

Dear Client,

Thank you for Purchasing our UHV-420 Vacuum Interrupter Test Set. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.



Our aim is to improve and perfect the company's products continually, 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/draw the test wire or power outlet, they will cause electric spark. PLEASE

CAUTION RISK OF ELECTRICAL SHOCK!

Company Address:

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◆ **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 body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

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

Connect and Disconnect Correctly

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

Grounding

The product is grounded through the power wire; besides, the

ground pole of the shell must be grounded. To prevent electric shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with the input/output port.

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 Circuit and Charged Metal.

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

Do Not Operate with Suspicious Failures

If you encounter operating failure, 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.

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I. Introduction

JB8738-1998 Vacuum Arc Extinguishing Chamber for 3.6-40.5KV AC High Voltage Switchgear, formulated by the "National Technical Committee for Standardization of High Voltage Switchgear", stipulates that "internal gas pressure measurement and allowable storage period inspection" is a necessary test item for the production and use of the vacuum arc extinguishing chamber of high voltage switchgear, and stipulates that the allowable storage period of the arc extinguishing chamber is 20 years. The gas pressure inside the vacuum arc extinguishing chamber shall be lower than 6.6×10^{-2} Pa.

Inspection method for allowable storage period of vacuum interrupter: measure the internal gas pressure of vacuum interrupter with pulse magnetic vacuum tester and record the measured value P_1 (Pa). After standing for a period of time t (d), measure the internal gas pressure with this instrument and record the measured value P_2 (Pa). The standing time t shall not be less than 7d. The allowable storage period T (year) is calculated by the following formula:

$$T = \frac{6.66 \times 10^{-2}}{P_2 - P_1} \times \frac{t}{365} (\text{year})$$

This instrument is the latest generation product improved by our company based on the previous experience and according to the response of on-site users. It has the characteristics of higher test accuracy, better stability and higher intelligence. Vacuum circuit breaker is a common method to judge whether the vacuum degree of vacuum tube is deteriorated or not, which is the power frequency withstand voltage method. This method can only judge the arc extinguishing chamber with seriously deteriorated vacuum degree. When the vacuum degree deteriorates to 10^{-2} - 10^{-1} Pa, although the breakdown

voltage does not decrease, the arc extinguishing chamber is unqualified. This instrument adopts a new type of excitation coil, and uses the magnetic controlled discharge method to test the vacuum degree of the arc-extinguishing chamber, without dismantling the arc-extinguishing chamber. At the same time, the microcomputer is used for synchronous control and data acquisition and processing, so that the on-site test sensitivity of the vacuum degree of the arc extinguishing chamber reaches 10^{-5} Pa. The most prominent feature of this instrument is that it adopts a new excitation coil and data processing method to realize the measurement of vacuum degree without disassembly. This instrument has the advantages of convenient use, simple operation, non-disassembly measurement and high testing accuracy. It is a practical testing instrument, and is widely applicable to departments using vacuum switches such as electric power, steel, petrochemical, textile, coal, railway, etc

II. Specifications

- ✧ Detection objects: various models of vacuum switch
- ✧ Detection method: using new excitation coil and detect vacuum tube without disassembly
- ✧ Application area: This instrument is a all-purpose type, can measure the vacuum of variety models of open magnetic vacuum tube.
- ✧ Detection range: 10^{-5} - 10^{-1} Pa
- ✧ Measurement accuracy: 10^{-5} - 10^{-4} Pa, 5%
 10^{-4} - 10^{-3} Pa, 5%
 10^{-3} - 10^{-2} Pa, 5%
 10^{-2} - 10^{-1} Pa, 5%
- ✧ Magnetic field voltage: 1700V , 850V
- ✧ High-voltage of pulsed electric field: 30KV ,15KV

- ✧ Open distance of switch tube in vacuum test: normal open distance
- ✧ Testing environment: -20°C~ 40°C
- ✧ Weight: 21kg
- ✧ Dimension: 410 × 320 × 360 (mm)
- ✧ Sampler: magnetic coil

III. Testing principles of instrument

Open the two contacts of the arc extinguishing chamber at a certain distance and apply pulse high voltage; Place the arc-extinguishing chamber inside the spiral coil or the new electromagnetic coil outside the arc-extinguishing chamber to apply magnetic field voltage to the coil, so as to generate pulse magnetic field synchronized with high voltage in the arc-extinguishing chamber. In this way, under the action of pulsed magnetic field and strong electric field, the electrons in the arc-extinguishing chamber make helical motion and collide and ionize with the residual gas molecules. The ionic current generated is proportional to the density of the residual gas (i.e. vacuum value). For different types of vacuum tubes (tube types), due to their different structures, the ionic current is also different under the conditions of the same contact opening distance, the same vacuum degree, the same electric field and magnetic field. The corresponding relationship curve between the vacuum degree of various tube types and the ion power supply can be calibrated through experiments. After the ion current is measured, the vacuum degree of the tube type can be obtained by querying the ion current-vacuum degree curve of the tube type. The schematic diagram of the test circuit is shown in Figure 1.

