

NCD 1000

Circuit Breaker Tester

Operation Manual



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Cautions

- The following instructions are used by qualified person to avoid fire accident and any electrical shock, do not perform any service beyond operation instructions unless you are qualified to do so.
- Before connecting or removing the cables, please make sure to power off the tester, and cut off the power supply of whole testing units.
- Please connecting the wire according the wiring diagram strictly, and wire to the ground reliably. And please cordon off the test area to make sure the safety and prevent unqualified person entrance, and avoid accident occurred.
- Do not operate this device in flammable, moist and high temperature environment. Keep the surface clean and dry, ventilate area free from corrosive gas.
- Connect cables correctly. The order is to connect the device with ground first and then to connect with other cables.
- Test operator should keep safe distance from high voltage electrified apparatus. Do not touch exposed contacts and apparatus when test item electrified.
- Do not touch the metal of the test leads to avoid electric shock.
- Please turn off the power after the testing is finished or the user left the test area.
- Please make sure the equipment is upright before opening. Do not drop equipment heavily avoid equipment movement damage.
- Panel should be upright during storage. Elevate stored items to protect from moisture.
- Please confirm the replaced fuse is same type and rated as the old one.

Warranty

The warranty period for this series is one year from the date of shipment, please refer to your invoice or shipping documents to determine appropriate warranty dates. Newpath Technologies Co. Ltd. warrants to the original purchaser that this product will be free from defects in material and workmanship under normal use. Throughout the warranty period, provide that such defects are not determined by Newpath Technologies Co. Ltd. to have been caused by abuse, misuse, alteration, improper installation, neglect or adverse environmental condition, Newpath Technologies Co. Ltd. is limited solely to repair or replacement of this instrument during the warranty period.

Packing List

Tester	1 unit
Contact Wire	2 sets (2 green, 2 yellow, 2 red, 2 black)
Extend Wire	2 sets (2 green, 2 yellow, 2 red, 2 black)
Open-Close Wire and Trigger Common Wire	1 set
Ground Wire	1 ea
Energy Storage Wire	1 set
10A Power Cord	1 ea
10A Fuse	2 ea
Printer Paper	2 rolls
50mm Linear Sensor and Joint	1 set
360° Rotary Sensor and Joint	1 set
Universal Sensor and Joint	1 set
Magnetism Stand	1 ea
Sensor Accessories	1 set
Vacuum Circuit Breaker Short Connected Wire	1 set
Mouse	1 ea
Operation Manual	1 ea
Factory Calibration Certificate	1 ea
Hard Case	2 ea

300mm or 500mm sensor is optional.

All the sensors are with magnet and suitable for all kinds of switchgears.

General Information

NCD 1000 is a circuit breaker analyzer designed to test the mechanical dynamic characteristics various voltage degree vacuum, SF₆, and oil circuit breaker. Suitable for both high voltage and low voltage circuit breakers.

