



产品使用说明书

PRODUCT INSTRUCTION MANUAL

M0E0RW-JC5-50

Fully Automatic Insulation Material
Dielectric Breakdown Voltage Tester

全国统一客服热线：4000-177-185

Dear Customer

Thank you for purchasing our equipment . Before using this product for the first time, please read this instruction manual carefully, which will help you become proficient in using this instrument .



Our goal is to continuously improve and perfect our products; therefore, the product you use may differ slightly from the instruction manual. If there are any changes, we will inform you via an appendix. Thank you for your understanding! If you have any questions, please contact our after-sales service department; we will certainly meet your requirements.



Since input/output terminals and test posts may be energized, sparks may be generated when you plug or unplug test leads or power sockets. Be careful of electric shock and avoid the risk of electric shock!

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一、 Product Overview

1、 Equipment Introduction

Our company's fully automatic insulation material withstand voltage breakdown tester is manufactured according to the national standard GB1408.1-2006 "Electrical Strength Test Method for Insulation Materials". Its function can also be called an electrical insulation strength tester or dielectric strength tester. Its working principle is: a voltage higher than the normal operating voltage is applied to the insulator of the tested equipment for a specified period. If the applied voltage only produces a very small leakage current, the insulation performance is good. This equipment adopts advanced microelectronic chip processing technology, touch screen control, and host computer operation, making it simple and clear to operate. The testing system consists of three modules: a programmable power supply module, a signal acquisition and conditioning module, and a computer control system. After all test parameters are set, the test is performed automatically without manual intervention.

2. Scope of application

This device is mainly suitable for testing the breakdown strength and withstand voltage of solid insulating materials (such as plastics, rubber, laminates, films, resins, mica, ceramics, glass, insulating varnishes, etc.) under power frequency or DC voltage. It is designed and manufactured for high-voltage breakdown testing in the power electronics industry,

machinery industry departments, research institutes, military research, and insulating material production units.

二、 Features

1. The device is operated and controlled via a 7-inch touchscreen.
2. If curve analysis is required, a computer can be provided for data and curve recording only, without controlling the equipment. This avoids the need for experimenters to switch between the computer and the equipment, making it more user-friendly.
3. The equipment has a test parameter memory function. The same test conditions do not need to be set for each test, and the last test setting parameters will still be remembered even after power failure.
4. The experimental interface is simple and clear, and easy to understand.
5. The control panel is simple, the functions are clearly labeled, and the operation is easy.
6. It can record 100 experimental data points simultaneously, with 10 experimental records per page, facilitating comparative analysis of experimental data.
7. The equipment test interface uses a real-time display method, which makes it more convenient to watch the test process.
8. This instrument has multiple safety measures to ensure the personal safety of the operator .
 - 8.1 Door limit protection: If the door is not closed, the equipment will not respond even if the experiment starts at the power-on point.

8.2 Voltage Zero Protection: If the power is suddenly cut off during the experiment, the voltage will automatically return to zero after the next power-on, ensuring that the initial voltage is zero .

8.3 Overvoltage protection: The termination voltage can be set by software to ensure that if an abnormal voltage rises to the specified voltage during the voltage boosting process, the voltage will automatically terminate and return to zero .

8.4 High-voltage mechanical limit: If the software system loses control and the voltage continues to rise, the system will indicate that the upper limit has been reached after the high-voltage limit is reached .

8.6 . There is a running indicator light. You can determine whether it is running by observing the status of the indicator light .

三、 Main technical parameters

Number	project	5KV	10KV	20KV	50KV	100KV
1	Input voltage	AC220V 50Hz				
2	Output voltage	AC : 0~5kV DC : 0~5kV	AC: 0 ~ 10kV DC: 0 ~ 10kV	AC: 0 ~ 20kV DC: 0 ~ 20kV	AC: 0 ~ 50kV DC: 0 ~ 50kV	AC: 0 ~ 100kV DC: 0 ~ 100kV
4	Output power	0.5kVA	1kVA	2kVA	5 kVA	10kVA
5	Measurement range	AC: 0.05~5kV DC: 0 ~ 5kV	AC: 0.5 ~ 10kV DC: 0.5~10kV	AC: 1~20kV DC: 1~20kV	AC: 1 ~ 50kV DC: 1 ~ 50kV	AC: 1~100kV DC: 1~100kV