The vacuum curve is used to obtain the vacuum degree of the tube type. The test circuit diagram is shown in Figure 1 .

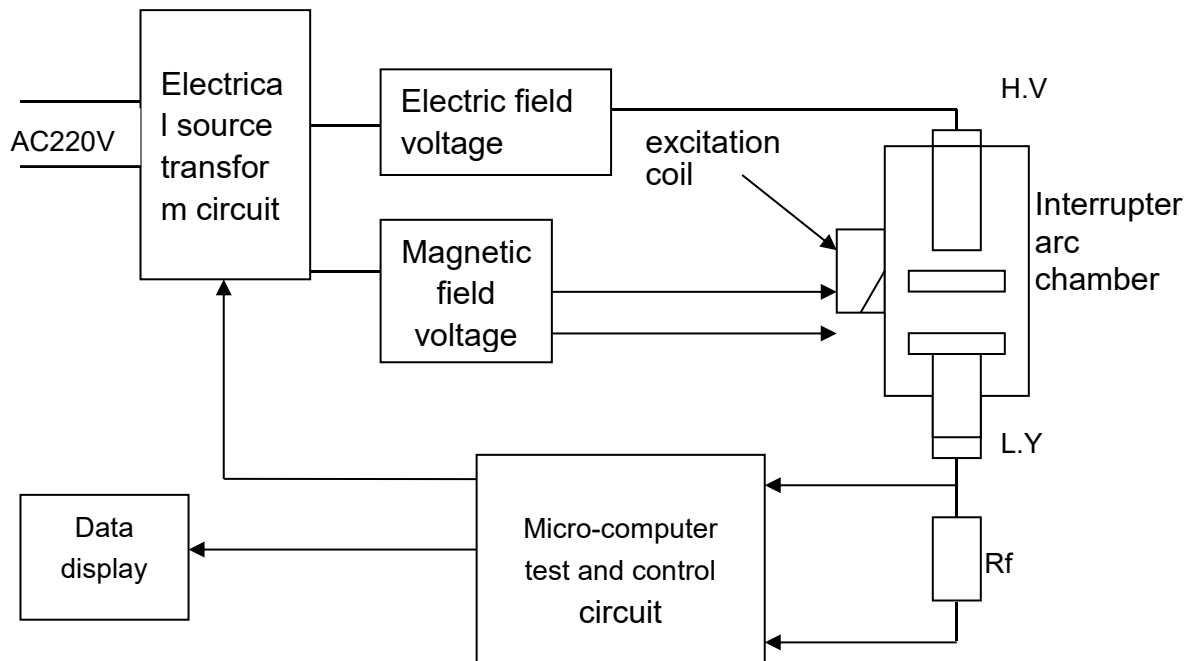


Figure1. Test Circuit of magnetron control discharge for testing vacuum of interrupter arc chamber

When testing the vacuum degree of the arc-extinguishing chamber with the conventional magnetic discharge method, in order to improve the test sensitivity, it is necessary to remove the arc-extinguishing chamber from the circuit breaker and place it in the spiral tube coil. In this way, the mechanical parameters need to be readjusted when the arc extinguishing chamber is reinstalled on the circuit breaker device, which requires a lot of work and professionals. The arc extinguishing chamber can be surrounded from the side by using the new magnetic coil, so it is not necessary to disassemble the arc extinguishing chamber. At the same time, a single chip microcomputer is used for synchronous control and data acquisition and processing, which improves the sensitivity of the on-site test of the vacuum degree of the arc extinguishing chamber

IV. Operation and Using

1. Instructions of instrument panel and wiring

The instrument panel is shown in Figure 2. The leak detection key is used to preliminarily judge the vacuum degree of the vacuum tube, and the measurement key is used to apply high voltage and strong electromagnetic field to quantitatively test the vacuum degree of the vacuum tube. There is a high-voltage output terminal on the side of the instrument, which can be connected to a contact of the vacuum tube with a high-voltage wire. The ion current input terminal is connected to another contact of the vacuum tube. The two output terminals of the field voltage shall be connected to the two terminals of the excitation coil. The grounding terminal is used for the protective grounding of the instrument housing. The tube type input dial switch is used to input the tube type of the arc-extinguishing chamber. The tube type of the arc-extinguishing chamber is directly determined by the arc-extinguishing chamber, and the diameter of the outer cover shall prevail if the outer cover is provided.