Features

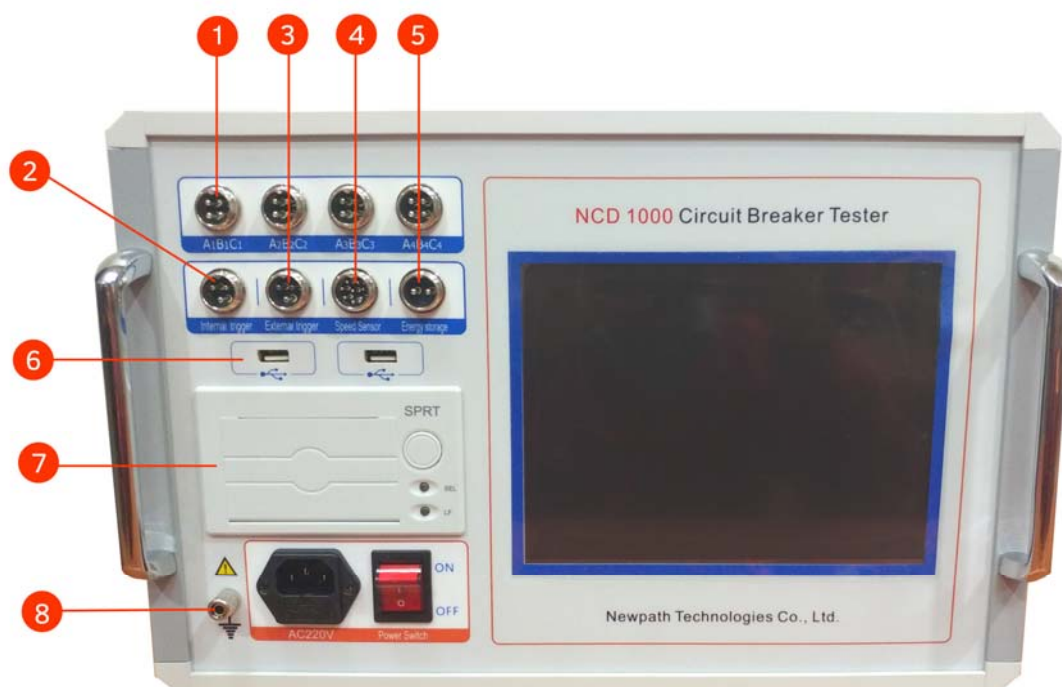
- 8.4 inch large color LC which can read clearly even in direct sunlight.
- Friendly English interface, touching key, easy to operate.
- Build-in printer.
- Integrated power supply, suitable for on-site test. DC30-280V adjustable power source, current 20A. The active voltage value of open/close coil can be set arbitrarily, the low voltage action of circuit breaker is also can be tested.
- Universal type velocity sensor, easy to install.
- All the data and graph can be available only by one time switching.
- To be suitable for all kinds of GIS, SF₆ / vacuum / oil switchgears.
- 6000 groups data storage (memory card is extendable). Built-in clock to save the test date and time.
- USB port, to save the data to use storage.
- 12 channels metal contactors.
- Contains the envelope line, through multiple (2-10 units) circuit breeder's test values, generate standard envelope line, for analysis and comparison, but also for switching vibration frequency analysis.
- Built-in anti interference circuit, suitable for 500kV substation reliable testing.

Specification

- Time test:
 - 12 channels
 - Open (Close) time
 - Open (Close) same phase no-synchronism
 - Open (Close) phase to phase no-synchronism
 - Close (Open) bounce time (bounce numbers)
 - Test range: 0.01 ms ~ 200s
 - Resolution: 0.01 ms

- Velocity test:
 - Open (Close) velocity
 - Pointed periods of time (travel period or angle period) average speed
 - Open (Close) max. velocity
 - Range: 1 mm sensor: 0.01 ~ 25.00m/s,
0.1 mm sensor: 0.001 ~ 2.50m/s,
0.5° angle sensor: 1 cycle/0.5°
- Travel test (Moving contactor travel):
 - Contactor travel (open distance)
 - Overshoot travel or bounce travel (amplitude)
 - Sensor: 50mm, Resolution: 0.1mm
 - Sensor: 300mm (optional), Resolution: 0.1mm
 - 360 line sensor: 360°, resolution: 0.5°
 - 300 mm / 500 mm / universal sensor are optional.
- Current: Max. current output 20A
- AC source: AC 220V \pm 20%; 50Hz \pm 2%
- DC source: Output voltage: 15 ~ 265V continuous adjustment, output current: \leq 20A (short time)
- Control unit dimension: 380 \times 240 \times 170 mm
- Working temperature: -10°C ~ +50°C
- RH: \leq 90%

Panel



1. 12 Channels Contactor signal: to measure 12 channels metal circuit breakers, time of open/close, bounce, synchronism, same phase and etc.
2. Internal Trigger: It is tester output DC 15 ~ 265V adjustable DC power source, default as DC 220V, to proceed open / close operate.
3. External Trigger: It is onsite power source (both AC/DC are permitted), to sample circuit breaker open / close voltage signal.
4. Speed Sensor: to connect line sensor and rotary sensor and universal sensor.
5. Energy Storage: to connect energy storage motor.
6. USB port: to connect USB storage and mouse.
7. Printer: to print test data.
8. Ground port: to connect ground well before testing.