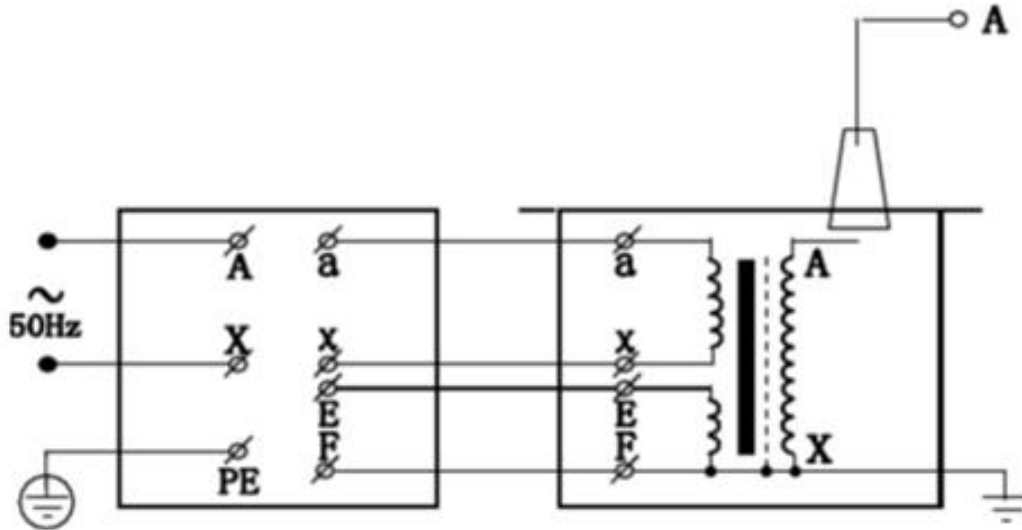
6	Measurement error	$\leq 2\%$
8	Withstand time	0 ~ 60S
9	Leakage current	It can be freely configured by computer software.
10	power supply	220V $\pm$ 10% single -phase AC voltage and 50Hz $\pm$ 1% frequency
11	Test environment	It can operate stably at temperatures of 15 to 30 °C and relative humidity of 30% to 65% .
12	Grounding requirements	The instrument requires a separate ground, and the grounding must meet national standards, with a grounding resistance $\leq 0.5\Omega$.

四、Equipment Images



Insulation material breakdown withstand voltage test device

五、Equipment working principle diagram



六、Instructions for use

Please read the following safety precautions carefully to avoid personal injury and to prevent damage to this product or any other products connected to it. To avoid potential hazards, this product should only be used within the specified scope .

1、Equipment installation and connection

Please carefully read the following installation and connection steps before using the device:

Equipment installation

– Choose a suitable location: Place the testing equipment in a dry, well-ventilated, and level indoor location. Ensure there is sufficient space around the equipment for easy operation and maintenance, while keeping it away from water sources and other factors that could damage

the equipment.

– Fixed equipment (if required): For some large power frequency withstand voltage equipment, if it may vibrate or shift during operation, it is necessary to use anchor bolts or other methods to fix the equipment to the ground to ensure the stability of the equipment.

Connect to power

– Confirm power requirements: Carefully check the power specifications on the equipment nameplate, such as voltage and frequency. Generally, power frequency withstand voltage equipment uses AC power, with common voltage levels being 220V or 380V.

– Connect the power cord: Use a compliant power cord to connect the device's power input to a suitable power outlet or distribution cabinet. Ensure the connection is secure and insulate the wire joints to prevent electrical leakage.

Connect the test sample

– Clean the connection points of the test sample: Before connecting, clean the connection points of the test sample and the test leads to ensure good electrical contact.

– Select appropriate test leads: Choose test leads with an appropriate cross-sectional area based on the capacitance and test voltage of the test sample. For high-voltage, high-capacity test samples, it is necessary to

use conductors with a larger cross-sectional area to reduce line resistance and inductance.

– Connection method: According to the equipment's instruction manual and test requirements, connect one end of the test lead to the output terminal of the power frequency withstand voltage tester, and the other end to the corresponding test point on the test specimen. For example, when performing a withstand voltage test on a motor, connect the test lead to the motor's winding lead. Ensure a secure connection during the process to prevent loosening or detachment during the test.

