

Table of Contents

Chapter 1 Safety rules.....2

Chapter 2 what will you notice before testing.....4

Chapter 3 Brief introduction.....5

Chapter 4 Working theory.....6

Chapter 5 Technical parameter.....6

Chapter 6 Operation Instructions and Procedures.....7

Chapter 7 Applying Illustration10

Chapter 8 Calibration and maintenance.....11

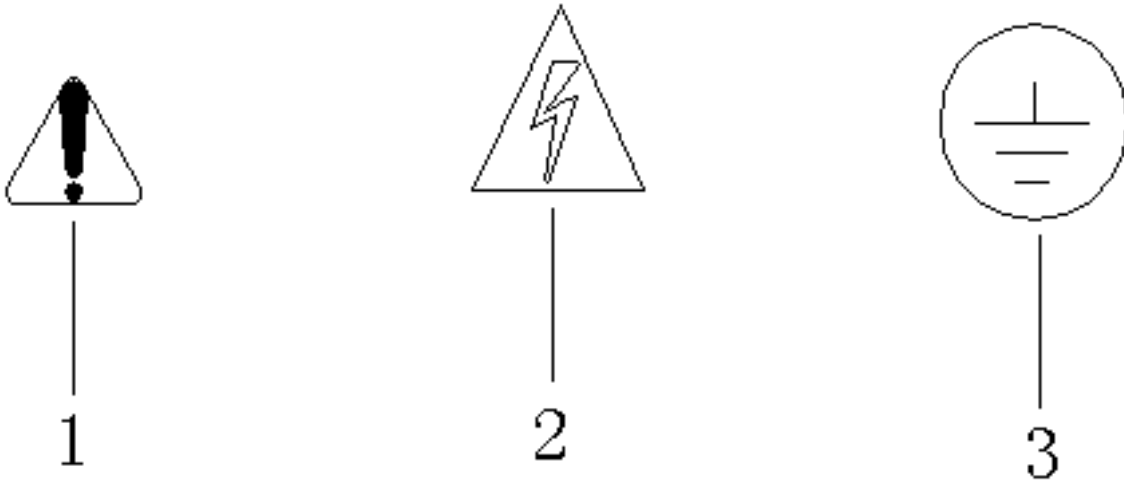
Chapter 9 Maintenance16

Chapter 1 safety rules

Note: please read the items of this chapter before testing the high voltage.

1. Common safe rules

- Before using it, please know about the safety signs of the withstanding voltage tester.
- Before switching on the power, please check to be sure whether the input voltage is right in comparison with the sign.



1---The warning sign of the high voltage. In order to avoiding the damage to the tester and injury to the user, please read the warnings and rules in the manual.

2---The danger sign. There may be the high voltage. Please do not touch it.

3---The ground sign.

The voltage and the current caused by the withstanding voltage tester are too high enough to hurt people. In order to avoiding the injury and the death, please first check it carefully when moving and using it.

2. Maintenance

(1) User's maintenance

In order to avoid an electric shock, please don't take apart the tester. The user mustn't repair all of the components in the tester. If the tester doesn't work well, please put in touch with Meteronic or the appointed distributors and agents.

(2) Periodic maintenance

According to the working frequency band, the input power cord, the P-wire, the correlative accessories and so on of the withstanding voltage tester need to be checked and examined carefully in period, which can protect the user and the accuracy of the tester.

(3) Modification of the user

The user mustn't modify the circuit and the components inside. If you did, the warrant of the tester is invalid, and my company doesn't take the rap. The warrant is invalid either if you use the

components and the accessories which are not accepted by Meteronic. If the reprocessed product has already been modified, we will charge the maintenance costs and we will resume our design.

3. The working platform of testing

(1) Which situations are the best for the worktable?

It is important to select a suitable position for the worktable. So the place should be which the persons accept the operator far away from. If there is no place like that, you must isolate the worktable with the other instruments and mark it "Testing High Voltage Field". If the worktable is near other worktables, please mark "Danger! High voltage is being tested! Don't stay nearby!"

(2) The input power supply

A good ground is a vital part of the withstanding voltage tester. There is a ground interface in its back panel. Please check to be sure the ground connection has continuity. The tester must have the independent switch fixed in well-marked position, and the function of the switch must be marked. Once the emergency happened, cut off the power source at once, and then do with matter.

The input power of the tester is designed to be used on AC only. Its range is $220V \pm 10\%$. The frequency of the power is 50HZ. If the power in its range is instable, it maybe does harm to the components inside or cause the tester wrong running.

Note: The fuse in the tester must be a rapid melting model.

