turned on), press the soft key [QC3.0] at the bottom of the screen to enter the <QC3.0> display interface. If it is not on the main measurement interface, users can press the button [Mode], then select the soft key [Quick charge] to enter the quick charge horizontal bar selection interface, and finally enter the <QC3.0> display interface by pressing the soft key [QC3.0].
- After entering the QC3.0 mode interface, the electronic load will automatically have a handshake with the measured object:
During the handshake/operating process, the indicator at the top right of the screen is red, otherwise it is white.
If the handshake is successful, the status will be displayed as [OK], as shown in the upper right corner of Figure 5-2, otherwise it will be displayed as [Err].

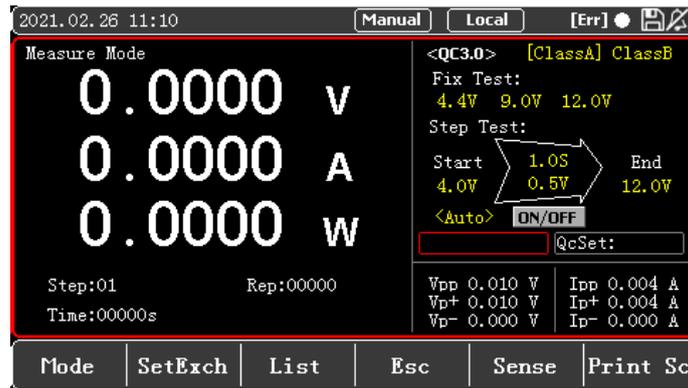


Figure 5-2 <QC3.0> Setting and Display Interface

QC3.0 test interface setting steps:

1. After entering the setting interface, press the soft key [Setting Switch] to switch the selected box to carry out load setting or quick charge setting.
2. If users select the left box, they can input the load value with the keyboard, press the Enter key  to confirm the input value, and then press the ON button on the panel. The system will load according to the initial voltage on the screen and the input load value. It is also possible not to load immediately, and to load after performing step 3.
3. Select the box on the right through [Setting Switch] to set the parameters of the quick charge test. There are two ways: single point test and step test.
 - For single point test, there are two selection areas: Class A and Class B. Press the  key to enter the Class selection area, use the knob and left/right keys to select Class A (5V/9V/12V voltage can be set) or Class B (5V/9V/12V/20V voltage can be set). Then press  key to enter the voltage setting area, use the knob and up/down keys to select the voltage to be triggered, and press the enter key  to trigger. If the trigger is successful, the voltage display value will change accordingly, and then press the ON button on the panel to load. If the load is successful, the ON button indicator light will be green, the correct voltage and load value will be displayed on the screen, and the OK symbol will be displayed at the upper right of the screen, as shown in Figure 5-2, which is the interface after the successful 4.4V/0.500A load. If Err appears on the upper right of the screen during the loading process, users need to check whether the loaded value and the test parameter value exceed the specification range of the loaded object and need to be reset.
 - The step test function is used to test the performance of the object under test by continuously triggering different voltage points in automatic/manual mode. The parameters that can be set include: start voltage, step voltage, step time, end voltage, and step mode. As shown in Figure 5-2, users can set the start voltage of 3.6V, end voltage of 5.0V, step voltage of 0.2V, and step time of 1.0S. There are two kinds of stepping modes: automatic and manual. Use the up/down keys to select <auto>, and

- press the Enter key  to switch between the <auto> and <manual> stepping modes.
- a) In automatic mode, the electronic load starts from the start voltage, and after every step time, the trigger voltage automatically increases by the step voltage value. After setting the automatic mode value, first press the ON button on the panel to load, and the ON indicator light turns green at this time. Then use the arrow keys to select [ON/OFF] on the screen, and press the Enter key  to start or stop. After the startup is successful, the [ON/OFF] on the screen is displayed in red, and the indicator light at the top right of the screen is displayed in red during operation, and turns to white after the operation is over. A pop-up box pops up on the screen to display "Quick charge Test Ended", and press the Enter key  to confirm the end.
 - b) In manual mode, use the up/down keys to select <auto>, and press the Enter key  to switch between the <auto> and <manual> stepping modes. Turn on the ON button on the panel to load, and then users need to select [Trig] on the screen and press the Enter button to manually trigger. Press once to trigger and the trigger voltage will increase once. If users need to exit the step test halfway, use the arrow keys to select [ON/OFF] on the screen, and then press the enter key .
4. The instrument defaults to CC mode as the main measurement interface. Users can also use the soft key [Mode] to select other load modes (CV, CR or CP) and load fixed value settings (such as Vset, Rset or Pset). After setting and entering the test, press the ON button on the panel to load. Please refer to chapter 5.1 step 4 for details.
 5. In the test operating interface, users can see the operating process and result data, such as Time, Vpp, etc.
 6. After pressing the ON button on the panel, press the [EXIT] button to exit the quick charge mode and return to the main measurement interface.

5.3 QC4.0 Test

In QC4.0 mode, single point voltage test and step test can be carried out. The specific operation process is the same as QC3.0 test, but QC4.0 test has higher voltage resolution and can meet higher test requirements.

Steps to enter the QC4.0 test interface:

1. Press the power button to turn on the electronic load. In the main measurement interface (the default main measurement interface is CC mode when the instrument is turned on), press the soft key [QC4.0] at the bottom of the screen to enter the <QC4.0> display interface. If it is not on the main measurement interface, users can press the button [Mode], then select the soft key [Quick charge] to enter the quick charge horizontal bar selection interface, and finally enter the <QC4.0> display interface by pressing the soft key [QC4.0].
2. After entering the QC4.0 mode interface, the electronic load will automatically have a

handshake with the measured object:

During the handshake/operating process, the indicator at the top right of the screen is red, otherwise it is white.

If the handshake is successful, the status will be displayed as [OK], as shown in the upper right corner of Figure 5-3, otherwise it will be displayed as [Err].