How to connect contact wires and sensor?

1. Connect contactor wires

There are two contact testing inputs of NCD 1000 Circuit Breaker Tester, each contact has 4 lines, that is A1 (yellow), B1 (green), C1 (red) to connect with moving contact port, GND (black) fixed contact (3 phase short connect), there are total 6 contacts could be test sampled of the circuit breaker.

For example as 3 contacts (Figure 1) and 6 contacts (Figure 2):

A1, A2 connect with yellow

B1, B2 connect with green

C1, C2 connect with red

For 3 phases 3 contacts, only to connect with previous signal input is enough. A1 is primary contact. (Note: 3 contacts and 6 contacts to share one GND)

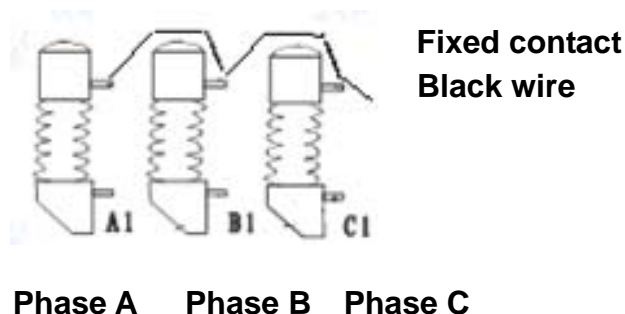


Figure 1: 3 contacts signal wire connecting

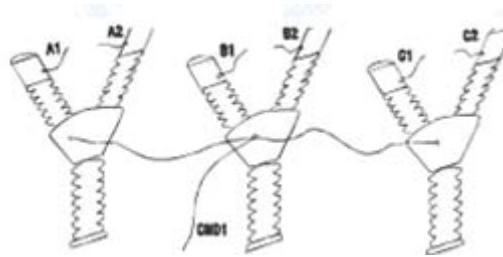


Figure 2: 6 contacts signal wire connecting

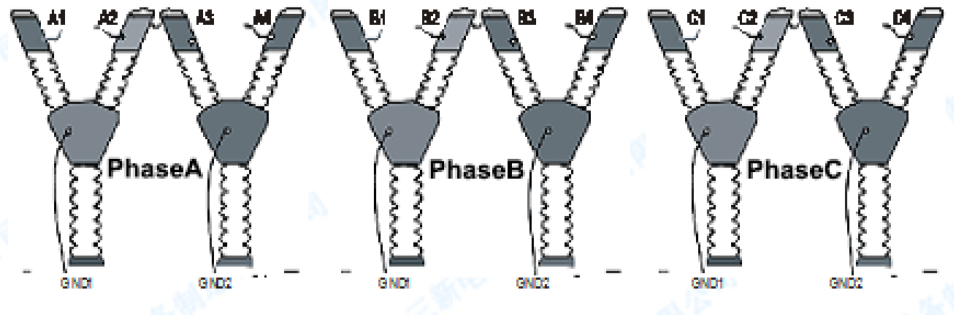


Figure 3: 12 contacts signal wire connecting

2. How to connect internal trigger open/close controlling (Figure 4)

When adopting build-in power supply to do the onsite testing, the close controlling wire (red), open controlling wire (green), common wire (black) to connect with the “internal trigger” port of the panel. And when the tester to do O+, C+, N outputs, usually connecting to the auxiliary switch contacts (to protect coil and tester effectively). **Please DO cut off the external power supply before connecting the wires, to avoid two supplies to damage tester.**