(3) The working test board

When tested, the tester must be placed on the worktable, which is the non-conductor. Don't use the conductor between the operator and the tested device. The position of the operator is appropriate. Don't stride the tested device to operate or adjust the tester.

When operating the tester, the testing working field and around it don't contain fuel gas or the inflammable matter which can cause the explosion and fire hazard.

(4) Operator

The electric shock can cause the injury even death to the user when the wrong operation has been done. So it is important to train the suitable staff to use and operate the tester. The clothes of the operator mustn't contain the metal. And don't wear the metal, either such as the watch, i.e... The persons who have the heart disease or carries the rate adjuster mustn't operate the tester.

(5) The essential point of safety

- The operator who is not fit for the job and the person who is incoherent with the job must far away from the test field.
- Keep the test field in order and in safety at any time.
- Note: Don't touch the tested device or the devices, which are connected with it when testing.
- Once any problems to the tester turned up, please cut off the high voltage output and input power.
- After testing, please discharge first, and then remove the P-wire.

Chapter 2 what will you notice before testing

The output of the withstanding voltage tester can output 10kV, the highest voltage. Any false operation will result in the misadventure even death. So please read this chapter carefully with the view of safety.

1. An electric shock

In order to avoiding the electric shock, please wear the rubber-insulated gloves before using the tester.

2. The tester is in the testing state

When the tester is running in the testing state, the P-wire, the tested device, the test probe and the output port all carry the high voltage. Please don't touch!

3. Changing the tested device

After finishing testing, when you change another tested device, please check to be sure:

- The tester is in the reset state.
- The test light is not flicking.
- The figure of the voltage in the liquid-crystal display is not changing.

Especially notice: Don't touch the high voltage probe when changing the tested device.

4. Switch on or off the power switch

Once the power is cut off, please wait for a minute if you want to start it once more.

Caution: It is very dangerous in the high voltage output state to change the power state, "on" or "off", continuously. It also do harm to the tester.

Don't join the output port of the high voltage with any things when switching on or off the power for it maybe cause the abnormal high voltage output which is very hazard.

5. Emergency treatment

In order to avoiding the more loss, please do according to the following way under any emergent conditions such as an electric shock, the burning of the tested device or the host:

- First cut off the power.
- Then unplug the plug of the power.

6. Trouble occurring

The following situations are very dangerous. Be careful please! Because it may still output the high voltage even you press the "RESET".

- The test light is still going on when presses the "RESET" down.
- The voltmeter shows no readout while the test light is still going on.

When one of the situations occurs, please cut off the power and unplug its plug, and don't use it any more. The trouble is very dangerous. Please bring it to our company or the business-acted place to repair.

7. Trouble of the test light

The voltmeter shows the readout while the test light doesn't light after the "TEST" is pressed. This state may be the trouble of the test light. Please make the tester off and bring it to our company or the business-acted place to repair.

