

HZZGF-Z 60kV/5mA DC Hipot Generator



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Safety Warning

- Those operating DC HV generators must be professional staff with electrical and HV test certificate.
- Provisions of Working Regulation of Power Safety should be strictly observed when using the equipment. There should be a clear cut-off point in the working power supply, which should be cut off clearly in case of replacement of test object and wiring.
- Before the test, it is necessary to make the connection of ground leads of tester control box, voltage-multiplying cylinder and sample reliable; the one-point grounding is conducted as shown in Figure 4-5.
- For large-capacitance test objects, a 100Ω/V resistance discharging rod should be used; the case that no discharging rod is passed through but ground lead is directly connected to the test object is prohibited.

Proper method of discharge: Firstly, make the top metal tip of discharging rod gradually close to the test object, then a hissing sound will appear when it comes to a certain distance, indicating that air gap begins to discharge free. When there is no discharge sound, the top tip of the discharging rod can be used to contact the test object for discharging, and finally the ground lead is connected directly to the test object.

- In case of 200kV+ DC HV tests, although testers wear insulated shoes and stand in a safety area, those persons standing nearby will carry different DC potentials due to HV DC ion space electric field distribution. There will be a slight shock occurred in testers when contacting with each other or the grounding body, which is more obvious in dry areas and in winter; however the energy is small and will not generally cause harm to human body.
- In the tests that discharge impact may be possible (test object breakdown), if the voltage rising is controlled by a host computer in a remote control manner, then the mode of isolating source and electrical isolation (optical fiber or radio) should be applied. Otherwise, the discharge impact may cause damage to the host computer instantaneously.

Contents

I. Product Feature.....	1
II. Block Diagram Of Working Principle.....	2
III. Instructions.....	3
IV. Fault Checking And Disposal.....	21
V. Packing List.....	22

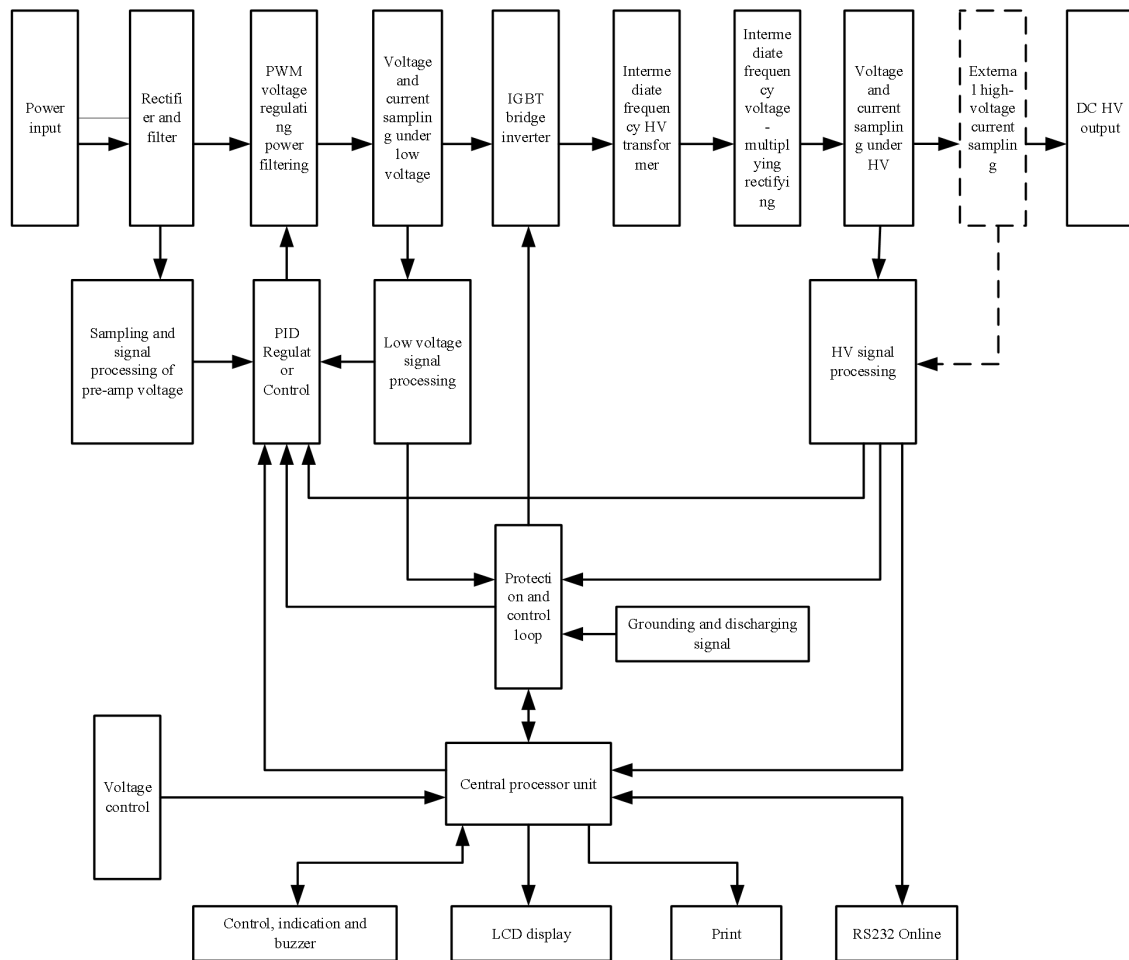
I. Product Feature

DC HV generator is widely applied in the DC HV tests carried out for the zinc oxide lightening arrester, magnetic blow-out arrester, power cable, generator, transformer, circuit breaker, etc.

