Dear Client,

Thank you for choosing our product. Please read this manual carefully before your initial use, and this manual will help you use our 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!

WARNING!

Since the input and output terminals, test posts, etc. may have voltage, when you plug and unplug the test line and power socket, there will be electric sparks. Be careful of electric shock, avoid the risk of electric shock, and pay attention to personal safety!

◆ SERIOUS WARRANTY

All products of our company carry a three-month limited warranty from the date of shipment. If any such product proves defective during this warranty period we will provide a replacement in exchange for the defective product without charge. In one year (including one year) the product will be maintained and repaired for free if it proves to be defective. Beyond one year, lifetime maintenance and repair with charge is available.

◆ SAFETY REQUIREMENTS

Please read the following safety precautions to avoid personal injury and to prevent this 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. Use only the product-specific power cord and the power cord must be in line with the specifications of the product.

Connect and Disconnect Correctly. When the testing wire is connected to the charged terminal, do not connect or disconnect to test wire at will.

Ground the Product. In addition to this product being grounded

through the grounding conductor of the power cord, the grounding column of the product shell must also be grounded. To avoid 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. In order to prevent the fire hazard or electric shock, please be care of all ratings of this product and labels. Before connecting this product, please read the product manual to acquire information about the ratings in further detail.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Touching Bare Wire and Conductor. When the product is charged, do not touch the bare connection point and parts.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmosphere.

Keep the Surface of the Product Clean and Dry.

－Security Terms

Warning: Warning statements identify conditions or practices that could result in injury or loss of life.

Caution: Caution statements identify conditions or practices that could result in damage to this product or other property.

Contents

I. Product description

The induced voltage withstand test of transformer and mutual inductor is an important test to ensure that the quality of transformer meets the national standard.The induced voltage withstand test of the turn to turn, layer to layer, section to section and phase to phase insulation of the transformer winding is an important item in the insulation test of the transformer.Based on the particularity of the longitudinal insulation test, it is necessary to apply the frequency doubling power supply device to improve the test voltage of the insulation between windings, so as to achieve the purpose of voltage withstand test.

Multiple frequency induction withstand voltage tester is designed and manufactured by our company according to the field experience and customer feedback information to meet the needs of various customers. Its operation is simple, its performance is reliable, and it can better meet the needs of transformer and transformer induction withstand voltage test.

The output of this instrument is sine wave, with small distortion, Waveform distortion rate ＜ 3 ％.The whole set of multi octave induction voltage withstand tester has small volume, good waveform and stable output. The core component of the device is the frequency conversion power supply controlled by high

performance microprocessor,it has the advantages of high automation, fast and reliable protection, friendly human-computer interface, etc. Please read the instructions carefully before use to avoid unnecessary damage to the tested object and test device caused by misoperation.

The multi frequency induction withstand voltage tester has the following main functions and technical features：

1、Multi frequency induction withstand voltage tester has over-voltage, over-current, zero start, flashover and other protection functions. The over-voltage and over-current protection value can be set according to the user's needs, and the flashover protection action can be taken when the test object flashover to protect the test object.

2、The whole multiple frequency induction withstand voltage tester is light in weight and easy to use on site.

3、Multiple frequency induction withstand voltage tester has two working modes, **automatic** and **manual**, which is convenient for users to choose flexibly according to the site conditions and improve the test speed.

4、Data can be stored and printed off-site. The number of the stored data is numeric, which is convenient for users to identify and search.

5、Adopted DSP platform technology, which can easily add or remove functions and upgrade according to user needs, and also makes the human-machine exchange interface more humane.

Technical Parameters

1. Power capacity：15kVA

2. Input voltage：AC three-phase,380V±10%

3. Power frequency：50Hz

4. Output voltage：0～400V （Voltage can increase after adding boost transformer,need to be equipped separately）

5. Output frequency：50Hz,100Hz,150Hz,200Hz、custom frequency

6. Waveform distortion rate：<3%

7. Size：length540mm、width 390mm、height430mm

8. Weight：27.8kg

II. Principle of induced voltage withstand

1.Introduction

Transformer coil insulation is divided into main insulation and longitudinal insulation,Main insulation, also called transverse insulation, refers to the insulation of the coil from other structural parts,including its insulation of the fuel tank, iron core, clamps and pressure plates, insulation of other coils in the same phase, and insulation of coils in different phases (phase-to-phase insulation). Vertical insulation refers to the insulation inside the coil itself.It includes interturn insulation, interlayer insulation, and insulation between segments. In the electrical test of the external frequency withstand voltage, only the main insulation of the transformer winding is tested. As the voltage level and capacity of the transformer increase, the turn-to-turn insulation becomes relatively weak, but the power frequency withstand voltage is applied externally. Electrical test fails to test transformer longitudinal insulation.

Since the self excitation method is used in the induced voltage withstand test, if the test method is selected reasonably, the main insulation and longitudinal insulation of the transformer can be inspected at the same time.Considering the magnetic saturation of the transformer core, the power source with inductive withstand

voltage often uses a frequency multiplier, so the inductive withstand voltage is also called frequency-doubled withstand voltage.

2.Fault Analysis Caused by Transformer Insulation Defect

Compared to the transformer's main insulation, that is, the insulation between the windings and between the windings and the iron core, the transformer has another important insulation performance indicator: vertical insulation.The "Induction Withstand Voltage Test" specified in the International Electrotechnical Commission (IEC) standard is one of the test methods specifically used to verify the longitudinal insulation performance of transformers.

The vertical insulation of transformers mainly depends on the insulation medium in the group-the insulation paint of the enameled wire itself, transformer oil, insulation paper, impregnation varnish and insulation glue, etc. Different types of transformers may contain one or more of them.It is difficult to guarantee 100% purity of longitudinal insulation dielectric, and it is inevitable to mix in solid impurities, bubbles or moisture, etc. It will also be damaged to varying degrees during the production process.The highest field strength of the transformer during operation will be concentrated in these defects, and the temperature rise of long-term load operation will reduce the breakdown voltage of the insulating medium,

resulting in partial discharge. The power absorbed by the dielectric through the applied electric field, that is, the dielectric loss, will increase significantly, resulting in serious heat generation of the dielectric and increase of the dielectric conductivity. The large current in this part will also generate heat, which will cause the temperature of the dielectric It will continue to rise, and the rise of temperature in turn will increase the conductivity of the dielectric, which will lead to a long-term vicious cycle, and finally lead to the thermal breakdown of the dielectric and the destruction of the whole transformer. This fault is manifested in the characteristics of the transformer, that is, the no-load current and the no-load power consumption are significantly increased, and the winding has such bad phenomena as burning, arcing, vibration and screaming.It can be seen that it is extremely necessary to detect whether the transformer contains longitudinal insulation defects by using an inductive withstand voltage test.

3.Principle of induction withstand voltage test

When the transformer was shipped from the factory, it did not pass the test of long-term harsh environment,there is no external power supply with rated voltage and frequency for long-term test, so that the voltage between turns and sections of winding is not enough to reach the breakdown voltage at dielectric defects, which

is difficult to cause the discharge and breakdown at these insulation defects,the no-load current and no-load power consumption of such transformers with hidden insulation faults are not much different from similar transformers with good insulation performance, so it is difficult to find these hidden dangers.

Induction voltage withstand voltage applies more than twice the rated voltage to the transformer, which can establish a higher and more concentrated field strength at the longitudinal insulation defect. The voltage between turns, layers and sections of the winding reaches and exceeds the breakdown voltage at the dielectric defect.The frequency applied to the transformer by the induced voltage withstand test is more than twice of the rated frequency, and the higher frequency can greatly reduce the breakdown voltage of solid dielectric, making the insulation defects more easily to be broken down. The action time of the applied voltage specified in the induced voltage withstand test can also ensure the breakdown of the insulation defects, so the induced voltage withstand test can reliably detect the longitudinal insulation performance of the transformer.