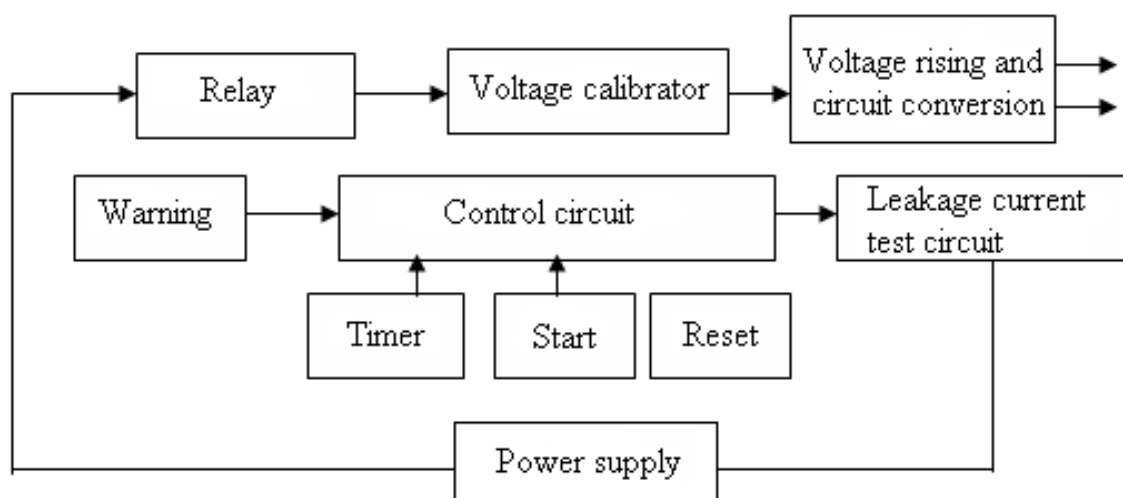
Chapter 3 Brief Introduction

The withstand voltage tester is an instrument applied to measure the density of withstanding voltage. It can visually, accurately, quickly and reliably tests the breakdown voltage, drain current and other electrical security performance indices of various measured objects, and can act as DC (AC) high voltage power supply to test the performance of components and the complete instrument. The CS2600 withstand voltage tester product series is designed according to the requirement of international and domestic security standards such as IEC, ISO, BS, UL, JIS and etc. Its withstanding voltage is 3kV to 50kV, and drain current is 0 to 200 mA, which the special requirement is determined in addition. This instrument is suitable for all kinds of white goods, power supply, cables, transformers, connecting terminals, high-voltage Bakelite electrical appliances, switches, outlets and plugs, motors, dishwashers, washing machines, centrifugal driers, microwave ovens, electromagnetic machines, electronic ovens, electric firepot, electric rice cookers, TV sets, electric fanners, medical services, chemical engineering, electronic instruments, meters, complete machines and etc, and applied to provide the security withstand voltage protection for a strong electricity system and to test the drain current. It is also an indispensable withstand voltage experiment device for scientific research laboratories and technical supervision departments.

The CS2600 series products of withstand voltage testers, based on introducing and digesting the advanced withstand voltage testers worldwide, combine with a large number of practical usage cases from Chinese users to enhance and improve. CS2670AX type, etc withstand voltage testers are full digital model withstand voltage tester series products latterly developed by our factory. Both the testing voltage and the drain current dwell time are displayed in digital, which the technique is the first applied in China. Based on the original products, its performance is further improved. The drain current can be continuously and optionally set from 0.1 mA to 100 mA according to the different security standards and the different requirements of users. For the time testing, the disadvantage, which the indication difference of the original product is a few greater, is improved, with the digital count-down-display, the precision of dwell time is increased to above $\pm 1\%$, and the testing range is improved to 99 s. Its function is richer and more practical, and the actual drain current values of the measured object can be reflected through the drain current display to achieve which products its withstand voltage grade is better compared with the different lots of the similar products or different manufacturers' products, which the security performance of your products can be guaranteed to have no fault. At the same time, the digital displayed drain current can be used to simultaneously display its function, and extended to measure the reverse voltage and reverse drain current of the high voltage silicon rectifier stack, the reserve voltage and reserve drain current of the high withstand voltage tube of a dynatron. It is a domestic leading withstand voltage tester compared from technique performance to quality, reliability.

Chapter 4 Working theory

Withstand Voltage tester is made up of high voltage rise circuit, leakage current detecting circuit and indicating meter. High voltage rise circuit can calibrate and output the required test voltage; Leakage current is capable of setting breakdown(protection) current; Indicating meter can directly read out the test voltage value and leakage current value(or set breakdown current value). DUT reaches the regulated time under the effect of test voltage, and instrument cuts off test voltage automatically or manually, once breakdown appears and leakage current goes beyond the set breakdown current, instrument can automatically cut off the output voltage and alert to confirm whether DUT can bear the insulation intensity test.

