

EMS61000-5A
SURGE GENERATOR
USER'S MANUAL

Ver 6.03

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Foreword

Thank you for purchasing the EVERFINE EMS61000-5A Surge Generator. This user's manual contains useful information involving the instrument's functions and operating procedures as well as precautions that should be noticed during operation. In order to use the instrument correctly, please read the manual carefully first, then put it in a right place for quick references.

Notes:

- EVERFINE pursues a continuing improvement of the performance and functions of its products, therefore, the contents of this manual may be changed without prior notice.
- Great effort has been made in preparation of this manual to ensure the accuracy of its contents. If you have any questions or find any errors, please contact your dealer or EVERFINE sales office.
- If you have different understanding to this manual, please refer to the Technical Service Department of EVERFINE.

Checking package contents

Please check the instrument carefully when you unpack the box for the first time. If the instrument and related accessories are missing or appear abnormal, please contact the dealer or EVERFINE immediately.

Warm notice to valued customers of EVERFINE

"Ensure the quality, insist on continuous improvement and make every customer more satisfied" is the quality policy of EVERFINE. Therefore, the quality of products and services provided by EVERFINE should be better than those have been promised. If you have further suggestions or advices on our products and services, please provide your feedback to our quality supervision department.

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Your supervision is the motivation for us to move forward!

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If EVERFINE has signed a written agreement with user and the contents in the agreement are in conflict with above terms, the contents in the written agreement have preferential force effect.

Safety previsions

The following general safety precautions must be observed during all phase of operations, including service and repair. If the instrument is used in the manner not specified in this manual, the function of this instrument may be hindered.

This instrument adopts the following safety symbol.



Electric shock



High voltage



Grounding

Warning**Don't operate the instrument in explosive environment**

Don't operate the instrument in flammable and explosive environment.

Operating any electronic instrument will cause damage in this kind of environment

Grounding

Ensure the instrument has been well grounded before turning on the power to avoid electronic shock.

No grounding

Prohibit operating the instrument without grounding.

Power supply

Ensure the power supply is in the range of rated power.

Fuse

Please use the specified standard fuse (current, voltage, model) to avoid fire. Cut off the power and load before switching the fuse.

Short circuit is prohibited.

Don't dismantle the instrument

Don't dismantle the instrument to avoid the partial voltage injury.

Relative humidity

Don't operate the instrument when the hand is wet or the relative humidity is too high.

Transportation

Please be careful when delivering the instrument to avoid collision, inversion and vibration.

Cautions

To ensure the safety of the persons and instruments, please notice the following general safety precautions:

1. The power is AC 100V-240V, 50Hz/60Hz $\pm$ 1%.
2. Don't operate the instrument when the hand is wet or the relative humidity is over 75%.
3. Please ensure the instrument is under standby state and the EUT(equipment under test) indicator extinguished before switching the wire as the high-voltage impulse existed between connection terminal.
4. Connect the grounding terminal with the EUT grounding when implementing interference immunity test.
5. Please ensure correct wiring before test.
6. Don't touch the wiring terminal when testing.
7. Keep the instrument clean and don't block the vent hole in the rear panel and case in order to ensure good ventilation and heat dissipation. Also, barriers is prohibited and no covering.
8. Please be careful when delivering the instrument to avoid collision, inversion and vibration.
9. Don't open the case to avoid electronic shock and damage to the instrument.
10. When the built-in coupling and decoupling network of this instrument is connected to the power supply network (50Hz/60Hz) of the test product, no matter whether the device under test is connected or not, the current flowing through the L-phase is not equal to the current flowing through the N-phase. Ampere of current will cause the circuit with leakage protector to trip. The customer should take corresponding measures.

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Chapter 1 Overviews

EMS61000-5A lightning surge generator is a high reliability test system specially designed for the characteristics and requirements of lightning surge immunity test in electromagnetic compatibility test. The equipment can simulate lightning strike, produce high energy (high voltage, high current) surge, can realize 1.2/50 μ s (8/20 μ s), pulse magnetic field test multi-function automatic switch, high intelligence degree, easy to use.

The instrument conforms to the latest national standard GB/T17626.5, GB/T17626.9, international Electrotechnical Commission standard IEC61000-4-5, IEC61000-4-9, and can widely meet the test requirements of electronic products' anti-surge ability.

Main characteristics of the instrument:

- (1) Built-in CWG and MF generators, one can realize lightning surge test and pulse magnetic field test at the same time;
- (2) Program-controlled voltage boost, surge voltage up to 7kV, meet the requirements of severe tests;
- (3) The built-in single-phase power line coupling decoupling network realizes automatic switching coupling path;
- (4) The built-in voltage and current differential probe can measure the surge voltage and current peak value and set the surge threshold;
- (5) Built-in file system, support U disk reading and writing, easy to import, export and save related procedures and test reports;
- (6) 10.1-inch LCD touch screen display, friendly human-computer interaction interface;
- (7) Configure RJ45 communication function;

Chapter 2 Specifications

2.1 Technical indicators

host feature			
user interface	10.1 inch capacitive touch screen	BNC detection port	Peak voltage/current, EUT voltage/current
operating system	Android	Trigger mode	Auto/Manual/External
Communication interface	RJ45	Sync source	Asynchronous /EUT power/external synchronization
Data storage interface	USB	Failure detection mode	Threshold/external signal/safety loop
CRO trigger	Oscilloscope 5V trigger signal		
Coupling/decoupling network			
voltage	Single phase MAX AC260V/DC300V	frequency	DC/50Hz/60Hz
current	20A		
Combined surge (1.2/50 μ s)			
Voltage range	500-7000V $\pm$ 10%	Front time	1.2 μ s $\pm$ 30%
Current range	250A-3500A $\pm$ 10%	Duration	50 μ s (The error according to the standard)
impedance	2 Ω /12 Ω	Repetition rate	10-9999s
Polarity	positive/negative/alt	Cruise parameters	Voltage/phase
Instrument power supply			
Alternating current	AC 100-240VAC(50Hz/60Hz)		

2.2 Built-in 1phase CDN

The maximum capability of the EUT source: maximum allowable durative current

20A at phase voltage 0~260V AC, or maximum durative current 20A at 0~220V DC..

- (1) Decoupling inductance: 1.5mH inductance;
- (2) EUT power capacity: Phase voltage 0~260VAC, Maximum allowable continuous current 20A, Peak current 30A; 0~220VDC, Maximum Continuous Current 4A。
- (3) When EUT is not connected, the residual surge voltage at the input end shall not exceed 15% of the test voltage applied or twice the peak value of the rated voltage, whichever is the greater.
- (4) When EUT is not connected and the input end is open, the residual surge voltage on the unapplied surge line shall not exceed 15% of the maximum applied voltage.

2.3 Definition of output waveform

2.3.1 1.2/50 μ s combination wave

Table1 1.2/50 μ s CWG Open-circuit voltage parameter

coupled mode	Front time $T_f=1.67T$	Duration $T_d=T_w$
Direct output/ line-to-line coupling	$1.2\mu s \pm 0.36\mu s$	$50\mu s + 10\mu s / -15\mu s$
line-to-ground coupling	$1.2\mu s \pm 0.36\mu s$	$50\mu s + 10\mu s / -30\mu s$

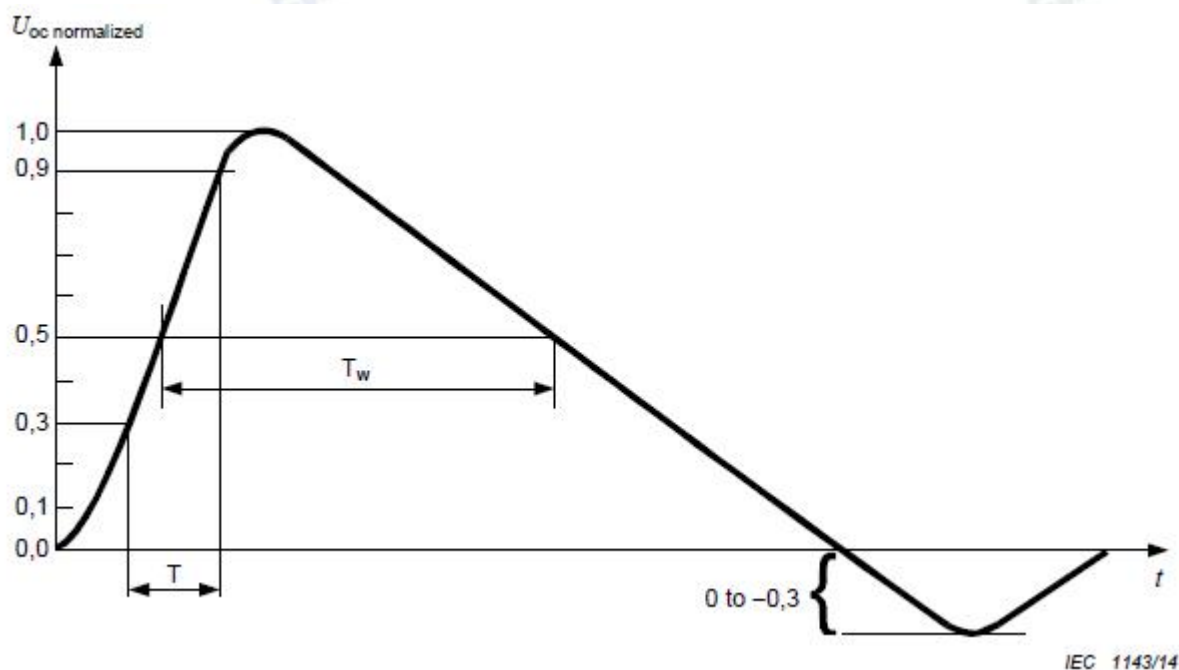


Fig2.1 1.2/50 μ s CWG waveform of the surge voltage

Table2 1.2/50μs CWG Short-circuit current parameter

coupled mode	Front time $T_f=1.25T_r$	Duration $T_d=1.18 \times T_w$
direct output / line-to-line coupling	$8\mu s \pm 1.6\mu s$	$20\mu s \pm 4\mu s$
line-to-ground coupling	$2.5\mu s \pm 0.75\mu s$	$25\mu s \pm 7.5\mu s$