The reason why the frequency of the external power supply for the transformer in the induced voltage withstand test is more than twice the rated frequency is that the characteristic curve of the main

flux amplitude of the excitation current I of the transformer is generally designed to be close to the bending saturated part at the rated frequency and rated voltage,as shown in Figure 1,In addition, the main flux m is determined by the applied voltage u when the power frequency is constant：

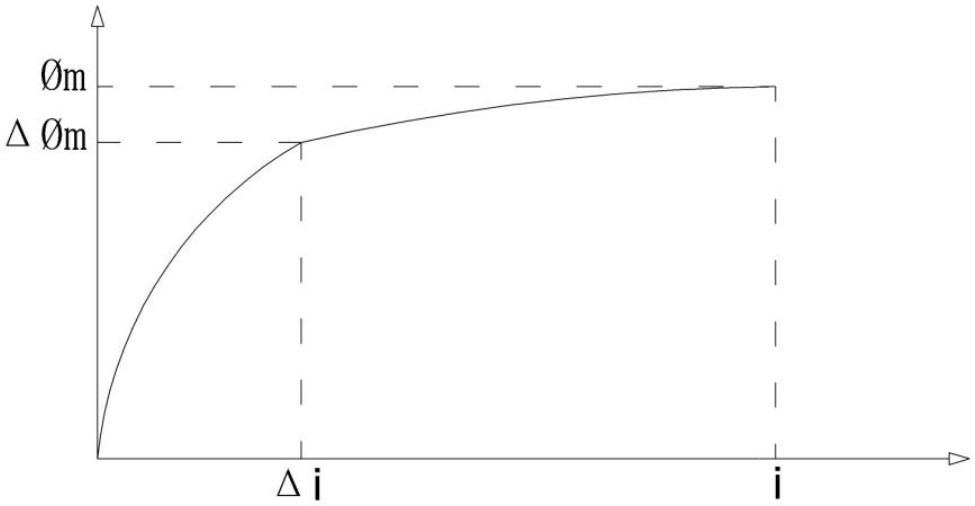


Figure 1:the relationship between excitation current and main flux amplitude

U=E=4.44WfØm

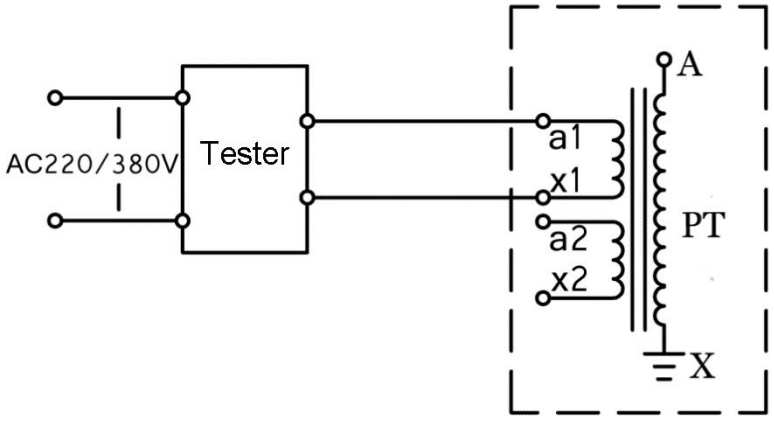
Among them, U is the applied power voltage (V), E is the induced electromotive force (V) of the powered winding, f is the applied power frequency (Hz), and W is the number of turns (n) of the powered winding..

Therefore, double the voltage of the transformer above the rated voltage will inevitably cause the core to be severely saturated, and the main magnetic flux Øm will increase. As shown in Figure 1, the excitation current i will increase sharply, causing the

transformer to heat up and burn out. In order to double the transformer The iron core is still not saturated when the pressure is higher than the above. It is necessary to increase the frequency of the power supply to more than twice the frequency..

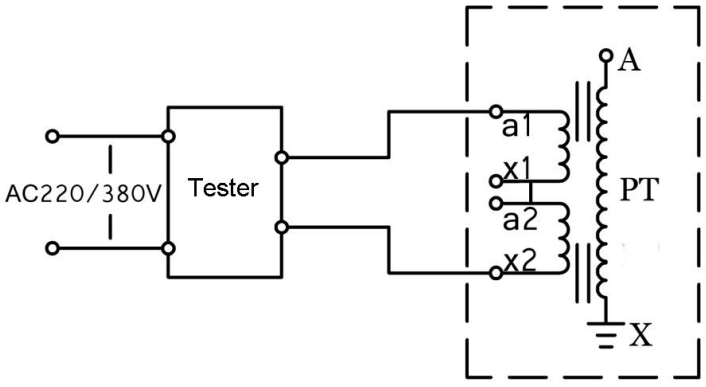
Inductive withstand voltage test Adds more than twice the voltage and more than twice the frequency to the primary side of the transformer. The main magnetic flux of the transformer will cause the primary and secondary sides to induce the induced electromotive forces E1 and E2 at the same time. It is more than twice as much, so the induction withstand voltage test can test the longitudinal insulation performance of the main and auxiliary windings at the same time.Of course, you can also test from the secondary side of the transformer as required. The applied voltage should be more than twice the no-load voltage in the rated operating state of the transformer, and the frequency should be more than twice the rated frequency.

III. Wiring schematic



Schematic diagram of applied voltage of secondary winding

This wiring diagram is a reference wiring method without a high-voltage divider. The output of the multi octave power supply is connected to the measuring winding of the tested Pt, and then the high-voltage voltage is converted according to the transformation ratio of the PT itself. Because there is no high-voltage divider, when the voltage level is high, the influence of the capacitance rise on the primary voltage needs to be considered.



Schematic diagram of secondary winding series applied voltage

Schematic diagram of applied voltage of secondary winding,if the output power of the multi octave host can not get a theoretical test voltage at the primary side of the tested object Pt, the secondary winding of the PT can be considered to be pressurized in series. At this time, the same power demand, because the secondary voltage is higher, so the required input current is smaller. In this wiring mode, the influence of capacity rise should also be considered because there is no voltage divider.

IV.Tester detailed introduction

1.Basic equipment description

1.1 Power description

Connect 380V directly to the "Power Input" of the multi-frequency induction withstand voltage tester.

1.2 Operation panel description

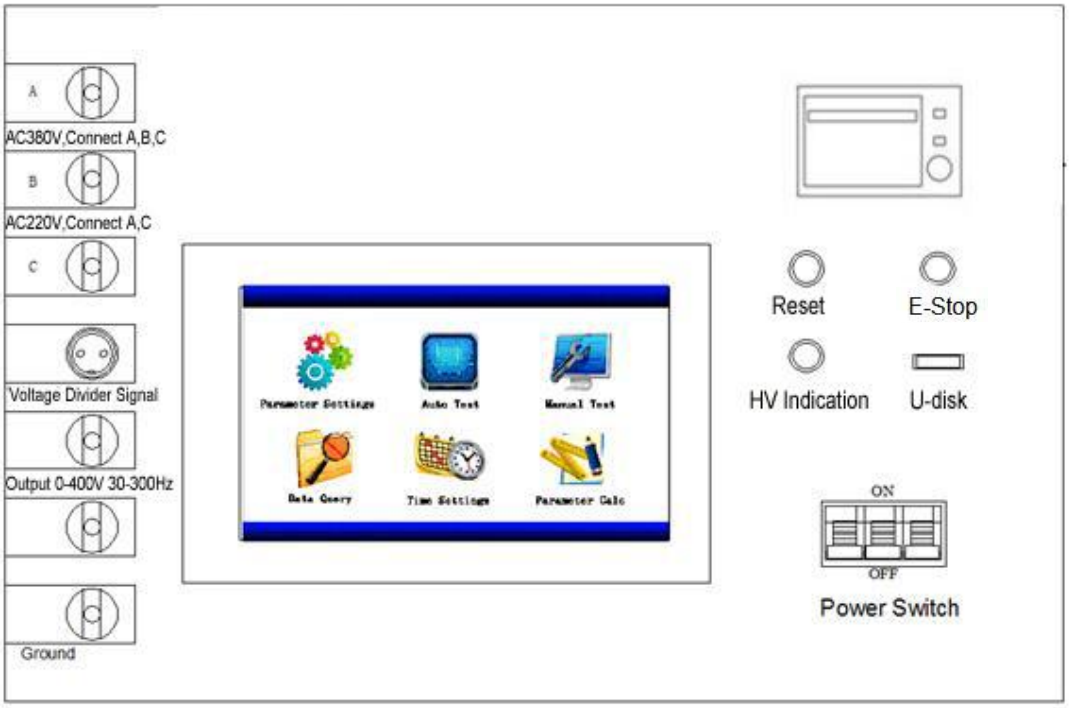


Figure 1

a.**Power switch:** Connecting and disconnecting power.

b.**High voltage indication**：Power on indication.

c.**Reset** ： Fault reset after protection actions such as overcurrent, overvoltage, flashover, etc..

d.**Emergency stop**： Emergency interrupt button in case of emergency.

f.**Ground**：For system safety grounding.

e.**USB interface:**Used to insert U disk to export data.

g.**Touch screen**： For the display of various parameters, waveforms, menus, etc. of the system,and you can also touch the display directly to operate.

h.**Input**：Power input,three phase AC380V±10%

i.**Output**：Multi-frequency power output.