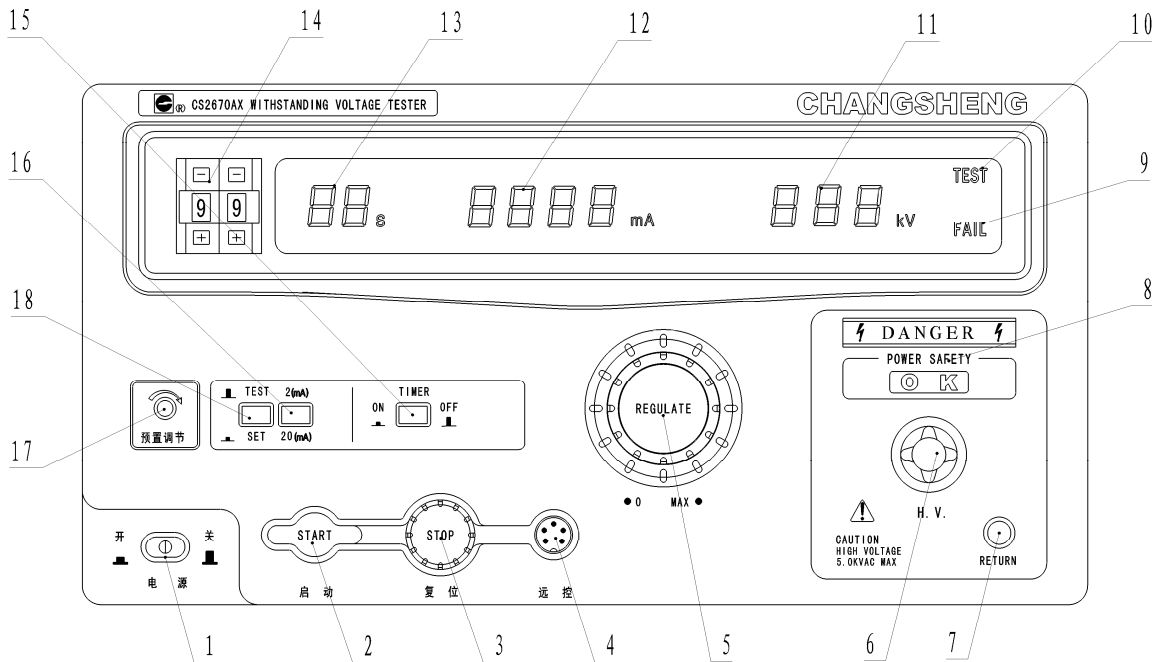


Chapter 5 Specifications

Specification	
Output voltage (kV) AC	0-5kV±(3%+3digits)
Cutoff Current (mA) AC	0.3-2/2-20mA±(3%+3 digits)
Preset warning value range AC (mA)	0.3-2/2-20mA±(3% +3 digits) (continue set)
Test Time	1—99s (continue set) ±1%
Transformer Capacity	100VA
Output Waveform	50Hz, sine wave
Environment	Temperature: 0—40°C, Humidity: ≤75%, Atmospheric pressure: 101.25kPa
Dimension	315mm×165mm×250mm
Weight	15kg

Power	240V±10% 50Hz±2Hz
Accessories	A test rods A grounding line A manual A Power Line

Chapter 6 Operation Instructions and Procedures



CS2670AX Front Panel

- 1、 Power switch: It's used to control whether turn on/off the power
- 2、 Start: Pressing it, the test light illuminates and the instrument begins to work.
- 3、 Reset: Pressing it, the test light goes out or over-resistance, over-current warning stops, no current is output at this moment.
- 4、 Remote control interface: Connecting with remote control test gun (optional for user).
- 5、 Voltage knob: Rotating it can set the output voltage to 1V-5000V;
- 6、 AC high voltage output ports;
- 7、 testing grounding ports;
- 8、 power failure indicator: When the tester not under the power switch, if the tester power input look somebody up and down lines (L), middle (N) and Ground wiring is correct, then "O" and "K" light whole - . If so lights eliminate, the power should check wiring and ensure that wiring is correct, we can use testing equipment. When the power switch tester press, "O" and "K" light eliminate.

- 9、 Test light: If the light illuminates, it shows current has output, contrariwise, the current has been cut off.
- 10、 Fall light: When setting alarm over the measured resistance value, the lights flickered at the same time buzzer intermittent sound - when there was stream, these continuous bright lights, the buzzer -- ring for sustained.
- 11、 Voltage displays: 0—5kV;
- 12、 Current displays: 0.3mA—20mA;
- 13、 Time displays: 1—99s count down.
- 14、 Time preset knob: It can be used to set test time.
- 15、 Timing switch: Turning “On”, it is timing test, test time is free set among 1—99s; While “Off”, it is manual test.
- 16、 Leakage flow-way switch: pop-up to 2 mA stalls, press the switch to 20 mA stalls;
- 17、 Leakage current adjustment button: press preset switching, with leakage flow-way switch, can be set 0.3 mA - 20mA leakage current arbitrary alarm value;
- 18、 The current preset Switches: press preset switch leakage current alarm can be set value.

2、 Operation Procedures:

Operation to wear rubber insulating gloves, good seats and rubber mat at the foot of insulation pad! Test lights extinguished only in the state without a state of high voltage output can be connected to the test materials or demolition operation!

In the case of close and reset, the measured object is connected when the indicator of the voltmeter is ensured to “0” and the indicator light for testing is switched off, and its grounding line is inserted under the earth;

1. The required testing value of leakage current is set:
 - (1). Press the Preset switch;
 - (2). Choose the range of the required alarm current;
 - (3). Adjust the preset potentiometer for leakage current to the required alarm value;
 - (4). Reset the preset switch;
2. Test Manual:
 - (1) The timing switch is set to the “OFF” position, the button “Activate” is pressed, and the “Test” indicator lights. The knob “Voltage Adjustor” is screwed to the required indicator value;
 - (2) After the testing finished, the voltage is adjusted to the 1/2 position of the testing value and then the button “Reset” is pressed. The voltage output is shut off and the indicator light is switched off. It proves that the measured object is good;
 - (3) If the current passing the measured object is greater than the specified leakage current, the

instrument shut off the output voltage automatically, and simultaneously the buzzer gives out an alarm, the overrun indicator light is activated. Here, the measured object is bad. The button “Reset” is pressed and then the alarm can be cancelled;

3. Timing Test

(1). While the “Timing” switch is “ON”, the time preset catch plate is dialed to set the required value of dwell time;

(2) The button “Activate” is pressed and the voltage is adjusted to the required testing value;

(3). When the timing is over, the testing voltage is shut off. It proved that the measured is good; if the current is greater, prior to the preset time, the overrun indicator light is activated and the buzzer gives out an alarm, and thus the measured object is bad.