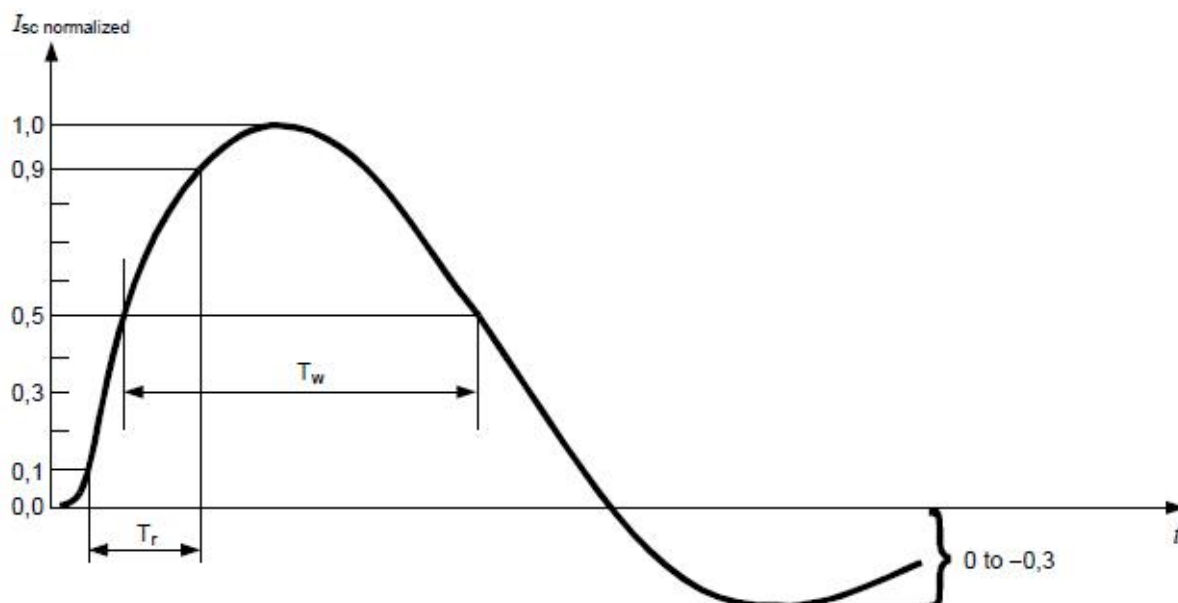


Fig2.2 1.2/50μs CWG waveform of surge current

2.3.2 Pulse magnetic current waveform

Table3 Pulse magnetic field current waveform parameters

coupled mode	Front time T_1	duration T_2
direct output	$6.4\mu s \pm 1.92\mu s$	$16\mu s \pm 4.8\mu s$

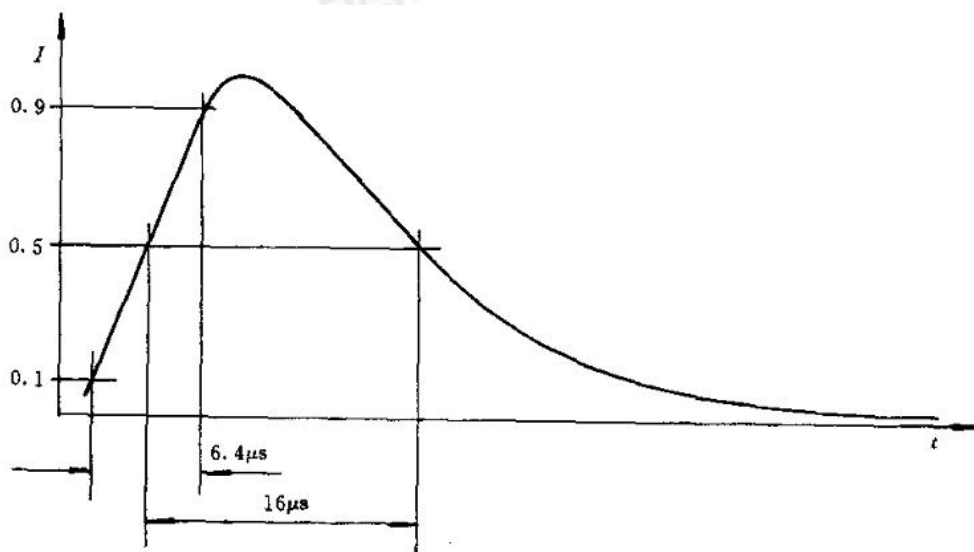


Fig2.3 Pulse magnetic current waveform

2.4 Conventional technical index

- ① Environment temperature: $15^{\circ}\text{C} \sim 35^{\circ}\text{C}$
- ② Relative humidity: $25\% \sim 75\%$
- ③ Atmospheric pressure: $86\text{kPa} \sim 106\text{kPa}$
- ④ Power voltage: AC $100\text{V} \sim 240\text{V}$
- ⑤ Power frequency: $50\text{Hz}/60\text{Hz} \pm 1\%$
- ⑥ Volume (W×H×D) : $480\text{mm} \times 226\text{mm} \times 500\text{mm}$
- ⑦ Weight: about 38kg

Chapter 3 Panel shows

3.1 Front panel



Fig3.1 Front panel fig of the EMS61000-5A surge generator

- | | |
|-----------------------------|---|
| ① Pulse voltage monitor BNC | U-CRO: 1000/1 ($\pm 20\%$) |
| ② Pulse current monitor BNC | I-CRO: 500A/V ($\pm 20\%$) |
| ③ Trigger out | 5V TTL |
| ④ USB | Import and export test procedures and reports, update APP |
| ⑤ power switch | equipment power switch |
| ⑥ Emergency stop switch | equipment reset switch in case of emergency |
| ⑦ Indicator light | Indicating the running state of the instrument |
| ⑧ Direct output terminal | Direct output port of the instrument |
| ⑨ EUT output terminal | Connect the EUT port |

3.2 Rear panel

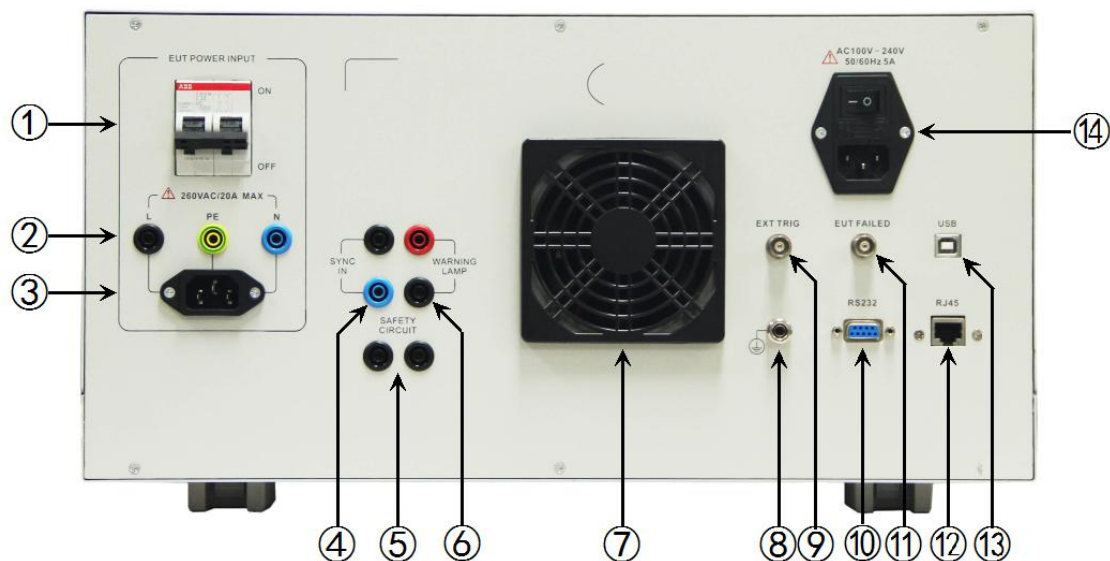


Fig 3.2 Rear panel fig of EMS61000-5A surge generator

- | | |
|---|--|
| 1) Circuit breaker | EUT switch; |
| 2) EUT input terminal | EUT power input terminal; |
| 3) Single-phase EUT input terminal | Single-phase EUT power input terminal; |
| 4) External sync signal | Power synchronous signal input (10-420VAC) ; |
| 5) Safety circuit | Instrument interlock safety circuit |
| 6) Caution light | Run the warning light interface |
| 7) Fan | |
| 8) Grounding terminal | Instrument grounding terminal |
| 9) External trigger terminal ¹ | External trigger input port, TTL level; |
| 10) RS232 port | External network interface of the instrument |
| 11) EUT Failed ² | EUT fail input, TTL level; |
| 12) RJ45 port | Upper computer communication port; |
| 13) USB port | Instrument commissioning port; |
| 14) Instrument power input | AC100V~240V; |

注：1、External trigger terminal (EXT TRIG) definition: External trigger signal input, when the trigger mode is set to external trigger in Fig 4.15, the pulse output of the instrument is triggered from the input signal of the terminal.

2、EUT failure terminal (EUT FAILED) is defined as: short connection is EUT failure anomaly.

Chapter 4 Parameter Settings

4.1 Interface and parameter setting

4.1.1 System main interface



Fig 4.1 System main interface

The main interface of the system is shown in Fig 4.1.

- | | |
|----------------------------------|---|
| ① Program title bar: | Displays the current program name, creates, loads, and saves the program; |
| ② Test step bar: | All test steps are displayed and the test steps can be edited; |
| ③ Bottom toolbar: | Display time and date; |
| ④ Dynamic display area: | Displays dynamic parameters and progress bar for the current test step; |
| ⑤ Instrument operation button: | Instrument status control area; |
| ⑥ Waveform display area: | Displays the waveform corresponding to the current test step; |
| ⑦ EUT parameter display area: | Display EUT voltage and current parameters; |
| ⑧ Generator module display area: | Display the generator module currently owned by the instrument; |
| ⑨ Instrument function | Set the general parameters of the instrument, file library and other functions. |

setting area:

4.1.2 "System Settings" interface

Click the "System Settings" TAB in Fig4.1 to enter the system Settings interface. Click the TAB on the right to enter different Settings.

