Dear Client,

Thank you for Purchasing our equipment. Please read the manual in detail prior to first use, which will help you operate the equipment skillfully.

Our aim is to continually improve and perfect the company's products, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix. Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.

The input/output terminals and the test column may bring voltage, when you plug in/pull out test line or power outlet, they will cause electric spark. PLEASE CAUTION RISK OF ELECTRIC SHOCK! To avoid risk of electric shock, be sure to follow the operating instructions!

◆ SERIOUS COMMITMENT

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ SAFETY REQUIREMENTS

Please read the following safety precautions carefully to avoid personal injury and to prevent the product or any other attached products being damaged. In order to avoid possible danger, this product can only be used within the scope of the provision.

Only qualified technician can carry out maintenance or repair work.

--**To avoid fire hazard or personal injury**:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specifications of this product.

Connect and Disconnect Correctly

When the test wire is connected to the charged terminal, please do not connect or disconnect the test wire at will.

Grounding

The product is grounded through the power cord; besides, the ground pole of the shell must be grounded. To prevent electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, please do check that the product is properly grounded.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Wire and Charged Conductor

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Faults

If you encounter operating faults/suspect there is damage to this product, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry.

—Security Terms

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

Foreword

Ⅰ. Thank you for using the company's products, so you get the company's comprehensive technical support and services.

Ⅱ. This product manual is applicable to this series of very-low frequency high voltage generators.

Ⅲ.Before using this product, please read the instruction manual carefully and keep it for future reference.

Ⅳ.After receiving this product, please let it stand for 24 hours before doing the test.

Ⅴ. This product is a test instrument for high-voltage electrical equipment. When using it, please follow the steps required in the instruction manual and strictly abide by the relevant national regulations. Improper use may endanger equipment and personal safety.

Ⅵ. If you have any doubts in the process of reading the instruction manual or using the instrument, you can consult our company.

Contents

Precautions before testing

1.Before and after the test, please ground the supporting discharge rod of the instrument and then fully discharge the test object (the method of using the discharge rod: first use the top of the discharge rod to block and discharge, and then use the ground terminal for direct discharge), and finally connect or remove the wire.

2.Before the test, be sure to use the matching grounding wire of the instrument to reliably ground all the grounding terminals of the instrument. The high-voltage output wire should be connected to the load reliably to avoid discharge due to unreliable contact.

Warning: When doing the cable withstand voltage test, the core wire and the insulating layer must be physically separated, and no other items can be used to cover it, otherwise it will cause high voltage discharge and endanger the safety!

3.After power-on and boosting, if you need to interrupt the test, please click the "stop" button on the screen, and the power switch can be turned off after the instrument discharges itself, and finally discharge.

Warning: If there is an emergency during the test, please take a photo of the power switch directly, and the test object must be discharged with a discharge rod before the next test, otherwise the instrument will protect itself and cannot continue the test.

4. AC 220V power supply is recommended, If a generator must be used for power supply, since the 0.1Hz verylow frequency is modul ated according to the input frequency of the power supply, there ar e higher requirements for the generator.The requirements are:frequ

ency 50Hz, voltage 220V, power greater than 8kW, In particular, th e output frequency of the generator is required to be stable, and th e frequency does not change with the change of the load.

I. Product description

1.1 Overview

The high-voltage withstand voltage test of electrical equipment is one of the most important items stipulated in the "Insulation Preventive Test". The withstand voltage test can be divided into AC withstand voltage test and DC withstand voltage test. and 0.1Hz very-low frequency test technology, of which 0.1Hz very-low frequency technology is the latest technology and is currently recommended by the International Electrotechnical Commission. According to the actual situation of my country's power system, the National Development and Reform Commission has formulated the industry standard of "Very-low frequency (0.1Hz) withstand voltage test method for XLPE insulated power cables of 35kV and below".

When the power frequency withstand voltage test is carried out on the large and medium-sized generators, motors, power cables, etc., because their insulating layers have a large capacitance, a large-capacity test transformer or resonant transformer is required. Such huge devices are not only cumbersome and expensive, but also very inconvenient to use. In order to solve this contradiction, the method of reducing the test frequency and thus the capacity of the test power supply is generally adopted internationally. The very-low frequency insulation withstand voltage test is actually an

alternative method to the power frequency withstand voltage test. It has been proved from many years of theory and practice at home and abroad that replacing the power frequency withstand voltage test with the 0.1Hz very-low frequency withstand voltage test can not only have the same equivalence, but also the size of the equipment is greatly reduced, the weight is greatly reduced, and the theoretical capacity It is about one-fifth of the power frequency, and the operation is simple, which is the main reason why developed countries generally use this method。

Our company's new generation series of very-low frequency high voltage generators are core products independently developed by the latest technology, using 7-inch touch screen, imported high-speed AD acquisition circuit, and advanced production technology. It improves the quality stability of the instrument, reduces the volume and weight of the equipment, is easy to operate, and overcomes many shortcomings of similar domestic products (see Table 1). Disadvantages of high failure rate and large volume. Compared with other methods of withstand voltage test equipment, 0.1Hz very-low frequency has many advantages, as shown in Table 2.