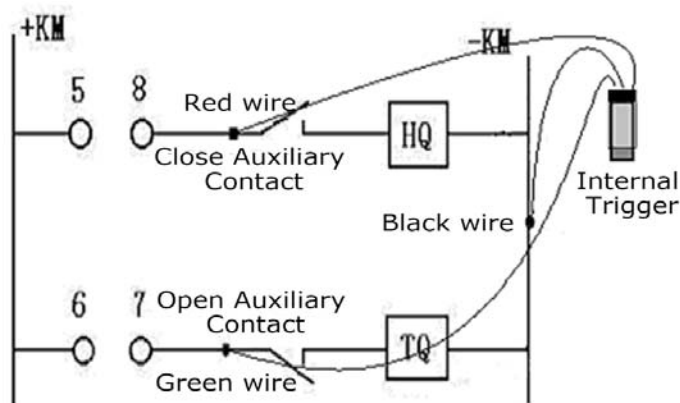


Figure 4

The vacuum circuit breaker O/C controlling diagram as Figure 4: Close red wire to connect (4), Open green wire to connect (31), Common point (14) and (30) short connect and then connect with black wire.

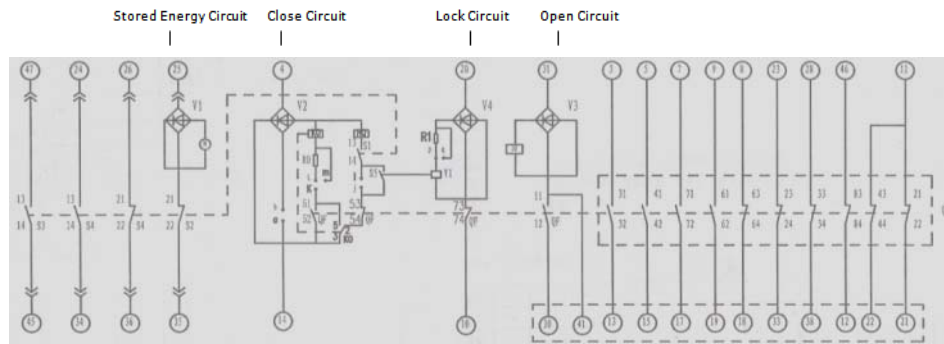


Figure 5

3. How to connect external trigger open/close controlling?

Used to AC switch, permanent magnet switch and any others unit which is without energy stored (as Figure 6).

When adopting external power supply, firstly to connect the controlling wire to “external trigger” port of the panel, then set the parameters via “**Parameter Setting**”, to set the trigger as external. When testing, to touch “Enter” to enter into testing and waiting signal, then to active breaker’s close or open, the signal could be sampled. Before connecting wires, the user should connect carefully according to the diagrams of various high voltage breakers.

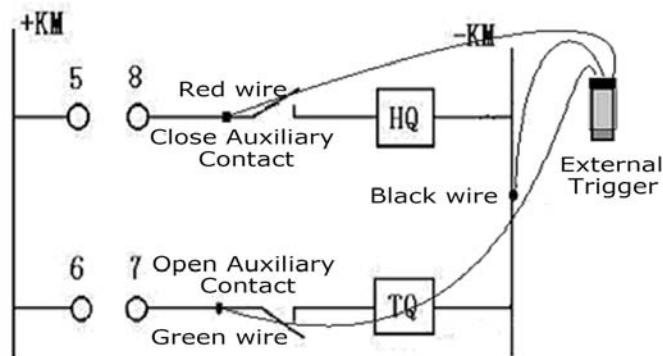


Figure 6

4. The controlling wire is not needed at manual triggering mode.

Firstly to set the test time as 3 seconds at “**time setting**”, then to measure at “**characteristic test**”. And to perform manual open/close fast, the signal could be sampled well. This action should be finished within 3 seconds, if not the result cannot be displayed.