(1) "General use" setting interface

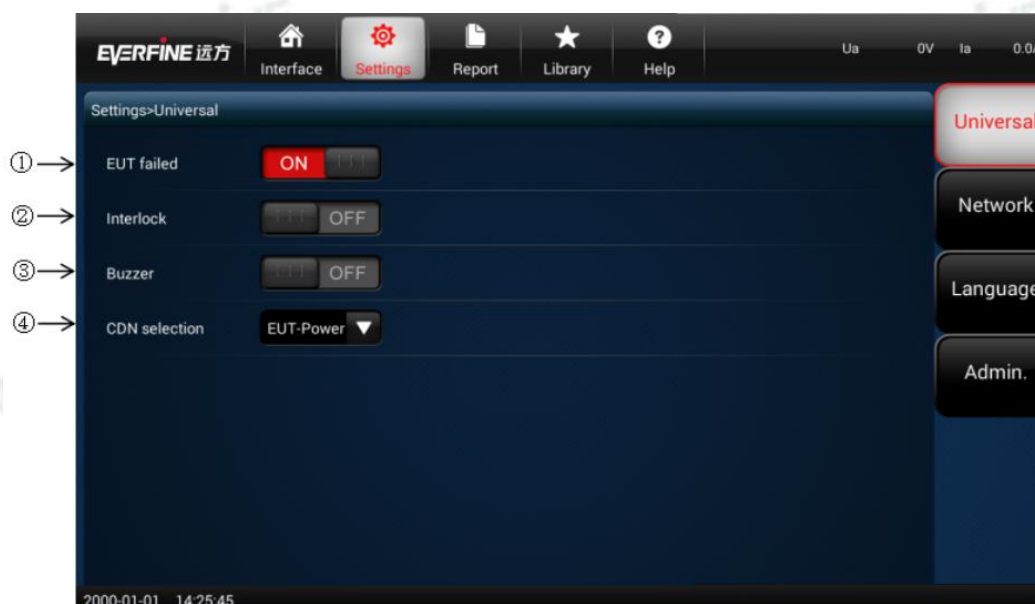
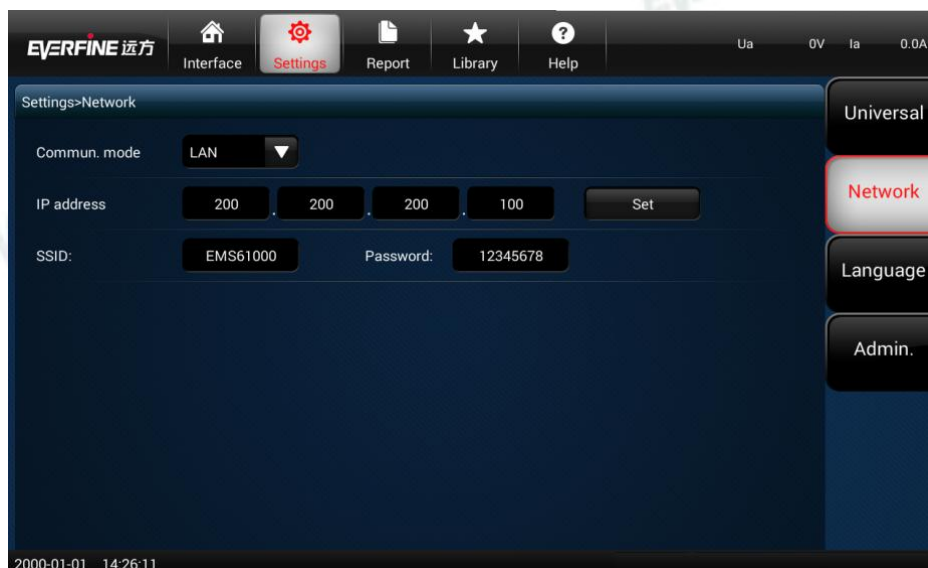


Fig4.2 General use setting interface

As shown in Fig 4.2, parameters setting on the general setting interface are explained as follows:

- ① EUT failure: EUT invalidation turns on/off options;
- ② Instrument chain: Instrument interlock on/off options; This setting is used for interlocking of multiple instruments.
- ③ CDN selection: Choose the External CDN.

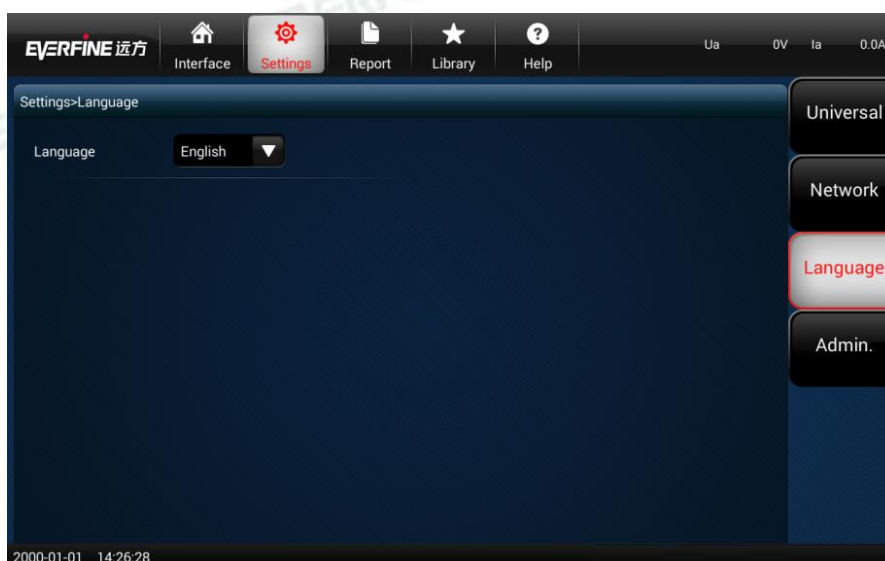
(2) "Network" setup interface

**Fig4.3 Network setup interface**

The interface of communication setting with PC is shown in Fig 4.3. Set the instrument address or PC address to the same IP segment, and the port number in the upper computer is 5100.

When choosing to use WIFI communication, first enter the name and password of WIFI that the instrument needs to access in the interface of "Network port" in the communication mode, and then select "WIFI" in the communication mode and the instrument will automatically connect. After successful connection, the IP address will display the address assigned to the current instrument. PC software will use this address to communicate with the instrument.

(3) "Language" setting interface

**Fig4.4 Language setting interface**

The language setting interface is shown in Fig 4.4, which can be switched between Chinese and English.

(4) "Administrator " interface

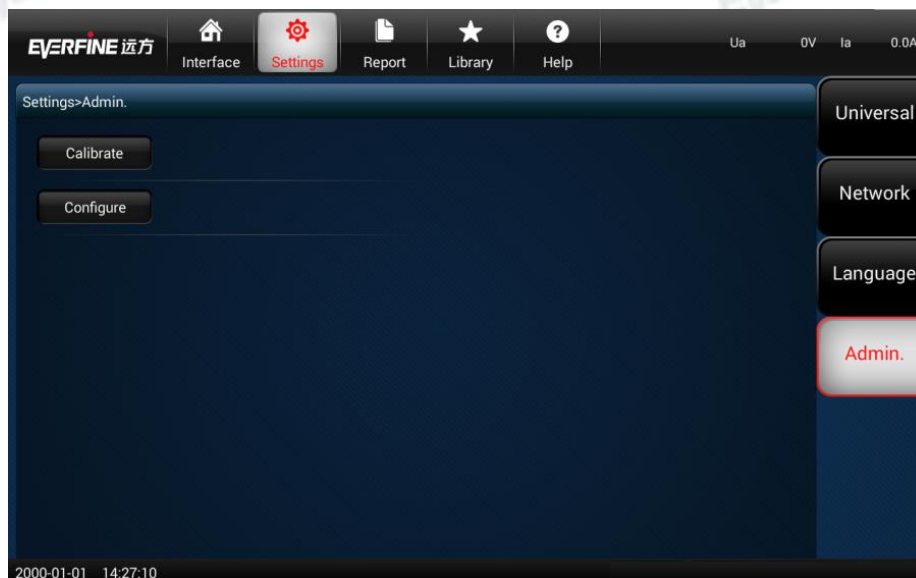


Fig 4.5 Administrator interface

Click the "Administrator" TAB, and the password box pops up. Enter the password "11" and enter the administrator interface as shown in Fig4.5. Click calibration to calibrate the output voltage of the instrument.

4.1.3 "Test Report" interface

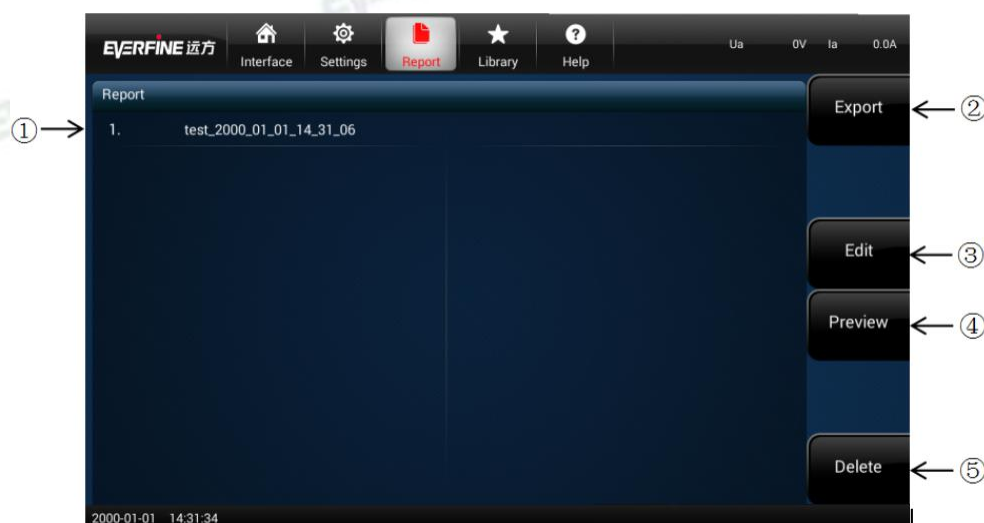


Fig 4.6 Test Report interface

Click "Test Report" in Fig4.1 to enter the interface as shown in Fig4.6. The functions of each part are as follows:

- | | |
|-----------------------|---|
| ① Report display area | Displays all test reports stored in the current instrument; |
| ② "Export" button | Used to export reports to a USB flash drive; |
| ③ "Edit" button | The preview interface is shown in Fig 4.9; |
| ④ "Preview" button | The preview interface is shown in Fig 4.10; |
| ⑤ "Delete" button | Used to delete the selected test report. |



Fig4.7 Test report edit interface

The edit interface of the test report is shown in Fig 4.7. Part of the report can be modified.