Through years of practice, feedback from a large number of users shows that this series of very-low frequency and high-voltage technology leads the market and has the highest cost performance！

0.1Hz withstand voltage equipment type	High voltage control method	High voltage waveform	Energy saving	Noise	Mechanical life	Electrical life

Mechanical	High voltage mechanical switch to switch polarity	Square wave	No energy saving: consume excess energy with high-power resistors	High	Short	Short
Electronic	High voltage electronic switch to switch polarity	Sine wave	Energy saving: feeding excess electrical energy back to the grid	Slight	None	Long

Table 1 Performance comparison between mechanical and electronic 0.1Hz withstand voltage test equipment

Compare content	Power frequency withstand voltage	Frequency conversion withstand voltage	0.1Hz withstand voltage	DC withstand voltage
Equivalence	good	good	good	ordinary
Insulation damage	small	small	small	larger
Operational Safety	lower	lower	high	lower
Test wiring	complex	complex	simple	simple
Device volume	The largest	larger	small	small

Table 2 Performance comparison of various withstand voltage test equipment

1.3 Instrument characteristics

1.High degree of intelligence: using digital frequency conversion technology, microcomputer control, fully automated test processes such as boosting, bucking, and measurement.

2.Convenient operation: simple wiring, 7-inch full color large LCD touch screen, convenient operation, friendly human-computer interaction.

3.Comprehensive protection: multiple protections (overvoltage protection, high and low voltage side overcurrent protection), rapid action (action time ≤ 10ms), safe and reliable instrument.

4. Safe and reliable: low-voltage connection between controller and high-voltage generator, photoelectric control, safe and reliable use.

5.The high and low voltage closed-loop negative feedback control circuit is adopted, and the output has no capacity rise effect.

6.Accurate sampling: The high-voltage current and voltage data are directly obtained by sampling the high-voltage side, so the data is true and accurate.

7.Complete configuration: 7-inch capacitive touch screen, LCD English character display, automatic storage, automatic printing.

8. Wide test range: 0.1Hz, 0.05Hz and 0.02Hz multi-frequency selection, large test range.

9. Easy to carry: The instrument is small in size and light in weight, which is very conducive to outdoor operations.

10.Multi-language display: Chinese and English switching function, other languages can be customized.

1.4 Technical parameter

1.Working power： 220V±5%，50Hz

Note:that a digital variable frequency generator

must be used, its output frequency is 50Hz, input voltage is 220V a nd power is larger than 8kW.

2.Output voltage：80kV

3.Output frequency：0.1Hz、0.05Hz、0.02Hz

4.Load capacity：0.1Hz-0.5uF、0.05Hz-1.0uF、0.02Hz-2.5uF

4.Measurement accuracy：3%

5.Voltage positive, negative peak error：≤3％

6.Voltage waveform distortion：≤5％

7.Working temperature：-10℃～+40℃；humidity：≤85％RH

1.5 Panel structure

The instrument consists of two parts: the controller and the booster. The structure and functions of the two parts are as follows：

1.The layout of the components of the controller panel is shown in Figure 1, and the functions of each component are described as follows：

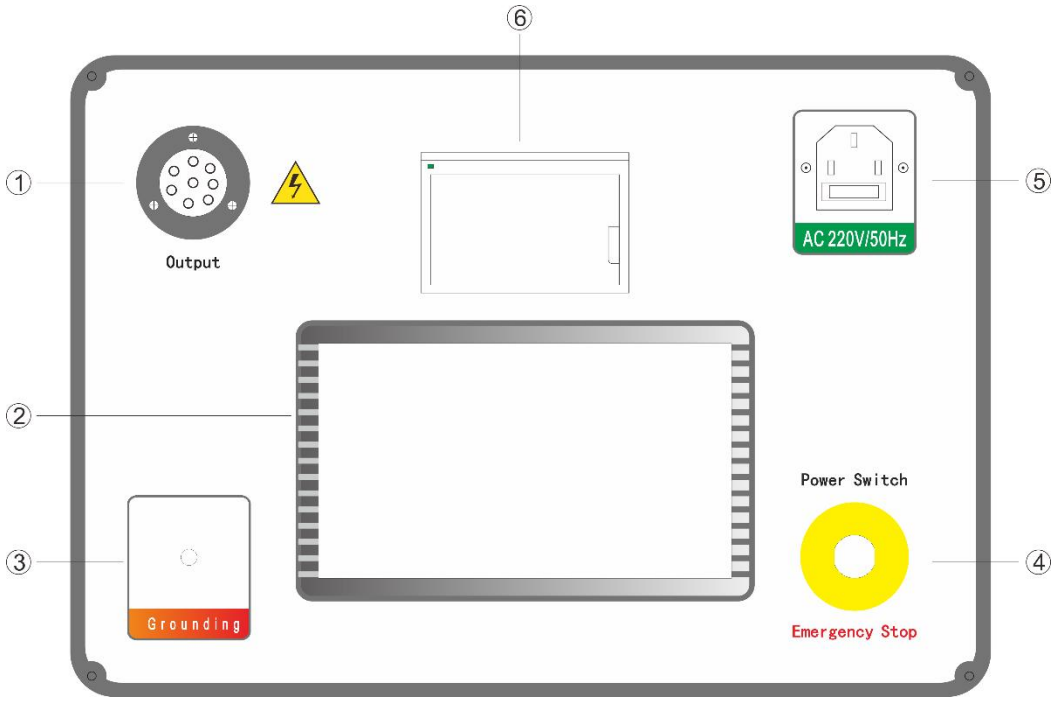


Figure 1 Schematic diagram of the controller panel

(1).Controller signal output socket: connected to the input of the booster here, used to control the booster and sampling.

(2).Capacitive touch screen: used for various operations, parameter settings and display of test data, output waveform, etc.