5. How to install speed sensor?

0.1mm linear sensor (Vacuum breaker)

- Before installing, the circuit breaker should be in opening.
- Before testing, the straight sensor should be installed on the moving contact of circuit breaker. To select the relevant sensor according the different type of breakers.
- 0.1mm straight sensor (vacuum breakers)
- Using the magnet to absorb the straight rod of sensor on the vertical conductive rod (moving contact), then using universal rack to fix the sensor.
- Electronic ruler should be perpendicular to moving contact, to pull around 15 cm firstly to protect the sensor against damage when breaker is under moving at Close/Open.

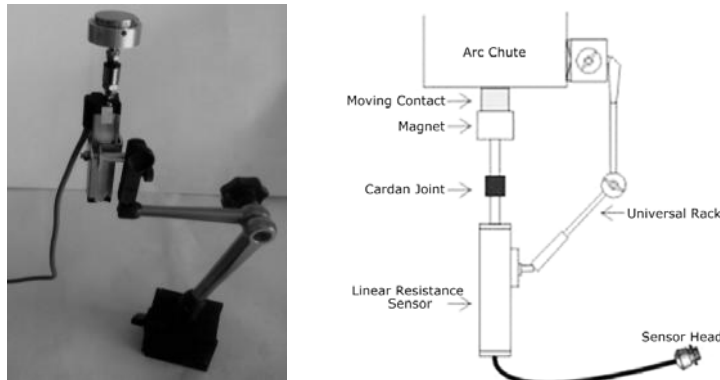


Figure 7

360° rotary sensor

To install the sensor on the principal axis of switchgear, remove the white seal cover of two sides, the plum shape principal axis could be found. To put on the contactor and keep it horizontally, then be fixed with universal rack, as figure 8.

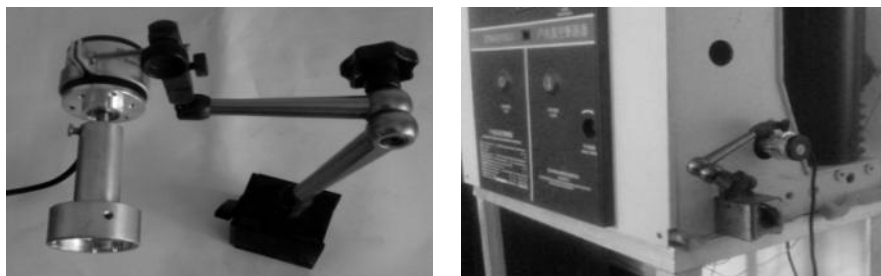


Figure 8

If the principal axis is not plum shape, to install as below Figure 9.

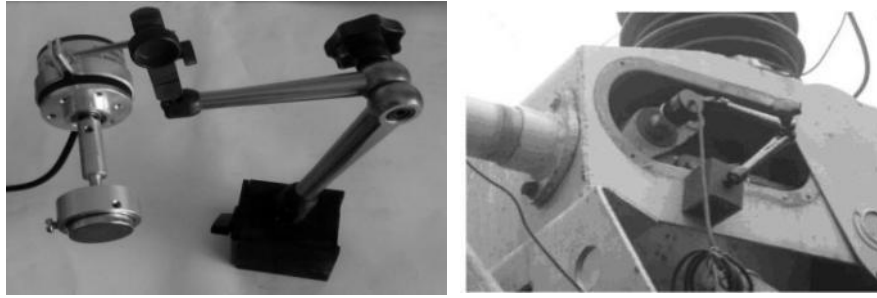


Figure 9: 110KV SF6 switch sensor installation

Outdoor vacuum switchgear and SF₆ install as below Figure 10.



Figure 10: 35KV SF6 switch sensor installation

This installation is mainly applied for outdoor vacuum breakers, to install on the pointer. To remove the pointer firstly, then twist the sensor connecting head. Above installation methods for reference using, some methods are applied for SF₆ switchgears as well.