1.3 Operating instructions

After completing the wiring, the multi-frequency induction withstand voltage tester closes the "power switch", and the LCD screen lights up.

Note: When the fans at the openings on both sides of the instrument are running, it means that the internal power devices of the instrument are working normally, otherwise it means that the internal of the instrument is overheating or the previous test was not reset. At this time, the power should be cut off, and the instrument should be left in a ventilated place for about 1 hour, and the power should be turned on after the internal temperature is appropriately reduced.When the fan does not start frequently, it is recommended to contact the manufacturer immediately.

2.Touch screen display instructions

The control screen of the multi-frequency inductive withstand voltage tester is a full touch screen, which can be operated by simply tapping directly on the screen where you want to operate.

2.1 After booting, the display interface is shown in Figure 2.

Figure 2

2.2 After clicking "Parameter Configuration", the display interface is shown in Figure 3.

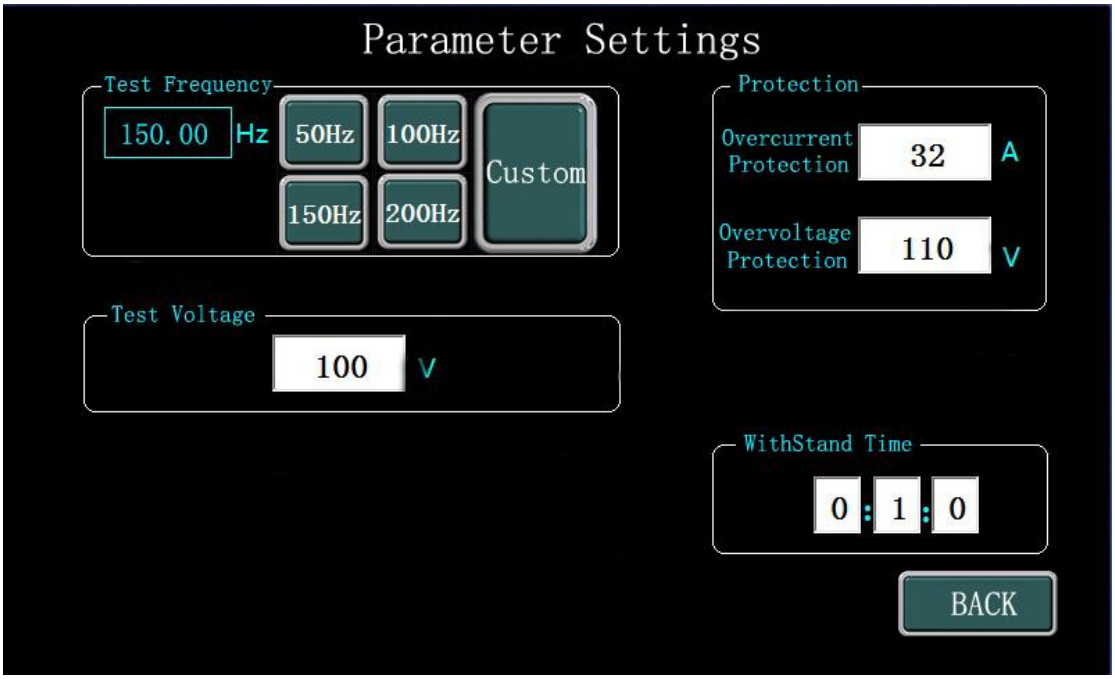


Figure 3

2.2.1 Test Frequency： Select the frequency of the test output or set the test frequency arbitrarily through customization. The lower limit frequency is 30Hz and the upper limit frequency is 300Hz.

2.2.2 Test Voltage： Set the target voltage value for the current test.

The voltage tracking system of this equipment has the function of automatically checking the large voltage fluctuation, but the fluctuation amplitude of the grid voltage is small, and the fluctuation of the high voltage voltage caused by it is also within the catching range of the instrument. Therefore, it is recommended to set the value of "test voltage" to 2% UE lower than the test voltage to be applied when setting the test voltage.

2.2.3 Overvoltage Protection： Set the limit value of the test voltage. When the voltage exceeds, the test will be terminated automatically, which is generally 10% higher than the test voltage, and the maximum can be set to 1.2 times of the rated voltage. When the test voltage changes, the over-voltage protection will be updated automatically.

2.2.4 Overcurrent Protection： Set the highest value of the low-voltage output current. Without knowing the actual test current, it is generally set to the rated current of the device.

2.2.5 Withstand Time： After reaching the target voltage, the time required for holding. After the withstand voltage time is reached in the automatic test, the voltage will be automatically reduced. In the manual test, the voltage will be manually reduced.

2.2.6 Auto Test： When the "Parameter Settings" setting is completed, click "Back" to exit to the main interface. Click "Auto Test" to enter the "Auto Test" interface, and the display interface is as shown in Figure 4.

Figure 4

Click "Start", the system will automatically boost the voltage according to the preset frequency, and prompt "Voltage Rising..." When it is close to the target voltage, the system will automatically reduce the rise speed, and the display interface is shown in Figure 5. (In case of any abnormality, please press the "EMERGENCY" button!)

Figure 5

Start timing after the target voltage is reached, and prompt "Timing In Target Voltage." The display interface is shown in Figure 6. (In case of any abnormality, please press the "emergency stop" button!)

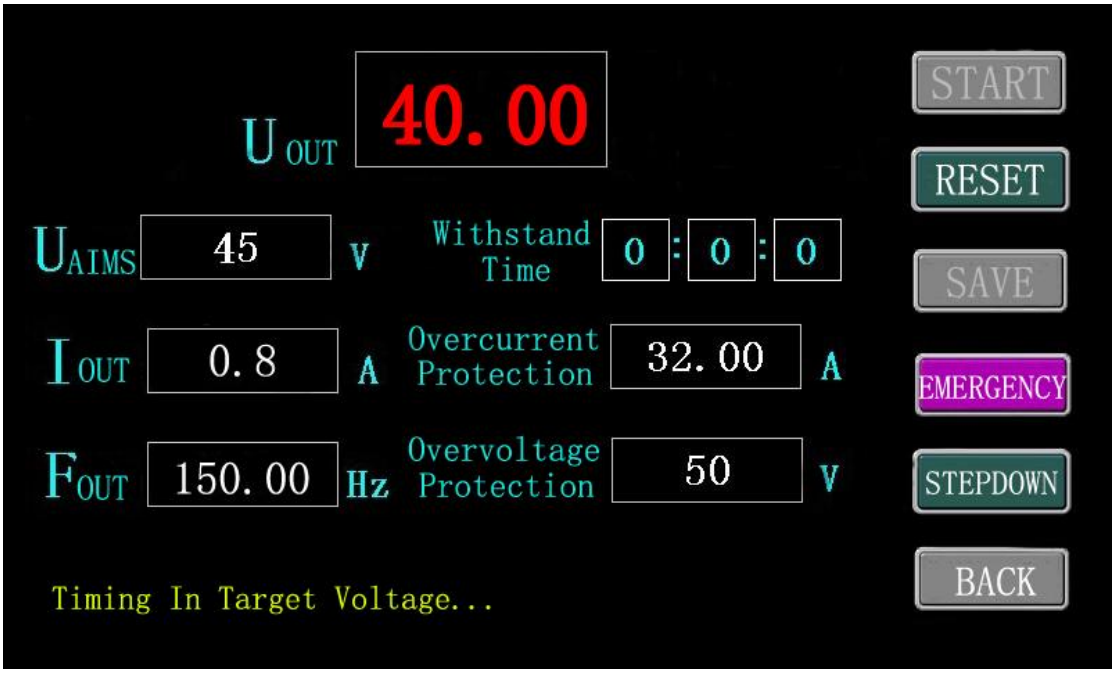


Figure 6

When the timing reaches the set withstand voltage time, the system will automatically depressurize, and the lower left corner will prompt "Step Down" , the display interface is shown in Figure 7. (In case of any abnormality, please press the "emergency stop" button)

Figure 7

When the U_{out} voltage drops to 0, the lower left corner will prompt "Stopped...", and the display interface is as shown in Figure 8.

Figure 8

At this time, click the "SAVE" button, and the display interface is as shown in Figure 9. Enter the test number to save. Then click "OK" to save, or click "Cancel" to give up saving.

