

Foreword

Before using this instrument, please read the instruction manual in detail. In order to let you operate the instrument proficiently as soon as possible, we are equipped with a detailed instruction manual, which will help you use the product better. From it, you can get information about product introduction, usage, instrument performance and safety precautions.

When writing this manual, we are very careful and rigorous, and believe that the information provided in the manual is correct and reliable. However, errors and omissions are inevitable. Please bear with me and warmly welcome your corrections.

Our aim is to continuously improve and perfect the company's products. At the same time, we reserve the right to improve and upgrade the function of the instrument. If you find that the function of the instrument is not completely consistent with the description in the manual during use, please refer to the actual instrument. The function shall prevail. If you find any problems during the use of the product, please contact us in time! We will try our best to provide perfect technical support!

Contents



XX

Dielectric loss insulation test can effectively discover the overall damp deterioration and local defects of the insulation of electrical equipment. It is widely used in electrical manufacturing, electrical equipment installation, handover and preventive testing.

The anti-interference precision dielectric loss measuring instrument is used for on-site anti-interference

High voltage dielectric loss: support high voltage dielectric loss of frequency conversion and resonance power supply

Measuring time: about 30s, related to the measuring method

Real-time clock: real-time display of time and date

Internal storage: 100 sets of measurement data can be stored inside the instrument

U Disk: Support U Disk Storage

Printer: Mini thermal printer

Computer interface: Standard RS232 interface (optional)

Dimensions and weight: Dimensions 368mm×288mm×280mm; host weight 22kg.

1.2 Main features

1. It has multiple working modes such as positive/reverse wiring, internal/external standard capacitance, internal/external high voltage, reverse wiring low-voltage shielding, CVT and transformation ratio. Can automatically distinguish capacitance, inductance, and resistance type samples. Integrated structure, automatic and intelligent measurement, easy to use and carry.

2. Frequency conversion anti-interference, accurate measurement under 200% interference, stable test data, suitable for on-site anti-interference dielectric loss test.

3. Using digital waveform analysis and bridge self-calibration technology, the accuracy and stability of the positive and negative wiring are consistent, and the high-precision three-terminal standard capacitor is used to achieve high-precision dielectric loss measurement.

4. Built-in series and parallel dielectric loss measurement models, and can simulate the work of Xilin bridge and current comparator, which is convenient for instrument verification.

5. During CVT self-excitation measurement, the measuring line can be grounded, and C1/C2 can be measured at the same time during one connection. It automatically compensates for the effect of busbar grounding and the partial voltage of standard capacitors, without changing wires and connecting any external accessories.

6. With reverse wiring low-voltage shielding function, when the 220kVCVT bus is grounded, 10kV reverse wiring dielectric loss measurement can be performed on C11 without disconnecting the wiring, and the capacitance and dielectric loss value of the lower shielding part can be measured at the same time.

7. With CVT ratio measurement function, it can measure CVT ratio, polarity and phase error.

8. Safety measures

High-voltage protection: short-circuit, breakdown or high-voltage current fluctuations of the test product can cut off the output at a high speed in a short-circuit mode.

Power supply protection: wrong connection of 380V, power supply fluctuation or sudden power failure, start protection, will not cause overvoltage.

Grounding protection: It has a grounding detection function, and the voltage cannot be boosted when it is not grounded. If the grounding of the instrument is poor during the measurement process, the grounding protection will be activated.

CVT protection: Four protection limits for high-voltage side voltage and current,

low-voltage, low-voltage and high-voltage. The instrument can measure the output voltage of the test product, and the output voltage of the test product can be measured. The instrument can also measure the output voltage of the test product, and the output voltage of the test product can be measured.

Misoperation prevention: two-level power switch, real-time monitoring of voltage and current; multiple strokes to confirm; terminal high voltage is distinct; slow boosting, rapid decompression, sound and light alarm.

Anti- "capacity rise": When measuring large-capacity samples, there will be a "capacity rise" effect of increased voltage. The instrument can automatically track the output voltage and keep the test voltage constant.

High-voltage cable: It is a high-voltage resistant insulated wire that can be used for mopping the ground.

Anti-seismic performance: The instrument adopts a unique anti-seismic design, which can withstand strong long-distance transportation vibration and bumps without being damaged.

9. Print and storage: The instrument comes with a micro-printer, which can print out the measurement results and store the measurement results in the instrument (100 sets of measurement data can be stored) or U disk for future reference.

10. Real-time clock: the instrument has a real-time clock, real-time display, and can record the date and time of the measurement.

2.1 High voltage output socket (100V 10000V, maximum 200mA)

Position: The front side of the box.

Function: internal high voltage output; detection of reverse wiring test current; high voltage end of internal standard capacitor.

Wiring method: pin 1 of the socket is connected to the high-voltage wire core wire (red clip), and pins 2 and 3 are connected to the high-voltage wire shield (black clip). When connecting positively, both the core wire (red clip) and shielding (black clip) of the high-voltage wire can be used as a pressurizing wire; when connecting reversely, only the core wire can be used to pressurize the high-voltage end of the test product. If the high-voltage end of the test product has a shielding pole (such as a shielding ring on the high-voltage end), it can be connected to a high-voltage shield. If there is no shield, the high-voltage shield is suspended. The configured high-voltage test line has a grounding shielding layer, and the grounding shielding layer of the high-voltage measuring line needs to be connected to the measurement ground under the socket side.

Precautions:

(1) High-voltage sockets and high-voltage lines have dangerous voltages. It is absolutely forbidden to touch high-voltage sockets, cables, clamps and live parts of the test sample! Make sure to wire after the power is off,

product, please refer to the instruction manual. I
Ensure the voltage level is within the range of 10V to 100V.
Simple voltage measurement is possible. However, if the voltage is too high, it
also cause instrument damage.