HZZGF-Z intelligent series of DC HV generator has the following main technical characteristics and functions:

1. Use large touch LED screen with human-machine dialogue function;
2. Full-automatic MOA voltage rise measuring function: good repeatability, high accuracy;
3. Automatic voltage rising function: With preset test voltage, the output voltage can be maintained constant;
4. Automatic timing function: Preset the voltage rising time of the standard test voltage, after rising to the standard test voltage, the timing will start automatically, when the timing is completed the voltage will drop automatically;
5. The HV over-voltage setting uses micro-processor for setting, which is highly precise and highly reliable;
6. Preserve the manual test mode;
7. Data storage function: Being able to timely catch the test parameters and automatically preserve the test results;
8. Based on the electromagnetic compatibility theory, use the special shielding, multi-level isolation and grounding and various other protection strategies to form a organized protection combination, during discharging under rated voltage the equipment will not be damaged;
9. HF, ZGF totally intelligent series of DC HV tester possesses the online operation function with built-in online control software. The host computer (such as being equipped with PC) is installed with control software and auxiliary communication cable (optional) which can realize the online control.

II. Block Diagram Of Working Principle



specification technic parameter	40/4	60/2	60/5	120/ 2	120/ 3	120/ 10	200/ 2	220/ 2.5	200/ 10	300 /2	300/ 3
Rated voltage (KV)	40	60	60	120	120	120	200	220	200	300	300
Rated current (mA)	4	2	5	2	3	10	2	2.5	10	2	3
Rated power (W)	160	120	300	240	360	1200	400	550	2000	600	900
Voltage meter precision	number on voltage meter $\pm$ (1.0 %reading $\pm$ 0.2KV)										
Current meter precision	number on current meter $\pm$ (1.0 %reading $\pm$ 0.2KV)										

Ripple coefficient	$\leq 0.5\%$
Voltage stabilization	stochastic wave $\leq 1\%$ when power wave $\pm 10\%$
Overloading ability	overstep 10% of rated voltage when loading nothing for ten minutes; the biggest charge current can be 1.5 times of rated current
power	single-phase alternating current power of 50HZ 220V $\pm 10\%$
working	incontinuous use
	The time should be no more than 30 minutes when continuously use it
Work condition	temperature: $-10\sim 40^{\circ}\text{C}$
	relative humidity: $\leq 85\%$ when room temperature is 25°C
	height above sea level: below 1500 meters
capacitance	capacitance of the tested res is absoluteness
	Can be charged with 1.5 times of rated current
configuration	electric insulated Voltage Multiplier is made of epoxy FRP(Fiberglass-Reinforced Plastics)
	Air insulated、without leak
characteristic of Control box	One button for high precision of $0.75U_{DC-1mA}$ (precision $\leq 1.0\%$) is suit to do zinc oxide lightning arrester test
	overvoltage protection use dialing code set, be clear at a glance
	International standard box with Two kind of using way (can be take out from the box for using) makes it easy to use.

III. Instructions

1、 Control Box(As Shown In Figure 2-1)



1. Grounding terminal: This grounding terminal and that of the voltage-multiplying cylinder as well as the grounding point of the test object shall be connected to one point, only after which it can be connected to the grounding grid. Please use the dedicated ground lead provided along with the equipment.
2. Connection socket: Used for the power and signal connection between the control box and voltage-multiplying unit. Connect the intermediate frequency inverse voltage to the intermediate frequency transformer through dedicated five-core cable, and send back the voltage and current sampling signal from the HV side to the control box. In case of connection, it only needs to align the white point on the cable plug to that on the socket, and turn in clockwise direction to the proper position. In case of disconnecting the cable, it needs simply to turn the cable plug in the opposite direction.
3. Optical fiber interface: The external high-voltage current signal input terminal, connected to the HV shielded micro-ampere-meter through the dedicated optical cable. When the micro-ampere-meter in the system setting is chosen to be "optical fiber", the screen will show two lines of high-voltage current, among them what the auxiliary screen shows is the HV current going through the HV shielded micro-ampere-meter.(Reserved terminal, setup update).
4. Power input socket: The power line provided along with the equipment is used and connected to the power source. Power model: AC 220V, one-phase 50/60Hz. This power socket is fitted with fuse.
5. Bluetooth .
6. 0.75UDC1mA button: Yellow, with indicator. Under switch-on condition in HV, push down the button when the voltage rises to a certain level, and the voltage will drop to 75% of the original level and be stabilized to this level. This function is designed for the leakage current 0.75UDC-1mA for the zinc oxide arrester test. After the test is completed, the voltage drops to zero automatically and returns the test results.
7. Indicator and button for HV switch-on: Red, with indicator. The light-on refers to the HV switch-on condition, which means being able to or having already released HV. In a particular state interface, when the green light is on, press the red button, and the red light will be on and the green light is off, which indicates that the HV loop is switched on,

now it's ready to do the voltage rising test.

8. HV off/power indicator, button: Green, with indicator. The light-on indicates the present condition is in a state of HV off, and the power is already switched on. When the red light is on, press the green button, and the red light is off and green light is on, the HV loop is cut off, being able to cut off the HV loop under all modes.
9. Control rod: Used for the setting of the parameters and adjustment of the voltage.
Rotation and press are available to it. The manual mode offers the clockwise and anti-clockwise rotation for function selection, or for voltage rising and lowering. As the interfaces vary, the operation function also bears some differences, which can be referred to in the screen instructions.
10. Touch LED screen: Indicate various parameter setting, test condition, results, prompt message, etc
11. Thermal printer.
12. Power switch: Control the On/Off state of the machine power.