Grounding connection

– Determine the grounding location: Locate the grounding terminal of the equipment; usually, there will be a specific grounding mark on the equipment casing. Also, if the test object requires grounding, locate its grounding connection point.

– Connect the grounding wire: Use a copper grounding wire of sufficient cross-sectional area to connect the equipment grounding terminal and the test object grounding connection point to a reliable grounding device, such as a grounding grid or grounding stake. The grounding resistance should meet safety requirements.

2、Preparations before the experiment

Before conducting a withstand voltage test on insulating materials, the following preparations need to be made:

Equipment inspection

- Inspect the power frequency withstand voltage equipment itself, including the main unit and control console, to ensure that there is no damage to the appearance, and that the connection lines are not broken or loose.
- Check whether the instruments (such as voltmeters and ammeters) are working properly and whether the display screen shows any faults.
- Check that the withstand voltage equipment is properly grounded.

Test sample preparation

- Clean the test specimen thoroughly to avoid surface dirt, dust, etc., affecting the test results. For example, when testing a transformer, clean its bushings and other parts.
- Verify that the test item is connected correctly and securely. If the test item is an electrical device, connect the test circuit according to the device's wiring diagram.
- Whether the test sample is properly grounded.

Environmental inspection

- The test site should be spacious and clean, and there should be no flammable or explosive materials nearby.
- Ensure that the temperature and humidity of the test environment are within the allowable operating range of the equipment, generally between -10°C and 40°C , and the humidity is not higher than 85%.

Safety measures

- Check that the grounding is good and that the grounding resistance meets the requirements. Generally, the grounding resistance should not exceed 0.5Ω to ensure the safety of test personnel and equipment.
- Set up clear warning signs in the test area to prevent unauthorized personnel from entering.

Test parameter settings

- Set appropriate test voltage, test time, and other parameters according to the type, specifications, and test standards of the test specimen. For example, the power frequency withstand voltage test value is different for electrical equipment of different voltage levels.

3. Start-up and Operation Steps

3.1 Stage boost mode:

- 1) Connect the test leads according to the relevant test procedures,

turn on the power, and power on the system to enter the main interface, as shown in Figure 1 :



Figure 1

2) Click the "Stage Boost" icon to enter the test parameter settings for stage boost mode: as shown in Figure 2 :



Figure 3

- ① Enter the sample number, sample thickness parameters, and test type;
- ② Enter the overvoltage protection and leakage current protection values. If the entered protection values exceed the maximum limit of the device, the software will prompt "Parameter exceeds limit" and the OK button will disappear!
- ③ This is a 3-stage mode. Input the corresponding voltage value and withstand voltage time, and the device will execute according to: initial stage - middle stage - final stage.
- ④ For example: Set the initial voltage to 5kV and the withstand voltage time to 10s; the intermediate voltage to 10kV and the withstand voltage time to 30s; the final voltage to 20kV and the withstand voltage time to 60s. After clicking the "OK" icon, the software will

enter the test interface (see Figure 3). Click the "Start Test" icon, and the device will start closing the circuit and increasing the voltage to the initial voltage of 5kV, then start the initial withstand voltage timing. After the timing ends, the device will increase the voltage to the intermediate voltage of 10kV and start the intermediate withstand voltage time. After the intermediate withstand voltage time ends, the device will increase the voltage to the final voltage of 20kV and start the final withstand voltage timing. After the final withstand voltage time ends, the device will automatically reduce the voltage to zero and open the circuit. Click the "Return" icon to return to the main interface.

⑤ The boost rate method is the same as above.