(4) When removing the wiring under strong interference, disconnect the connection while
keeping the instrument's power on.

2.2 Low voltage output jack (50V/30A)

Function: The low voltage output is a power source for the CVT's self-excited motor. It is
used to output a voltage between 0V and 100V.

Precautions:

(1) Because the voltage is low, the instrument's safety is not a problem. However, the
low-resistance wiring should be connected properly. Poor connection
will cause the instrument to malfunction.

instrument protection.

(4) When removing the wiring under strong interference, disconnect the connection while keeping the cable grounded to prevent induced electric shock.

2. Standard capacitance input Cn socket (10 μ A ~ 5A)

Function: used to input external standard capacitor current

Precautions:

(1) Use fully shielded plug wires to connect external standard capacitors. This method is mainly used for external high-voltage standard capacitors to achieve high-voltage dielectric loss measurement.

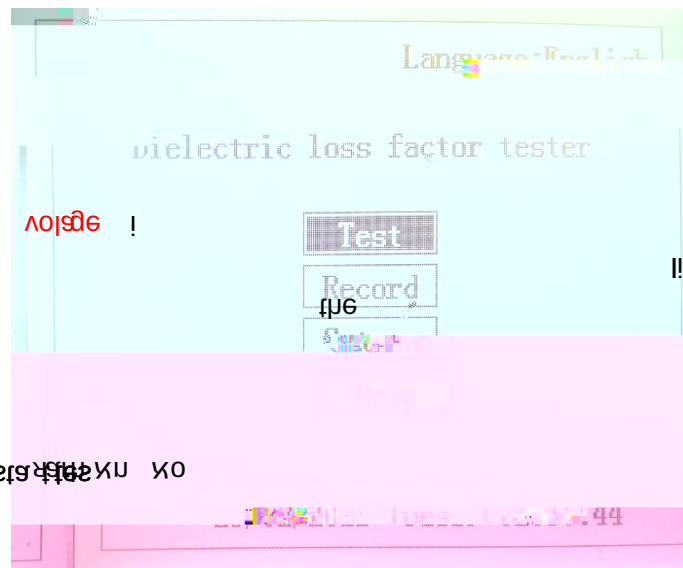
(2) Select the "external standard" mode in the menu.

(3) Put the C and $\tan \delta$ of the external standard capacitor into the instrument to realize the absolute value measurement of the dielectric loss of the Cx capacitor.

In principle,

3.1 Initial menu interface

After turning on the main power switch, the system enters the initial menu interface.



Language: Chinese and English menu switching

Test mode: select test mode and set various test parameters,

History: View the saved historical data

System setting: factory parameter setting and system time calibration

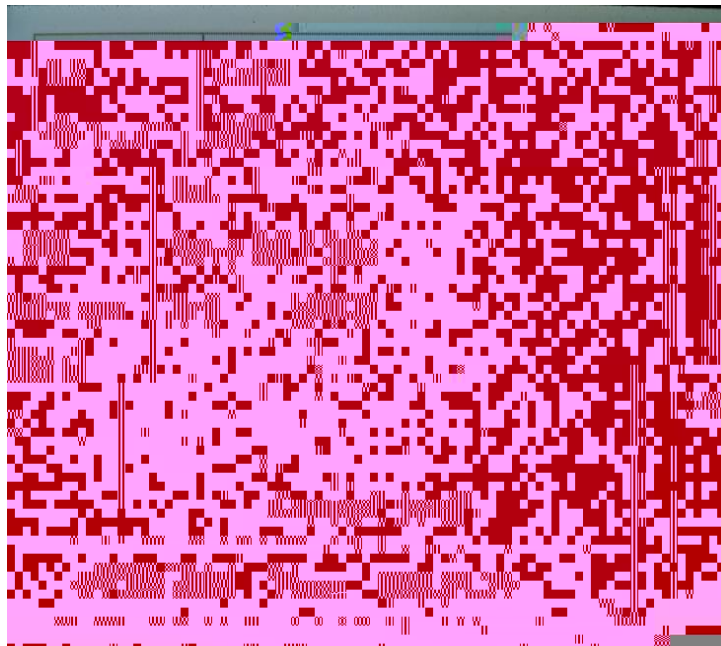
Help: You can check the software version and other information

3.2 Test mode

In the initial menu interface, move the cursor to "Test Mode" and press the OK button to enter the start test menu interface, as shown in Figure 3-2.

The left side of the interface is the parameter setting options. Move the cursor to the relevant parameter options and press the "OK" button to set the relevant test parameters. The display on the right shows that the test parameters have been set. The cursor stays in the "Start test" column and long press the "OK" button. The test can be started.

The lower right side of the interface is the information prompt line. If the internal and external high voltage is selected into



Mov

selection range is 1000V
at frequency

45~65Hz. Single frequency measurement, used when studying the change of dielectric loss at different frequencies. The $\bar{R}$ $\bar{R}$ keys will display in a 1Hz step cycle.

Auto: Valid in the external high pressure measurement mode (cannot be changed), the system automatically recognizes the frequency of external high pressure.

frequency conversion:

"50 $\square$ 1Hz": 49/51Hz automatic frequency conversion, suitable for measurement under 50Hz grid power frequency interference.

"50 $\square$ 2Hz": 48/52Hz automatic frequency conversion, suitable for measurement under 50Hz grid power frequency interference.

"60 $\square$ 1Hz": 59/61Hz automatic frequency conversion, suitable for measurement under 60Hz grid power frequency interference.