2. Pipe type selection: (calculated by the diameter of outer sheath with sheath)

00 # pipe type with pipe diameter less than 80mm

02 # pipe type with pipe diameter greater than 80mm but less than 100mm

04 # pipe type with pipe diameter greater than 100mm but less than 110mm

06 # pipe type with pipe diameter greater than 110mm

Control 6000V and below arc extinguishing chamber to select 01 # pipe type

3. Perform leak detection:

Leak detection shall be carried out before vacuum test. During leak detection, pay attention to whether the outside of the vacuum tube is wiped clean and dried. If the vacuum pipe has serious leakage, it is not necessary to conduct quantitative vacuum test. If the leakage is qualified, quantitative vacuum test shall be conducted again.

4. Conduct the test:

After pressing the test key, the tester first displays the electric field voltage and magnetic field voltage and carries out the automatic charging process. When the two voltages reach a certain value, the tester automatically adds the electric field voltage and magnetic field voltage to the vacuum tube and excitation coil, and automatically starts the test and analysis program to display the test results of the vacuum tube under test and automatically discharge the internal capacitance of the instrument. (Display result: 3.26E-4Pa is 3.26×10^{-4} Pa Pascal)

The minimum measurement value of this instrument is 1.06×10^{-5} Pa, if the vacuum degree of the measured vacuum tube is better than this value, the display result is still 1.06×10^{-5} Pa. For the vacuum circuit breaker, it means that the vacuum degree of the vacuum bubble is intact, and it can be recorded as $<10^{-5}$ Pa when recording the test results. If the vacuum degree is greater than 6.6×10^{-2} Pa, the vacuum bubble is unqualified.

When the same vacuum tube is tested several times, the interval between two adjacent measurements shall not be less than 10 minutes. At the same time,

turn off the power supply of the instrument, short circuit the ion current clamp and the high-voltage output terminal clamp, eliminate the residual high voltage, and then conduct the next test. Otherwise, the test results will be distorted because the ionized air in the tube cannot return to the normal state in time.

5. Arc suppression discharge:

Press the leakage detection key to detect the leakage, reduce the magnetic field voltage, press the reset key after the action is completed, and then shut down the machine. Discharge the large clamp at the high voltage output end to the ground, or lightly touch the vacuum tube end clamped by the high voltage clamp with a discharge rod, or short connect the ion current clamp with the high voltage terminal clamp to eliminate the residual high voltage and static electricity generated during the test.

V. Operation Steps

1. Ensure that the vacuum circuit breaker is insulated from the outside, and there is no leakage and reverse charging during the test.

The following aspects need to be addressed:

- A. Grounding at both ends;
- B. Transformer;
- C. Lightning arrester;
- D. Arc suppression capacitor
- E. Sensor

2. Ensure that the vacuum circuit breaker is clean and dry

3. Ensure the opening distance of vacuum circuit breaker (opening)
4. Then hang the excitation coil as shown in Figure 2, align the white scale line with the middle position of the vacuum circuit breaker, and tie the electromagnet and vacuum circuit breaker tightly with a bandage (pulse voltage will produce impact force during the test to avoid damage and crack of the vacuum circuit breaker).
5. Connect the line according to the color of the test line and the size of the plug-in. The high voltage clamp is clamped at one end of the vacuum circuit breaker that is far away from the electromagnet. The yellow and green line must be connected to the electromagnet before the instrument.
6. Select the tube type matched with the vacuum circuit breaker through the input of the pull-code switch (calculate the diameter of the outer sheath with sheath).
7. Turn on the power after the preparation is completed and the wiring is checked to be correct. Press the reset key to ensure that the instrument is in the initial state.

8. Press the leak detection key to detect the leak, and judge the quality of the vacuum tube to see whether the vacuum circuit breaker leaks or is qualified.

9. Press the measurement key to enter the measurement, see how much vacuum is in the vacuum circuit breaker, and then print the test results.

(Display: 3.26E-4Pa is 3.26×10^{-4} Pa Pascal)

National standard of vacuum circuit breaker: factory standard is less than 1.33×10^{-3} Pa Pascal;

Greater than 6.62×10^{-2} Pa Pascal unqualified

10. Discharge: reduce the residual voltage of the magnetic field according to the leakage detection, turn off the power supply, discharge the large clamp to the ground (or discharge with a discharge rod), pull out the yellow and green test lines on the instrument separately (do not touch the exposed part of the plug-in with your hands), discharge is completed, and other test lines can be removed at will.

11. Install the accessories and complete the test.

VI. Note

1. The vacuum degree test should be conducted in sunny and dry weather, and the surface of the vacuum bubble should be wiped clean. The leakage caused by the dirty surface of the vacuum bubble will seriously affect the actual test results of the vacuum degree. For the vacuum degree test of the same vacuum switch, the interval between each test shall not be less than 10 minutes. Otherwise, the test results will be distorted because the ionized air in the tube cannot return to the normal state in time.

2. It is recommended not to test the vacuum degree of the same vacuum switch more than 3 times a day.

3. When testing the vacuum degree, leak detection shall be conducted

first, and quantitative test shall be conducted after the leak detection is qualified.