SF₆ switchgear

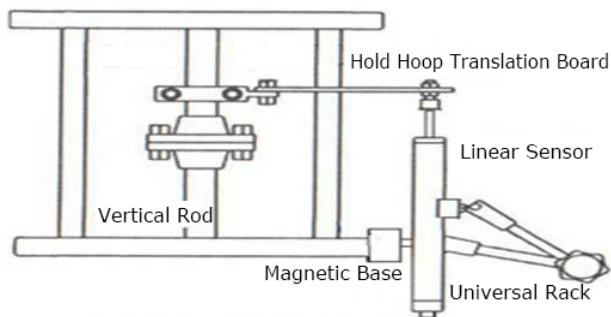


Figure 11: SF₆ Switch Linear Speed Testing Installation

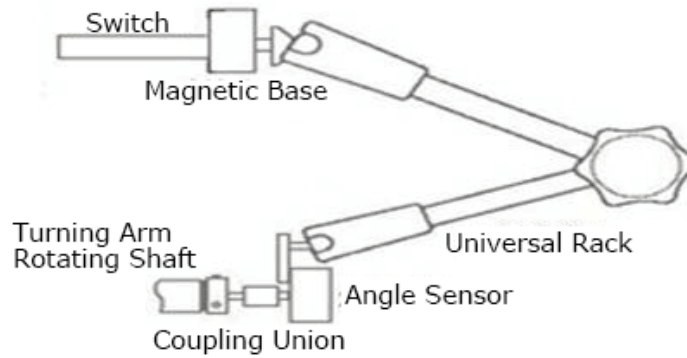


Figure 12: Angle Switch Linear Speed Testing Installation

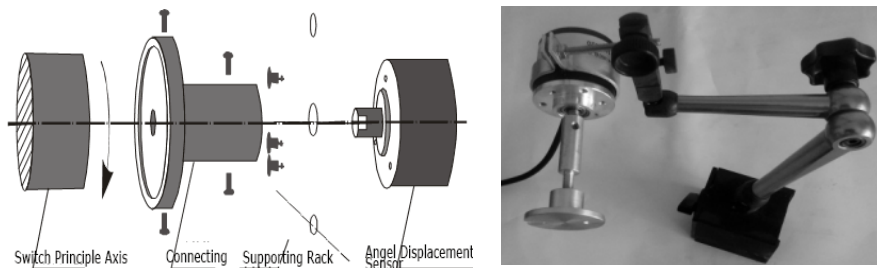


Figure 13

Angle displacement sensor could be adsorbed on the turning arm axis of switch, and the connecting unit to be connected with angle displacement sensor on the operation rotating axis. For this type switchgear, its rotating angle usually moves as rectilinear motion corresponding to moving contactors.

1mm linear sensor (oil switchgear)