"60 $\square$ 2Hz": 58/62Hz automatic frequency conversion, suitable for measurement under 60Hz grid power frequency interference.

note:

"50Hz" or "60Hz" is power frequency measurement. This setting cannot be used in a 50Hz or 60Hz interference environment. It is recommended to use $\bar{f}$ 50 $\square$ 1Hz $\bar{L}$ or $\bar{f}$ 60 $\square$ 1Hz $\bar{L}$ instead of $\bar{f}$ 50Hz $\bar{L}$ or $\bar{f}$ 60Hz $\bar{L}$, which can resist interference and will not affect the measurement accuracy.

2160210 m, 7 0 kb L

Preset voltage selection:

Forward/reverse/transformation ratio mode can be selected "0.1/0.2/0.3/ 0.5 /0.6 /0.8 /1 /1.5 /2 /2.5 /3 /3.5 /4 /4.5 /5 /5.5 /6 /6.5 /7 /7.5 / 8 /8.5 /9 /9.5 /10.0kV" (the maximum output voltage of F type is 12kV), the appropriate test voltage should be selected according to the high voltage test procedure.

ED0 !9!! f S J

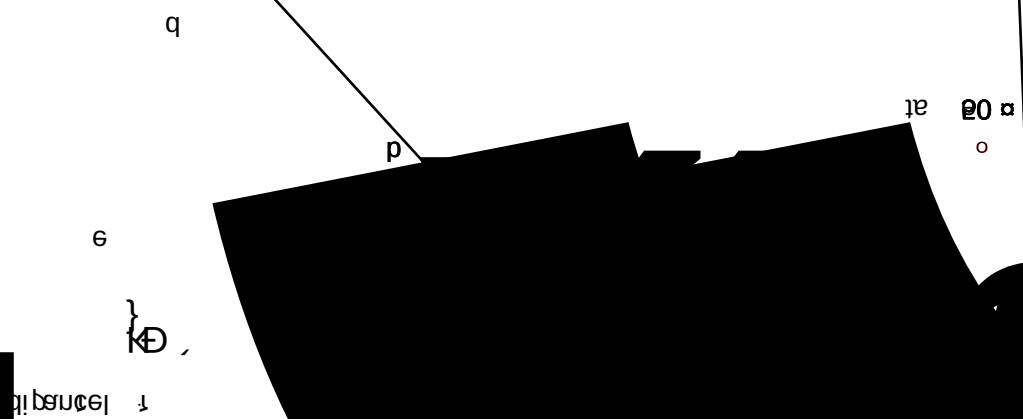
Any voltage setting:

If you can't find a suitable test voltage in the preset

and the negative sequence limit (uA) (A) are displayed in sequence below. The has reached the protection limit.

The cursor is at the "wiring mode", long press the series symbol "" on the right side of the line. The instrument operation of the Xilin-type bridge, and the instrument operation of the current comparator bridge. And the same measured by the two methods is the same. The dielectric loss 1Hz and 50Hz are also basically the same.

Only when the dielectric loss is large, the cam r



where: DF (dissipation factor) has the same units as loss tangent, i.e., dimensionless; ϵ' (permittivity) is dimensionless; ϵ'' (dielectric loss) has dielectric constant units.

The English version of the above equation can be written as follows:

C

>>>>	100/004		
Clear	Number	Test date	
USB	001	27/11/2020	14:00:20
ESC	002	27/11/2020	14:08:54
	003	04/12/2020	10:14:31
	004	14/12/2020	13:40:59
23/02/2021 Tues. 02:59:45			

3.4 System Settings

Enter the system setting menu to calibrate the system time. The "factory settings" parameter prohibits the user to modify, and only the manufacturer is allowed to set the factory parameters.