(3).Grounding post: connect the ground wire here.

(4).Power/emergency stop switch: used to turn on and off the power of the controller, turn it clockwise to turn on the power, press it directly and then disconnect the power, it can also be used as an emergency stop.

(5).Three-core power socket: connect to AC220V power supply. This power socket has a built-in fuse. When the instrument fuse is blown due to overcurrent, replace the same type of fuse and continue to use it.
(6).Printer: for printing test result reports.

2.The schematic diagram of the booster structure is shown in Figure 2：

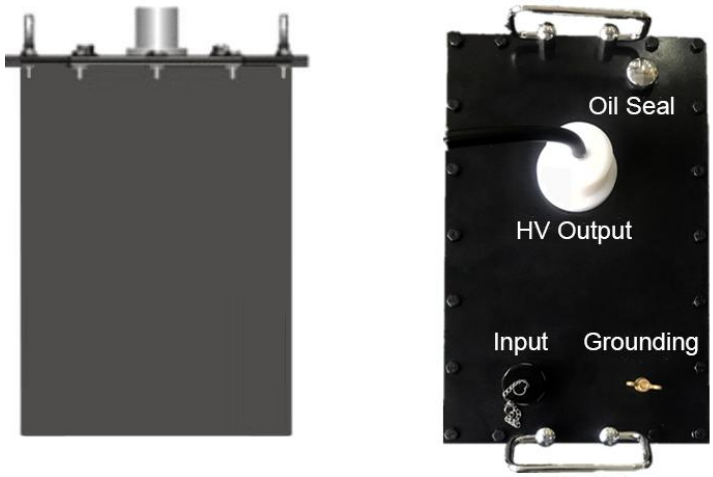


Figure 2 Schematic diagram of the booster structure

(1) Input: connect the signal wire of the controller output terminal
(2) Ground: Connect the ground wire here.
(3) High voltage output: high voltage output from this, connect to the tested object.

II. Controller menu introduction

2.1 Set interface

First, connect the AC220V power supply to the power socket of the controller panel, turn on the power switch on the panel, and the instrument directly enters the parameter setting interface, where all parameters related to the test can be set, as shown in Figure 3：

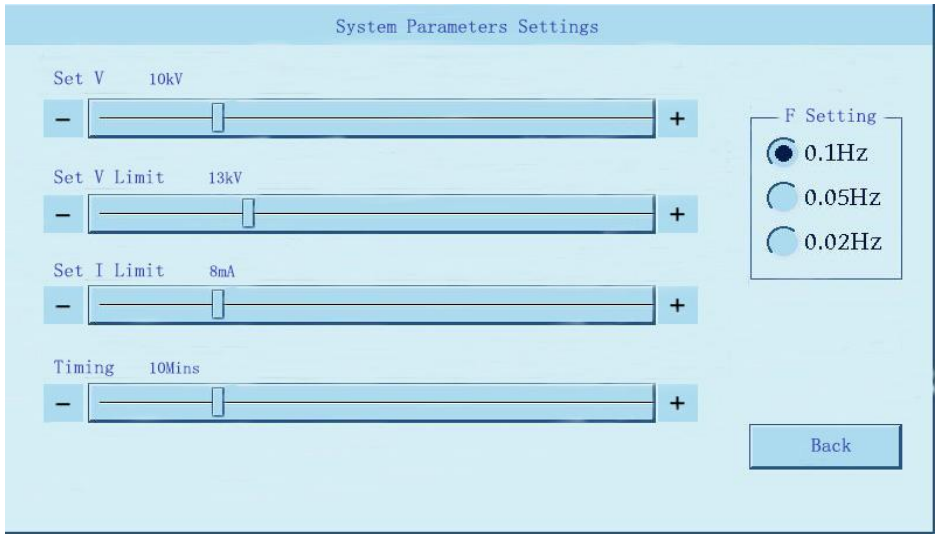


Figure 3 System parameter setting interface

1.Set V: adjust the "set voltage" slider left and right to change the test voltage.“+”、“-” button is fine adjustment, click once to increase/decrease 1kV, the green font in the curve is the current setting test voltage.

2.Set V Limit: adjust the "Limited voltage" slider left and right to change the protection voltage。“+”、“-” button is fine adjustment, click once to increase/decrease 1kV, the red font in the curve is the current set protection voltage.

3.Set I Limit: Adjust the slider of "Set Current Limit" left and right to change the protection current.“+”、“-”button is fine adjustment, click once to increase/decrease 1mA. The protection current determines the upper limit of the current passing through the test product. When the current exceeds this setting, the instrument automatically cuts off the output.