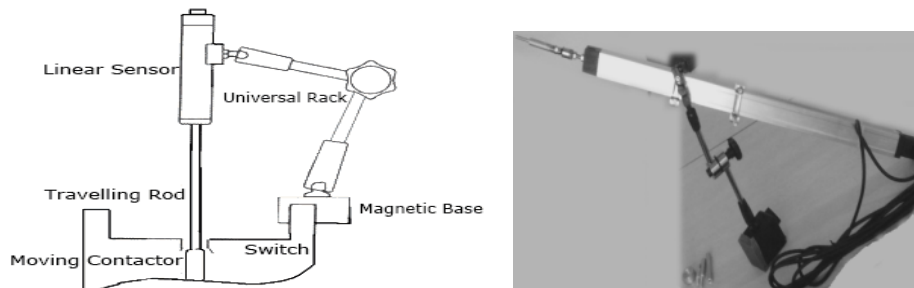


Figure 14

Universal Sensor

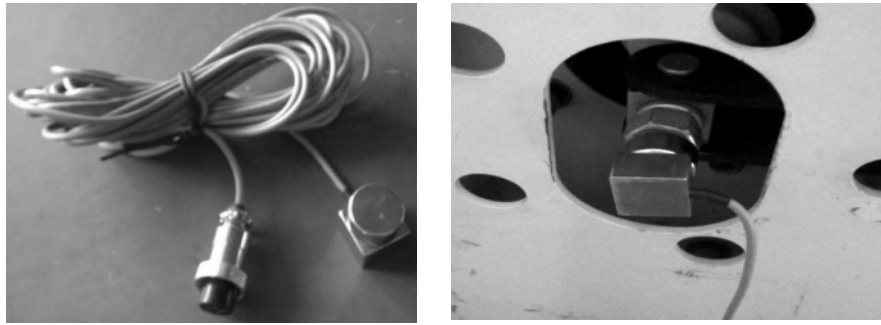


Figure 15

Universal sensor, also known as acceleration sensor, in the measurement of the installation of the trip, please adsorption in the circuit breaker on the movable contact bar, must be linear motion, such as installed in the arm on the rotation of the measurement process is wrong. If it is moving horizontally, the sensor is fixed on the cross bar, but the front of the sensor is moving in the forward direction.

How to operate?

After all the wires and cable installed well, power on the tester, the interface to show as Figure 16:

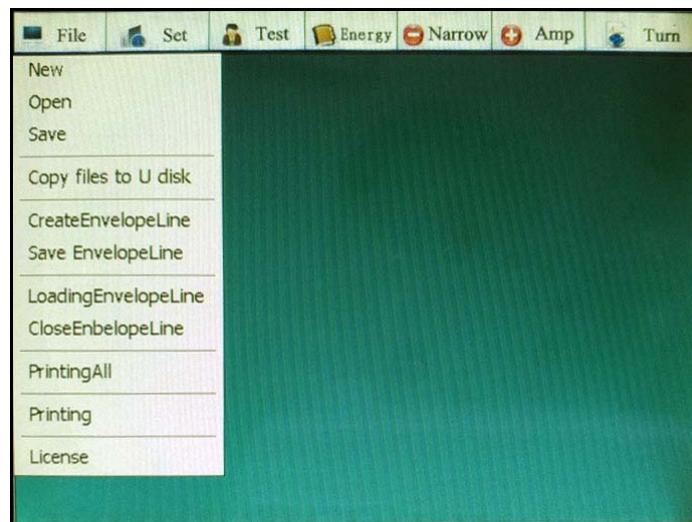


Figure 16

A. File menu:

Click the File menu as shown below:

1. NEW: If the data is not saved, click this button to refresh.
2. OPEN: in the folder will save the file double-click to open.
3. SAVE: save the test data. As shown below (figure 17):

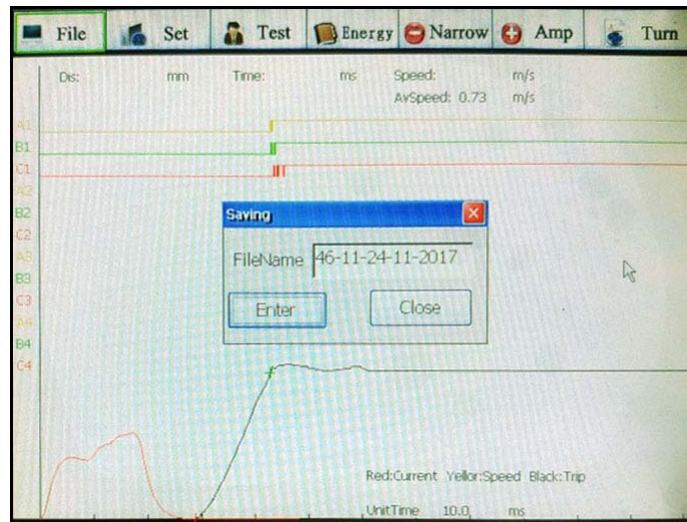


Figure 17

4. Create Envelope Line

5. Loading Envelope Line

Close Envelope Line: These three menus are the same type of switch test data (the same type of switch, while closing or opening data) can be compared, analysis, if not the same type of switch test data import, Will prompt this file error.