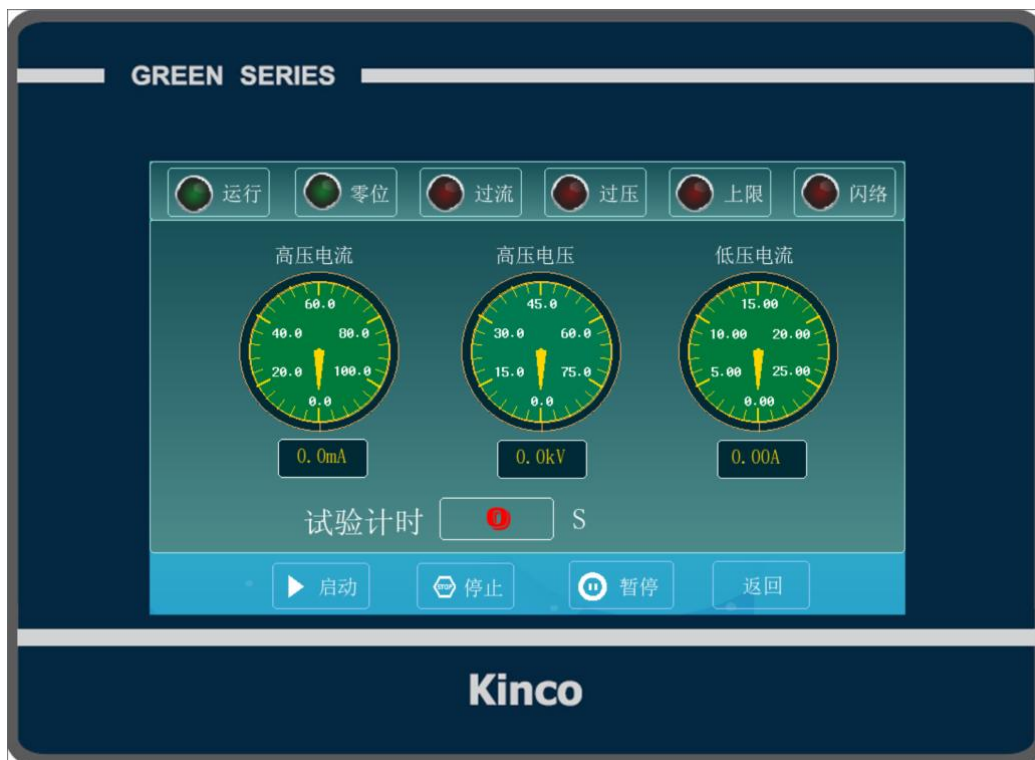


Figure 3

3.2 Continuous boost mode:

Click the "Continuous Voltage Boost" icon to enter the test parameter settings for continuous voltage boost mode: as shown in Figure 4:



Figure 4

- 1) Enter the corresponding sample parameters and test type;
- 2) This is a two-stage mode; the operation method is the same as the "stage boost" method.

3.3, Step-up boost mode :

Click the "Step-up Voltage Boost" icon to enter the test parameter settings for the step-up voltage boost mode: as shown in Figure 5:



Figure 5

1. Enter the corresponding sample parameters and test type;
2. This is an unlimited stage mode; the operation method is as follows:
3. For example: Set the initial voltage to 10kV and the initial withstand voltage time to 10s; the secondary voltage to 2kV and the secondary withstand voltage time to 5s; the overvoltage protection to 50kV; and the leakage current to 50mA.

The voltage ramp rate works on the same principle as the phase mode. Click the "OK" icon to enter the test interface, then click the "Start" icon. The device will automatically ramp up to the initial voltage of 10kV; withstand voltage for 10 seconds; then the device will continue to ramp up to 12kV, and then time for 5 seconds; then it will continue to cycle indefinitely until the leakage current of the test sample exceeds the

protection value of the device. The device will then automatically cut off the power and display the voltage and current records at the time of breakdown.

3.4 Instantaneous boost mode :

1. Enter the corresponding sample parameters and test type;
2. This is a stage 1 mode; the operation method is the normal power frequency withstand voltage mode; see Figure 7 :



Figure 7

3.5 Historical Data

1. Click  the icon on the main interface to enter the historical data interface: as shown in Figure 8



Figure 8

2. Select the data you want to print and click the “” icon to print the data;

3. Click the up and down arrow icons to flip through pages, and click the “Clear” icon to clear all historical data;

3.6 System Settings

① Click the “ ” icon on the main interface  to enter the system settings interface. A system prompt will appear before entering the settings interface; see Figures 9 and 10 :