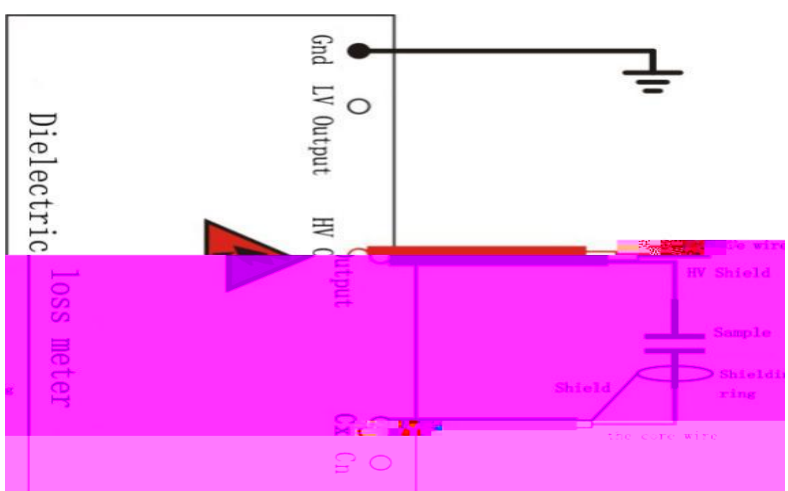
3.5 help

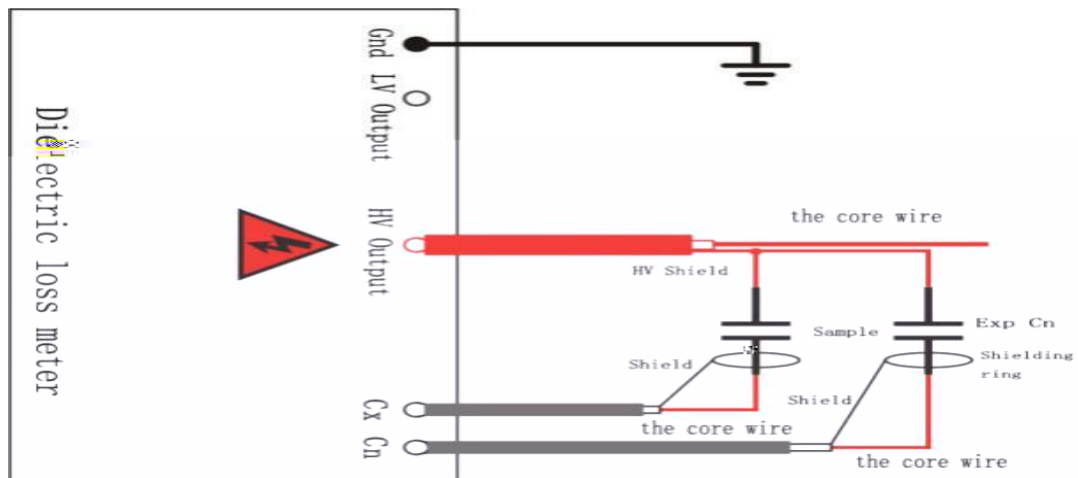
You can view the relevant operating instructions of the instrument.

3.6 Contrast adjustment

The contrast of the LCD screen has been calibrated at the factory. If you feel that it is not clear enough, adjust the potentiometer on the panel to make the LCD display clear.

4.1 Positive wiring





The applied high voltage can provide a larger test current and can measure a larger capacity sample. Due to the limitation of the internal standard capacitance, the applied high voltage cannot exceed the maximum voltage of the instrument (10kV).

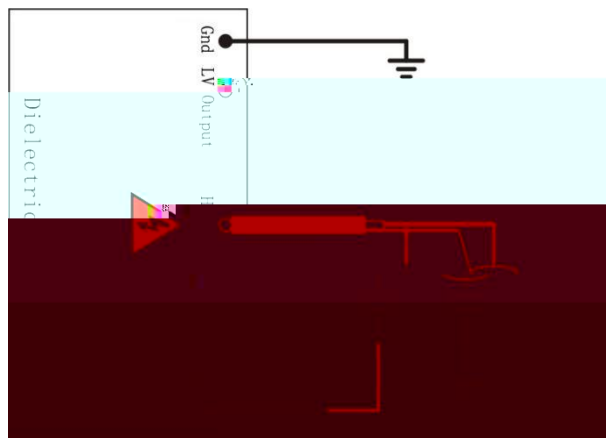


Figure 4-1.4 reverse wiring, external standard capacitor, internal high voltage

When calibrating with a standard loss device, a shielded wire with a shielded plug must be used for connection. It is recommended to use the "frequency conversion" method. If the capacitance of the standard loss device is calibrated according to the RC series model, the instrument should select the RC series model. Multi-channels of positive wiring share one measurement loop, and only need to calibrate according to single channel.

4.2 Reverse wiring

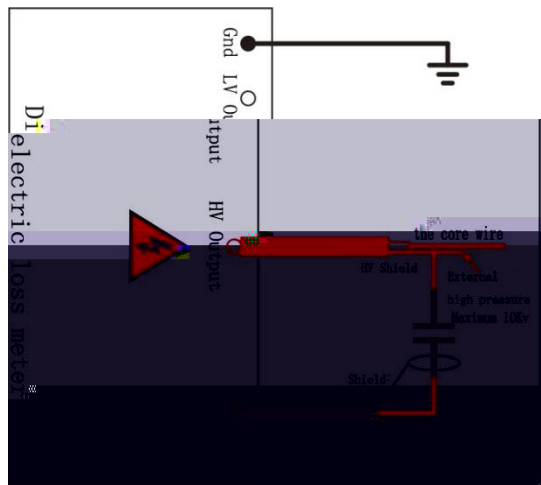


Figure 4-2.1 positive wiring, internal standard capacitor, external high voltage

Use the high-voltage core wire (red clip) to connect the high-voltage end of the test sample. The high-voltage shield (black clip) is used to connect the high-voltage shield, especially to shield off the shunt branch, such as C1 and C2 in the above figure. When shielding is not required, the black clip is suspended.

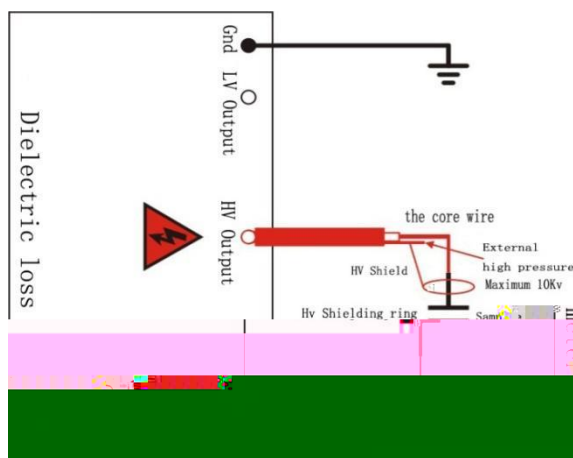


Figure 4-2.2 reverse wiring, internal standard capacitor, external high voltage

The applied high voltage can provide a larger test current and can measure a larger capacity sample. Due to the internal standard capacitance and current sensor withstand voltage limitation, the external high voltage cannot exceed the maximum voltage of the instrument (10kV).

The external standard capacitor is connected between the Cn socket and the high-voltage shield, and the C/tg α is placed in the instrument. Since the reverse wiring must use the current sensor inside the instrument, even if the external standard capacitor and external high voltage are used, the maximum voltage of the instrument (10kV) cannot be exceeded. Therefore, this method is not recommended.