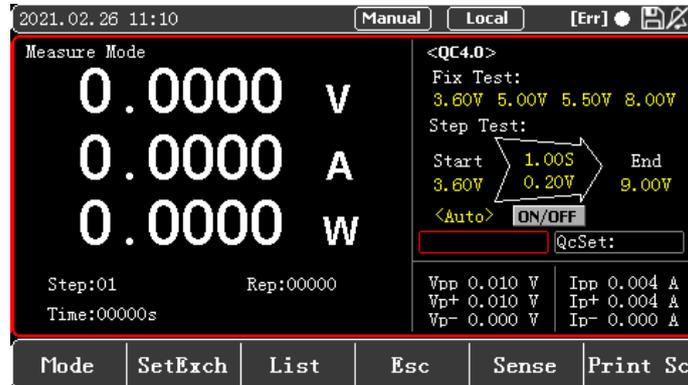


Figure 5-3 <QC4.0> Setting and Display Interface

QC4.0 test interface setting steps:

1. After entering the setting interface, press the soft key [Setting Switch] to switch the selected box to carry out load setting or quick charge setting.
2. If users select the left box, they can input the load value with the keyboard, press the Enter key  to confirm the input value, and then press the ON button on the panel. The system will load according to the initial voltage on the screen and the input load value. It is also possible not to load immediately, and to load after performing step 3.
3. Select the box on the right through [Setting Switch] to set the parameters of the quick charge test. There are two ways: single point test and step test.
 - Single point test can set a voltage of 3.60V/5.00V/6.00V/9.00V. Use the knob and up/down keys to select the voltage to be triggered, and press the enter key  to trigger. If the trigger is successful, the voltage display value will change accordingly, and then press the ON button on the panel to load. If the load is successful, the ON button indicator light will be green, the correct voltage and load value will be displayed on the screen, and the OK symbol will be displayed at the upper right of the screen, as shown in Figure 5-3, which is the interface after the successful 5.00V/1.000A load. If Err appears on the upper right of the screen during the loading process, users need to check whether the loaded value and the test parameter value exceed the specification range of the loaded object and need to be reset.
 - The step test function is used to test the performance of the object under test by continuously triggering different voltage points in automatic/manual mode. The parameters that can be set include: start voltage, step voltage, step time, end voltage, and step mode. As shown in Figure 5-3, users can set the start voltage of 5.00V, end

- voltage of 9.00V, step voltage of 0.50V, and step time of 0.10S. There are two kinds of stepping modes: automatic and manual. Use the up/down keys to select <auto>, and press the Enter key  to switch between the <auto> and <manual> stepping modes.
- c) In automatic mode, the electronic load starts from the start voltage, and after every step time, the trigger voltage automatically increases by the step voltage value. After setting the automatic mode value, first press the ON button on the panel to load, and the ON indicator light turns green at this time. Then use the arrow keys to select [ON/OFF] on the screen, and press the Enter key  to start or stop. After the startup is successful, the [ON/OFF] on the screen is displayed in red, and the indicator light at the top right of the screen is displayed in red during operation, and turns to white after the operation is over. A pop-up box pops up on the screen to display "Quick charge Test Ended", and press the Enter key  to confirm the end.
 - d) In manual mode, use the up/down keys to select <auto>, and press the Enter key  to switch between the <auto> and <manual> stepping modes. Turn on the ON button on the panel to load, and then users need to select [Trig] on the screen and press the Enter button to manually trigger. Press once to trigger and the trigger voltage will increase once. If users need to exit the step test halfway, use the arrow keys to select [ON/OFF] on the screen, and then press the enter key .
4. The instrument defaults to CC mode as the main measurement interface. Users can also use the soft key [Mode] to select other load modes (CV, CR or CP) and load fixed value settings (such as Vset, Rset or Pset). After setting and entering the test, press the ON button on the panel to load. Please refer to chapter 5.1 step 4 for details.
 5. In the test operating interface, users can see the operating process and result data, such as Time, Vpp, etc.
 6. After pressing the ON button on the panel, press the [EXIT] button to exit the quick charge mode and return to the main measurement interface.

5.4 PD2.0/3.0 Test

Steps to enter the PD2.0/3.0 test interface:

1. Press the power button to turn on the electronic load. In the main measurement interface (the default main measurement interface is CC mode when the instrument is turned on), press the soft key [PD3.0] at the bottom of the screen to enter the <PD2.0/3.0> display interface. If it is not on the main measurement interface, users can press the button [Mode], then select the soft key [Quick charge] to enter the quick charge horizontal bar selection interface, and finally enter the < PD2.0/3.0> display interface by pressing the soft key [PD3.0].
2. After entering the PD2.0/3.0 mode interface, the electronic load will automatically have

a handshake with the measured object:

During the handshake/operating process, the indicator at the top right of the screen is red, otherwise it is white.

If the handshake is successful, the status will be displayed as [OK], as shown in the upper right corner of Figure 5-4-1, otherwise it will be displayed as [Err].

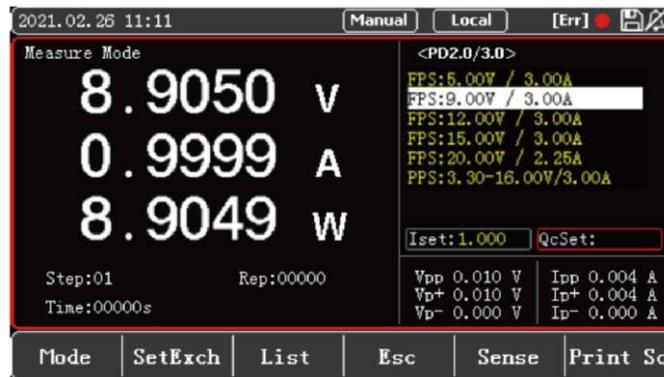


Figure 5-4-1 <PD2.0/3.0> Setting and Display Interface

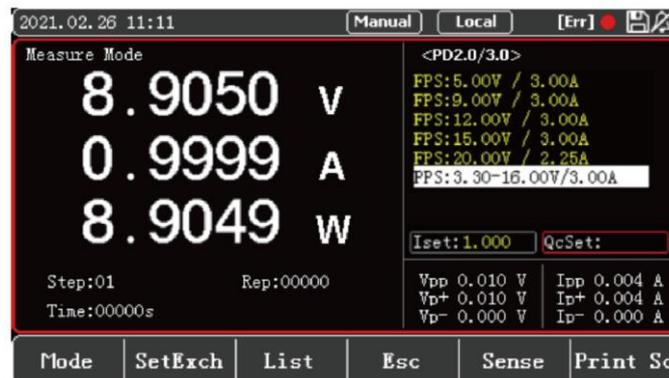


Figure 5-4-2 <PD2.0/3.0> Setting and Display Interface

PD2.0/3.0 test interface setting steps:

1. After entering the setting interface, press the soft key [Setting Switch] to switch the selected box to carry out load setting or quick charge setting.
 2. If users select the left box, they can input the load value with the keyboard, press the Enter key  to confirm the input value, and then press the ON button on the panel. The system will load according to the initial voltage on the screen and the input load value. It is also possible not to load immediately, and to load after performing step 3.
 3. Select the box on the right through [Setting Switch] to set the parameters of the quick charge test. After entering the setting interface, the electronic load will automatically have a handshake with the tested power supply and display the output voltage type supported by the power supply on the screen. At this time, users can use the knob and up/down keys to select the voltage to be triggered.
- For fixed voltage point FPS and other types, as shown in Figure 5-4-1, after selecting

an FPS item with the knob and up/down keys, press the Enter key  to trigger the voltage, and the voltage input in the QcSet column is invalid. Then press the ON button on the panel to load. After the load is successful, the ON button indicator will turn green, the correct voltage and load value will be displayed on the screen, and the OK symbol will be displayed on the upper right of the screen.

- For types such as the programmable voltage item PPS, users can enter the required voltage value through the QcSet column and press the Enter key  to confirm. If the input data is within the range, the Vset value will change accordingly. Then press the ON button on the panel to load. After the load is successful, the ON button indicator will turn green, the correct voltage and load value will be displayed on the screen, and the OK symbol will be displayed on the upper right of the screen. Figure 5-4-2 shows the page after PPS 9V/1.000A is loaded.
- 4. The instrument defaults to CC mode as the main measurement interface. Users can also use the soft key [Mode] to select other load modes (CV, CR or CP) and load fixed value settings (such as Vset, Rset or Pset). After setting and entering the test, press the ON button on the panel to load. Please refer to chapter 5.1 step 4 for details.
- 5. In the test operating interface, users can see the operating process and result data, such as Time, Vpp, etc.
- 6. After pressing the ON button on the panel, press the [EXIT] button to exit the quick charge mode and return to the main measurement interface.

5.5 PE2.0 Test

Steps to enter the PE2.0 test interface:

1. Press the power button to turn on the electronic load. In the main measurement interface (the default main measurement interface is CC mode when the instrument is turned on), press the soft key [PE2.0] at the bottom of the screen to enter the <MTK PE2.0> display interface. If it is not on the main measurement interface, users can press the button [Mode], then select the soft key [Quick charge] to enter the quick charge horizontal bar selection interface, and finally enter the <MTK PE2.0> display interface by pressing the soft key [PE2.0].
2. After entering the MTK PE2.0 mode interface, the electronic load will automatically have a handshake with the measured object:
During the handshake/operating process, the indicator at the top right of the screen is red, otherwise it is white.
If the handshake is successful, the status will be displayed as [OK], as shown in the upper right corner of Figure 5-5, otherwise it will be displayed as [Err].

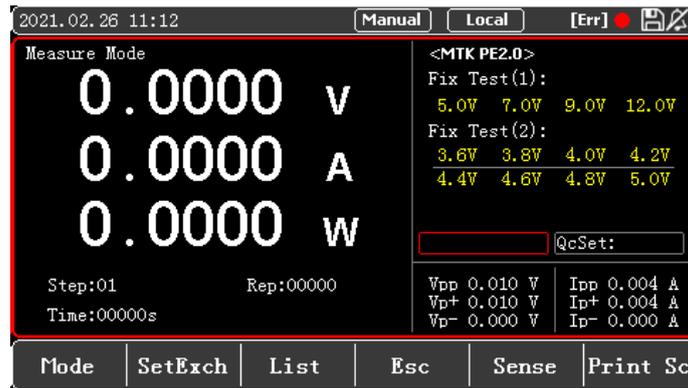


Figure 5-5 <PE2.0> Setting and Display Interface

PE2.0 test interface setting steps:

1. After entering the setting interface, press the soft key [Setting Switch] to switch the selected box to carry out load setting or quick charge setting.
2. If users select the left box, they can input the load value with the keyboard, press the Enter key  to confirm the input value, and then press the ON button on the panel. The system will load according to the initial voltage on the screen and the input load value. It is also possible not to load immediately, and to load after performing step 3.
3. Select the box on the right through [Setting Switch] to set the parameters of the quick charge test. Through the knob and left/right keys, users can set a single point voltage not greater than 12V, such as 5.0V/7.0V/9.0V/12.0V.
 - Single point test (1) is used to trigger a specified voltage point. Select the voltage to be triggered, and press the enter key  to trigger. If the trigger is successful, the voltage display value will change accordingly, and then press the ON button on the panel to load. If the load is successful, the ON button indicator light will be green, the correct voltage and load value will be displayed on the screen, and the OK symbol will be displayed at the upper right of the screen.
 - Single point test (2) has more test points for users to select. The operation steps and methods are the same as single point test (1).

Note: The PE2.0 protocol framework does not support override adjustment of voltage (for example, direct adjustment from 5V to 3.6V), and can only be adjusted to adjacent voltage points.

4. The instrument defaults to CC mode as the main measurement interface. Users can also use the soft key [Mode] to select other load modes (CV, CR or CP) and load fixed value settings (such as Vset, Rset or Pset). After setting and entering the test, press the ON button on the panel to load. Please refer to chapter 5.1 step 4 for details.
5. In the test operating interface, users can see the operating process and result data, such as Time, Vpp, etc.
6. After pressing the ON button on the panel, press the [EXIT] button to exit the quick

charge mode and return to the main measurement interface.