4. AC Test

(1) The voltage change-over switch is pressed, and the DC step is set;

(2) The high voltage line of the measured object connects to the high voltage DC output terminal;

(3) Continue to operate according to the above operating step 3 and 4;

(4) Caution: voltage of the high voltage DC output terminal is negative voltage;

(5) The setting range of the leakage current alarm value is from 0.3 mA to 10 mA. When the leakage current is above 10 mA, the current automatic protection and alarm are activated.

5. Remote Control Test: (Note: When a remote control test gun is applied, the time is controlled manually.)

Example: The timing time is set to 11 s, and the remote control test gun is used to test the measured object. The test gun is activated till the time is over, and then the test gun will restart.

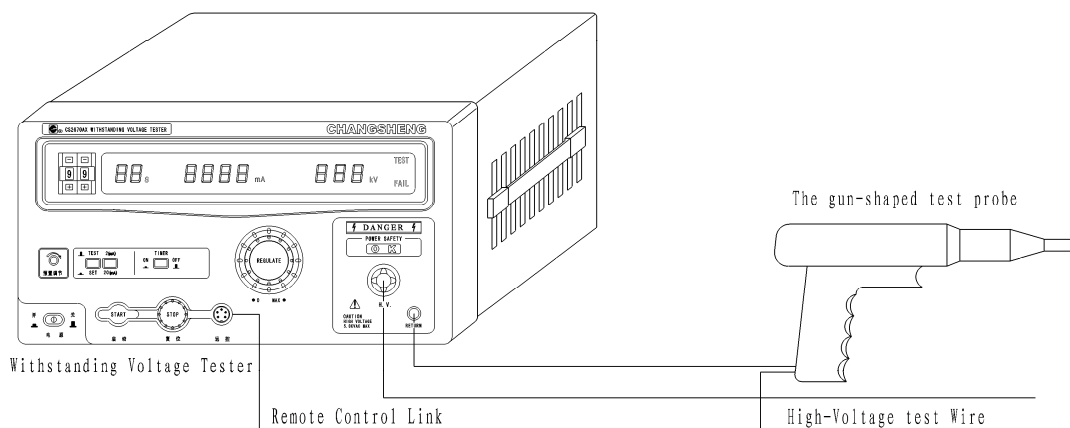
(1) The remote control testing accessories connects to the instrument, and the testing voltage (AC/DC) is selected;

(2) The required value of testing voltage is set;

(3) The required value of leakage current testing is set;

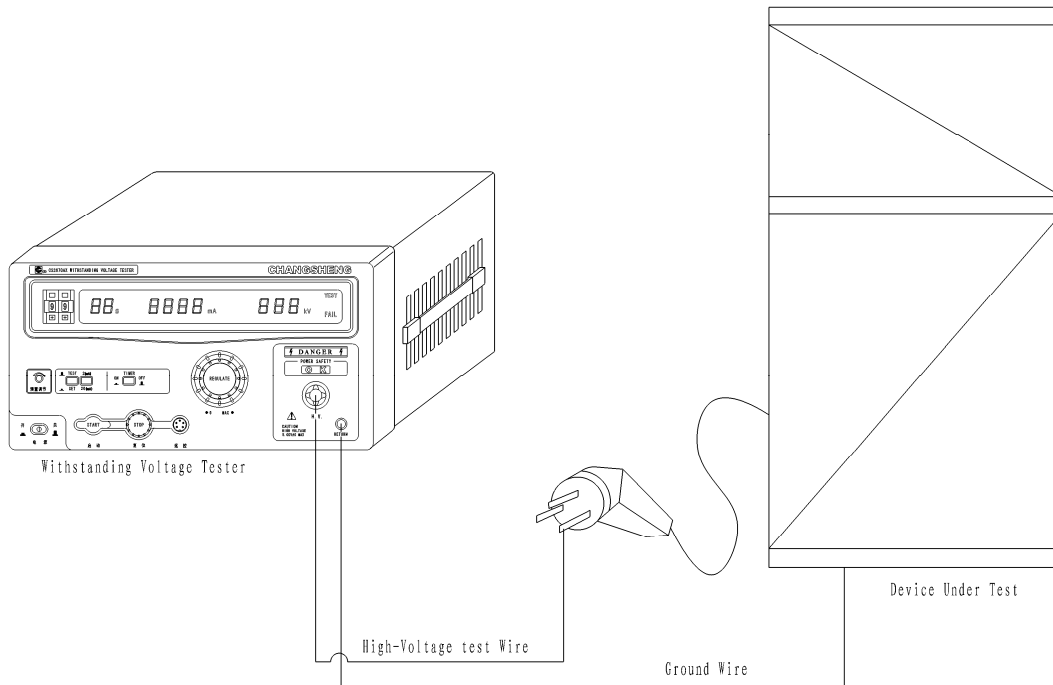
(4) The remote control test gun connects to the measured object;