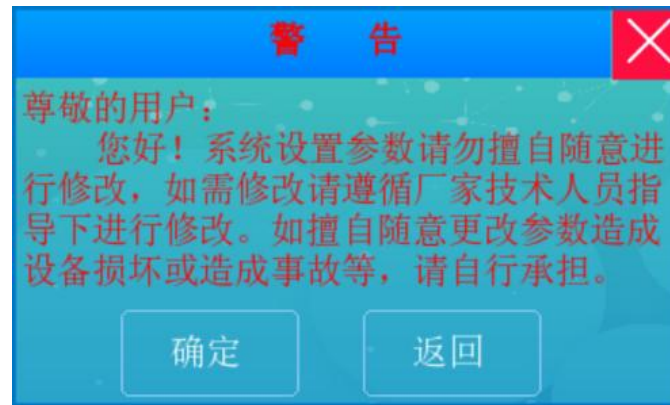


Figure 9



Figure 10

② The parameters in the system settings interface can be configured and modified;

③ **WARNING:** The parameters set on this interface are those set by our company's professional technicians after system debugging. Do not change these parameters arbitrarily! Doing so may cause system malfunctions or high-voltage accidents! If you need to modify the parameters, please

contact our company and modify them under the guidance of our professional technicians !

4. Procedures for ending the experiment

4.1 Pressure Reduction Operation

- Closely observe the voltage and current indicators on the screen, and only disconnect the power supply after ensuring that the zero position key on the left side of the screen is lit.
- After confirming that the voltage has dropped to zero, press the power stop button to cut off the power to the device.

4.2 Discharge Operation

- Qualified insulated gloves must be worn when opening windows and doors.
- Use a dedicated discharge rod to fully discharge the high-voltage end to ground . Perform the discharge operation at least three times .
- Discharge the test sample to ensure that the charge on the test sample is completely released, so as to ensure the safety of the operator.
- Special Note:

During DC testing, a complete discharge must be performed using a blocking discharge method! Ensure that the voltage has been completely discharged before proceeding to the next step.

4.3 Disconnect the test wiring

- Carefully disconnect the test circuit connected to the test sample, following the order of first removing the grounding wire and then removing

the high-voltage lead.

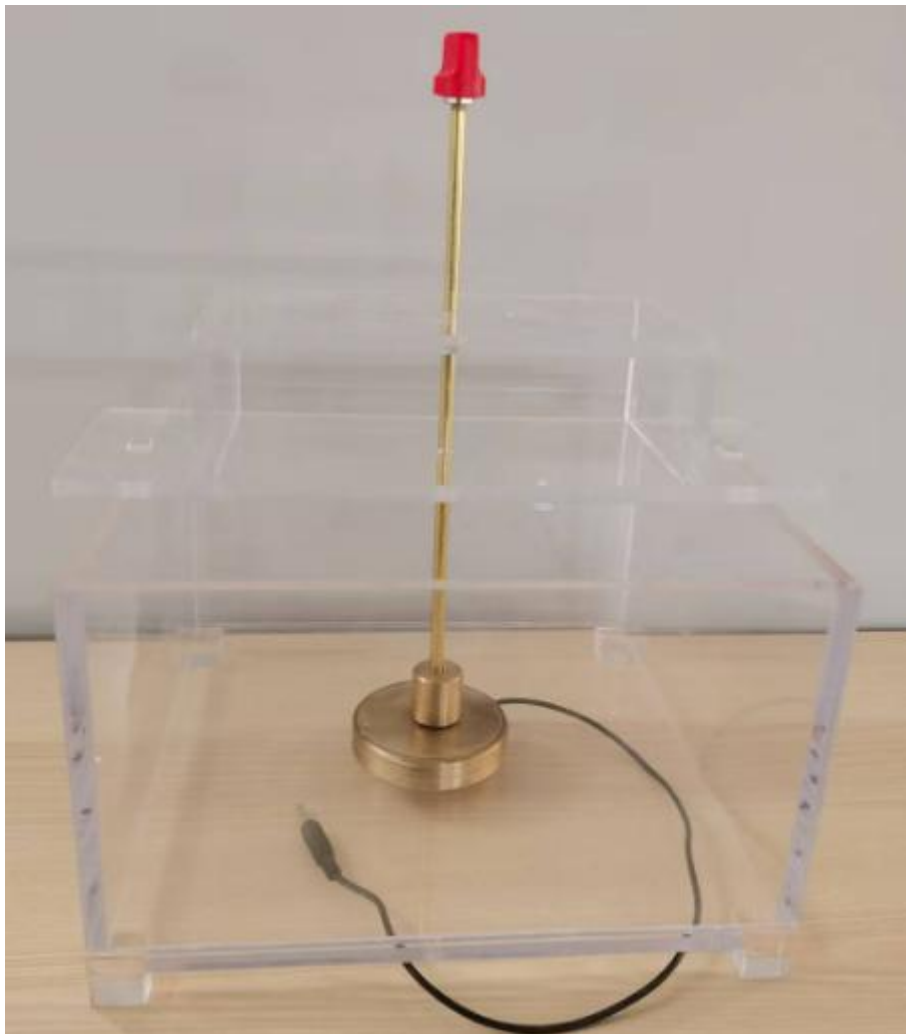
- Organize the test cables neatly to avoid damage or tangling.