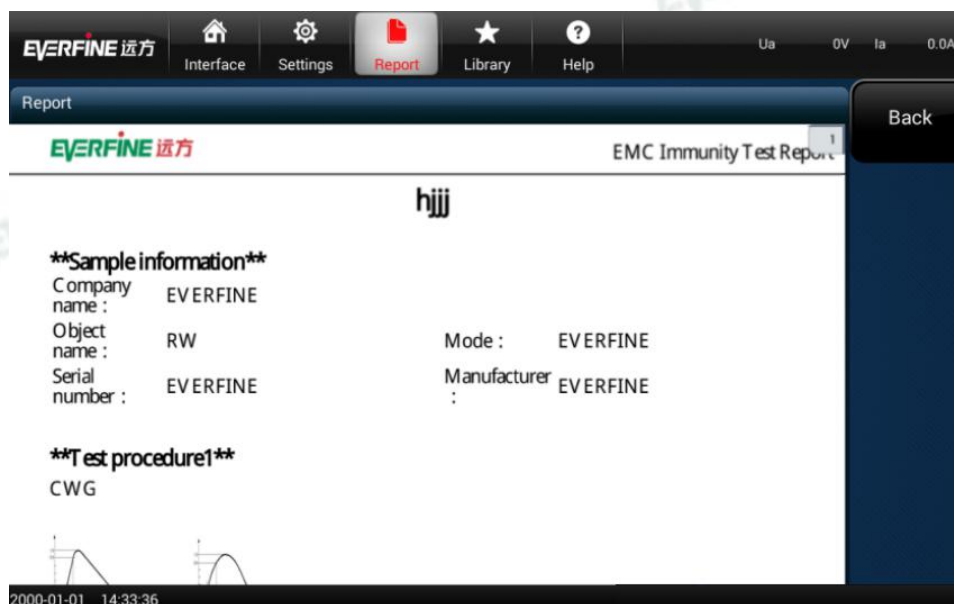


Fig 4.8 Test report preview interface

The preview interface of the test report is shown in Fig 4.8. Relevant parameters of the test report can be previewed by swiping up and down on the touch screen.

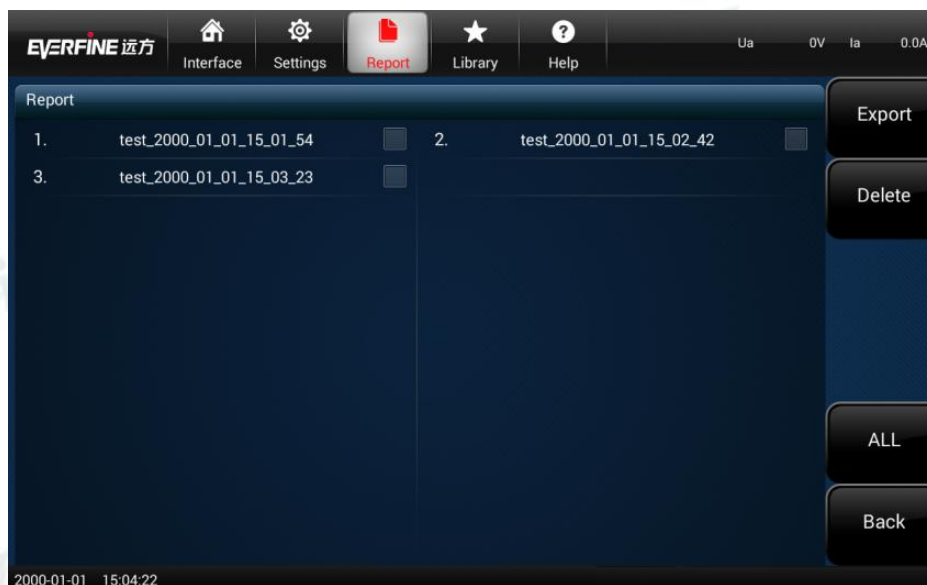


Fig4.9 Test report check screen

Press the report name in Fig4.8 long enough to enter the check interface as shown in Fig 4.9. The report can be exported or deleted by check operation.

4.1.4 "Library" interface

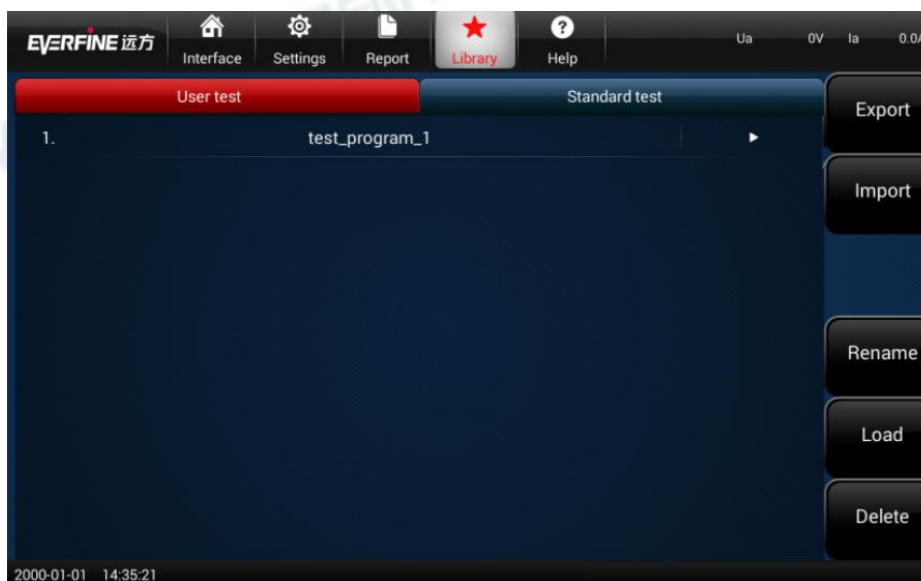


Fig 4.10 User Library interface 1

Click "Program Library" in Fig 4.1 to enter the user program library interface, as shown in Fig 4.10, showing all test programs saved in the current instrument. You can switch between two different libraries by using user programs and Standard Programs at the top. Click "►" to the right of the program name to display the test steps in the current program, as shown in Fig 4.11.

- ① Export: Export the selected program to the usb disk;
- ② Import: Import the program from the usb disk into the instrument;
- ③ Load: Load the selected program into the test screen;
- ④ Delete: Deletes the currently selected program;
- ⑤ Rename: Rename the selected program.



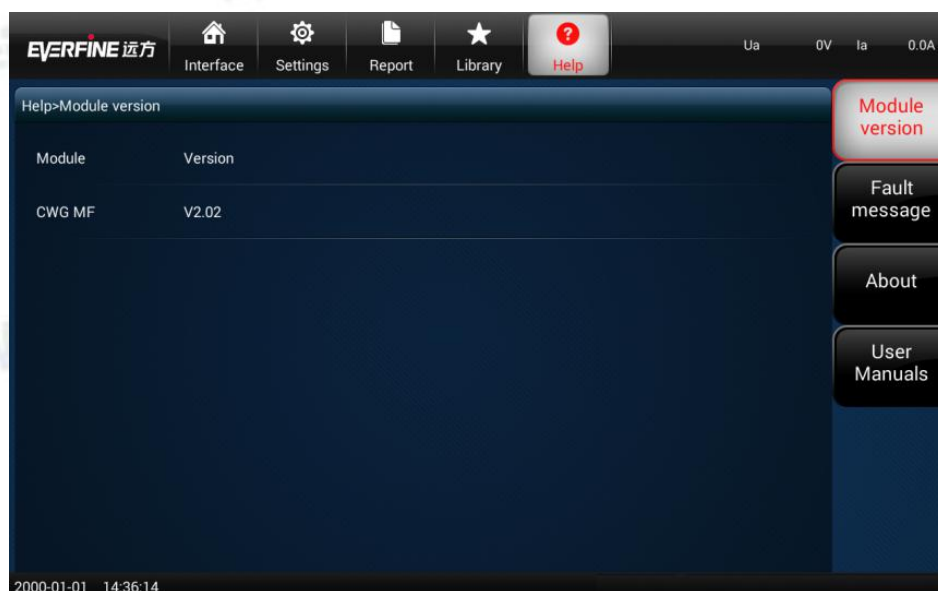
Fig 4.11 User Library interface 2

The standard library interface is shown in Fig 4.12, where the standard library cannot rename a program name.

**Fig 4.12 Standard library interface**

4.1.5 “Help” interface

(1) “module version” interface

**Fig4.13 Module version interface**

The module version information interface is used to display the current embedded version number of the instrument.