4. When installing the excitation coil, its positioning indicator line points to the middle seam of the arc extinguishing chamber connection.

5. During the test, the human body should not touch the high voltage and magnetic field voltage output terminals, and the shell of the tester should be grounded.

6. The high-voltage output line and the ion current line should be separated to prevent interference.

7. Do not short circuit the magnetic field voltage line, or seriously damage the instrument and personal safety! Before the experiment, the yellow-green line must be connected to the electromagnet before the instrument; After the test, pull out the yellow and green test lines on the instrument separately (don't touch the exposed part of the plug-in with your hands).

8. After the test, the power supply shall be turned off, and the high-voltage output terminal shall be short-circuited to the ground for discharge, so as to avoid being shocked by the residual voltage on the charging capacitor.

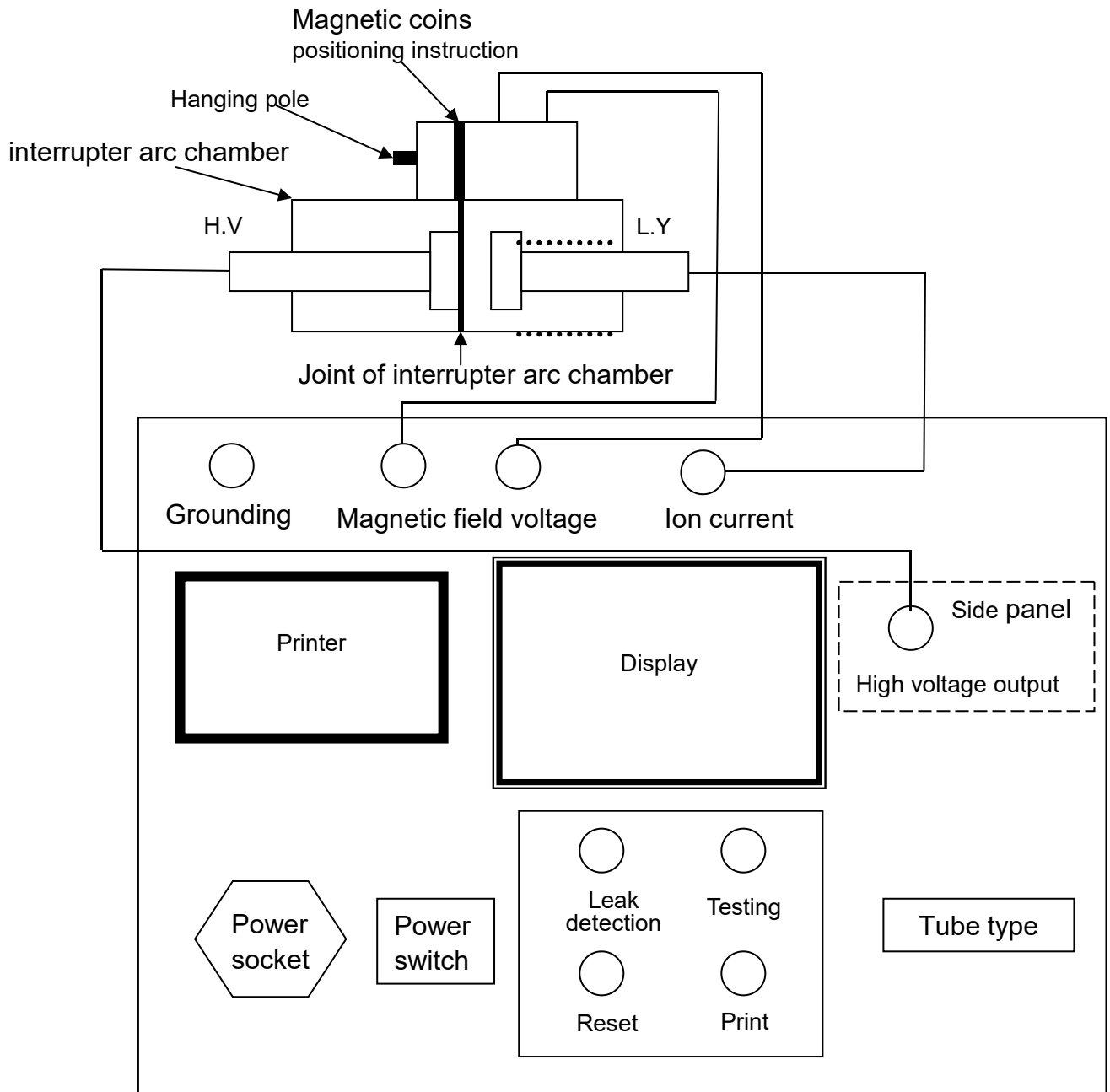


Figure 2. vacuum switch