When using a standard loss device, a shielded wire with a shielded plug must be used for connection. The standard loss device is used upside down, its shell has high voltage, and the high voltage terminal is grounded. The insulating feet of the standard loss device

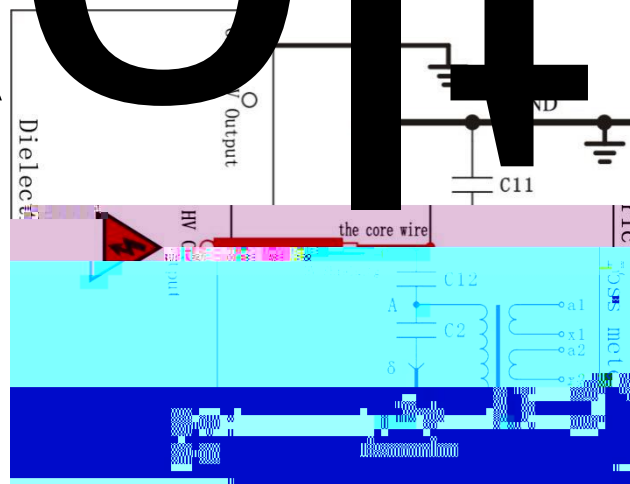


Figure 4-3.2 low voltage shielding of reverse connection

Choose reverse wiring low voltage shield. The low-voltage terminal of the capacitor C_g that needs to be shielded cannot withstand high voltage and cannot be shielded by conventional reverse wiring high voltage shields, so reverse wiring low-voltage shields can only be used. The instrument uses the reverse wiring to measure the total current of C_x and C_g , while using the positive wiring to measure the C_g current, the difference between the two is the C_x current, and C_x and C_g are calculated from this. The instrument simultaneously displays C_x and C_g data. Figure 4-9 is a schematic diagram of measuring the capacitance C_{11} of the upper section of the CVT with the busbar grounding.

4.4 CVT self-excitation method

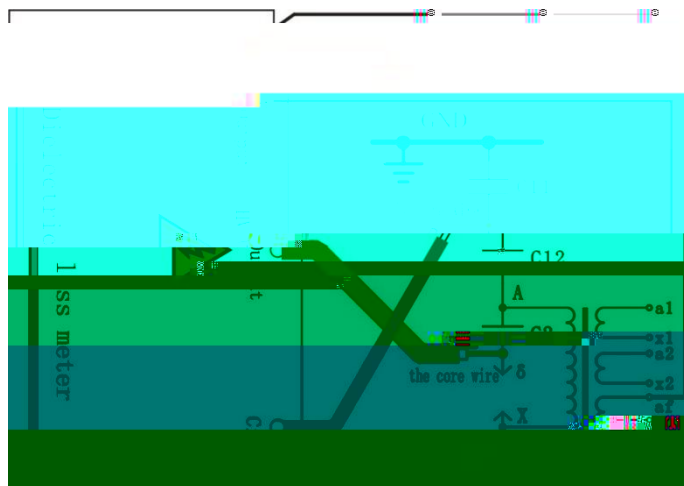


Figure 4-4 CVT self excitation method

The high-voltage core wire is connected to the end of C_2 , and the C_x core wire is connected to the upper end of C_{12} . Whether the bus bar is grounded does not affect the measurement. But when there is only one section C_1 on the upper part of the CVT, the bus bar cannot be grounded, otherwise the C_x core wire will be short-circuited.

polarity requirement. The protection threshold is recommended to set low-voltage voltage 30V, low-voltage current 20A, and high-voltage current 200mA

Two results are obtained in one measurement: C1 is the data of C12, and C2 is the data of C2.

4.4 transformation ratio

Various voltage transformers (electromagnetic PT or CVT, etc.) can measure its transformation ratio. Note: the primary voltage (between A-X) cannot exceed the allowable voltage of PT, and the secondary voltage (between a-n) cannot exceed 120V. Note that the PT end with the same name and the core wire/shield of Cx should not be reversed, otherwise the phase will change 180°. The measured data K is the ratio of the primary voltage to the secondary voltage; $\dot{U}$ is the angle at which the primary voltage leads the secondary voltage. C and DF are the dielectric loss data of the reverse wiring, so you don't need to care about it.

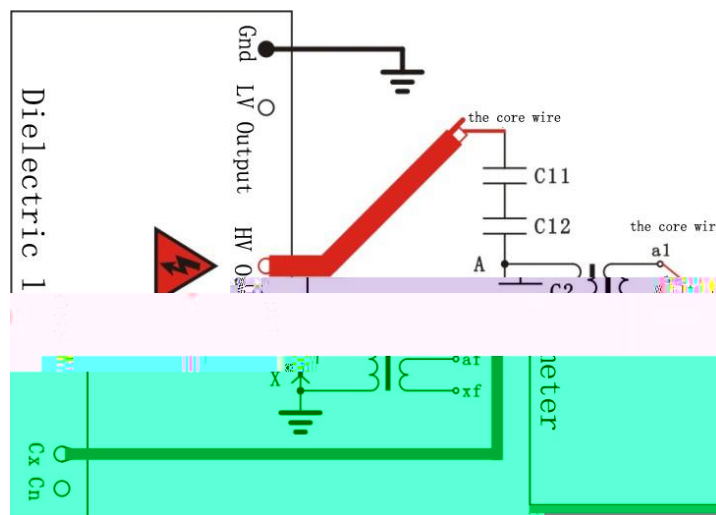


Figure 4-11 CVT ratio test

The core wire (red clip) of the high-voltage line of the instrument is connected to the upper end of the CVT, the bus bar is disconnected from the ground, the lower end of the CVT is grounded, and the red and black clips of the low-voltage line are connected to the secondary winding.

Common capacitive voltage transformers can be divided into 110kV, 220kV, 500kV and other different voltage levels. Generally, 110kV CVT has one C1 section, 220kV CVT has two C1 sections, and 500kV CVT has three C1 sections.