(2) "Fault information" interface

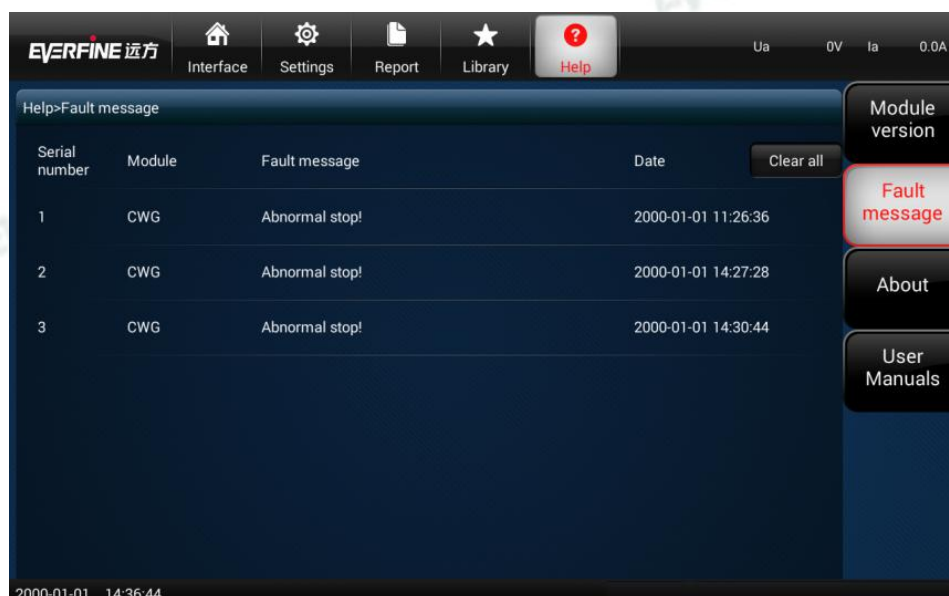


Fig4.14 Fault information interface

The interface of fault information is shown in Fig 4.14. This interface displays the fault status of the instrument for recording and displaying for maintenance. Long press one of the fault information to delete it.

(3) "About" interface



Fig4.15 About interface

The interface of "about" is shown in Fig 4.15, where the UI software of the instrument can be upgraded.

4.1.6 Test step area

The test step setup area is shown in Fig 4.16.

- ① Test steps: Displays all test steps for the current program;
- ② Add button: Add a test step;
- ③ Edit button: Edit test step status.

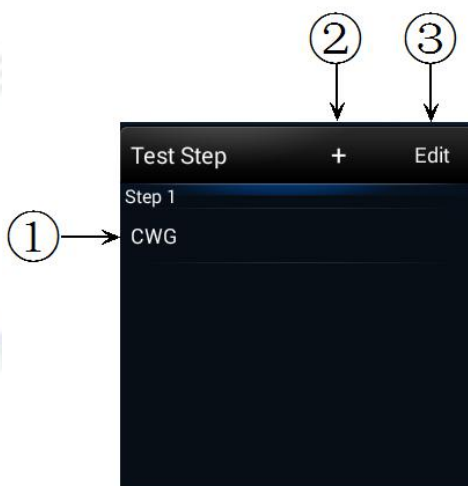


Fig 4.16 Test the step setup area

Click the add button in Fig. 4.16 ②, as shown in Fig. 4.17.

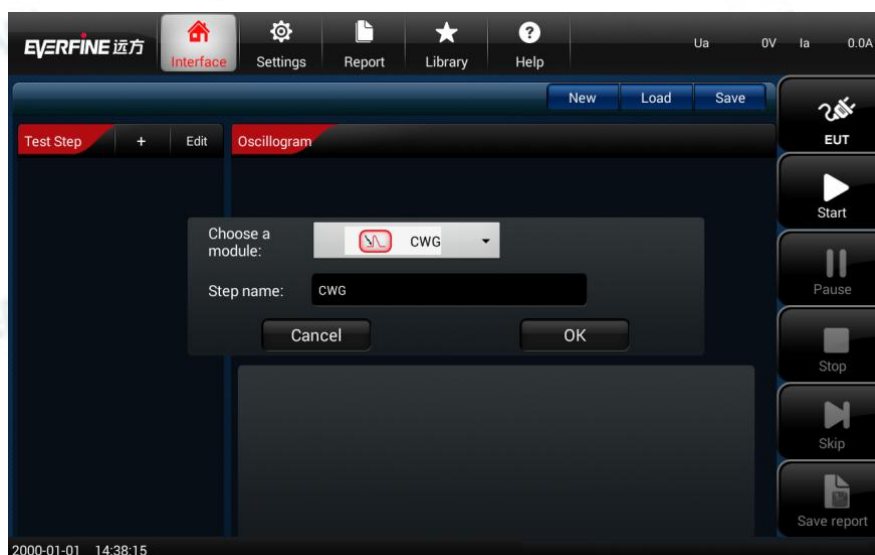


Fig 4.17 Add button selection interface

Click the drop-down menu to add waveform module/message box/delay. See parameter setting area for related parameters.

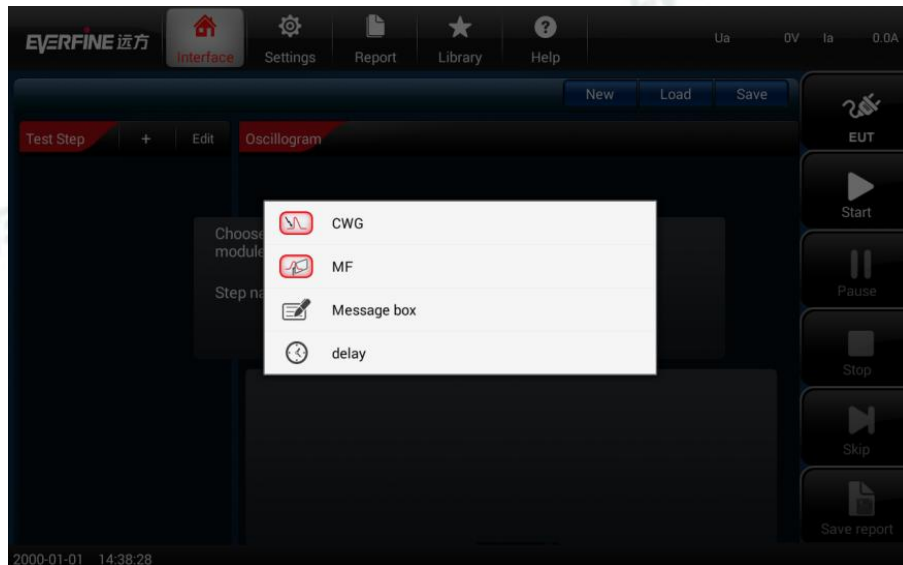


Fig 4.18 Add button selection interface

Click "edit" in Fig4.16, and the test step area becomes as shown in Fig 4.19 below. Click  to delete the current test step, Click  to copy the current test step to the new test step, Click   to adjust the order of the test steps.



Fig4.19 Test step edit interface

4.1.7 Parameter setting area

When you click the message box step, it appears as shown in Fig 4.20. You can set this step to display information.

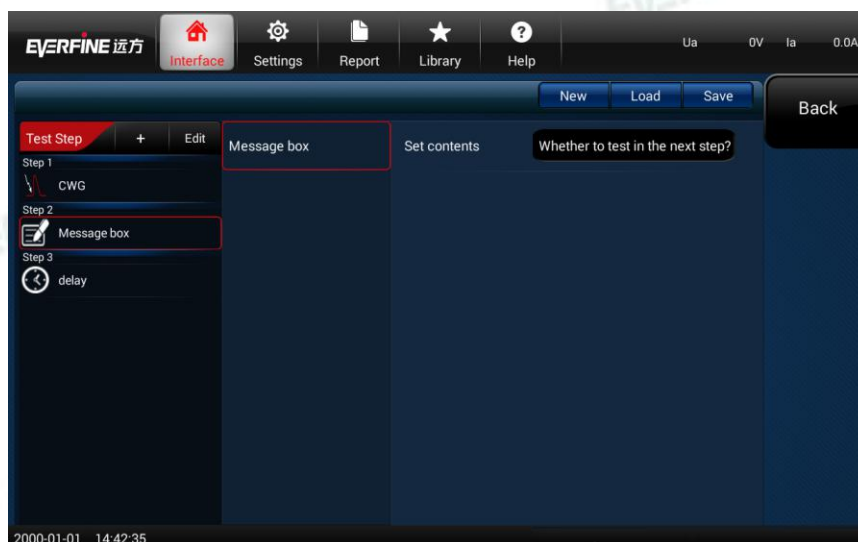


Fig4.20 Message box step edit interface

When the delay step is clicked, it appears as shown in Fig 4.21. Delay time can be set.

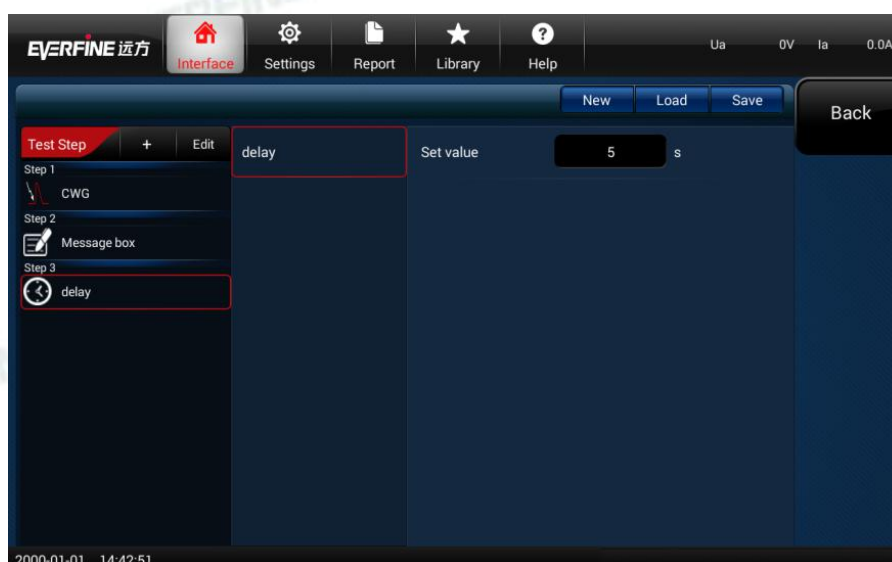


Fig4.21 Delay step edit interface

Click the steps of waveform module to enter the setting interface of waveform module parameters, as shown in Fig. 4.22.