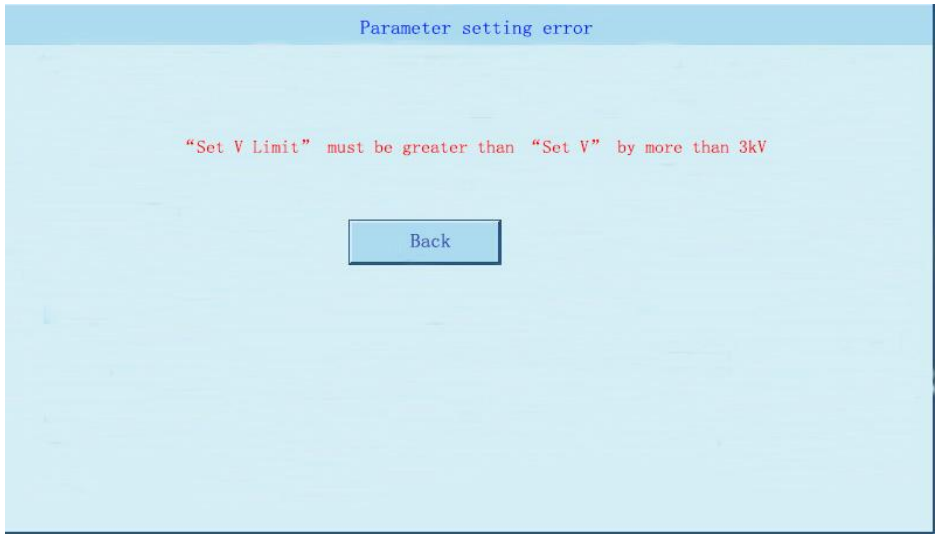
4.Frequency Setting: The frequency is divided into 3 gears, 0.1Hz, 0.05Hz, 0.02Hz. When the circle on the left side of the frequency is displayed as solid, the current frequency gear is selected.

5.Timing(min):adjust the "Timing" slider left and right to change the test time.“+”、“-” button is fine adjustment, click once to increase/decrease test time, The longest test time of the instrument is 99 minutes.

Note:

1.The above voltage, current and measurement data displayed by the instrument are all peak values.

2.The Set V Limit must be greater than the Set V 3kV or above, otherwise the test interface cannot be accessed, and the pop-up prompt is shown in the following figure.



After setting the parameters, click "Back".

2.2 Test interface

After the test parameters are set, click "Return" to enter the test interface, as shown in Figure 4：

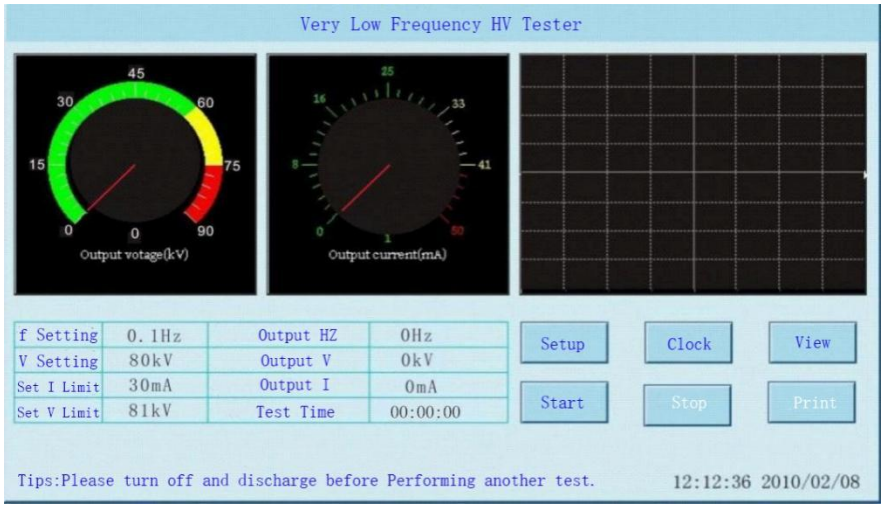


Figure 4 Test interface

2.3 History record

After pressing the "View" button on the test interface, the history record interface is entered, as shown in Figure 5. Any data instrument that has passed the timed shutdown, the shutdown by clicking the "stop" button, the shutdown of overvoltage protection, and the shutdown of overcurrent protection will automatically save it as historical data. The data of up to 64 measurements can be saved, and the previous 64 measurements will be automatically deleted.

At the same time, you can also select the "Print" button on the right side of the history record interface to print the selected historical record data.

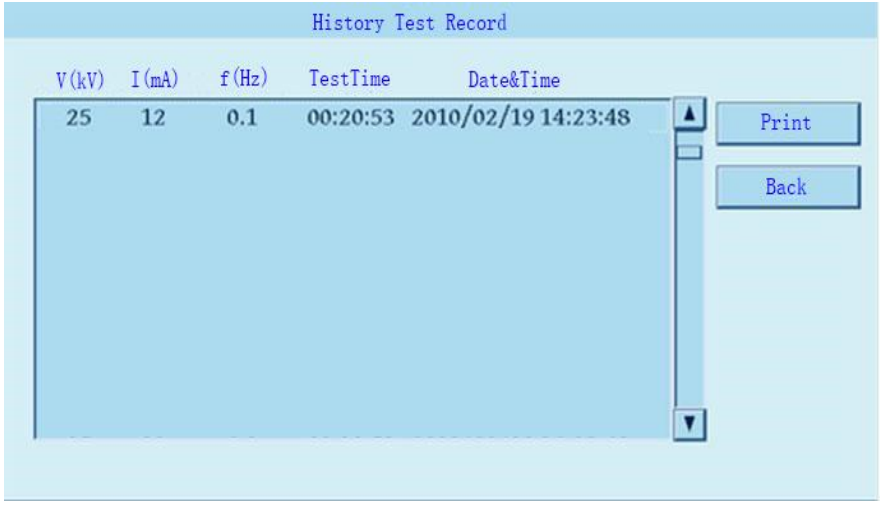


Figure 5 History interface

2.4 Time setting

After pressing the "clock" button on the test interface, the date and time setting interface will be entered, as shown in Figure 6.