5.1 The measurement method of 500kV CVT

1) C11 measurement method

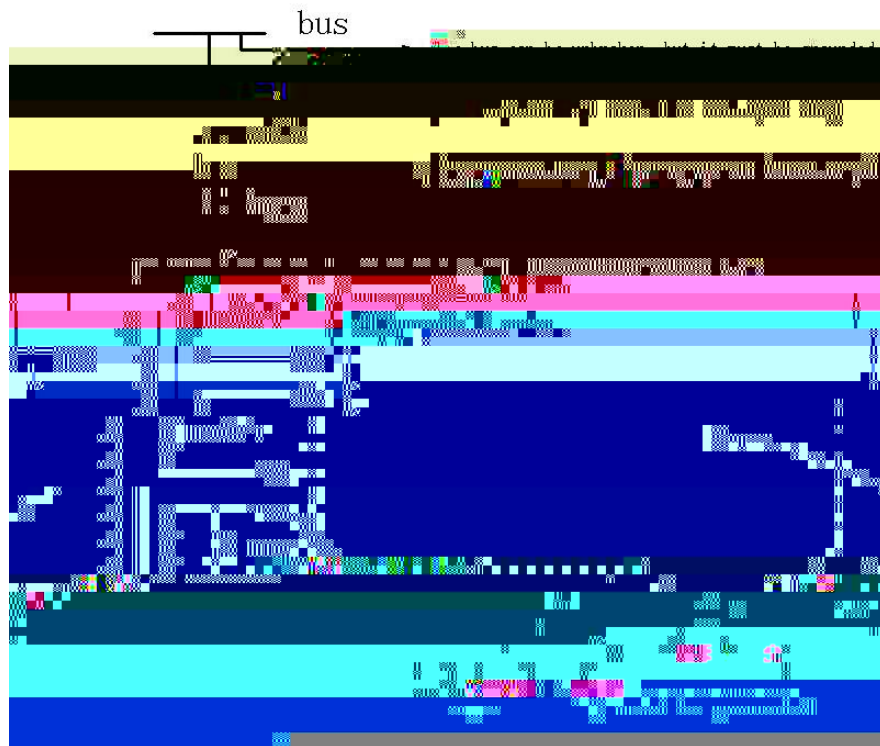


Figure 5-1 C11 measurement methods (selection of internal standards, reverse wiring, 10kV test voltage)

When selecting reverse wiring for the wiring method, pay special attention to disconnecting the J terminal and the X terminal must be grounded.

2) C12 measurement method

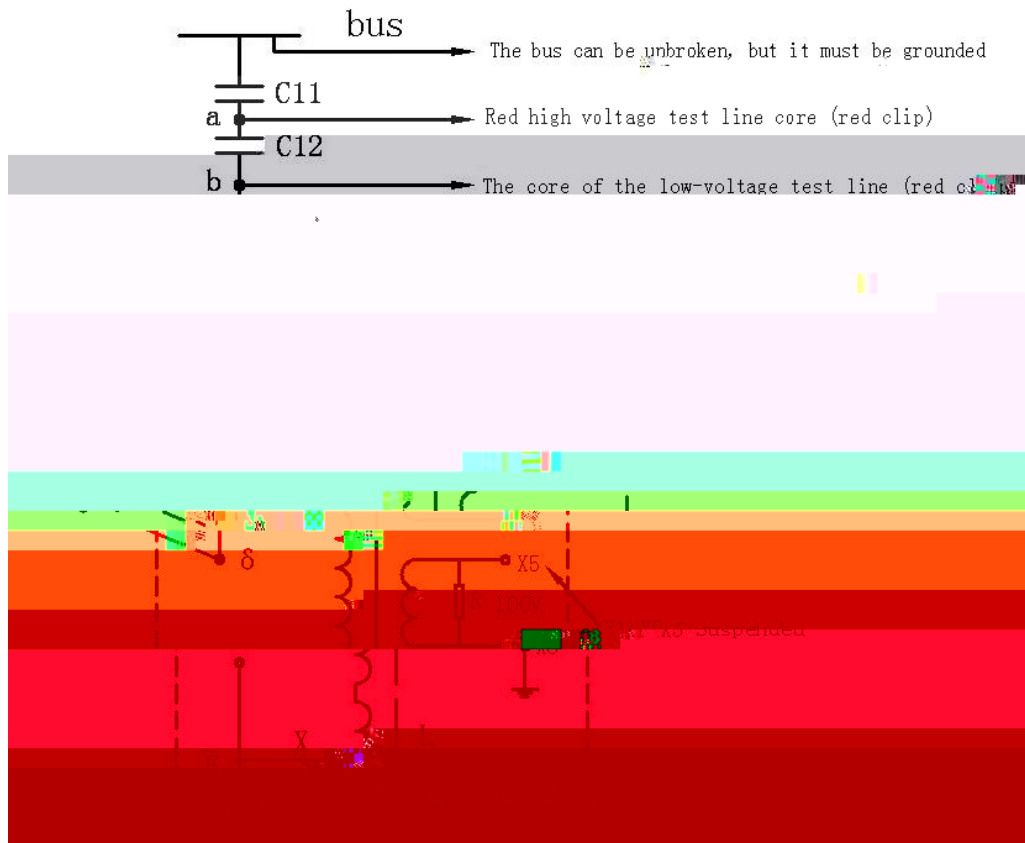


Figure 5-2 C12 measurement methods (selection of internal standards, positive wiring, 10kV test voltage)

The wiring method is positive wiring, and special attention should be paid to disassembling the J terminal, and the X terminal must be grounded.