2、Voltage-multiplying Cylinder (As Shown In Figure 2-2)



Figure 2-2 Voltage-multiplying Cylinder

13. Grounding 14. Intermediate frequency input 15. High pressure output

3、Interface Description And Operation Procedures

1. Startup and system setting

(1) Turn on the power switch to show the startup interface:



Figure 2-3.1-1 Startup Interface

(2) Enter into the main menu interface as shown in the following picture after waiting for several seconds:

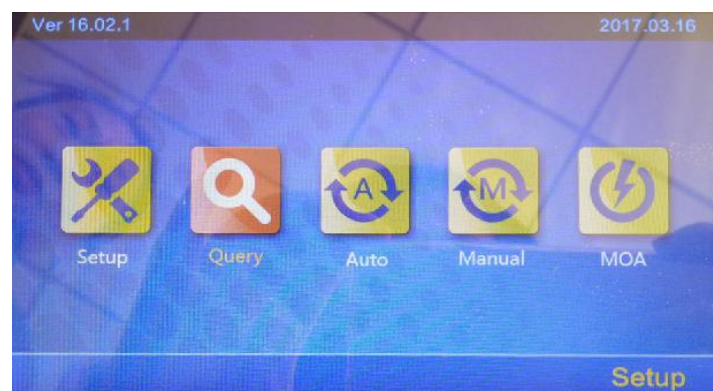


Figure 2-3.1-2 Main Menu Interface

(3) Click the system setting to enter into the system setting interface



Figure 2-3.1-3 Setting of System Parameters

(4) Click the setting of system time to enter into the following interface, which can be clicked to change any number. For example, Change the number 1 of 2016, which only requires you to click the number 1, it will show the nine numbers as shown in the following picture; based on the actual condition, click any number from 0 to 9, and then click OK to save it, the setting is completed.

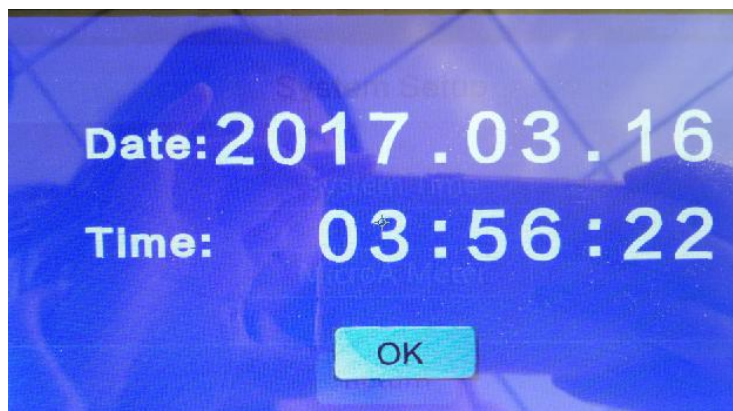


Figure 2-3.1-4 Interface for the setting of the system time

(5) As shown in Figure 2.3.3, click setting of micro-ampere-meter to enter into the following interface, and select the type of micro-ampere-meter as required (Note: Cabled micro-ampere-meter is provided only for the moment).

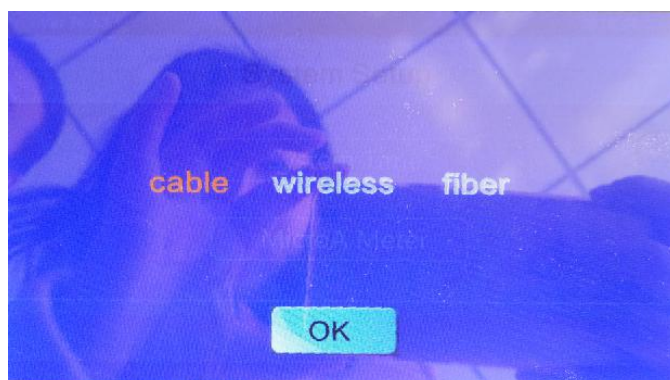


Figure 2-3.1-5 Interface for the Setting of Micro-ampere-meter

2. Auto mode

(1) As shown in Figure 2-3.1-2, click the auto mode to enter into the interface accordingly

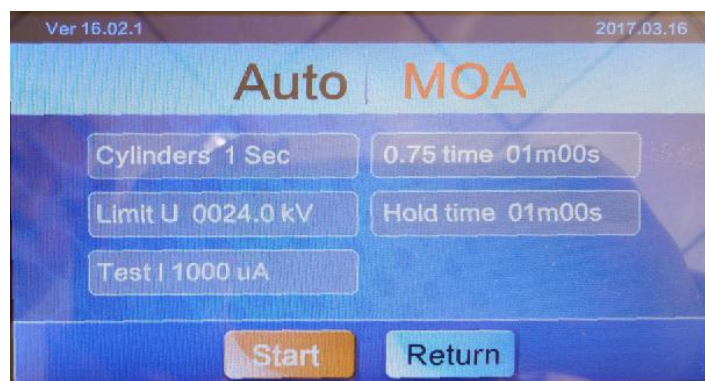


Figure 2-3.2-1 Interface of Auto Mode

(2) Click the voltage-multiplying section number, select as required, as shown below