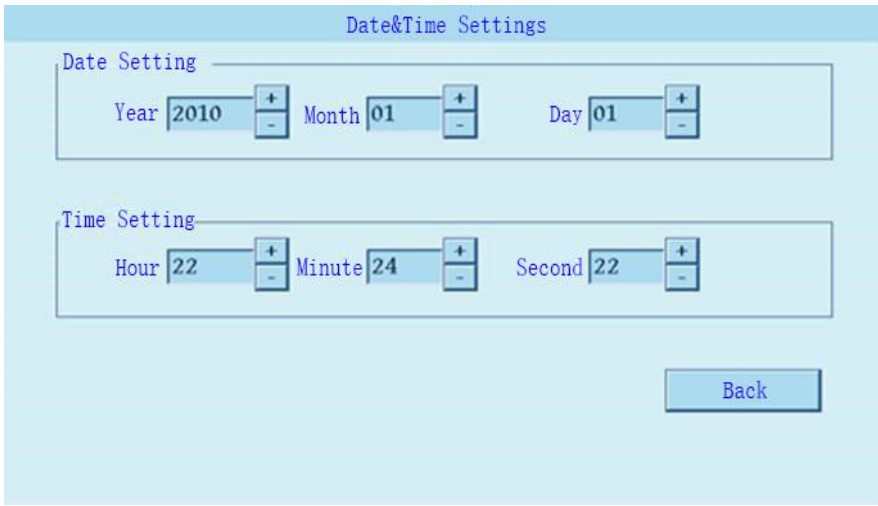


Figure 6 Time setting interface

In this interface, the date and time can be set separately. By clicking the "+" and "-" buttons on the right side of the corresponding parameter, the year, month, day, hour, minute, and second can be set respectively. After the setting is completed, click the "Return" button. can be saved.

III. Operation method

3.1 Wiring

When doing the test on site, use the control output special line, high-voltage output special wire and grounding line that are randomly equipped with the instrument, and wire in strict accordance with Figure 7.

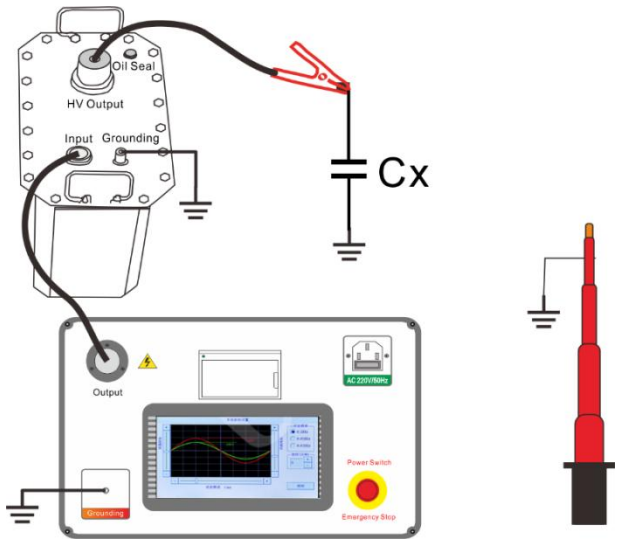


Figure 7 Test wiring diagram

3.2 Start test

3.2.1 After the wiring is completed, the controller is connected to the power supply, and the power switch is turned on. After setting the corresponding parameters in the parameter setting interface and selecting "Return", the instrument enters the test interface. After clicking the "Start" button, the test is carried out according to the following process：

Self-check → boost → constant amplitude output → withstand voltage timing → step-down shutdown

The instrument will first perform self-test. After the self-test is passed, the instrument will automatically boost the voltage. After the voltage is boosted to the target voltage, the instrument will display equal-amplitude output, and the voltage will be timed according to the set time. The boosting process is shown in Figure 8：

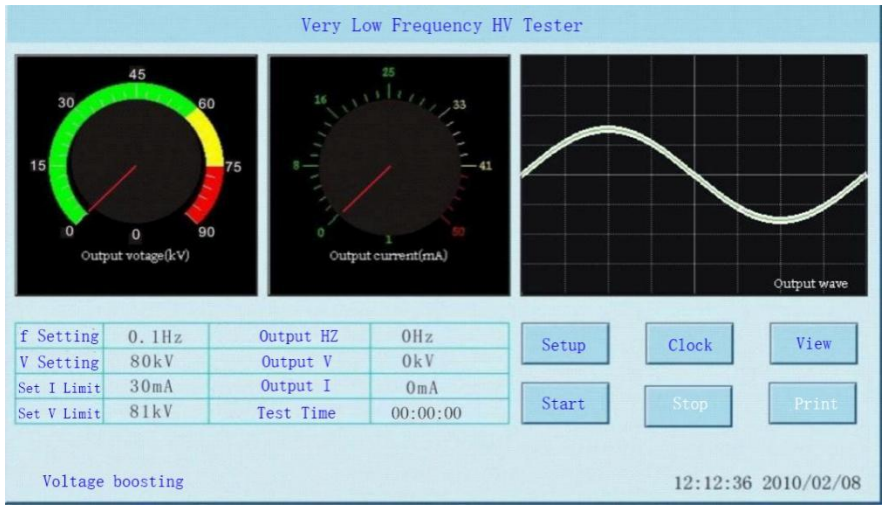


Figure 8 Schematic diagram of boosting

3.2.2 The controller raises the voltage to the set value within several cycles, the instrument will output constant amplitude, and the prompt message in the status bar: "Equal amplitude output", as shown in Figure 9：