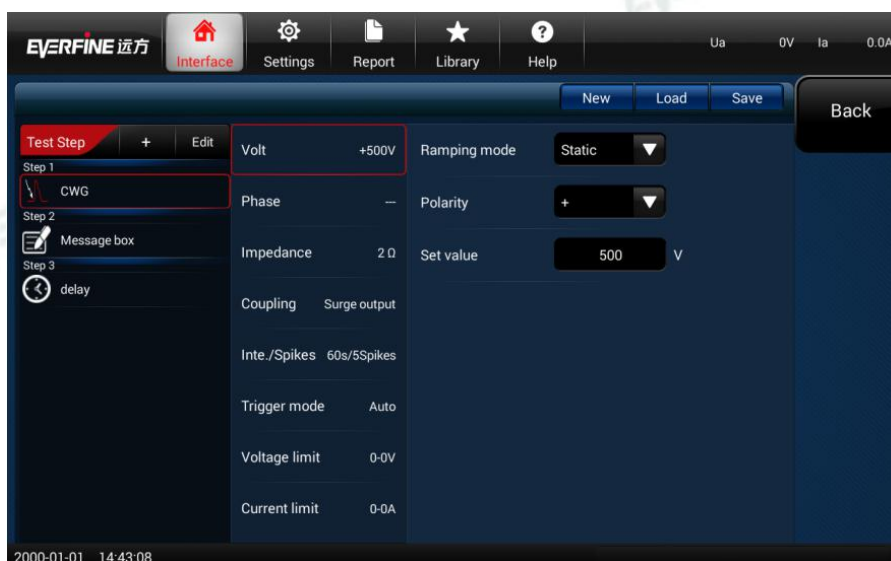


Fig4.22 Parameter setting interface

(1) "Voltage" setting

The voltage setting interface is shown in Fig. 4.22.

- ① Cruise mode: Can be set to fixed, gradient, times, and percentage modes;
- ② Polarity: Can be set to +, -, +/-, -/+;
- ③ Set value: Set the range to 250V~7000V.

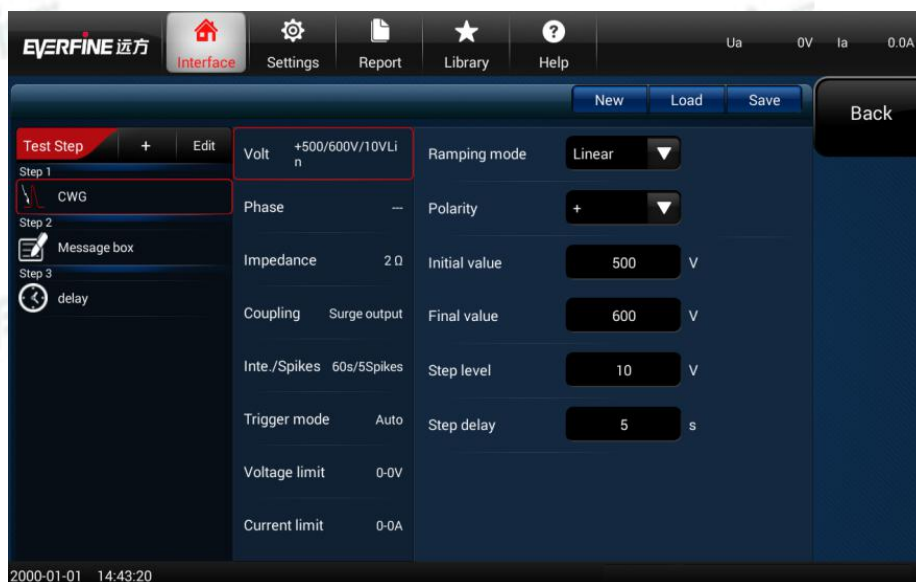


Fig4.23 Voltage gradient mode setting interface

The interface for setting voltage gradient mode is shown in Fig. 4.21. The Settings range is as follows:

- ① Initial value: Setting range 500V-7000V;

- ② Stop value: Setting range 501V-7000V;
- ③ Step level: Setting range 1V-6750V;
- ④ Step delay: Setting range 1-9999。

Note: Cruise mode setting item function description, see cruise section for details.

(2) "Phase" setting

- ① Cruise mode: Can be set to fixed, gradient, times, and percentage modes;
- ② Phase: Can be set to asynchronous, phase synchronous, external synchronous;
- ③ Set value: Set the range is 0-359。

Phase asynchrony means that the pulse output of the instrument is random phase output. Phase synchronization is performed by using EUT power supply as the synchronous source for fixed phase pulse output. External synchronization is a synchronous source with external input for fixed phase pulse output.

Where, the phase synchronization setting interface of cruise mode is shown in Fig 4.21, and the setting range is as follows:

- ① Initial value: Setting range 0-359;
- ② Stop value: Setting range 1-359;
- ③ Step level: Setting range 1-359;
- ④ Step delay: Setting range 1-9999。

(3) "Impedance" setting

The impedance can be set to 2Ω or 12Ω 。

(4) "Coupling path" setting

The coupling path output mode can be set to direct output or built-in CDN. When set to direct output, the coupling path becomes non-optional.

(5) Setting of "Pulse interval/times"

The pulse intervals/times are set to a range of 1-9999.

(6) "Trigger mode" setting

Trigger mode can be set to automatic/manual/external trigger.

- ① Automatic: The instrument will be tested in a cycle according to the set value. When the test time arrives, the instrument will stop testing;
- ② Manual: Once the instrument is pressed for operation, it will be triggered by an impulse, and the instrument will be suspended after the trigger is completed;

③ External trigger: The instrument pulse output runs according to the external trigger signal given.

(7) Setting of "voltage threshold/Current threshold"

Can be set to close/mark/fail. When setting the mark, the peak value will not stop the test when it exceeds the set range, and the peak value will turn red. If set to fail, the test will be aborted if the peak value exceeds the set range during the instrument test.

The upper and lower limits of the voltage threshold range are 0-7700V.

The upper and lower limits of the current threshold range are 0-4000A.

4.1.8 Parameters of the cruise

Parameter cruise is used to realize the function of changing the value of relevant setting items according to the set process during the test. There are three modes: gradient, times and percentage. The functions of the three modes are as follows:

(1) Gradient mode: Parameter change = step level.

(2) Frequency mode: parameter variation = (termination value - initial value)/step level.

(3) Percentage mode: parameter variation = initial value $\times$ step level %

Example: 1. The voltage cruise is set to gradual change mode, the initial value is 500V, the termination value is 1000V, and the stepping level is 100, step delay is 5s, and the number of tests is 5. When the instrument is in operation, 500V voltage class Run 5 times, wait 5 times for 5s voltage to increase to 600V test, and so on, until the instrument Operating voltage class up to 1000V.

2. The voltage cruise is set as frequency mode, the initial value is 500V, the termination value is 1000V, and the stepping level is 2, step delay is 5s, and the number of tests is 5. When the instrument is in operation, 500V voltage grade is operated Line 5 times, wait 5 times for 5s voltage to increase to 750V, and so on, until the instrument transports Line voltage class to 1000V.

3. The voltage cruise is set as percentage mode, the initial value is 500V, the termination value is 1000V, step, etc Level 10, step delay 5s, and test times 5. When the instrument is in operation, 500V voltage class Run 5 times, wait 5 times for 5s

voltage to increase to 550V, and so on, until the instrument Operating voltage class to 1000V.

Note: When the cruise type is set to a percentage, the minimum parameter variation must not be less than the minimum resolution of the setting item.

4.1.9 Dynamic display area

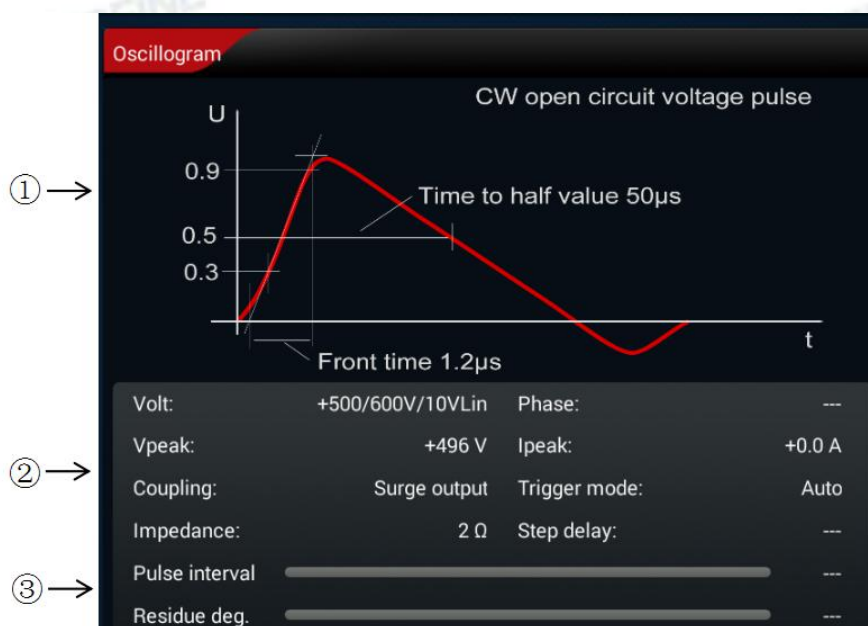


Fig 4.24 Dynamic display area interface

The interface of dynamic display area is shown in Fig. 4.24. The functions of each part are described as follows:

- ① Waveform: Displays the test waveform of the current step;
- ② Dynamic parameter display area: display the dynamic parameter table of the current instrument test;
- ③ Progress bar: Displays the time information for the current test.

4.1.10 Operation state control area

The interface of the operation state control area is shown in Fig. 4.25. The functions of each button are described as follows:

- ① EUT button: Controls the instrument EUT switch to snap or disconnect;
- ② Start button: The control instrument program starts to run;

- ③ Pause button: Controls the instrument to pause the current test state;
- ④ Stop button: Control the reset test procedure of the instrument to restore the standby state;
- ⑤ Skip button: Skip the current test step and proceed to the next test step;
- ⑥ Save Test Report button: Save the current test report.