Figure 9

If you click OK, you can save the data and enter the save data preview interface as shown in Figure 10. (printing function is optional)

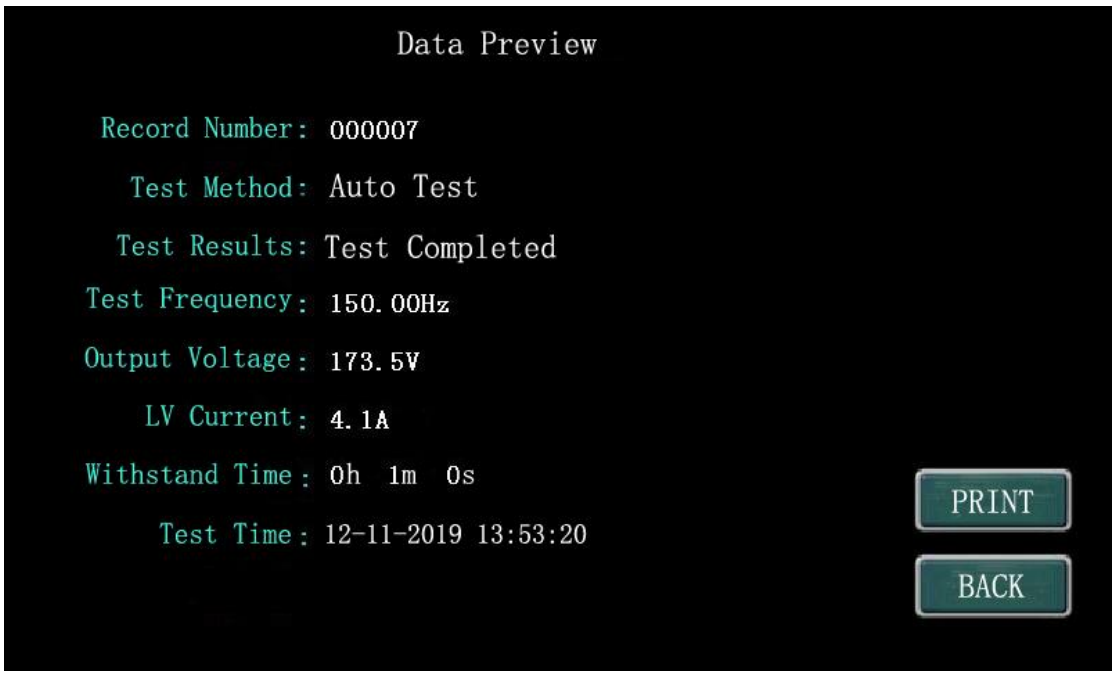


Figure 10

2.2.7 Manual Test： When the "Parameter Settings" are set, return to the main interface, click "Manual Test" to enter the "Manual Test" interface, and the display interface is as shown in Figure 11.

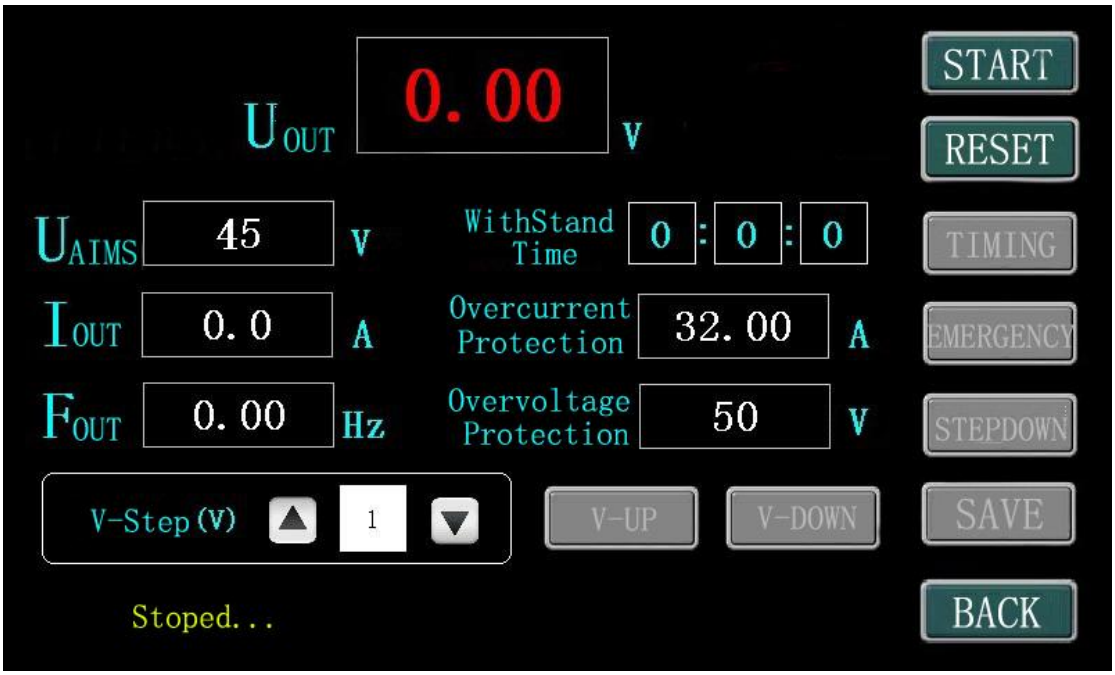


Figure 11

Click "START", the instrument will output according to the preset frequency, and prompt "Testing..." The display interface is shown in Figure 12

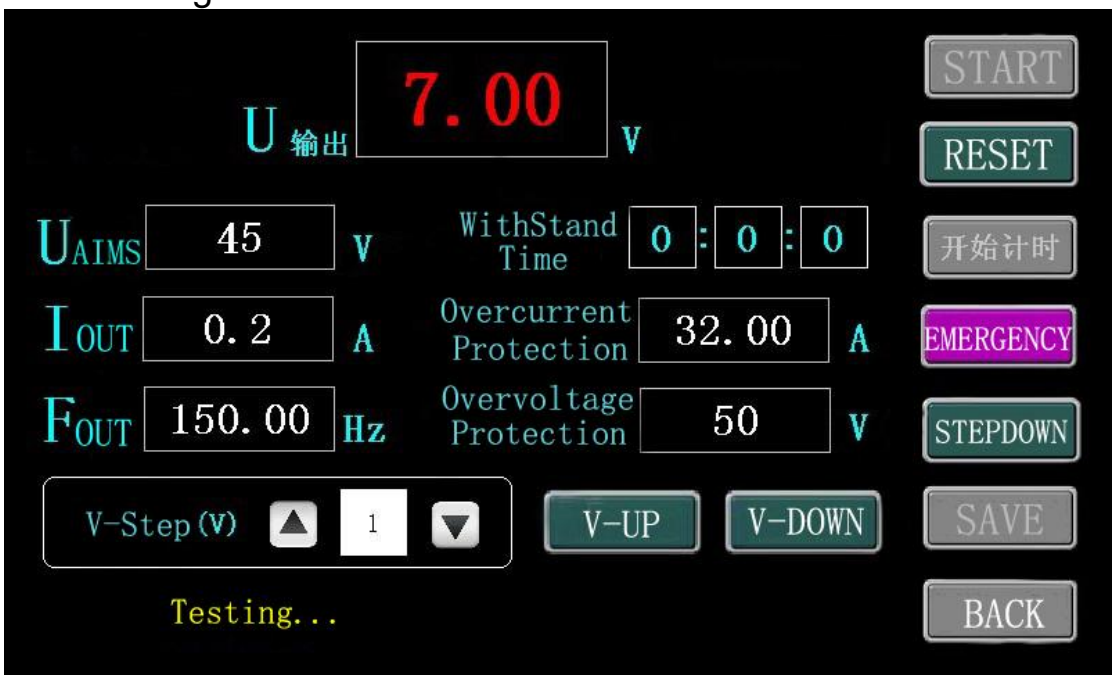


Figure 12

At this time, you can select the appropriate step voltage and

click "V-UP" to boost the voltage. When approaching the target voltage, you can change the step voltage to boost or reduce the voltage to reach the target voltage. The display interface is shown in Figure 13.