5.6 DPDN Test

In the main interface of the electronic load, press the corresponding soft key at the bottom of the screen to enter the setting interface. The DPDN mode is initialized according to the BC1.2 protocol. After the initialization, the power supply type will be given, and the test interface will display the voltage on the D+ and D- data leads of the current measured object in real time.

Steps to enter the DPDN test interface:

1. Press the power button to turn on the electronic load. In the main measurement interface (the default main measurement interface is CC mode when the instrument is turned on), press the soft key [DPDN] at the bottom of the screen to enter the <DPDN> display interface. If it is not on the main measurement interface, users can press the button [Mode], then select the soft key [Quick charge] to enter the quick charge horizontal bar selection interface, and finally enter the <DPDN> display interface by pressing the soft key [DPDN].
2. After entering the DPDN mode interface, the electronic load will automatically have a handshake with the measured object:

During the handshake/operating process, the indicator at the top right of the screen is red, otherwise it is white.

If the handshake is successful, the status will be displayed as [OK], as shown in the upper right corner of Figure 5-6, otherwise it will be displayed as [Err].

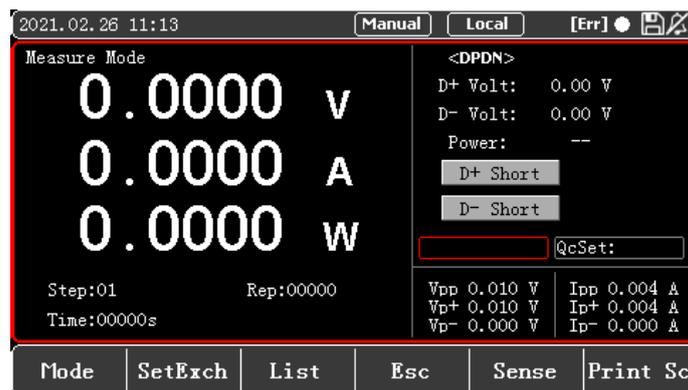


Figure 5-6 <DPDN> Setting and Display Interface

DPDN test interface setting steps:

1. After entering the setting interface, press the soft key [Setting Switch] to switch the selected box to carry out load setting or quick charge setting.
2. If users select the left box, they can input the load value with the keyboard, press the Enter key  to confirm the input value, and then press the ON button on the panel.

The system will load according to the initial voltage on the screen and the input load value.

3. Select the box on the right through [Setting Switch] to set the parameters of the quick charge test. Select the DPDN test parameter D+ short circuit test or D- short circuit test through the knob and left/right keys, and press the enter key  to trigger.

DPDN test parameters:

Parameters	Description
D+ short circuit test	Manually pull up the D+ voltage to 3.3V
D- short circuit test	Manually pull up the D- voltage to 3.3V

4. The instrument defaults to CC mode as the main measurement interface. Users can also use the soft key [Mode] to select other load modes (CV, CR or CP) and load fixed value settings (such as Vset, Rset or Pset). After setting and entering the test, press the ON button on the panel to load. Please refer to chapter 5.1 step 4 for details.
5. In the test operating interface, users can see the operating process and result data, such as Time, Vpp, etc.
6. After pressing the ON button on the panel, press the [EXIT] button to exit the quick charge mode and return to the main measurement interface.



Note: The measured object needs to allow the external device to control the voltage of the D+ and D- data leads; otherwise the measured object may be damaged.

5.7 Quick charge Setting

Press the [System] key to enter the <System Configuration> interface, select the soft key [Quick charge Setting] at the bottom of the screen to enter the <Quick charge Setting> interface, and set the parameters such as the quick charge handshake/operation process to achieve the best test effects.

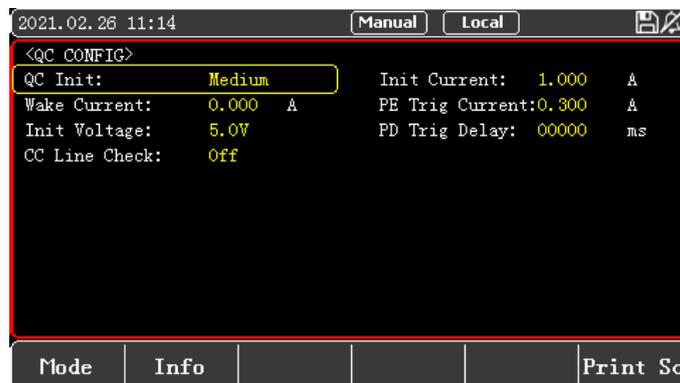


Figure 5-7 <Quick charge Setting> Interface

Parameters in quick charge setting interface:

Parameters	Description
QC initialization	Select QC initialization speed to adapt to different fast charging sources, slow speed: better stability, fast: shorter initialization time
Initial current	Set the current value of the load after the QC handshake is successful
Wake-up current	Set the current value of continuous load after the end of the list test
PE trigger current	Set current value when PE trigger control
QC initial voltage	Set the initial voltage after successful QC handshake
PD trigger delay	Set the waiting time before initializing PD power
CC channel detection	Check whether the CC1 and CC2 leads are connected well

6. System Configuration Page

- System Configuration
- Parameter Setting
- File
- Instrument Info
- Local/Remote

In non-running status, pressing the [System] button on the panel can enter the system configuration page. The system configuration page includes <System Config>, <Para Set>, <File>, <Info> and Local/Remote switching. Select the corresponding function keys at the bottom of the panel to enter the corresponding setting page.

6.1 System Configuration

Press the [System] button on the panel to enter the <SYSTEM CONFIG> page, as shown in Figure 6-1. Language, time, communication, etc. can be set on this page. For details, please see Table 6-1.