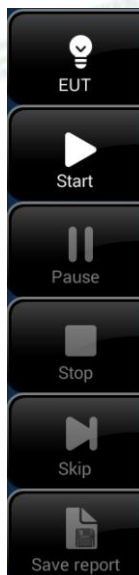


Fig 4.25 Operation state control area interface

4.1.11 Time display area



Fig 4.26 Time display interface

- ① Date: Display current year/month/day, click to adjust the date;
- ② Time: display the current time, click to adjust the time;

4.1.12 Communication interface

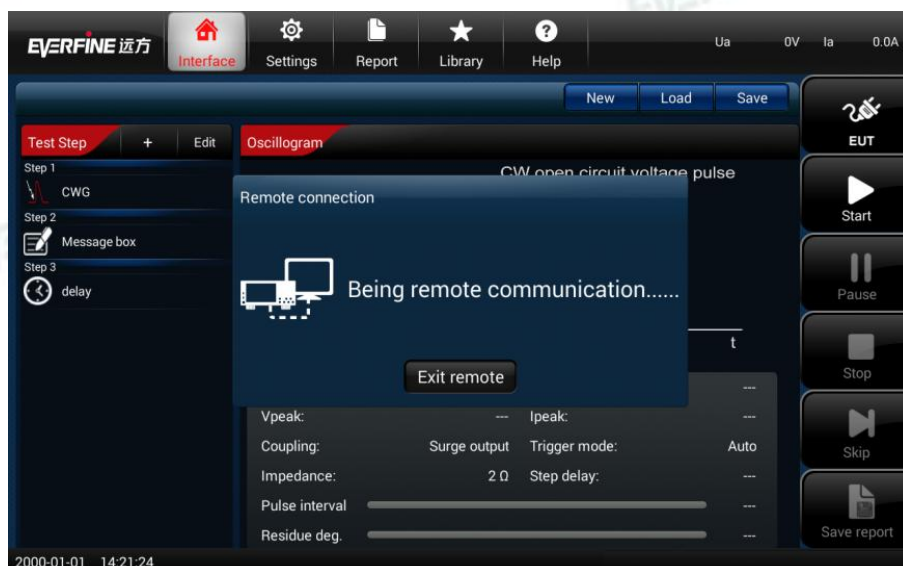


Fig 4.27 Communication interface

The interface display when communicating with the upper computer is shown in Fig. 4.27. Press the exit remote button during communication to exit the communication and restore the standby state of the instrument.

4.2 Abnormal prompt

When the EUT failure detection function is turned on and the instrument detects the external given EUT failure signal, the prompt interface as shown in Fig. 4.28 will appear.

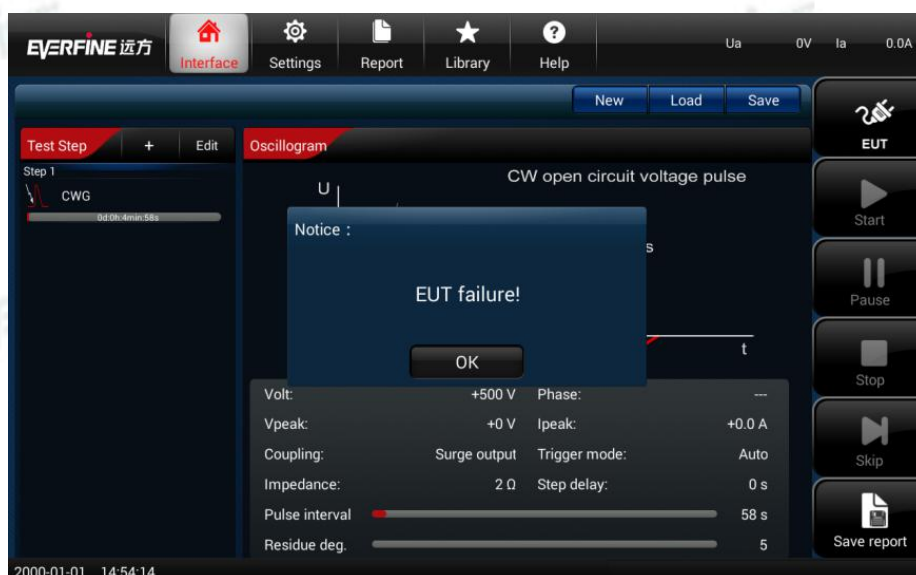


Fig 4.28 EUT failure prompt interface

Instrument failure and troubleshooting information are as follows:

The alarm information	The cause of the problem	Processing method
High pressure source anomaly	High voltage supply voltage is too high/too low	Contact the manufacturer
EUT failure	EUT failure alarm	Check the EUT failure signal input
Instrument interlock	Instrument interlock alarm	Verify that the instrument interlock loop is connected properly
Stop alarm	The emergency stop switch is pressed	Check whether the emergency stop switch is pressed
Discharge switch anomaly	Discharge switch fault	Contact the manufacturer
Phase synchronization anomaly	No phase synchronization signal detected	Check whether the synchronization signal is normal

Chapter 5 Operating steps

5.1 Preparatory work

- (1) Verify that the "POWER" switch on the operation panel is disconnected.
- (2) Connect the instrument power supply: Make sure the power supply voltage is within the range of 100~240V 50Hz/60Hz $\pm$ 1%.

5.2 Connecting test wire

5.2.1 Coupling end test wiring

The test wiring diagram of pulsed magnetic field/passive device is shown in Fig 5.1.



Fig 5.1 Pulse magnetic field/passive device surge test wiring diagram

The wiring diagram of power cord port surge test is shown in Fig 5.2.

- (1) Connect the power supply of the device under test to the corresponding input port on the back panel of the instrument;
- (2) Connect the power line of the device under test to the corresponding output port on the front panel of the instrument.

5.3 Turn on the power

Close the POWER switch on the back panel of the instrument and press the POWER button on the front panel of the instrument to start the instrument system and enter the standby state.

5.4 Set test parameters

Set "voltage", "pulse interval/times", "Trigger mode", "phase" synchronization (synchronizing phase Angle setting, phase synchronizing enable). The specific operation method is referred to the explanation of "parameter setting area" in chapter 4.

5.5 Start testing

(1) Close the "EUT POWER" air switch and switch on the sample POWER (this step is not required for electrical stray surges).

(2) Press the "Run" key to enter the test.

Note: For safety reasons, do not touch the terminals of the instrument during the test.

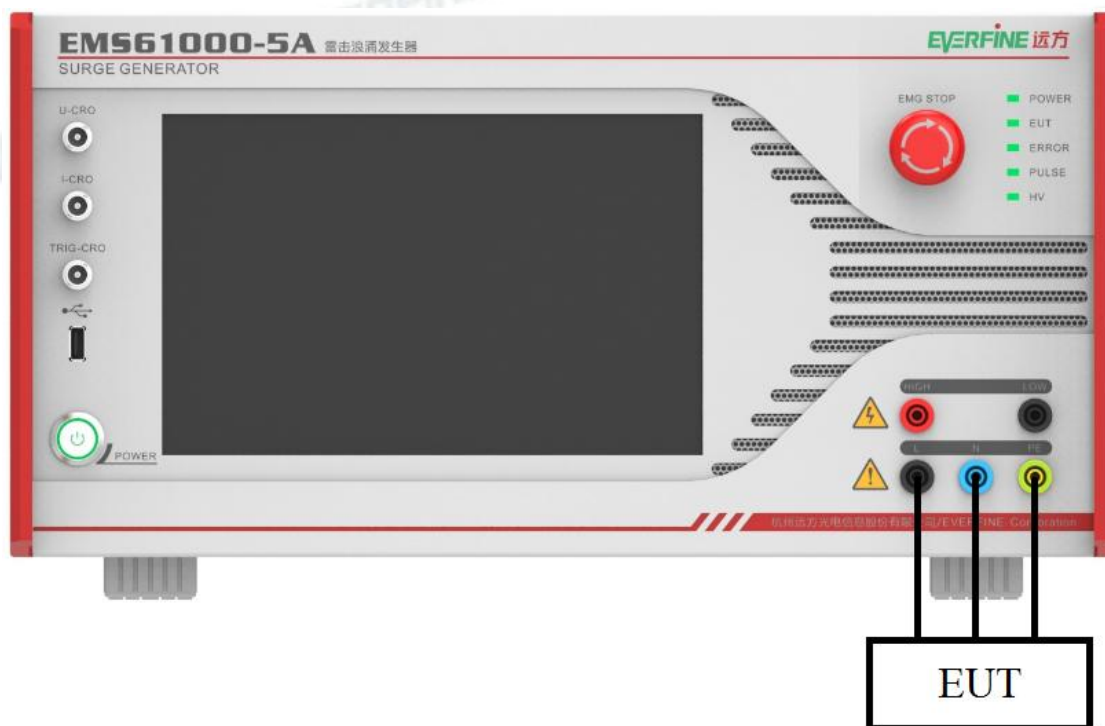


Fig 5.2 Power line coupling voltage surge test wiring diagram

5.6 Error message

In case of unreasonable operation or malfunction of the instrument, the LCD will prompt the fault information and press the "Stop" button to return to the standby interface.

5.7 Termination of the test

Press the Stop key to terminate the test status. The LCD returns to the standby interface.

5.8 Experiment ended

- (1) Disconnect the power supply of the test product and remove the tested product (this step is not required for electrical surge).
- (2) Turn off the operating power of the instrument.

Chapter 6 Inspection of instruments

6.1 Inspection standard

- GB/T 17626.5 Electromagnetic compatibility -Testing and measurement techniques-surge immunity test
- GB/T 17626.9 Electromagnetic compatibility -Testing and measurement techniques-pulse magnetic field immunity test
- IEC61000-4-5 Electromagnetic compatibility (EMC)-Testing and measurement techniques-surge immunity test
- IEC61000-4-9 Electromagnetic compatibility (EMC)-Testing and measurement techniques-pulse magnetic field immunity test

6.2 Equipment used

- (8)Digital oscilloscope: bandwidth of 60MHz or above, accuracy is better than 1%.
- (9)High-voltage differential probe: bandwidth of more than 10MHz, peak range of not less than 7kV, accuracy better than 1%
- (10)AC current probe: bandwidth over 10MHz, peak range no less than 3.5kA, accuracy better than 1%

6.3 Environmental conditions

- 1、Environment temperature: $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- 2、Relative humidity: 45%~75%;
- 3、Power voltage: $220\text{V} \pm 5\text{V}$;
- 4、Power frequency: $50\text{Hz}/60\text{Hz} \pm 1\%$;
- 5、Atmospheric pressure: 86kPa~106kPa;
- 6、The surrounding electromagnetic environment should not affect the test results

6.4 Inspection items

6.4.1 Direct output terminal voltage waveform test

(1) Instrumentation:

- ① Digital oscilloscope: bandwidth of 500MHz or above, accuracy is better than 1%;
- ② High-voltage differential probe: bandwidth over 10MHz, peak range not less than 7kV, accuracy better than 1%.