(5) The switch “Activate” on the high voltage gun is pressed to test, and while the test finish, the switch is released. (The connection is shown on the Fig.5)



Chapter 7 Applying Illustration

1. Electrical machine- whole instrument's electric intensity (Withstanding voltage intensity) test



According to the picture below to connect the Withstanding voltage tester and DUT, get through the power supply switch, set the leakage current warning value according to the product standard of DUT, and then test it as per the 3 or 4th operation steps. If there is no concrete leakage current warning value in the product standard, following formula is recommended:

$$I_Z = k_p (U/R) \dots \dots \dots (1)$$

I_Z —Leakage current warning value A;

U —Test voltage, V;

R —Allowed minimum Insulation resistance value Ω ;

k_p —Motion index, generally take 1.2~1.5

For instance: One electrical machine with its regulated min. IR value as $2 \times 10^6 \Omega$, test voltage is 1500V.

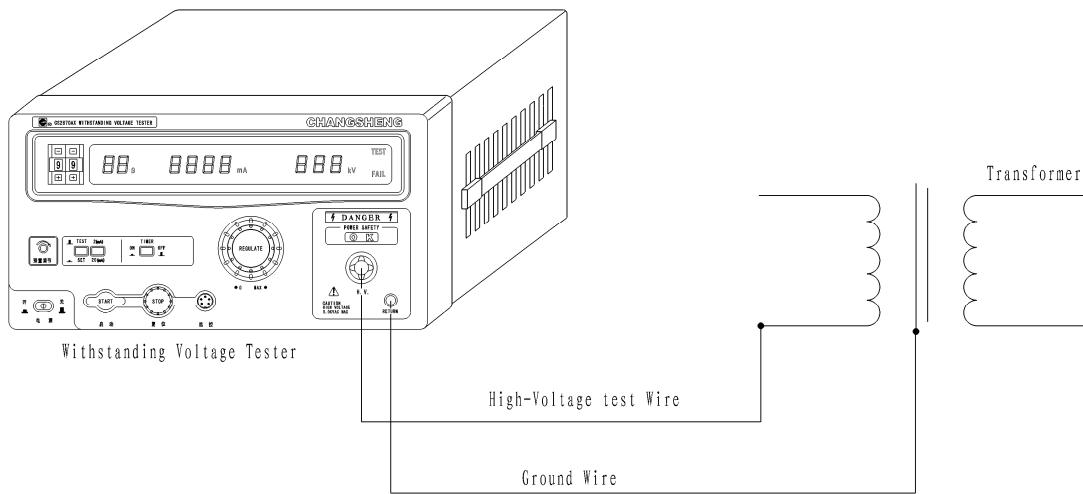
As per formula (1), then

$$\begin{aligned} I_Z &= k_p (U/R) = (1.2 \sim 1.5) \times (1500/2 \times 10^6) \\ &= (1.2 \sim 1.5) \times 0.75 \times 10^{-3} \approx 1 \times 10^{-3} \text{ (A)} \end{aligned}$$

Take 1mA.

2. Transformer or electrical instrument's electric intensity (Withstanding voltage intensity) test

According to the picture below to connect the Withstanding voltage tester with DUT, set the leakage current warning value according to the product standard of DUT, and then test it as per the 4 or 5th operation steps. If there is no concrete leakage current warning value in the product standard, please calculate as formula (1) above and then set the value:



Chapter 8 Calibration and maintenance

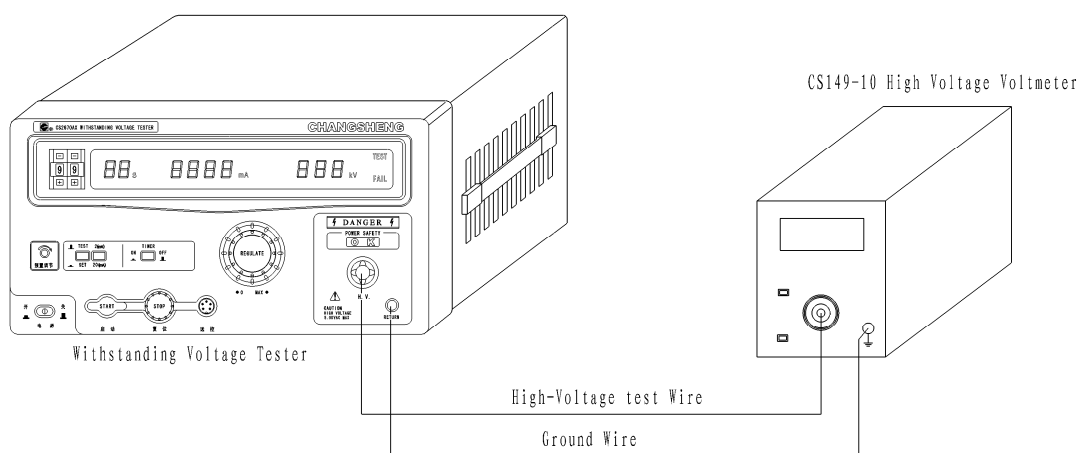
1. Calibration

(1) Voltage calibration

- A) Instrument states in Reset, and voltage knob is rotated to the end in anti-clockwise;
- B) Connected the voltmeter with the instrument well according to the picture and table below;
- C) Choose the proper measurement range on the voltmeter according to different model of the instrument. Please notice that the error of the voltmeter shall be within $\pm 1.5\%$, if it is a hand-style voltmeter, the measurement range shall be out of 1/3 in the graduation of staff gauge. The company produced CS1940 Digital Voltmeter or CS2040 Withstanding Voltage Calibrator are recommended(CS2674A、CS2674 excluded);
- D) Press down Start, and calibrate the voltage output knob to make the readout numbers in voltmeter correspond with the detecting points in List 1 and then adjust the potentiometer to make the meter indication and high-voltage voltmeter's indication satisfy the technology requirement.

List 1

AC/DC	Voltage range	Potentiometer	Detecting points	Index
AC (kV)	5kV	W4	0.5; 1; 3; 5	3%
	10kV	W4	1; 3; 5; 10	
DC (kV)	5kV	W5	0.5; 1; 3; 5	
	10kV	W5	1; 3; 5; 10	



(2) Leakage current calibration

A) Connect the digital ampere meter with the precision of 1% to the Withstanding Voltage Tester according to the below picture.

B) Set the instrument in Reset state, calibrate the voltage knob to the end in anticlockwise, and swing the leakage current switch to 2mA level (2mA is the basic level of calibrating leakage current).

C) Choose proper load resistance as per List 2.

List 2 Calibrating voltage is 500V

Current(mA)	0.5	1	2	5	10	20
Resistance (kΩ/W)	1000/1	500/1	250/1	100/2	50/5	25/10

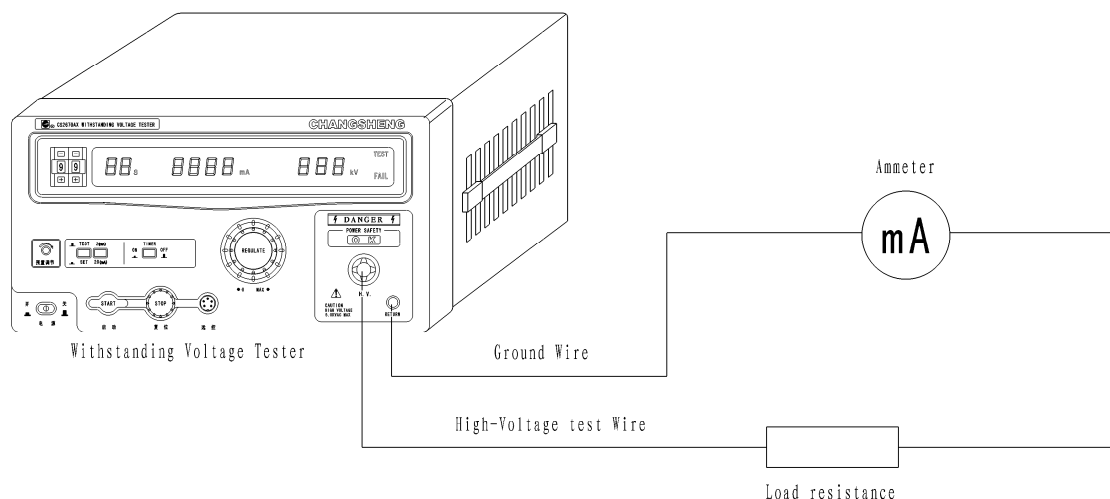
D) Put the load resistance between the input terminal and test place of the instrument in series connected with digital amperemter (or CS2040 Withstanding Voltage Calibrator).