Figure 6-1 System Configuration Page

Table 6-1 Parameters on System Configuration Page

System parameter	Setting content	Description
Language	[CHN]/ENGLISH	Set system language
Key sound	ON/OFF	Whether to enable key sound
Date	Year/Month/Day	Set system date
Warn sound	ON/OFF	Whether to enable warn sound
Time	Hour/Minute/Second	Set system time
DIM display	1~5 levels of brightness	Adjust the screen brightness, 5 levels
Initial mode	Default/Last	Default: boot into the constant current (CC) interface Last: boot into the last test mode
Knob active	ON/OFF	If it is ON, the parameter will change immediately after rotating the knob.
Address	001~032	Set the current communication address
Baud rate	9600/19200/38400/57600/115200	Set the baud rate of RS232 communication interface
SCPI set	SCPI1/Own	SCPI1: general SCPI protocol; Own: for internal debugging
Restore factory setting		Choose to restore factory settings: the device will delete the current setting parameters

		and restore to the state of factory settings
--	--	--

6.1.1 Language

The electronic load has two system languages (CHN/ENGLISH), which can be changed in the system parameter settings. Select Language, turn the knob or change the up and down direction keys to adjust to the needed language, and then press  to complete the setting.

6.1.2 Key Sound

The key sound is used to set whether to sound when users operate the keyboard or the knob. If it is on, the buzzer will emit a short sound when users press any key or rotate the knob. If it is off, no sound will be emitted at any time when users operate the button or the knob. The factory default key sound is on.

6.1.3 Date

It is used to set the current date of the system. Users first select the setting option, move the cursor to the position to be modified by the left and right direction keys, and then rotate the knob or directly enter the number with the keyboard to adjust the content to be modified. Lastly, press  to complete the modification.

6.1.4 Warn Sound

The UTL8500X series electronic load has warn sound function. When the load ends or encounters an abnormal problem during the test, the electronic load will emit a warn sound through the built-in buzzer. When the test is successful, the load will emit two short beeps. When the test fails or encounters other abnormalities, the load will emit two long beeps. The warn sound is on by default. If users need to change it, select this option on the system configuration page and adjust it.

6.1.5 Time

Time setting is the same as the date setting. It is used to set the current system time.

6.1.6 DIM Display

In order to adapt to the operating environment of different brightness, the electronic load has a screen brightness adjustment function, which can be changed in the system parameters. Select the option DIM Display, press , rotate the knob or use the direction keys to adjust to the required value, and then press  to complete the setting.

6.1.7 Initial Mode

When the initial mode is selected as "Last", the status of the load each time it is powered on is the test mode used before the last shutdown. If "Default" is selected, the electronic load will enter a constant current (CC) test mode after each power-on.

6.1.8 Knob Active

This option is used to make the current adjustment by the knob take effect immediately. It is on by default, that is, every time you rotate the knob to change the parameter in CC, CV, CR, CP mode, it will take effect immediately. After it is turned off, users need to press  after changing the parameter every time by the knob.

6.1.9 Communication Setting

The communication setting is mainly used to set the communication mode used between the electronic load and the upper computer. The electronic load communicates with the upper computer via RS232. Users can purchase the required connection lead to achieve remote control with the electronic load. Before connecting to the upper computer, please make sure to purchase the designated connection lead and select the corresponding communication parameters in the communication setting.

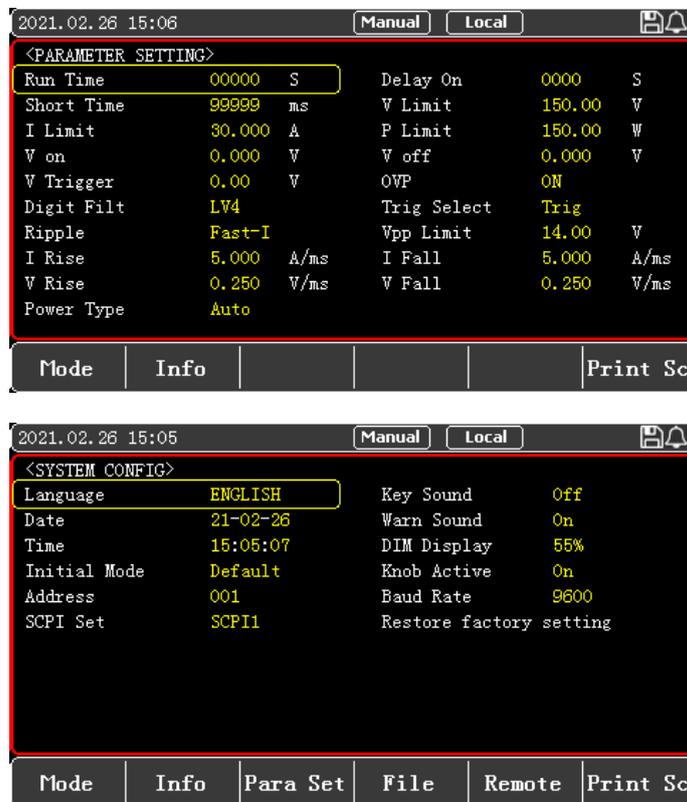
Communication setting	Setting content	Description
Communication mode	RS232	The general model only supports RS232 and supports expansion.
Baud rate	9600/19200/38400/57600/115200	Set the communication baud rate of RS232 communication interface.
Address	001~032	Set the current communication address

		of the load.
SCPI setting	SCPI1/Own	SCPI1: general SCPI protocol; own: for internal debugging.

6.1.10 Restore Factory Setting

The option can restore the set value in the electronic load to the factory default value. If users choose to restore factory settings, a dialog box will pop up on the screen to confirm whether to restore. Move the cursor to "Yes" and press  to confirm. The system will restore the system configurations and parameter settings to the factory settings status.

Factory Default Menu Parameter List (UTL8512S)



6.2 Parameter Setting

Users can enter the system configuration interface by pressing the [System] key, and select [Para Set] at the bottom of the screen can enter the <PARAMETER SETTING> page, as shown in Figure 6-2. The parameter setting is used to set the operating parameters and protection parameters of the system.