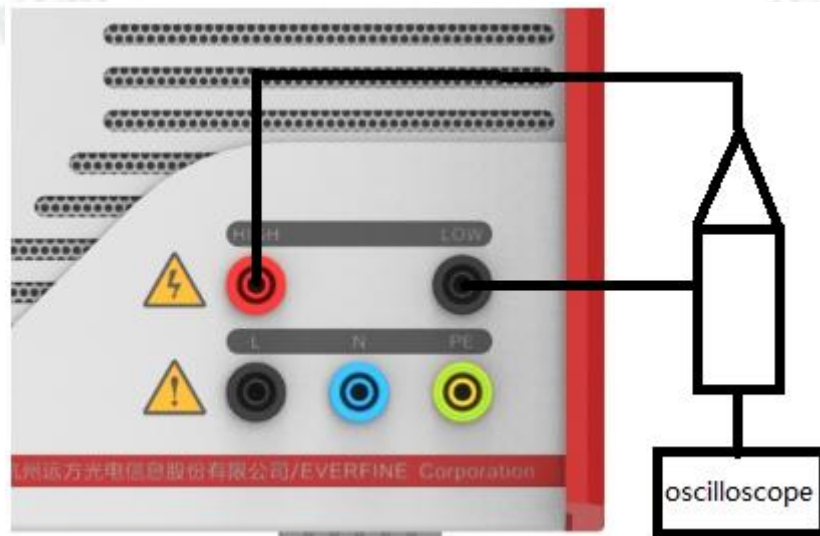


Fig6.1 CWG module directly outputs the open circuit voltage check wiring diagram

(2) Test steps:

- ① According to Fig6.1, set "module selection" as CWG, "trigger mode" as automatic, and "pulse"Interval/number "is 100 times," phase "is asynchronous," polarity "is +, and" coupling path" is direct output.
- ② Select the four test points of "voltage" - "setting value" for 0.5kV, 2.0kV, 4kV and 7kV.
- ③ Press the run button at each test point. Read the peak voltage and wave front from the oscilloscope. During the interval and half peak time, the allowable error should meet the requirements of relevant technical indexes in Chapter 2.
- ④ When the test is complete, set "polarity" to "-" and repeat the steps ②、③.

6.4.2 CWG direct output short circuit current test

(1) Instrumentation:

- ① Digital oscilloscope: bandwidth of 500MHz or above, accuracy is better than 1%;
- ② Ac current probe: bandwidth of more than 10MHz, peak range of not less than 3.5kA, accuracy better than 1%.

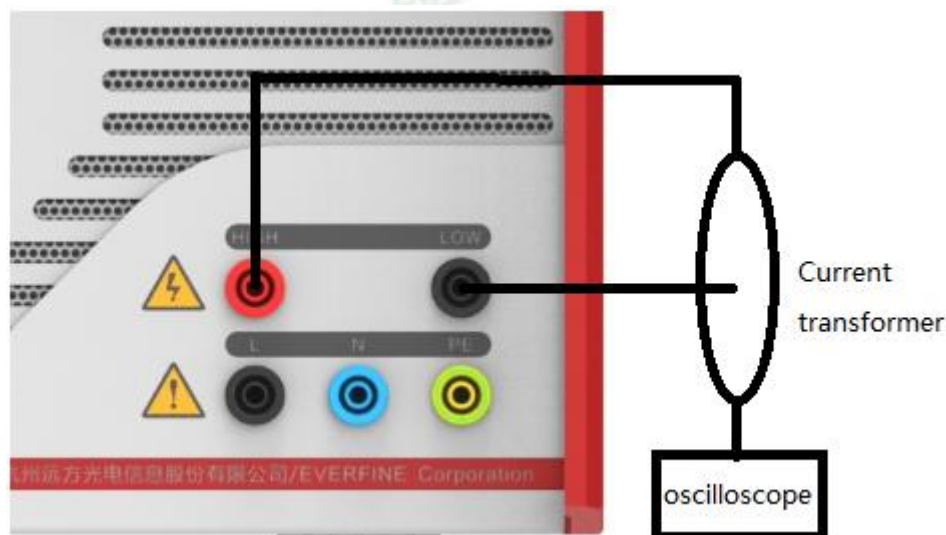


Fig 6.2 CWG module directly output short circuit current test wiring diagram

(2) Test steps:

- ① According to Fig 6.2 wiring, set "module selection" as CWG, "trigger mode" as automatic, "pulse interval/times" as 100, "phase" as asynchronous, "polarity" as "+", and "coupling path" as direct output.
- ② Select the four test points of "voltage" - "set value" for 0.5kV, 2.0kV, 4kV and 7kV.
- ③ Press the run button at each test point. Read short circuit current peak, wave front time, half peak time and overrush from the oscilloscope, and the allowable error shall meet the requirements of relevant technical indexes in Chapter 2.
- ④ When the test is complete, set "polarity" to "-" and repeat the steps②、③.

6.4.3 CWG open circuit voltage waveform test at coupling end

(1) Instrumentation:

- ① Digital oscilloscope: bandwidth of 500MHz or above, accuracy is better than 1%;
- ② High voltage differential probe: bandwidth over 10MHz, peak range not less than 7kV, accuracy better than 1%.

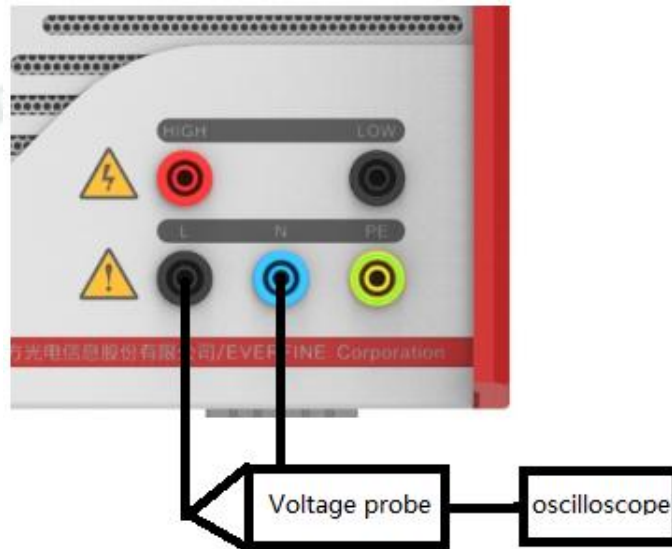


Fig 6.3 CWG module power coupling open circuit voltage test wiring diagram

(2) Test steps:

- ① According to Fig 6.3, set "module selection" as CWG, "trigger mode" as follows: automatic, "pulse interval/times" as 10 times, "polarity" as positive, "phase" as asynchronous, "coupling path" as power line coupling (L1->N).
- ② Select the four test points of "voltage" - "set value" for 0.5kV, 2.0kV, 4kV and 7kV.
- ③ Press the run button at each test point. The open circuit voltage peak, wave front time and half peak time should be read out from the oscilloscope, and the allowable error should meet the requirements of relevant technical indexes in Chapter 2.
- ④ According to the inspection record, change the coupling mode in the built-in CDN, connect the high-pressure probe to the corresponding terminal according to the coupling mode, and then carry out ①、②、③step.

6.4.4 Test the coupling end short circuit current waveform

(1) Instrumentation:

- ① Digital oscilloscope: bandwidth of 500MHz or above, accuracy is better than 1%;
- ② Ac current probe: bandwidth of more than 10MHz, peak range of not less than 3.5kA, accuracy better than 1%.

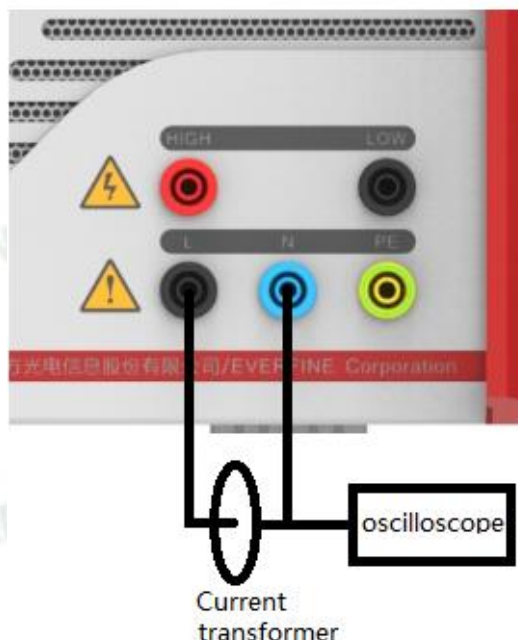


Fig 6.4 CWG module power coupling short circuit current test wiring diagram

Note: PE is chosen as common mode coupling for the low end of coupling, while non-PE is chosen as differential coupling.

(2) Test steps:

- ① According to Fig6.4, set "module selection" as CWG, "trigger mode" as automatic, "pulse interval/times" as 10 times, "polarity" as "+", "phase" as asynchronous, and "coupling path" as power line coupling (L1->N).
- ② Select the four test points of "voltage" - "setting value" for 0.5kV, 2.0kV, 4kV and 7kV.
- ③ Press the run button at each test point. The peak value, wave front time and half peak time of short-circuit current should be read out from the oscilloscope, and the allowable error should meet the requirements of relevant technical indexes in Chapter 2.
- ④ Change the coupling mode in the output mode/internal resistance CDN, according to the coupling mode respectively short the corresponding terminal and then carry out ①、②、③ step