E) Press Start into test state; slowly calibrate the output voltage to about 500V, when the digital ampere meter displays 1mA, then adjust potentiometer to W8 to make the ampere meter point to 1mA.

F) When it is correct in calibrating basic current of 1mA, calibrate alert gate voltage and potentiometer to make W7 alert.

G) Check 0.5mA、2mA、5mA、10mA、20mA (Model: 70A、71A、71B、74)、0.5mA、2mA、5mA、10mA、100mA (Model: 72C、73) and so on each point, if the alert value is within $\pm 4\%$, it is eligible.

H) If some individual level goes beyond error, the 1mA alert value can be calibrate properly according to the over-error value.



2. Maintenance

Maintenance of Withstanding Voltage Tester (Ref. to below list)

Faults	Reasons	Measurements
(1)Power light cannot be bright when turned on, and no indication and output.	(1) Whether power supply is connected well?	Connect power supply well and test by multimeter, there maybe 220V.
	(2)Whether fuse is OK?	Change fuse
	(3)Whether power switch is OK?	Change power supply switch
	(4)Whether there is about 17V AC voltage at the output terminal of transformer, if no, the power transformer maybe broken.	Change power transformer
	(5)Whether rectifier diode is broken?	Change corresponding rectifier diode
	(6)Whether three-terminal Steady pressure machine 7812 is broken?	Change 7812
	(7)Whether C1~C4 capacitor is electric short	Change relevant capacitor
(2) Alert when open the instrument	(1)Keys of leakage current level flick	Press down any key
	(2)LM324 is broken.	Change 324
	(3)Sample resistor on Leakage current switch is open.	Change relevant resistor

(3) Start, Reset failure	(1) 556 is damaged	Change 556
	(2) Relative Start or Reset key is broken.	Change the relevant switch
	(3) The linking jack is loose on main circuit board.	Secure the jack
	(4) Lead on main circuit board is open.	Weld the lead well
(4) State in test while turn on the machine	556 are damaged.	Change 556
(5) Timer fails in start when testing.	(1) Timer plug is loose.	Secure the plug
	(2) 4060 is broken.	Change 4060
(6) Timer cannot reset when time is up. (Manual operation is excluded.)	(1) Timer plug is loose.	Secure it
	(2) Timer 9013 is broken.	Change 9013
	(3) Timer 4060 is broken.	Change 4060
(7) When turn on the instrument, the test light is bright but no voltage display.	(1) Voltage in electric net is too low results in power voltage too low and power relay cannot work normally.	Use AC Steady pressure machine or voltage regulator
	(2) Power relay is broken.	Change relay
	(3) Voltage display board is broken.	Change it.
	(4) High-voltage output terminal is disconnected.	Welded it well
	(5) High-voltage transformer is broken.	Change the high-voltage transformer.
	(6) Plug or connecting wire of main circuit board is loose.	Secure the plug and connect it well.
(8) Manual start or reset is failed.	(1) No 12V voltage	Check power section
	(2) 556 is broken.	Change 556
(9) Start and Reset are failed in operation.	Start or Reset key is bad connection or damaged.	Change relevant switch
(10) AC/DC output voltage cannot be adjusted and the transformer works with noise.	(1) Capacitor box is broken (D6、C6、R3 and R4 are equipped in one plastic box.)	Change capacitor
	(2) High-voltage transformer is broken (there are striking fire and have electric short phenomenon)	Change high-voltage transformer
(11) No voltage indication when adjusting voltage.	(1) Voltage regulator is broken.	Change voltage regulator.

	(2) Linking plug of main circuit board may have bad connection or open phenomena.	Secure the plug and connect it well.
	(3) D8~D11 diodes have some broken or weak welding.	Change relevant diode
(12) Indicating value and actual value have large error (half).	(1) D12~D15 diodes have some broken.	Change relevant diode
	(2) Leakage current displaying board is broken.	Change current displaying board.
	(3) C7 and R11 Pressure sensitive resistor are weak welded.	Weld it well
(13) No voltage display	(1) 220Ω/5W resistor is open or weakly welded	Weld the component well.
	(2) Leakage current displaying board is broken.	Change current displaying board.
	(3) 324 is broken.	Change 324.
	(4) Pressure sensitive resistor has electric shock.	Change pressure sensitive resistor

Chapter 9 Maintenance

Maintenance:

1. Maintenance period: The instrument is warranted to be free from use for a period of 12 months from the date of shipment to the original end users in different sales spots.

2. In this period, consumer is responsible for the maintaining fee if the instrument is damaged by improper operation.

If you have any question, please contact us.

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