4.4 Equipment Inspection

- Check the equipment for any abnormalities, such as damaged instruments, loose wiring, or overheating components.
- If any abnormality is found, it should be reported promptly and repaired or handled accordingly.

七、Equipped with dedicated test electrodes (standard type)

1. Standard test electrodes



Electrode types can be matched to different test samples.

2. How to select a suitable test electrode:

There are many specifications for test electrodes. Different electrode sizes are selected for different materials and specifications. The specific selection depends on the test standards required for material testing. If there are no special requirements in the standards, the most commonly used test electrodes for testing plate materials are equal diameter and unequal diameter electrodes.

八、 Selection Common Sense

1. The difference between dielectric strength and breakdown voltage:

Dielectric strength : A measure of the electrical strength of a material when it acts as an insulator. It is defined as the maximum voltage per unit thickness that a sample can withstand when it breaks down, and is measured in kV/mm or MV/m. The higher the dielectric strength, the better the material's performance as an insulator. Dielectric strength can also be called electrical strength.

Breakdown voltage : The maximum voltage a material can withstand when acting as an insulator; that is, the maximum voltage at which it breaks down. The unit is kV.

2. How to select a voltage breakdown tester with an appropriate range:

In material standards or test reports, the withstand voltage rating is usually expressed in terms of dielectric strength, i.e., kV/mm. The relationship between breakdown voltage and dielectric strength can be expressed by the following formula:

$$\text{介电强度 (kV/mm)} = \frac{\text{击穿电压值 (kV)}}{\text{试样厚度 (mm)}}$$

From the above formula, we can conclude that the selection of the testing instrument's range depends on the thickness of the sample, that is:

$$\text{Breakdown voltage (kV)} = \text{Dielectric strength (kV/mm)} * \text{Sample thickness (mm)}$$

The breakdown voltage value obtained by the formula is the effective voltage value when testing the sample thickness. Therefore, after obtaining the breakdown voltage value, it is reasonable to appropriately widen the range based on this voltage value. It is recommended to increase the range by 10kV-20kV after calculating the breakdown voltage value.

3、Differences between voltage breakdown testers with the same voltage range but different power ratings:

3.1 In the test procedures and test standards, the most commonly used test data is the breakdown voltage value. When there are no requirements for the output current of the instrument, the capacity value of the equipment can be ignored, and only the range of the equipment needs to be considered, which will not affect the test data .

3.2 In some test standards or test requirements, the instrument must meet a certain maximum output current. Therefore, when selecting the instrument range, it is necessary to pay attention to the transformer capacity (i.e., power kVA).

3.3 The relationship between output current, voltage, and power is expressed by the following formula:

$$\text{输出电流 (mA)} = \frac{\text{变压器容量 (kVA)}}{\text{电压量程 (kV)}}$$

3.4 The capacity requirements in GB/T 1408.1-2006 are summarized as follows

(screenshot):

8.1.2 电源的容量应足够大,使之在发生击穿之前均能符合 8.1.1 要求。对于大多数材料,在使用推荐的电极的情况下,通常 40 mA 的输出电流容量已足够。对于大多数试验来说,电源容量范围为:对于 10kV 及以下的小电容试样的试验,其容量为 0.5 kVA;对于试验电压为 100 kV 以下者则为 5 kVA。

4、What are the differences between performing voltage breakdown tests in air and in oil?