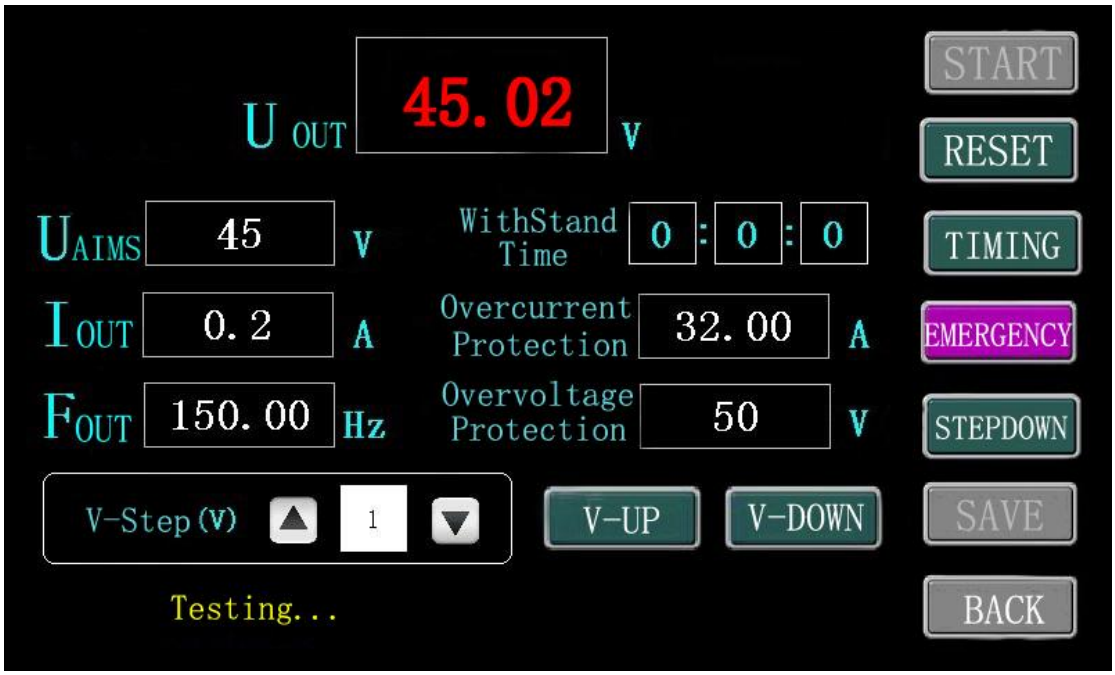


Figure 13

When the voltage rises to the set withstand voltage value, the "TIMING" button changes from gray to active state. At this time, you can click the button to timing, and the display interface is as shown in Figure 14.

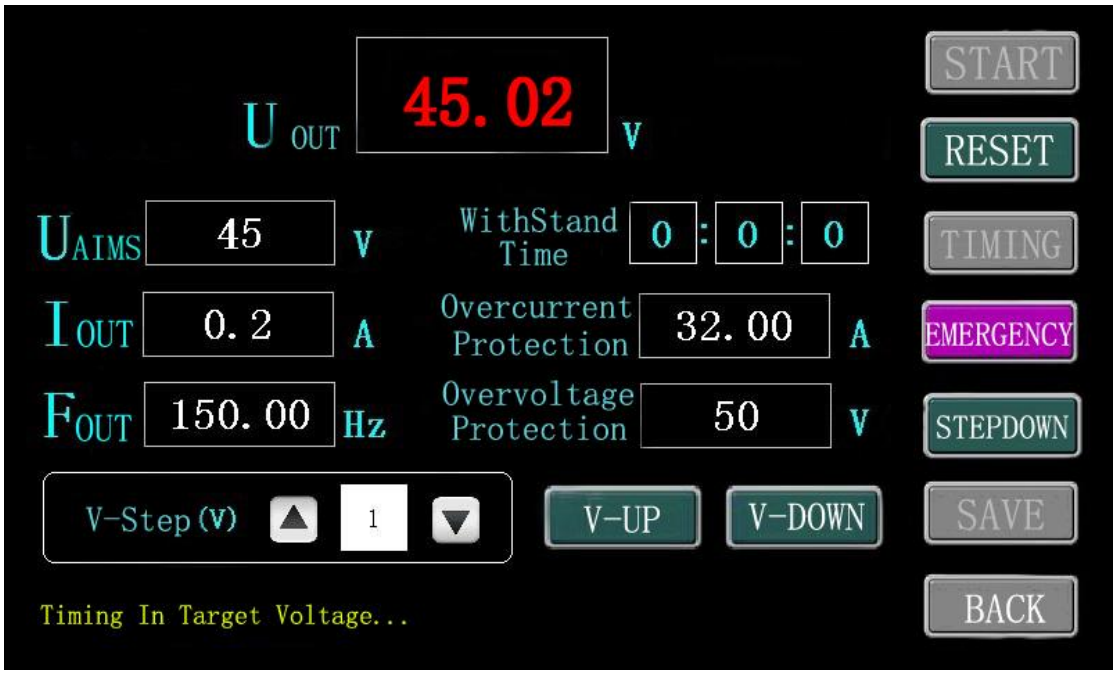


Figure 14

When the timing of "withstand voltage time" stops, click "STEPDOWN", the system will depressurize automatically, and the display interface is as shown in Figure 15.

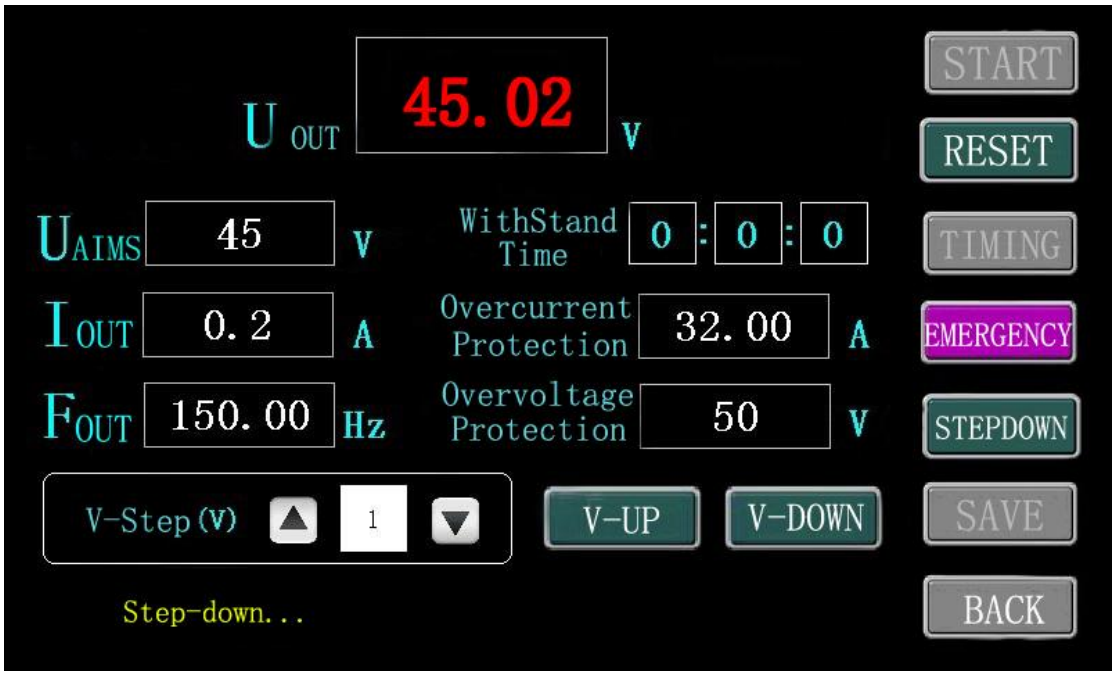


Figure 15

If you need to save the data, click “SAVE” to save the data as shown in Figure 16.