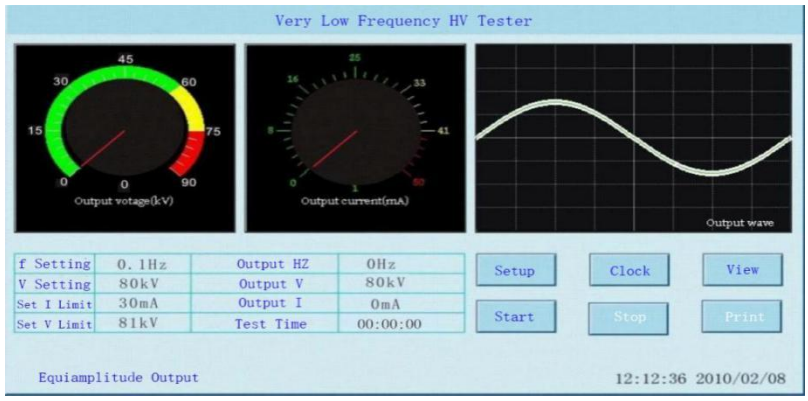


Figure 9 Schematic diagram of Constant amplitude output

3.2.3 When the withstand voltage reaches the set time, it will automatically depressurize, and the instrument will prompt "experiment passed" after depressurization, as shown in Figure 10. After the test is completed, the instrument will automatically save the test data, and you can also select the "Print" button on the test interface, and the data can be printed.

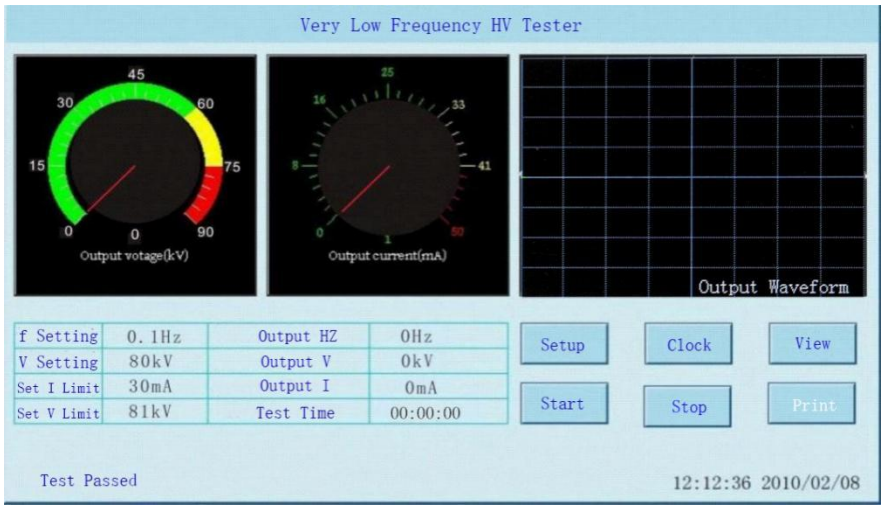


Figure 10 Schematic diagram of test passed

During the test, if you need to interrupt the test, please click the "Stop" button on the screen, and the power switch can be turned off after the instrument discharges itself, and finally discharge.

Warning: If there is an emergency during the test, please take a photo of the power switch directly, and the test object must be discharged with a discharge rod before the next test, otherwise the instrument will protect itself and cannot continue the test.

3.2.4 During the test, if the load is not connected, the load is broken down, the protection is caused by serious discharge, etc., the instrument will automatically judge that the load is not connected and prompt "the load is not connected, please connect the

capacitive test product", and stop the voltage output, as shown in Figure 11.：

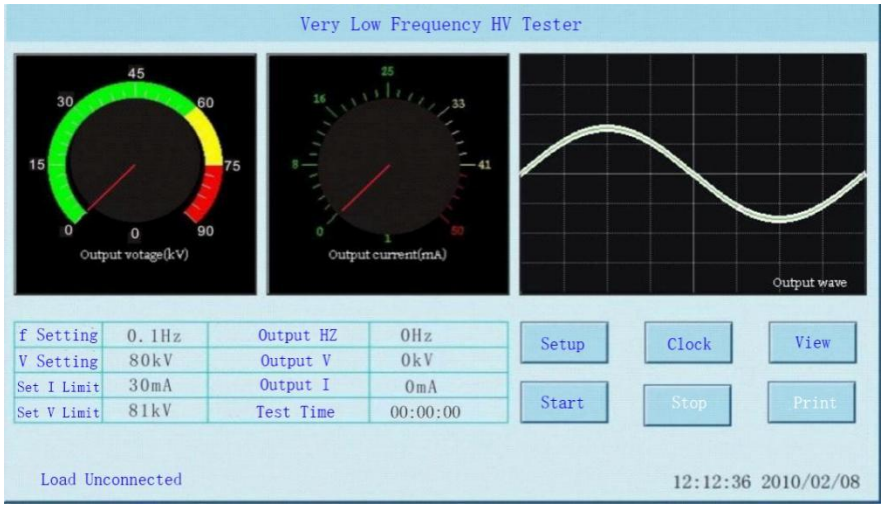


Figure 11 Schematic diagram of load unconnected

3.2.4 During the test, when the protection voltage or protection current is set too small and the actual output voltage or current exceeds the protection value, the instrument will display an overvoltage or overcurrent protection prompt, and the instrument will immediately stop outputting, and it is necessary to reset the appropriate protection Discharge after the value, and then restart the test. As shown in Figure 12 and Figure 13：