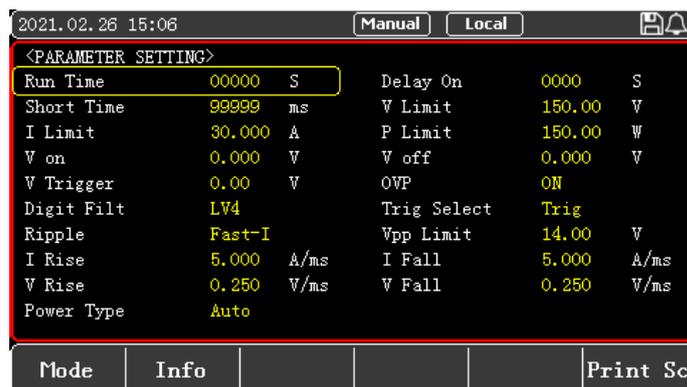


Figure 6-2 Parameter Setting Page

Table 6-2 Description of Parameter Setting (UTL8512S)

Parameter setting	Setting range	Description
Run time	0~99999s	Set the time for scheduled unload
Delay on	0~9999s	Set the start time of delay
Short time	0.1~99999ms	Set the time for short circuit test
V limit	0~150V	Set the voltage value of over-voltage protection
I limit	0~30A	Set the current value of over-current protection
P limit	0~300W	Set the power value of over-power protection
V on	0~150V	Set the load voltage at the beginning of each run
V off	0~150V	Set the low voltage to automatically end loading
V trigger	0~150V	Set the self-start voltage of the list mode
OVP	ON/OFF	Set whether to enable the overvoltage protection function
Digit filt	LV1/LV2/LV3/LV4	Set the level of digital filter
Trig select	Trig/On/Off	Set the role of external trigger signal input (function multiplexing)
Ripple	Fast-V/Fast-I/Medium/Off	Set the ripple sampling method, set the hardware high-speed sampling voltage ripple/current ripple

VPP limit	0~15V	Set the protection value for excessive ripple voltage
I rise	0.001~30A/mS	Set the current rising slope under load
I fall	0.001~30A/mS	Set the current fall slope under load
V rise	0.010~15V/mS	Set the voltage rise slope under load
V fall	0.010~15V/mS	Set the voltage fall slope under load
Power type	Auto/CV/CC	Set the type of power supply under test

6.2.1 Run Time

If users set the single load time of the electronic load, no matter what mode it is running in, the load will automatically stop loading after the set timing is reached. When this function is not needed, set the parameter to 0.

6.2.2 Delay On

If users set the delay before the electronic load is loaded each time, no matter what mode it is running, when the ON button is pressed, the electronic load will wait for the set delay time and then start loading.

6.2.3 V Trigger

V Trigger is the voltage value of automatically-started loading after setting the list mode. After setting the self-start voltage, enter the list mode without pressing the ON key to enable the load. When the input voltage of the electronic load exceeds the set self-start voltage, the list mode will automatically start.

This operation is suitable for testing environments that do not need manual operations such as automated production lines. The default self-start voltage of the device is 0, which means it is not enabled. When users need to use, first set the required V Trigger in the parameter setting, then users only need to set the parameters in the list mode according to the normal operation, and then enter the test. When the electronic load detects that the external input voltage exceeds the set value, it will run automatically and check out the result.

6.2.4 OVP

Overvoltage protection is used to protect the equipment from damage as much as possible under overvoltage conditions. After being turned on, when the external input voltage exceeds the voltage range that the electronic load can withstand, the load will short-circuit

the external power supply to protect the load itself from damage. This function is mainly suitable for LED power supply testing and other fields.

6.2.5 Digit Filt

Adjusting the parameter of digital filter can improve the stability of the displayed value. The electronic load has a total of 4 digital filter parameters that can be selected. The larger the filter parameter, the better the effect and the more stable the displayed value. The load defaults to LV4 digital filter and users can set it according to actual needs.

6.2.6 Ripple

There are three options for ripple measurement: voltage high speed, medium speed, and current high speed. High-speed sampling is performed at 300kHz, and medium-speed sampling is performed at 20kHz.

6.2.7 VPP Limit

Adjust the protection value of the ripple voltage. When the ripple voltage exceeds the set value, the pop-up window prompts that the ripple exceeds the limit and stop loading.

6.2.8 I Rise/Fall

Adjust the current rise and fall slopes of all modes (CC/CV/CP/CR/OCP/OVP/OPP/CR-LED/Battery/Short Circuit/Time/Dual/Quick charge/List/Load Effect).

In general: the larger the current rise value, the faster the load response speed, the larger the current fall value, the faster the unload response speed.

6.2.9 V Rise/Fall

Adjust the voltage rise and fall slopes of all modes (CC/CV/CP/CR/OCP/OVP/OPP/CR-LED/Battery/Short Circuit/Time/Dual/Quick charge/List/Load Effect).

6.2.10 Power Type

Select the power supply type: constant voltage source (CV) or constant current source (CC).

6.3 File

Press the [System] key to enter the SYSTEM CONFIG interface, and select [File] at the bottom of the screen to enter the <File> page, as shown in Figure 6-3.

File operations are mainly for applying, copying and deleting list test files and screenshots;

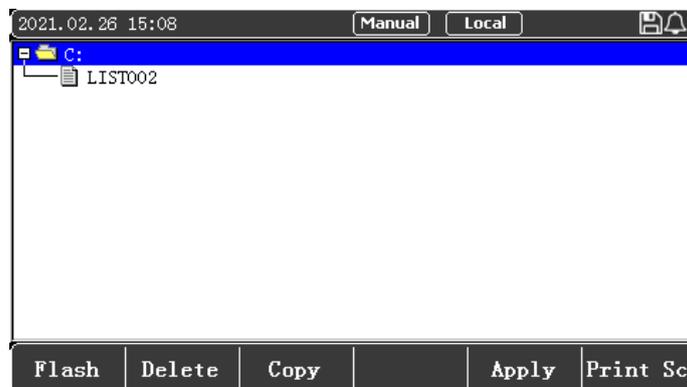


Figure 6-3 File Page

Save: The device has two storage methods (U disk/internal Flash). Users can view the files stored in the two paths. The screenshots can only be saved to the U disk and cannot be viewed on the electronic load.

Delete: Users can delete any files stored in the two paths.

Copy and apply: Users can copy and apply the list test files of the two storage spaces, and the files can be deleted.