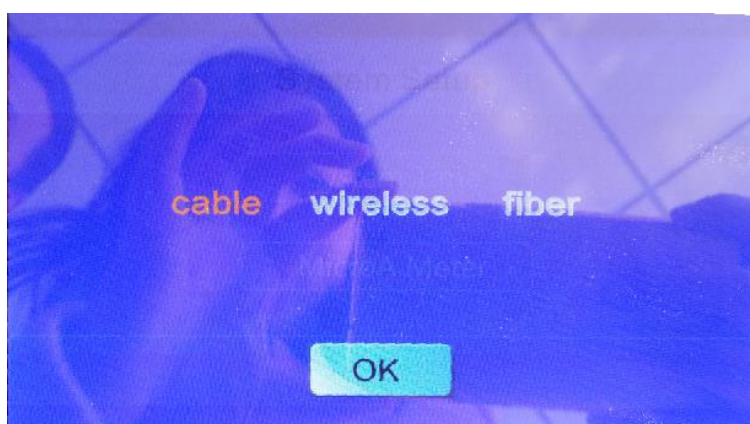


Figure 2-3.2-2 Setting of Voltage-multiplying Cylinder Section Number Interface

(3) As shown in Figure 2-3.2-1, click the over-voltage setting or test voltage level based on the test requirement (over-voltage setting should be larger than the test voltage), as shown below



Figure 2-3.2-3 Over-voltage Setting Interface

(4) As shown in Figure 2-3.2-1, click the test current and select the test current as required, as shown below



Figure 2-3.2-4 Interface of Test Current Setting

(5) After all settings are completed, click Start to enter into the test interface



Figure 2-3.2-5 Test Interface of Auto Mode

(6) After clicking HV On, the red light is on, the test begins, automatic voltage rising appears; in any mode under the voltage rising, pressing "HV Off" can end the test in emergency, as shown below

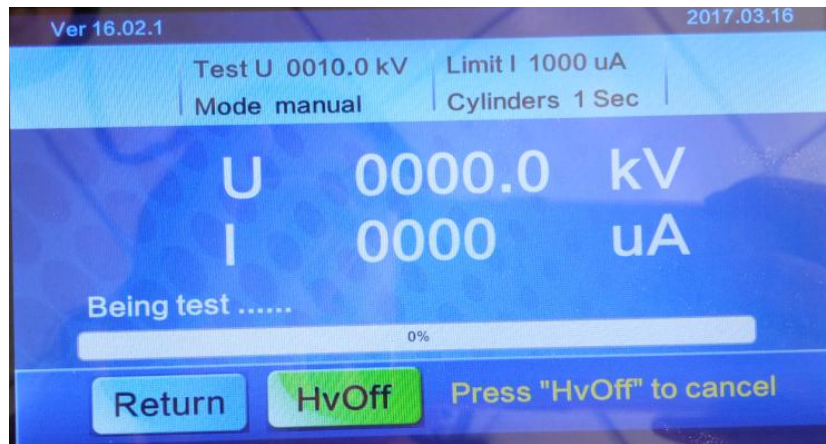


Figure 2-3.2-6 Voltage is Rising Automatically

(7) The voltage is rising to the setting value of the test voltage, and will maintain automatically according to the setting time.



Figure 2-3.2-7 Holding Voltage

(8) Holding voltage ends; the voltage drops to "0" automatically; the result interface comes out.



Figure 2-3.2-8 Auto Test Result

3. Manual mode

(1) As shown in Figure 2-3.1-2, click the manual mode to show the following interface.

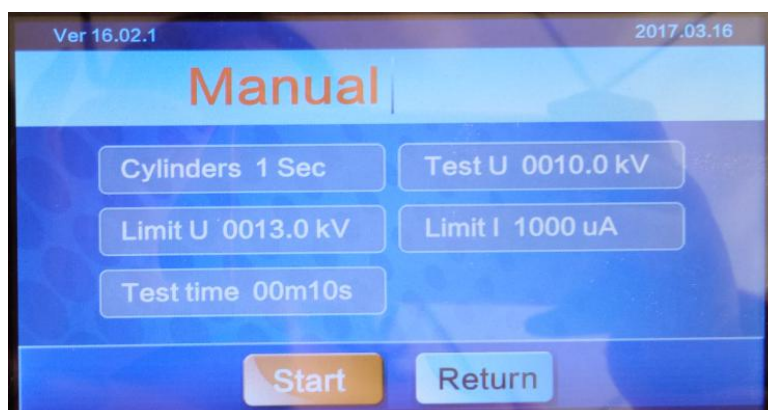


Figure 2-3.3-1 Setting of the Parameters for Manual Mode

(2) Select the voltage-multiplying section number, test voltage, over-voltage setting, limited current, and test time (all are the same as the operations of the auto test) as required, click Start and HV On, the red light will be on, and the test can be started; manually turn the potentiometer slowly to rise the voltage.