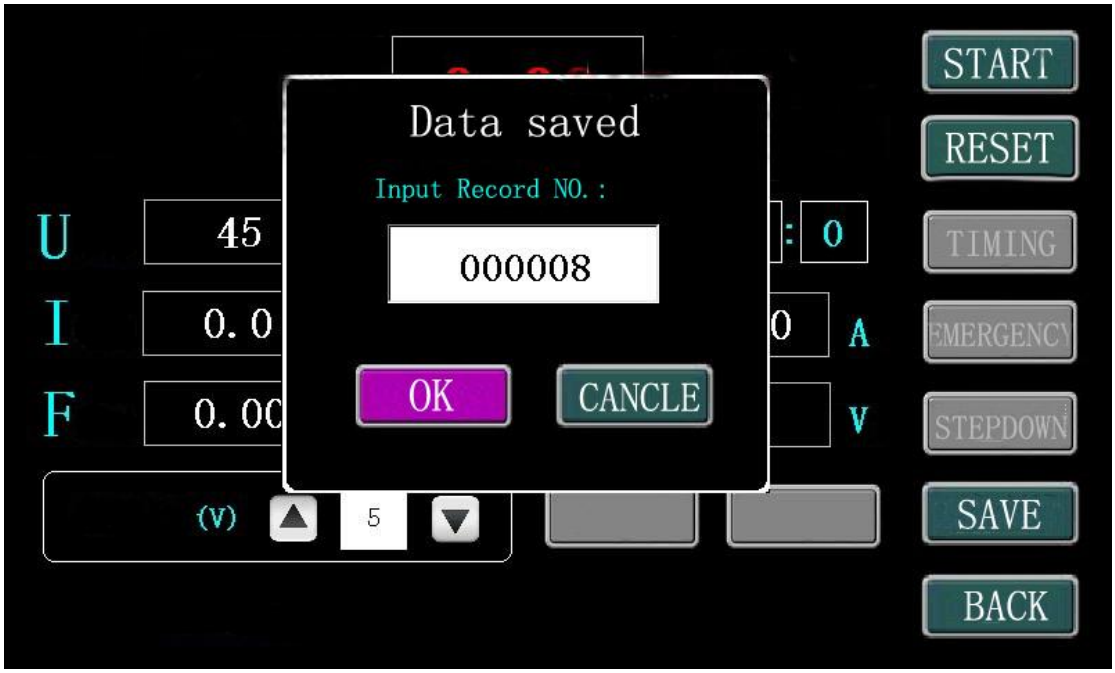


Figure 16

Click "OK" to save the data and enter the preview interface as shown in Figure 17.

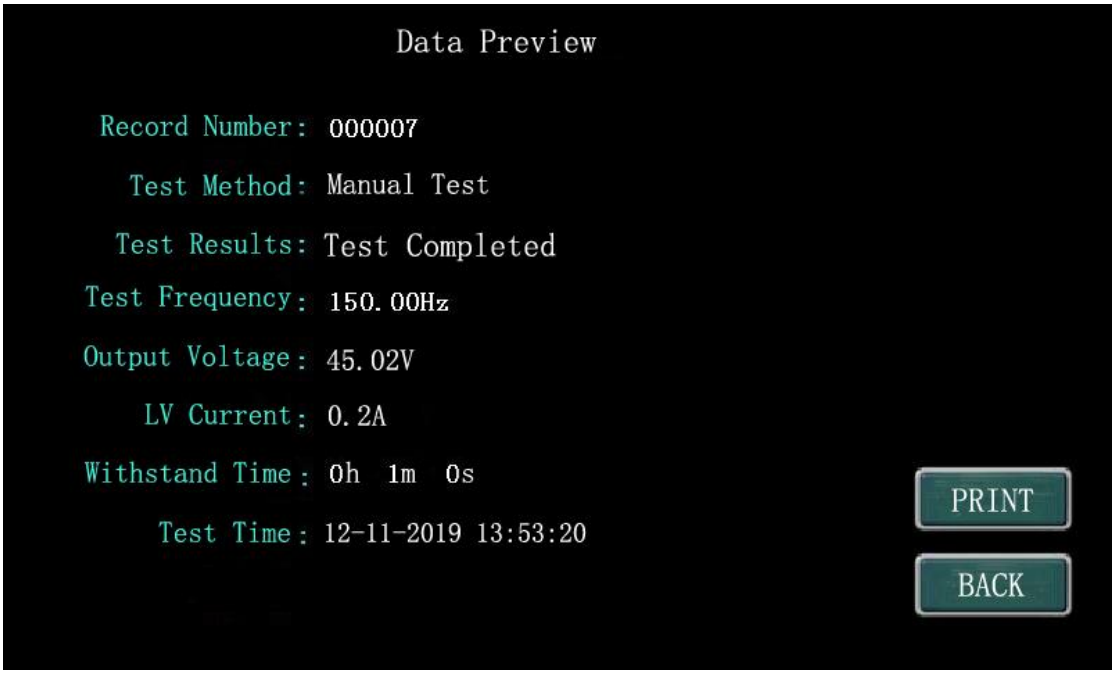


Figure 17

In case of emergency during the whole test, please press the "emergency stop" button! , the system will immediately stop the output and reset to zero.

In case of manual boosting, the appropriate voltage regulation step size can be selected according to the test situation.

2.2.8 Data Query： After reducing the voltage, return to the main interface and click "Data Query"; the display interface is as shown in Figure 18.

Figure 18

Select the "record number" to view and click the "open file" button to open the record, as shown in Figure 19 .

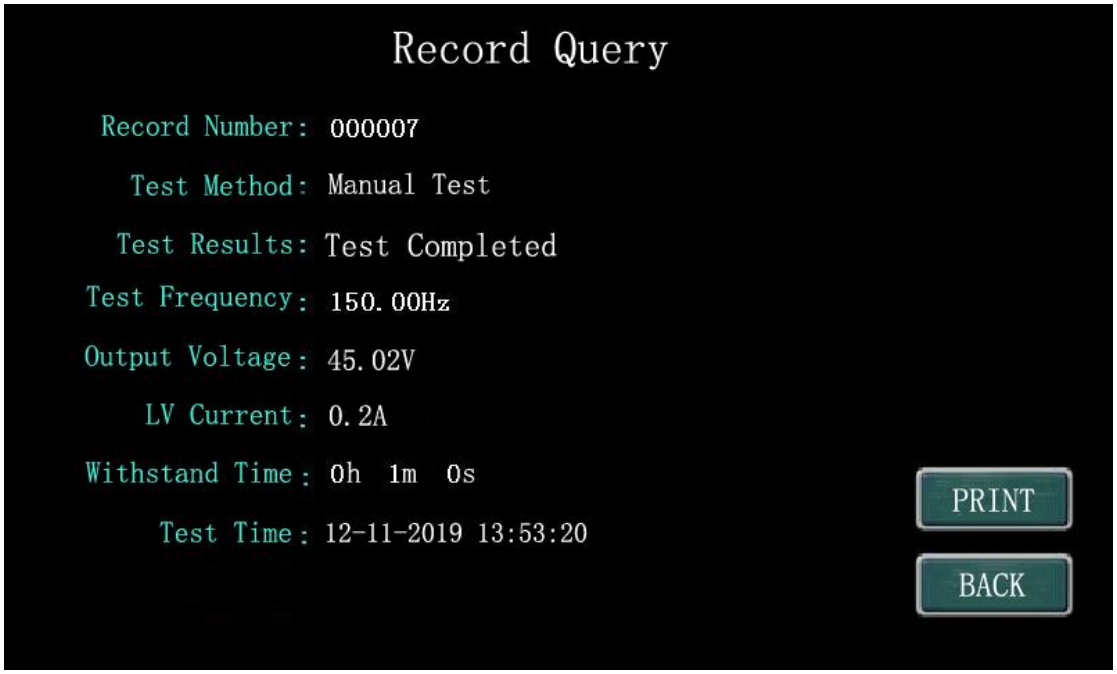


Figure 19

If you need to export all the test records, please insert the U disk first, wait for the identification of the U disk, and then click "EXPORT" to input the test records on the current page to the U disk If the export is successful, as show in Figure 20.

Figure 20

2.2.9 Time Settings： Click "Time Settings" in the main interface to enter the time setting interface as shown in Figure 21. At this time, you only need to set according to the correct date and

time. Click "OK" to save the set time and exit to the main interface.