3) Measurement methods of C13 and C2

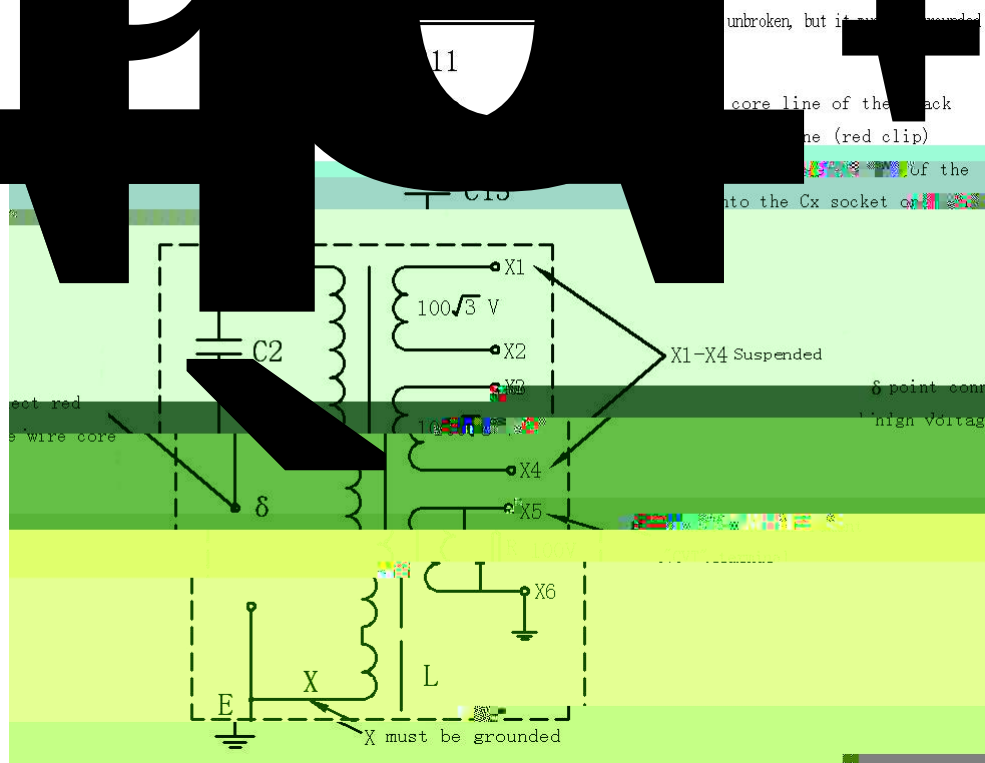


Figure 5-3 measurement methods for C13 and C2 (selection of internal standard, CVT self excitation method, 2kV test voltage)

The connection method selects the CVT self-excitation method, and the test voltage can be set to 2kV. The CVT self-excitation method can measure the dielectric loss and capacitance of the two capacitors C13 and C2 at one time.

5.2 Measuring method of 220kV CVT

Figure 5-4 C11 measurement methods (selection of internal standards, reverse wiring, low voltage shielding, 10kV test voltage)

The wiring method is reverse wiring low-voltage shielding. When measuring C11, pay attention to the connection between J and X and separate them from grounding.

2) Measurement methods of C12 and C2

The connection method selects the CVT self-excitation method, and the test voltage can be set to 2kV. The CVT self-excitation method can measure the dielectric loss and capacitance of the two capacitors C12 and C2 at one time.

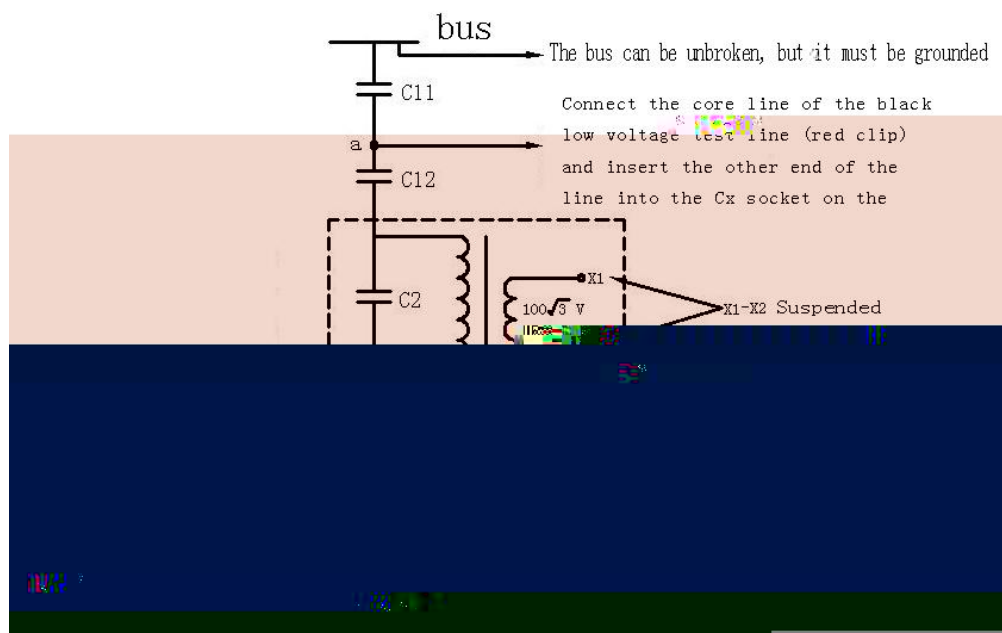


Figure 5-5 measurement methods for C12 and C2 (selection of internal standard, CVT self excitation method, 2kV test voltage)