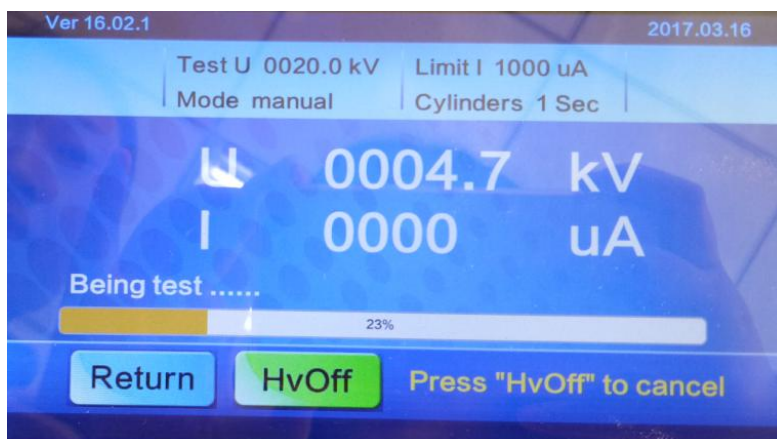


Figure 2-3.3-2 Voltage is Rising Manually

(3) Manually rise the voltage to the test value and keep it until the ending of the test time preset; automatically drop to "0" to enter into the interface of test result.

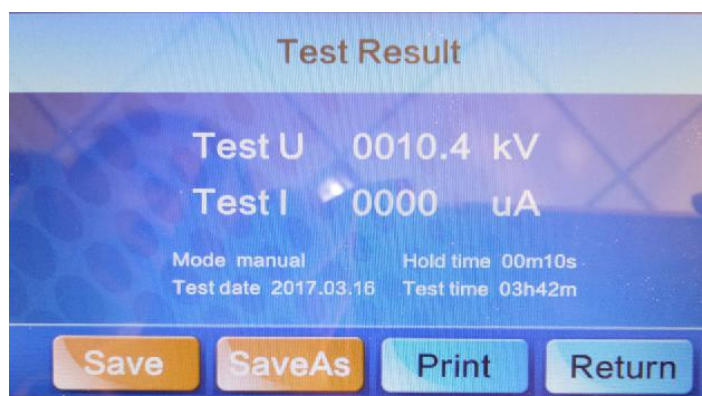


Figure 2-3.3-3 Manual Test Result

4. Mode MOA

(1) As shown in Figure 2-3.1-2, click MOA mode (zinc oxide arrester test) to enter into the following interface

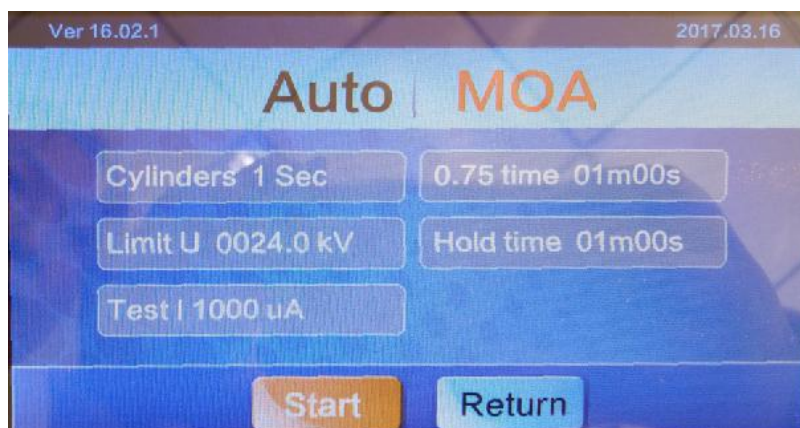


Figure 2-3.4-1 MOA Mode Interface

(2) According to your need, you can select the voltage-multiplying section number, 0.75 time, over-voltage setting (higher than the test voltage), test time, test current (for Zinc oxide arrester tests, the current should be 1,000uA). After the selection, click Start, and you will enter the following interface.



Figure 2-3.4-2 MOA Test Interface

(3) Click HV On, the red light is on, the test will start, as shown in the figure below.

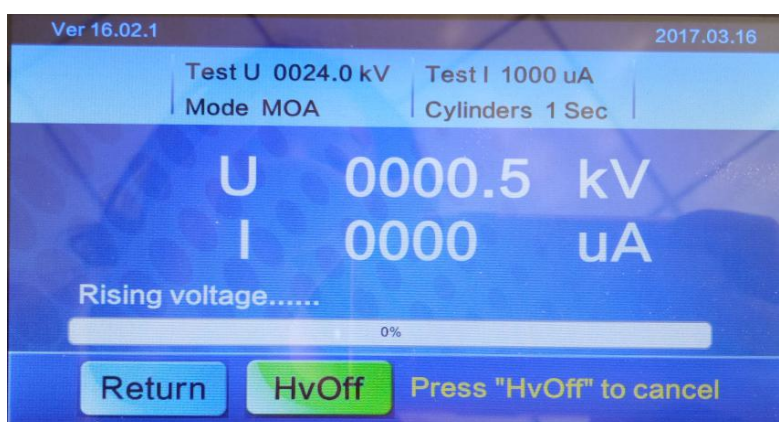


Figure 2-3.4-3 MOA test is rising voltage

(4) When the current rises to 1,000uA, it will hold voltage according to the setting test voltage time automatically.



Figure 2-3.4-4 Holding Voltage

(5) After the holding time, voltage will drop to 75%.



Figure 2-3.4-5 Voltage Drops to 75%

(6) Holding voltage according to the preset 0.75 time automatically.



Figure 2-3.4-6 Holding Voltage of 75%

(7) After the 0.75 holding voltage time, it will drop voltage automatically.



Figure 2-3.4-7 Voltage is Lowering Automatically

(8) The voltage drops to 0%, and it will go into the results interface.