File function:

Name	Description
U disk/Flash	Select U disk or flash as the currently displayed storage space
Delete	Delete the currently highlighted file
Copy	Copy the selected file to another storage space
Apply	Apply the selected test file (apply the list test file)
Print sc	Save the current screen image to U disk

⚠ Note: On File page, only the list test files can be copied and applied mutually, and the screenshots in the U disk cannot do that.

6.4 Instrument Info

Press the [System] key to enter SYSTEM CONFIG interface, and select [Info] function key at the bottom of the screen to enter the <Instrument Info> page. The Instrument Info page can view the basic information of the instrument, including the model, version number and serial number of the electronic load.

6.5 Local/Remote

The electronic load has two operating modes: local and remote.

Local: use the buttons on the electronic load to operate.

Remote: The electronic load is connected to the PC through RS232 and other communication cables, and commands are sent on the PC to perform related operations on the load through the upper computer software.

When the electronic load is in Remote mode, except for the function key [Local], other keys on the panel will not work. When users do not need to use the Remote function, they can switch to Local mode by pressing the [Local] button.

The status bar at the top of the screen will display Local/Remote, indicating the current control status of the load. Users can judge the control status of the load according to the display on the screen.

Operation steps:

1. Press the [System] key to enter SYSTEM CONFIG interface, and select [Local] at the bottom of the screen to switch the current Local mode to Remote mode. The "Remote" icon will be displayed at the top of the screen, indicating that the electronic load is in Remote mode.
2. If users want to return to Local mode, just press the [Local] function key. At this time, the word "Local" will be displayed at the top of the screen, indicating that the electronic load is in Local mode.
3. Repeat step 1 to enter Remote mode again.

7. Communication Interface and Terminal

- RS-232C Communication
- Introduction of Terminal

7.1 RS-232C

UTL8500X series electronic load is equipped with RS-232C communication interface according to standards. Users can use the corresponding communication lead for remote operation if they need. There is a DB9 female interface at the end of the electronic load, which can be connected to the computer COM port by using a standard RS-232C cable.



Note: In actual use, the electronic load only uses three pins (2, 3 and 5) to communicate with the device. It is recommended to turn off the power of the instrument

when plugging or unplugging the connector to avoid electrical shock.

Table 7-1 Definition of COM Interface (RS-232C) Pins

Pin number	Symbol	Description	
1	---	/	
2	TXD	Transmit data	
3	RXD	Receive data	
4	---	/	
5	GND	Ground	
6	---	/	
7	---	/	
8	---	/	
9	---	/	

The communication setting is mainly used to set the communication mode between the electronic load and the upper computer. The electronic load communicates with the upper computer through RS-232C. Users can purchase the needed connecting lead to achieve remote control with the electronic load. Before connecting to the upper computer, please make sure to purchase the designated connection lead and select the corresponding communication parameters in the communication settings.

Communication setting	Setting content	Description
Communication mode	RS-232C	The general model only supports RS-232C and supports expansion.
Baud rate	9600/19200/38400/57600/115200	Set the communication baud rate of RS-232C communication interface.
Address	001~032	Set the current communication address of the load.
SCPI setting	SCPI1/Own	SCPI1: general SCPI protocol; own: for internal debugging.

7.2 Current Monitor (I Monitor)

The current monitor output terminal uses 0~10V analog output signal to represent the zero to full rated input current of the channel to which the terminal belongs. An external voltmeter

or oscilloscope can be connected to display the change of input current.

7.3 Remote Compensation Terminal

When the load consumes a large current, a voltage drop will be generated on the connection lead between the instrument under test and the load terminal. In order to ensure the measurement accuracy, the UTL8500X series electronic load provides a remote measurement terminal on the rear panel. Users can use this terminal to measure the output terminal voltage of the instrument under test.

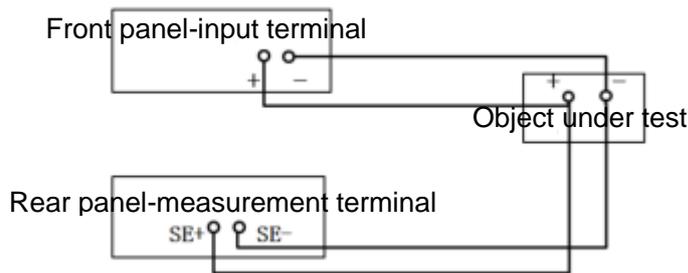


Figure 7-3 Wiring Diagram of Remote Compensation

SE+ and SE- are remote input terminals. In order to avoid the voltage drop caused by too long load input leads, remote test allows to measure directly on the input terminal source to improve measurement accuracy.

7.4 Trigger Signal Terminal

The external trigger signal is a voltage trigger. When a voltage signal of DC5V~DC24V is given, the trigger is valid; when there is no voltage, the trigger is invalid. The current monitoring output is a voltage output, and the output signal range is 0~10V. The real-time current from zero to full range is indicated. The output signal impedance is less than or equal to 10kΩ.

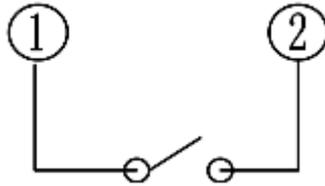
Description of terminals:

Terminal NO.	Description
1	Passive trigger positive / test result power supply positive
2	Passive trigger negative/active trigger positive
3	Ground (GND)/active trigger negative
4	Test result output 1 (incorrect detection)
5	Test result output 2 (correct detection)

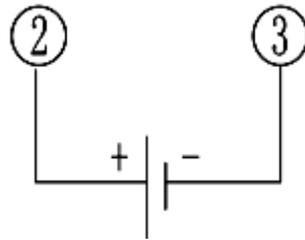
Trigger signal terminal diagram

Wiring instructions:

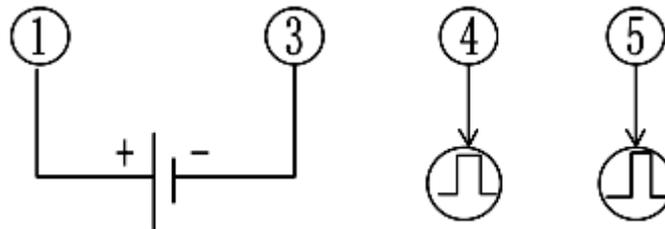
1. Wiring method for passive trigger input (external passive switch)



2. Wiring method for active trigger input (external power signal)



3. Wiring method for test result output (need external power supply)

**Note:**

- 1) The voltage range of all external power supplies shall not exceed DC5V~DC24V.
- 2) The maximum withstand current of the test result output terminals (④ and ⑤) is 20mA.
- 3) Due to the internal opticalcoupler, when the terminals ④ and ⑤ output high level, the high level voltage will be about 1V lower than the external power supply voltage.
- 4) When the test result is correct, the terminal ⑤ outputs a high level of about 500ms.