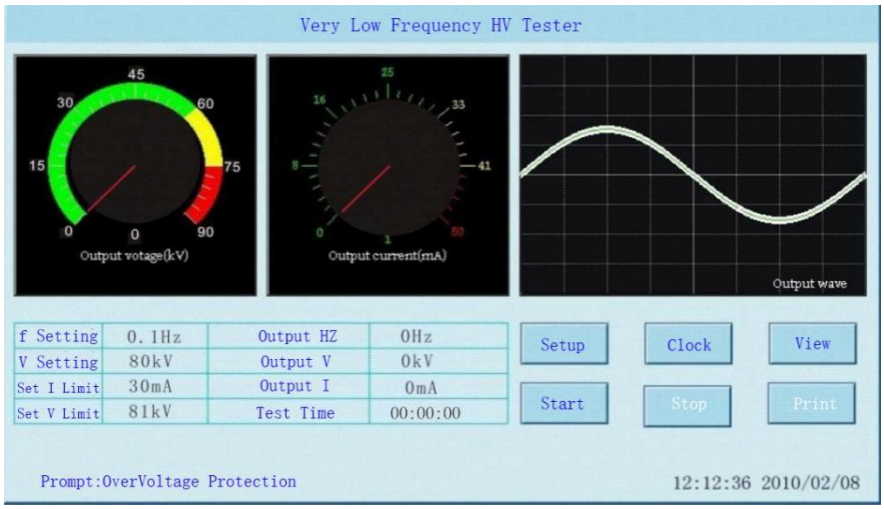


Figure 12 Schematic diagram of overvoltage protection

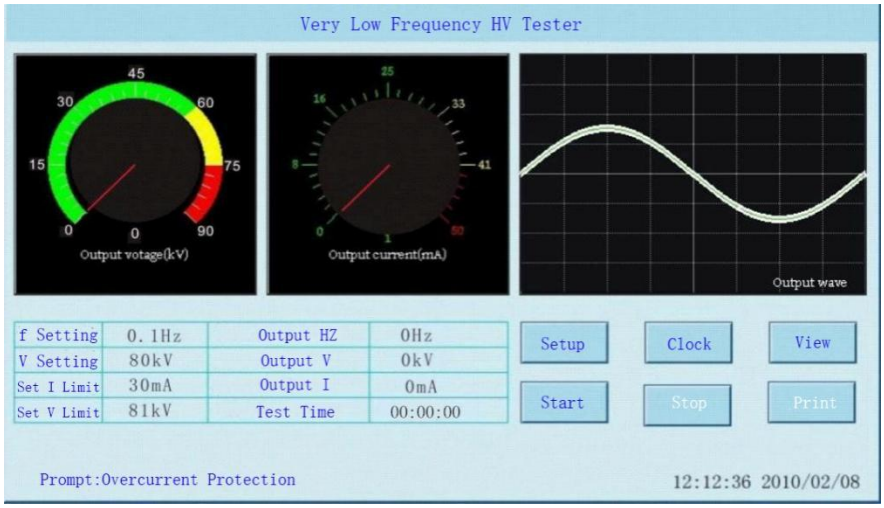


Figure 13 Schematic diagram of overcurrent protection

IV. Field Test Instructions

4.1 Test methods for power cables

1. Disconnect all electrical equipment connected to the cable under test.

2. Use a megohmmeter to test the insulation parameters of each phase of the cable, and the very-low frequency withstand voltage test can be carried out only after the test is passed.

3. Set the test voltage value.

4. Set the test time.

5. It can be tested by phase separation. When the capacitance value of the test cable is within the load capacity of the test equipment, the three-phase cores of the test cable can be connected in parallel, and then the withstand voltage test can be carried out at the same time.

6. Overcurrent protection setting current value:

Estimation method of capacitive current (or leakage current) of very-low frequency withstand voltage test products：

Io=2πfCU=2×3.14×0.1CU(mA)……(formula 1)

C is the cable-to-ground capacitance, in uF; U is the effective value of the test voltage, in kV.

Example 2: A certain type of 10kV (UN=10kV, Uo=8.7kV) cable is 4km long, the single-phase-to-ground capacitance is 0.21uF/km, and the 0.1Hz very-low frequency test voltage is 26kV (peak value), then the leakage current is approximately：

Io=2πfCU=2×3.14×0.1CU=0.628×0.21×4×26/√2=9.69（mA）

Overcurrent protection setting current value：

I=kIo

Among them: k is the reliability factor of overcurrent protection, obviously k＞1

If k is 1.5, the overcurrent protection setting current value can be taken as：14.5mA

7.Test wiring: Connect the test equipment and the test cable with the special connection attached with the machine according to the method shown in Figure 14. After carefully checking the wiring is correct, turn on the power supply, set the test frequency, time and voltage again, as well as the overcurrent protection value and overvoltage protection value of the high voltage side, and then start the boost test.

During the boosting process, the high-voltage circuit should be closely monitored, and the test cable should be monitored for abnormal noise.