Figure 2-3.4-8 Test Result

5. Save and query of test results

(1) After clicking default save, the following interface will appear; click OK to save successfully.

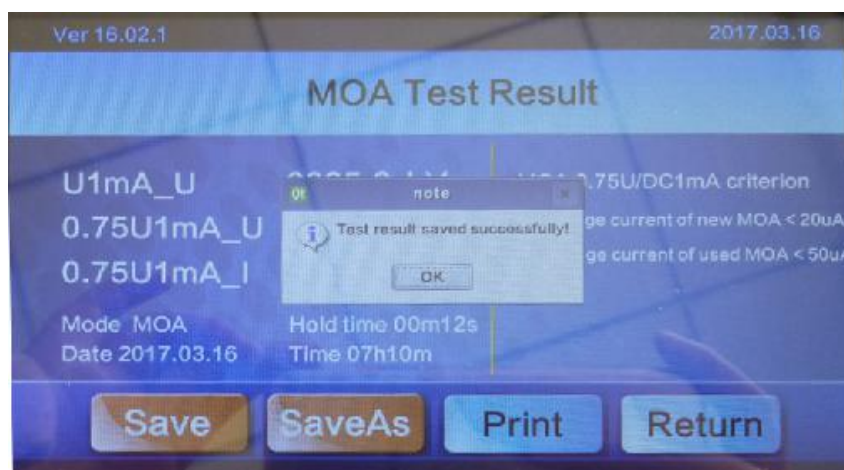


Figure 2-3.5-1 Test Result is Saved Successfully

(2) You can also use S/N Save. After clicking S/N Save, the following interface will appear, and you can set S/N arbitrarily (may be Chinese characters, symbols or numbers); click 1 to save successfully as follows, and then the interface will appear automatically as above. Click OK and return to go back to the main menu interface.

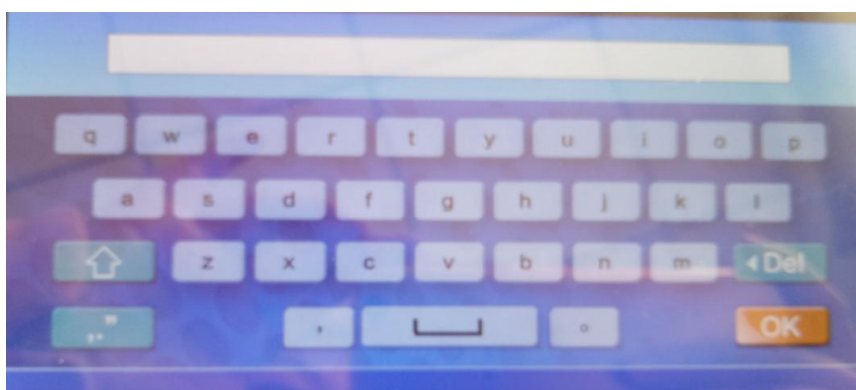


Figure 2-3.5-2 S/N Save Interface

(3) In the main menu interface, after clicking Record Query, the following interface will appear. At the moment, you can choose the test results to query according to your need.

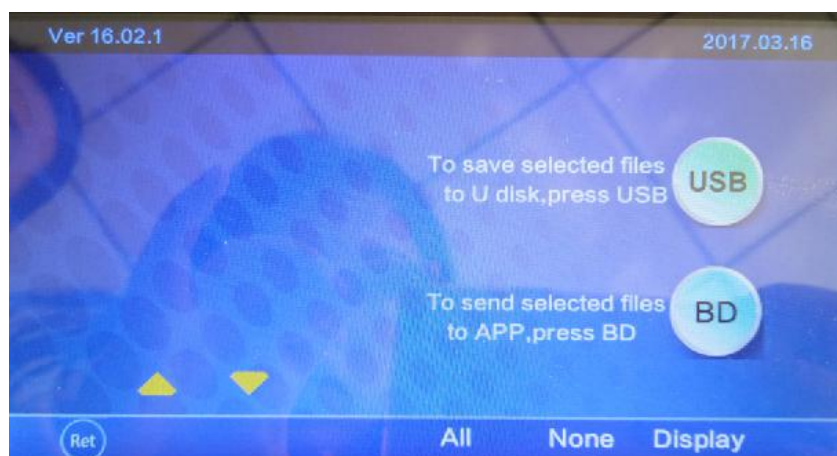


Figure 2-3.5-3 Record Query interface

(4) Click the dot behind the chosen test results, make it become black, and then click the "Display" below, the test results you want to choose will show.

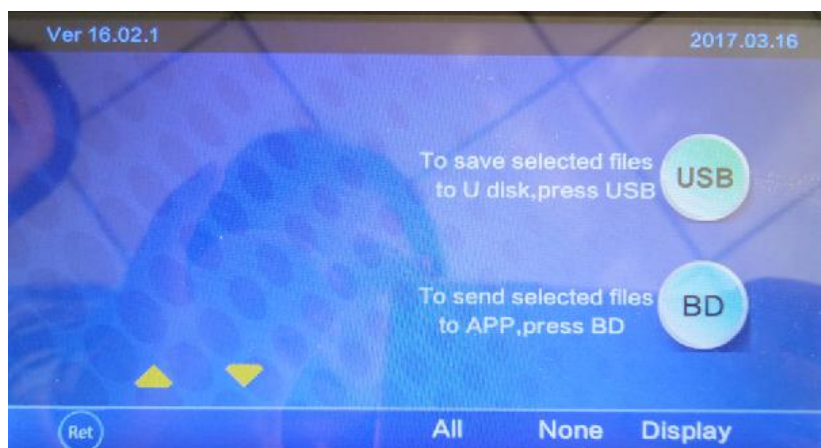


Figure 2-3.5-4 Click the Dot behind 1

(5) You can also click USB or Bluetooth according to your need, the results can be transmitted via Bluetooth or U disk, and then the results will be stored in the computer.