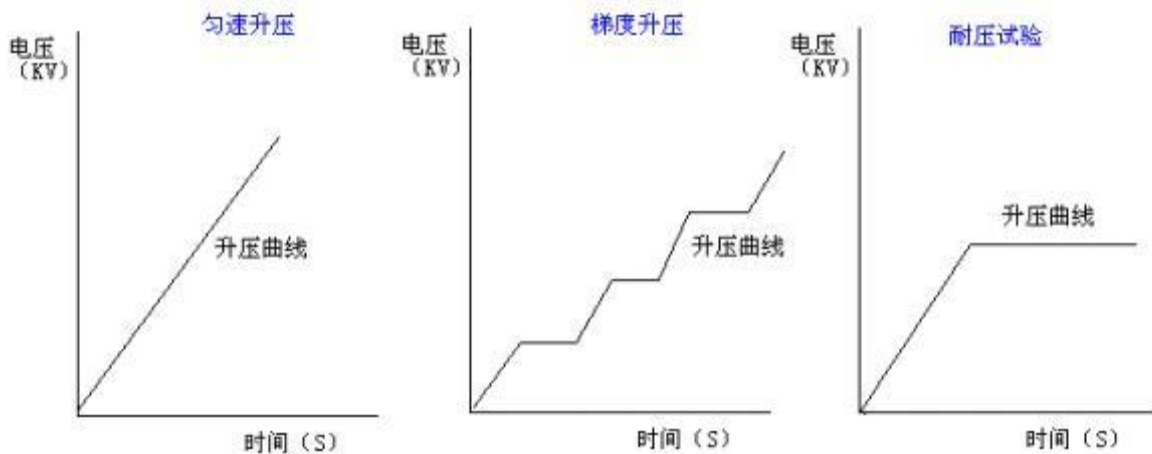
4.1 Test medium air: refers to placing the test sample and electrodes in air to conduct withstand pressure and breakdown tests.

4.2 Test medium oil: refers to oil in which the test sample and electrodes are completely immersed for withstand voltage and breakdown tests. 25# transformer oil is usually used as the test medium.

4.3 Whether the experiment is conducted in air or oil has no effect on the test data. Unless otherwise specified, the test is usually conducted in air. There are two situations in which the experiment must be conducted in oil: one is that the standard stipulates that the experiment must be conducted in oil, and the other is that if the test sample exhibits creepage or discharge sparks that prevent breakdown when the experiment is conducted in air, it must be placed in oil for the experiment.

5. Differences between voltage breakdown test methods: uniform voltage ramp, gradient voltage ramp, and withstand voltage test:

The following boost curve is used to represent it.



IX. Precautions

1、Safe operating procedures

- ① Use the appropriate power cord : Only use the power cord that is specifically designed for this product and conforms to the product specifications.
- ② Proper connection and disconnection : Do not arbitrarily connect or disconnect test leads when they are connected to live terminals.
- ③ The equipment must be grounded : The grounding post of the equipment must be grounded. To prevent electric shock, the grounding conductor must be connected to the ground. Before connecting to the input or output terminals of this product, ensure that the product is properly grounded.
- ④ Note the ratings of all terminals : To prevent fire or electric shock hazards, please note all ratings and markings on this product. Before connecting this product, please read the instruction manual for further information regarding the ratings.
- ⑤ It is required to be equipped with a power strip with an A rating of

not less than 16A; the circuit breaker should be no less than 25A for voltages below 50KV and no less than 32A for voltages below 100KV.

⑥ Use appropriate fuses : Only use fuses that conform to the type and rating specified in this product.

⑦ Avoid contact with exposed circuits and live metal : Do not touch exposed contacts and parts when the product is powered on.

⑧ Do not operate if there is a suspected malfunction : If you suspect that this product is damaged, please have it inspected by our maintenance personnel. Do not continue to operate it.

⑨ Do not operate in humid or explosive environments.

2. Routine equipment maintenance

1) This instrument is a precision and valuable piece of equipment. Please handle it carefully during use and prevent it from being dropped or impacted. When using it outdoors, operate it in the shade as much as possible to avoid prolonged exposure of the LCD screen to direct sunlight.

2) When not in use, the instrument should be stored indoors at a temperature of -10 to 40°C , with a relative humidity not exceeding 80%, in a well-ventilated area free of corrosive gases. During humid seasons, if the instrument is not used for an extended period, it is best to power it on once a month for approximately one hour each time.