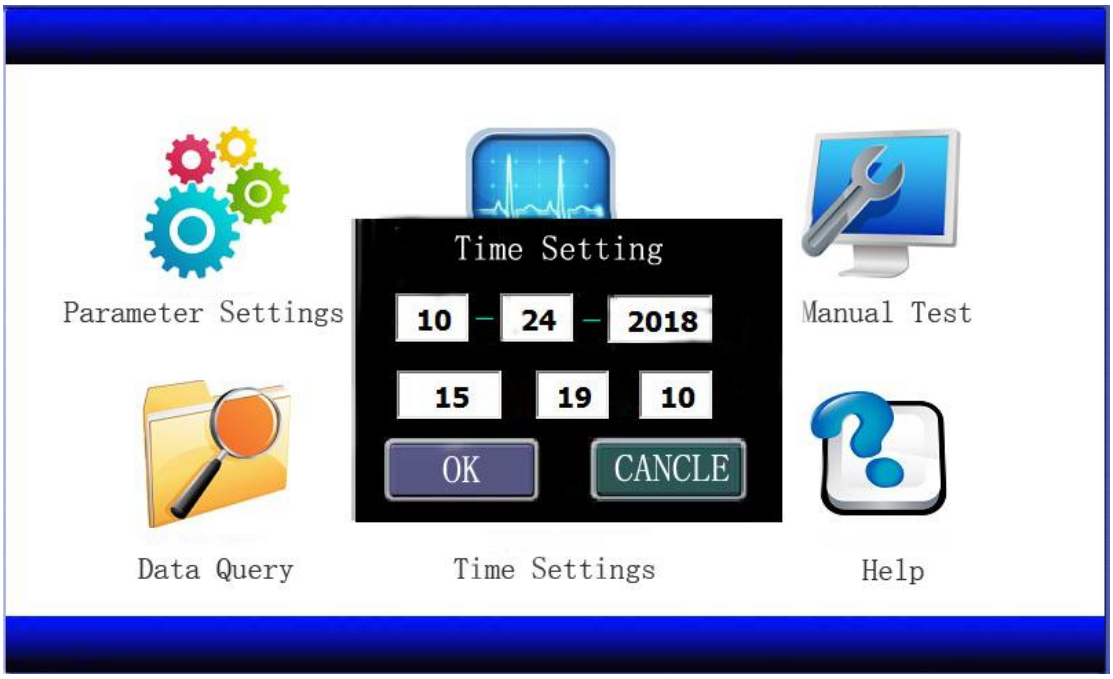


Figure 21

2.2.10 Help： This interface mainly displays the connection mode in the multi octave voltage withstand test schematic diagram, display interface as shown in Figure 22.

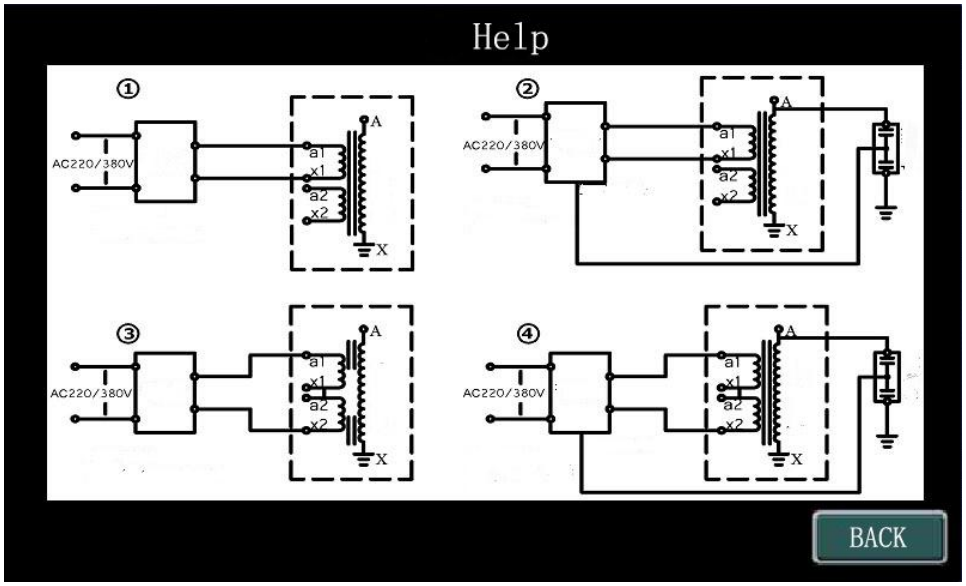


Figure 22

V. Operation method of upper computer software

1.Open the "upper computer software" folder in the U disk, you can see the software "DBP. Exe", open the software, and the operation interface of the matching upper computer software is shown in Figure 23.

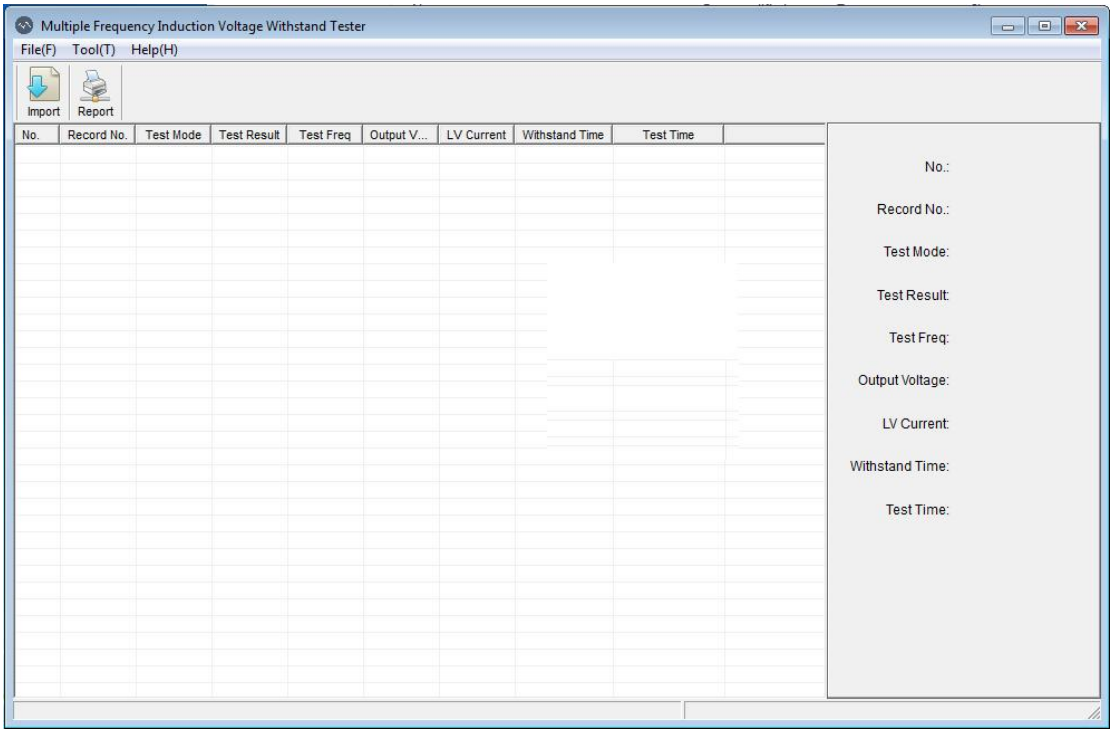


图23

2.Click the "Import" icon in the upper left corner to pop up as shown in Figure 24.

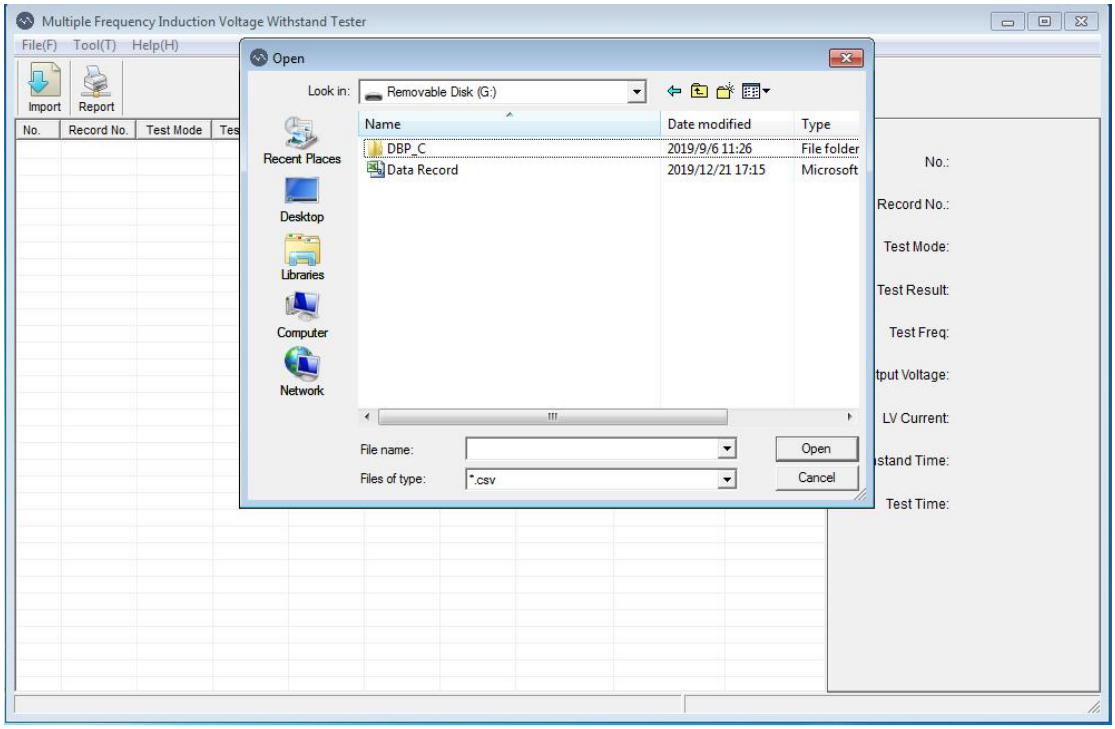


图24

3.Select the file to transfer out,File name is "Data Record. CSV".Click "open" and the interface is as shown in the figure below. The left side is the recorded test record, and the right side is the specific content of the selected item, as shown in Figure 25