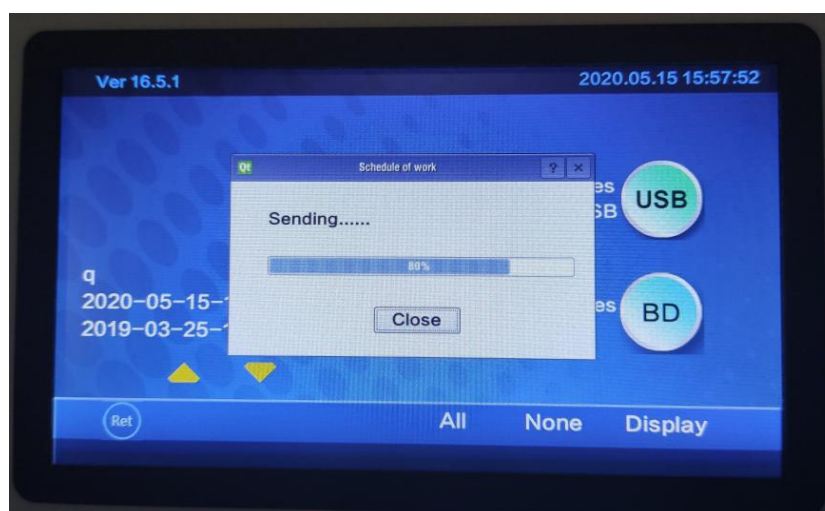


Figure 2-3.5-6 Data in the Bluetooth is Sending

4、Test Operation Details

1. Mode Of Manual Voltage Rising

After startup, it will enter into the main menu. Set the control rod in a rotation manner to make the cursor point to "Manual Voltage Rising"; click the control rod to enter the manual mode parameter setting interface. After setting the parameters according to the requirements of the specific tests, you can enter the voltage rising interface. Firstly press the HV On, and rotate the button after the red light is on; when the voltage rises to the test value, the timer will start to time. After the timing, the system will drop back to zero automatically, and then the test results save dialog box will appear. After making a choice,

the test will be over. If you press the $0.75U_{DC-1mA}$ button when the voltage is under the preset test voltage value, the system will automatically drop voltage down to 0.75 times of the current value, and then the system will count down with as per the preset saturation time. After the timing, the system will drop back to zero automatically, and then the test results save dialog box will appear. After making a choice, the test will be over.

2. Mode Of Automatic Voltage Rising

After startup, it will enter into the main menu. Set the control rod in a rotation manner to make the cursor point to "Auto Voltage Rising"; click the control rod to enter the auto mode parameter setting interface. After setting the parameters according to the requirements of the specific tests, you can enter the voltage rising interface. At the moment, after pressing the HV On, the system will rise voltage automatically; when the voltage rises to the test voltage value, the timer starts to time. After the timing, the system will drop back to zero automatically, and then the test results save dialog box will appear. After making a choice, the test will be over.

3. MOA Voltage Rising Test Mode

After startup, it will enter into the main menu. Set the control rod in a rotation manner to make the cursor point to "MOA Voltage Rising"; click the control rod to enter the auto mode parameter setting interface. After setting the parameters according to the requirements of the specific tests, you can enter the voltage rising interface. At this time, after pressing HV On, the system will increase voltage automatically, when reaching test current value preset and current is steady, start timing; after that, the system voltage will decrease to 0.75 times of the original voltage value, when the voltage is steady, restart timing, and then the system will decrease to zero, the test records save dialog box will pop out; this test is over after making a choice. Return to the main menu interface after completing the test, fully discharge with a discharging rod and then turn off the power source.

4. Turn off the power switch after completing the test.

5. For small capacitive test object such as zinc oxide arrester, generally voltage-multiplying cylinder internal voltage testing resistance can be applied during the discharge. For large capacitive test objects such as cable, supporting

current-limiting resistance should be installed; normally after test object self-discharging is under 20% of test voltage, the supporting discharging rod can be used to discharge. Only the test object is fully discharged and ground lead is hung well can HV leads be removed and replaced.

5、Test Method Examples

1. Rising removal method

In general measure, after connecting the wire, it is necessary to hang the wire connected with test object in the air first, read air corona and stray current I' when reaching test voltage, and then connect test object and read total current I_1 when reaching test voltage.

Test object leakage current: $I_0 = I_1 - I'$

2. HV side precision measurement method

When precision measurement is needed to measure leakage current of test objects, supporting HV micro-ampere-meter should be connected in series on HV side (see Figure 4-5a).