When the test result is wrong or fails, the terminal ④ outputs a high level of about

1500ms. The terminals ④ and ⑤ are both low level when there is no output.

- 5) The trigger input adopts positive transition edge input. Once the passive switch is closed (or the trigger voltage signal is loaded), it indicates that the trigger signal input has been completed. When triggering again, the operation needs to be redone.
- 6) When the terminal ① is connected to the external power source positive, either passive trigger or active trigger can be used normally. It is recommended that passive trigger input be used at this time.

8. Technical Specifications

- Main Technical Parameters
- Notes on Calibration Parameters

Table 8-1 Main technical parameters of UTL8500X series electronic load

Model		UTL8511S		UTL8512S		UTL8511C	
Rated value 0~40°C	Input value	0~150V		0~150V		0~150V	
	Input current	0~3A	0~30A	0~3A	0~30A	0~3A	0~15A
	Input power	150W		300W		150W	
	Minimum operating voltage	1.4V at 30A		1.4V at 30A		1.4V at 15A	
Constant voltage mode	Range	0~18V	0~150V	0~18V	0~150V	0~18V	0~150V
	Resolution	0.1 mV	1mV	0.1 mV	1mV	0.1 mV	1mV
	Precision	± (0.05%+0.025%FS)		± (0.05%+0.025%FS)		± (0.05%+0.025%FS)	
Constant current mode	Range	0~3A	0~30A	0~3A	0~30A	0~3A	0~15A
	Resolution	0.1mA	1mA	0.1mA	1mA	0.1mA	1mA
	Precision	± (0.05%+0.05%FS)		± (0.05%+0.05%FS)		± (0.05%+0.05%FS)	
Constant resistance mode	Range	0.05Ω~7.5kΩ		0.05Ω~7.5kΩ		0.05Ω~7.5kΩ	
	Resolution	16bit		16bit		16bit	
	Precision	0.1%+0.08S		0.1%+0.08S		0.1%+0.08S	
Constant power mode	Range	150W		300W		150W	
	Resolution	10mW		10mW		10mW	
	Precision	± (0.1%+0.1%FS)		± (0.1%+0.1%FS)		± (0.1%+0.1%FS)	
Dynamic mode (CC mode)	T1&T2	50μS~99.999S/Res:1μS		50μS~99.999S/Res:1μS		50μS~99.999S/Res:1μS	
	Precision	5μS±100ppm		5μS±100ppm		5μS±100ppm	
	Rise/Fall slope	0.001~3.0A/us		0.001~3.0A/us		0.001~3.0A/us	
	Minimum rise time	≥10us		≥10us		≥10us	
Voltage readback value	Range	0~18V	0~150V	0~18V	0~150V	0~18V	0~150V
	Resolution	0.1mV	1mV	0.1mV	1mV	0.1mV	1mV
	Precision	± (0.025%+0.025%FS)		± (0.025%+0.025%FS)		± (0.025%+0.025%FS)	
Current readback value	Range	0~3A	0~30A	0~3A	0~30A	0~3A	0~15A
	Resolution	0.1mA	1mA	0.1mA	1mA	0.01mA	0.1mA
	Precision	0.025%+0.05%FS		± (0.025%+0.05%FS)		± (0.025%+0.05%FS)	
Power readback value	Range	150W		300W		150W	
	Resolution	10mW		10mW		10mW	
	Precision	± (0.1%+0.1%FS)		± (0.1%+0.1%FS)		± (0.1%+0.1%FS)	
Ripple	Range	0~3V		0~3V		0~3V	
	Resolution	10Hz~200kHz		10Hz~200kHz		10Hz~200kHz	
	Precision	1%+5mV		1%+5mV		1%+5mV	

Over power protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+15W), immediate protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+15W), immediate protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+15W), immediate protection				
Over current protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+1.5A), immediate protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+1.5A), immediate protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+1.5A), immediate protection				
Over voltage protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+3V), immediate protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+3V), immediate protection	≥1.05 times the set value, delay protection ≥1.1 times the set value, immediate protection >(FS+3V), immediate protection				
Over temperature protection	≥85°C	≥85°C	≥85°C				
Short circuit	Current (CC)	≤3A	≤30A	≤3A	≤30A	≤3A	≤15A
	Voltage (CV)	0V	0V	0V	0V	0V	0V
	Resistance (CR)	35mΩ	35mΩ	35mΩ	35mΩ	35mΩ	35mΩ
Impedance of input terminal	300kΩ		300kΩ		300kΩ		
Fuse specification	0.5A(110V)/0.25A(220V)		0.5A(110V)/0.25A(220V)		0.5A(110V)/0.25A(220V)		
Requirements of power supply	110V/220V frequency 50/60Hz		110V/220V frequency 50/60Hz		110V/220V frequency 50/60Hz		
Size mm(Width*Height*Depth)	214W*88H*340Dmm		214W*88H*340Dmm		214W*88H*340Dmm		
Net weight (kg)	5.3KG		5.3KG		5.3KG		

Remarks:

Environmental requirements: 23°C±5°C ≤90%RH.

Recommended calibration frequency: once/year

AC power input level: (The switch on the rear panel of the electronic load can choose 110V or 220V)

110V: 110V±10% 50~60Hz

220V: 220V±10% 50~60Hz

UNI-TREND TECHNOLOGY (CHINA) CO., LTD.

No.6, Gong Ye Bei 1st Road,
Songshan Lake National High-Tech Industrial
Development Zone, Dongguan City,
Guangdong Province, China

Made in China