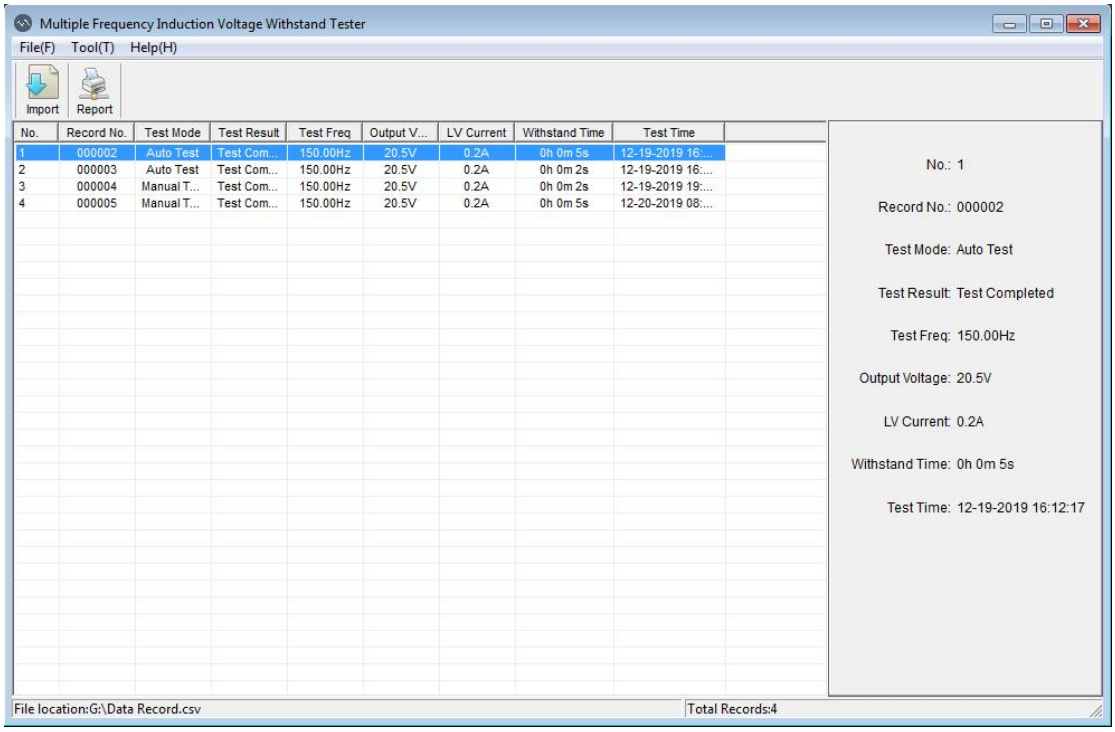


图25

4.To generate the test report, click the required entry and click the "Report" button at the top right.The software will automatically generate word format reports,you can fill in the blank and print after saving.

VI. Common troubleshooting

1.General notes

1.1 The test equipment shall be used by professional high-voltage test personnel. Before use, the user manual shall be read carefully and repeated operation training shall be conducted.

1.2 The number of operators shall not be less than 2. During use, the safety operation regulations of the unit on high pressure test shall be strictly followed.

1.3 In order to ensure the safety and correctness of the test, in addition to being familiar with the product manual, the test operation must be carried out in strict accordance with the relevant national standards and regulations.

1.4 All connecting wires shall not be connected wrongly, otherwise the test device may be damaged.

1.5 When the device is used, the output is high voltage or ultra-high voltage, it must be reliably grounded, pay attention to the safety of operation.

2.Common fault causes and troubleshooting

2.1Fan does not start

1） After over-current, over-voltage and fault protection, the "fault reset" is not pressed；

2）Internal temperature too high, thermal protection of power

components；

Elimination method： Turn off the power of the instrument, leave the instrument standing for about 30 minutes, turn on the power again, press the "Reset" key on the instrument panel, and then start the instrument.

If the fan still can't start, please contact the manufacturer and do not disassemble the instrument!

2.2 Can't boost to test voltage

Phenomenon：

1） During the test, the low-voltage voltage is high, but the high-voltage is low. Even when it does not rise to the test voltage, the low-voltage voltage has reached the rated voltage, and the circuit automatically reduces voltage;

Cause：

1）May exceed the maximum load capacity of the equipment；

2）Current leakage caused by insufficient insulation strength of tested object；

Elimination method：

1）380V power supply；

2） Dry the test object, improve the insulation strength of the test object and reduce the active power loss of the circuit;

If the problem still can't be solved after all processing,

please contact the manufacturer and do not disassemble the instrument!

VII.Matters needing attention

For the safety of you and the equipment, please read the following carefully:.

1.The enclosure must be reliably grounded before the test.

2.During the test, irrelevant items are not allowed to be stacked on and around the equipment panel.

3.Please check the power supply voltage before use.

4.When replacing the fuse tube and accessories, please use the same model as this instrument.

5.The instrument shall be moisture-proof and oil resistant.

6、Before the test, please confirm that the tested equipment is powered off and disconnected from other live equipment.

VIII Maintenance

1、Verify the availability of the device

Before using the instrument, first observe whether the appearance of the instrument is damaged. After power on, check whether the LCD display of the instrument has display and whether the display is complete. For the instrument that has not been used for a long time, check whether the output part of the terminal is rusted and aged. Otherwise, it shall be cleaned and reused in time. Please refer to the use operation method when using.

2、Maintenance of equipment

After each test, clear the wiring on the instrument terminal, turn off the power supply, disconnect the power plug, and place it in a dry, dust-free, ventilated and non corrosive room.

IX. Transport and storage

1、Transport

When the equipment needs to be transported, it is recommended to use the company's instruments to pack wooden boxes and shock absorption articles, so as to avoid unnecessary damage and loss to you during transportation.

When the equipment does not use wooden case during transportation, it is not allowed to stack and discharge. When using

the packing box of our company's instruments, the maximum number of stacking layers is two.

During transportation of the equipment, the panel should face up.

2、Storage

The equipment shall be placed in a dry, dust-free and ventilated room free of corrosive gases. Stacking and discharging are not allowed without wooden case packaging.

The equipment shall be stored with the panel facing up. The bottom of the equipment shall be padded with moisture-proof articles to prevent the equipment from getting wet.

X. Unpacking and inspection

1.Precautions for unpacking

Before unpacking, make sure that the arrow mark on the outer package of the equipment is facing up. When unpacking, please take care not to knock hard to avoid damaging the equipment. Unpacking and taking out the equipment, and keeping the outer packing and shock absorption articles of the equipment, not only facilitates your use in the future transportation and storage, but also plays an environmental protection and energy saving role.

2、Inspection contents

Take out the equipment after unpacking, and clean the equipment and accessories according to the packing list. In case of any shortage, please contact us immediately, and we will provide you with timely service.

XI.Other contents

The whole machine of the product is guaranteed for one year, with "Three Guarantees" and lifelong maintenance. During the warranty period, all equipment quality problems of the company are provided with free maintenance. Provide preferential service for damage caused by improper operation or carelessness of users.

We are looking forward to your valuable comments on our products. Please fill in the "user feedback card" carefully and send it back to our company in time after receiving the equipment. The company will establish a user profile for the equipment you purchased, so as to provide faster and better service for your equipment.

XII Packing list

1.Multiple frequency doubling host	1 set
2、Power cord（yellow、green、red）	1 piece
3、Ground wire	1 piece
4、Test connecting wire	2 pieces
5、Clip（red、black）	3 pieces
6、Insert terminal	2 pieces
7、U disk	1 piece
8、Printing paper	2 pieces
9、Test reporter	1 piece
10、Instruction manual	1 piece
11、Certificate of conformity	1 piece