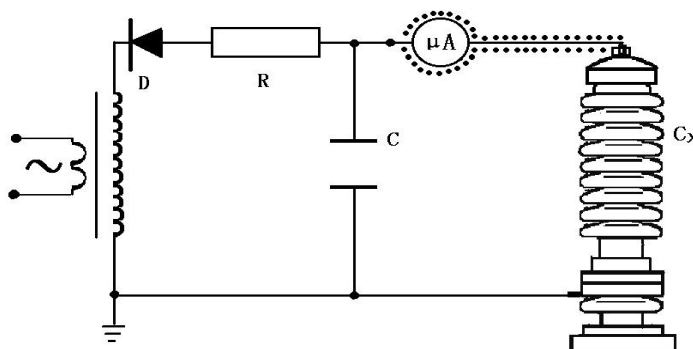


Figure 4-5a HV Side Wiring for Micro-ampere-meter Connecting Test Object C_x

Micro-ampere-meter should use specific shielded wire to connect with test object. HV Shields lead should be connected tightly with micro-ampere-meter shields. To eliminate the influence of leakage current of test object surface, high potential of test object wrapped with multistrand bare plain conductor can be connected with HV lead shields (see Figure 4-5b).

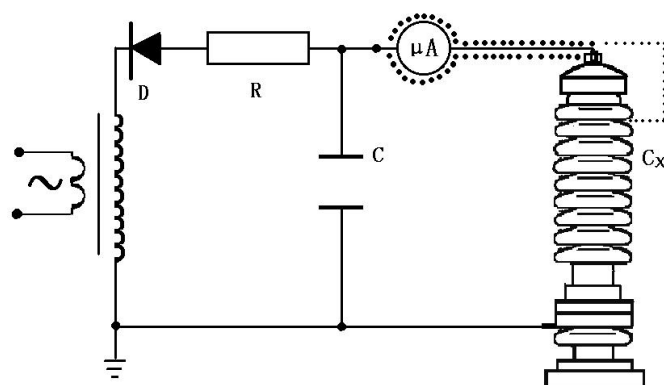


Figure 4-5b Wiring Diagram of Eliminating Influence of Test Object C_X Surface

3. LV side precision measurement method

In the case of test objects such as zinc oxide and magnetic blow-out arrester, whose ground terminal can be separated; the method of using ampere meter can be placed in series to measure on the bottom of test object (ground potential side) (see Figure 4-5c). To eliminate the influence of leakage current on test object surface, ground potential of test object wrapped with multistrand bare plain conductor can be connected to the ground together with shields of micro-ampere-meter (see Figure 4-5d).

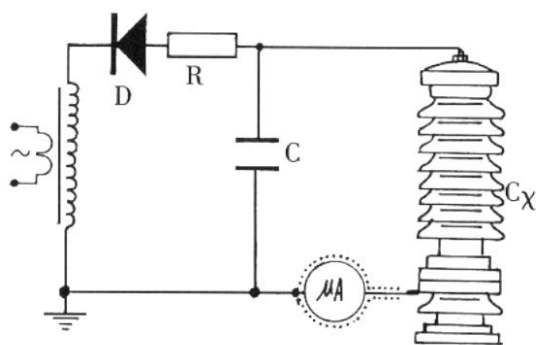


Figure 4-5c Bottom Wiring for
Micro-ampere-meter Connecting Test Object
 C_X

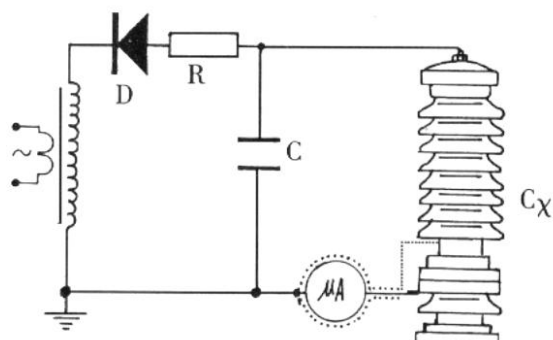


Figure 4-5d Wiring Diagram of
Eliminating Influence of Test Object C_X
Surface

6、Operations After Protective Action

In case of any LV overcurrent, LV over-voltage, HV overcurrent, HV over-voltage, discharge, protective action will be activated. All these protective actions will be displayed on the LCD screen. The following steps should be observed at this time.

1. After turning the power switch off, all indicators on the panel are off, test again after figuring out the situations and handle appropriately.
2. After 20 seconds, when LV capacitor is fully discharged, it is permissible to turn the power on.

IV. Fault Checking And Disposal

	Phenomena	Reasons	Treatment
1	After turning the power switch on, the green indicator is off	● Open circuit of power line ● Power fuse blows	Replace power line Replace fuse
2	After choosing optical fiber micro-ampere-meter, the current can't be read	● Optical fiber disconnected ● Micro-ampere-meter battery is undervoltage	Connect optical fiber Replace micro-ampere-meter battery
3	LCD screen displays "HV over-voltage protection"	● Protective voltage preset is too low	Return and set the menu to increase setting voltage value
4	LCD screen displays "HV overcurrent protection"	● Test object discharging or breaking down ● Limited current is set too low	Examine the test object. Increase the set value of limited current
5	LCD screen displays "LV over-voltage protection"	● Current load is 1.1 times greater than the rated load of this equipment	This equipment is not suitable for test
6	LCD screen displays "LV overcurrent protection"	● Current load is 1.1 times greater than the rated load of this equipment ● Equipment trouble	This equipment is not suitable for test, so it needs repairing

V. Packing List

No.	Item	Qty
1	Main engine	1
2	HV voltage-multiplying cylinder	1
3	HV micro-ampere-meter	1
4	Power line	1
5	Intermediate frequency output cable	1
6	Ground lead	1
7	Discharge bar	1
8	Discharge bar ground lead	1
9	Current-limiting resistance	1
10	Micro-ampere-meter line	1
11	HV outgoing line	1