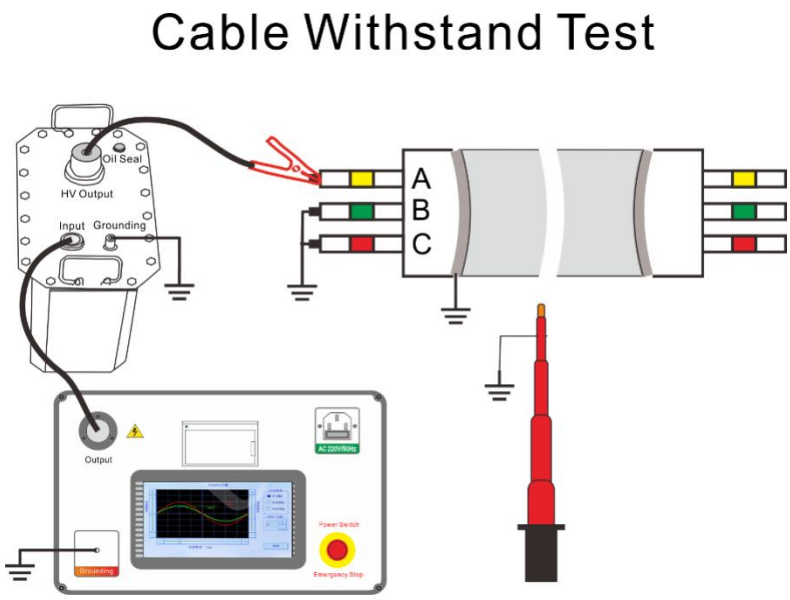


Figure 14 Wiring diagram of cable withstand voltage test

8.After the test time is up, the instrument automatically stops. If no destructive discharge occurs during the test, it is considered to pass the withstand voltage test.

9. In the process of boosting and withstanding voltage, if abnormal distortion of the output waveform, abnormal increase in current, unstable voltage, abnormal smell, smoke, abnormal sound or flashing occurs in the cable of the test product, the boosting should be stopped immediately. Find out the reason after the shutdown. If these phenomena are caused by the weak insulation of the test cable, the withstand voltage test is considered to be unqualified. If it is determined that the test cable is caused by air humidity or surface contamination, etc., the test cable should be cleaned and dried before testing.

10. During the test, if the insulation defect of the non-tested cable causes the overcurrent protection of the instrument, the withstand voltage test should be performed again after the cause is identified.

4.2 Instrument self-inspection test method

The instrument is equipped with a special self-test capacitor when it leaves the factory. When the on-site test encounters that the voltage cannot be boosted normally, you can first follow the wiring method in Figure 15. The high-voltage output terminal is not connected to the test object first, and the instrument is equipped with the self-test capacitor as a load. Airlift self-test, which can rule out whether it is caused by the failure of the instrument itself. If the instrument can be normally boosted to the rated voltage without any abnormality, it means that there is no problem with the instrument itself, and it is necessary to check the test product itself or the wiring problems.

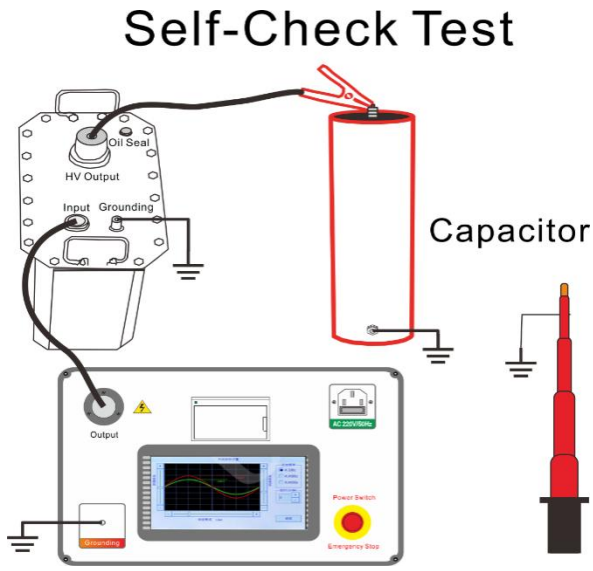


Figure 15 Schematic diagram of self-check wiring

The above introduces various test methods in the field test. The following points should be strictly paid attention to during the test:

1. The booster equipped with this instrument cannot be used for other purposes.
2. Do not put the booster on its side or upside down to prevent the internal insulating oil from seeping out.
3. There is electricity in the machine. If the instrument fails due to operation and wiring errors, do not disassemble and repair it by yourself, so as to avoid accidents, you should contact our company for repair.
4. To ensure personal safety, be sure to keep a safe distance before and during the test.
5. Use a discharge rod to fully discharge the test sample before or after each start of boosting.
6. When connecting, disconnecting, or temporarily not using the instrument, turn off the power.

V. Transport and storage

5.1 Transport

This product must be packed during transportation. The packing box can be a cardboard box or a wooden box. The packing box should be padded with a foam shockproof layer. Packaged products should be able to be transported by road, rail and air. During transportation, it shall not be placed in an open-air trunk. Warehouses should be protected from rain, dust and mechanical damage.

5.2 Storage

When the instrument is not in use, it should be stored in a room with an ambient humidity of -20°C to +60°C, a relative humidity of not more than 85%, ventilation, and no corrosive gas. It should not be stored close to the ground and walls.

In humid areas or wet seasons, if the instrument is not used for a long time, it is required to be powered on once a month (about two hours) to dissipate moisture and protect components。

Appendix 1. List of accessories

No	Name	QTY	Unit
1	Controller	1	nuit
2	Booster	1	unit
3	High voltage connecting cable	2	pcs
4	Dedicated low-voltage connecting cable	1	pcs
5	Power cord	1	pcs
6	Discharge rod	1	pcs
7	One point three ground wire	1	pcs
8	Self-test capacitor	1	pcs
9	Fuse	5	pcs
10	Printer paer	2	roll
11	Inspection report	1	pcs
12	Instruction manual	1	pcs
13	Certificate	1	pcs