5.3 Measuring method of 110kV CVT

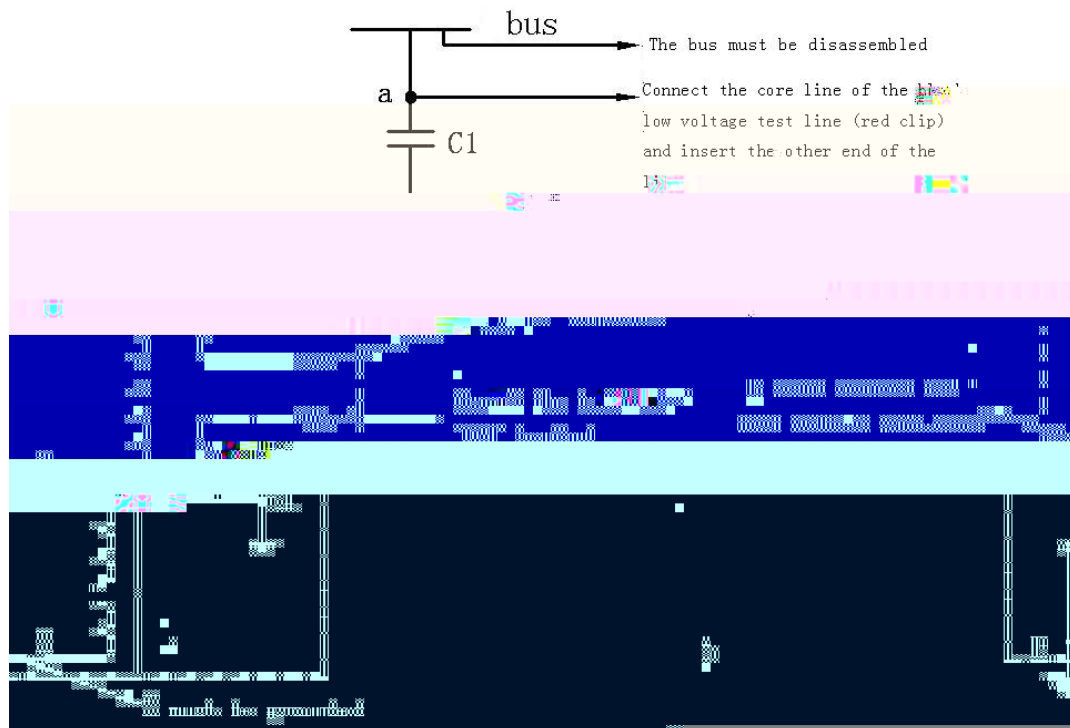


Figure 5-6 measurement methods for C1 and C2 (selection of internal standard, CVT self excitation method, 2kV test voltage)

The connection method selects the CVT self-excitation method, and the test voltage can be set to 2kV. The CVT self-excitation method can measure the dielectric loss and capacitance of the two capacitors C1 and C2 at one time.

If the test data is obviously unreasonable during use, please find the reason from the following aspects:

6.1 Poor contact of the hook

When using the hook to connect the test product in the field measurement, the hook must be in good contact with the test product, otherwise the discharge of the contact point will cause serious data fluctuations! Especially if the oxide layer of the drainage wire is too thick, or the wind blows the wire, it is easy to cause poor contact.

6.2 Poor grounding contact

Poor grounding can cause instrument protection or severe data fluctuations. The paint and rust on the grounding point should be scraped off, and 0 resistance grounding must be ensured!

6.3 Direct measurement of CVT or end shielding method to measure electromagnetic PT

Direct measurement of the coupling capacitor in the lower section of the CVT will result in negative dielectric loss. To eliminate the negative dielectric loss, the following

measures can be taken or the CVT self-excitation method can be used to measure:

- 1) During the test, the ground terminal of the measuring instrument is directly connected to the metal base of the tested product, and a good contact should be ensured.
- 2) When conditions permit, short-circuit the non-tested windings as much as possible to reduce the influence of inductance and core loss.
- 3) There should be no iron frame, scaffolding, wooden ladder and other objects around the tested product, so as to minimize the influence of distributed impedance.
- 4) The angle between the test lead and the test product should be as close as possible to 90° to reduce the distributed capacitance between the line and the test product.

When using the end shielding method to measure the electromagnetic PT, the negative dielectric loss will appear due to the "T-shaped network interference" caused by damp, just dry the bottom three skirt porcelain sleeve and the wiring terminal plate. It can also be measured by conventional method or terminal pressure method.

6.4 The air humidity is too high

The humidity of the air makes the measured value of dielectric loss abnormally increase (or decrease or even become negative) and unstable. If necessary, a shielding ring can be added. Because the shielding ring is artificially added to change the electric field distribution of the test sample, this method is controversial, and you can refer to the relevant regulations.

6.5 Generator power supply

When the generator is powered, it can work in a fixed frequency 50Hz mode.

6.6 Test line

- 1) Due to long-term use, it is easy to cause hidden open circuit of the test wire, or short circuit of the core wire and shield, or poor contact of the plug. The user should maintain the test wire frequently.
- 2) When testing standard capacitor samples, fully shielded plugs should be used to eliminate the influence of additional stray capacitance, otherwise the accuracy of the instrument will not be reflected.

6.7 Working mode selection

After connecting the wire, please select the correct measurement mode, no error can be selected. Especially in the interference environment, the frequency conversion anti-interference mode should be selected.

6.8 Influence of test method

Since the dielectric loss measurement is greatly affected by the test method, it is necessary to distinguish between the test method error and the instrument error. When there is a problem, you can first check the wiring, and then check whether it is an instrument failure.

6.9 Instrument failure

1) The input power 220V is too high or too low. Check whether the core wire and shield are short-circuited;

2) The input power 220V is too high or too low. Check whether the grounding is good;

3) Use the positive and negative wiring to test a standard capacitor or a capacitor sample with known capacity and dielectric loss. If the result is correct, you can judge that the instrument has no problem in H