Click Create Envelope Line to select the appropriate file.

6. Printing All: To print all test data

B. Click Set menu as below:

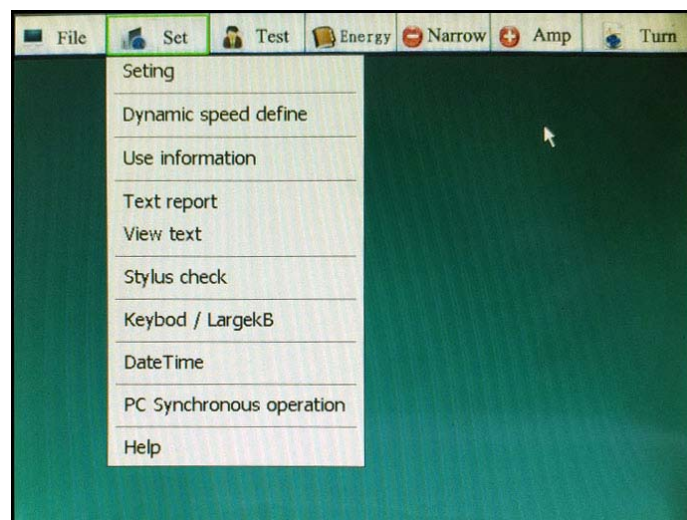


Figure 18

1. Click Setting:

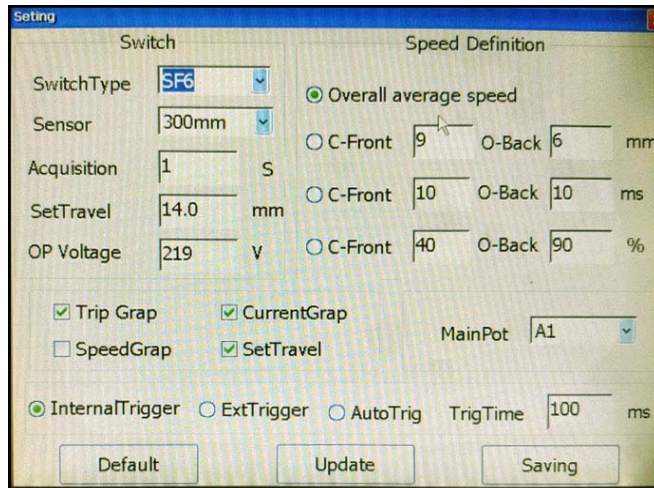


Figure 19

2. First to select switch type as below:

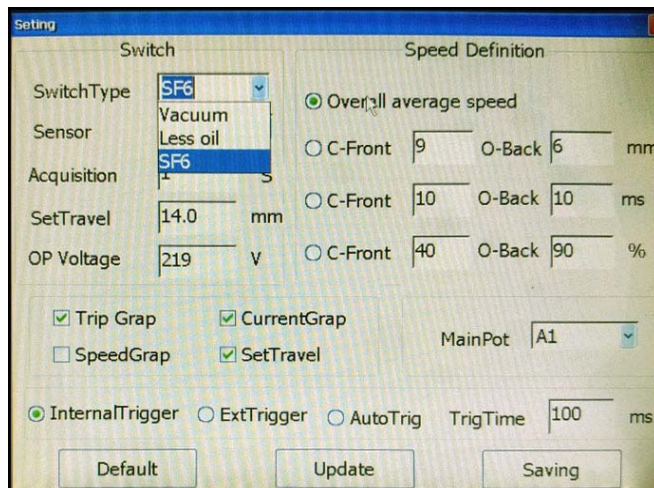


Figure 20

3. Second step to select sensor type as below:

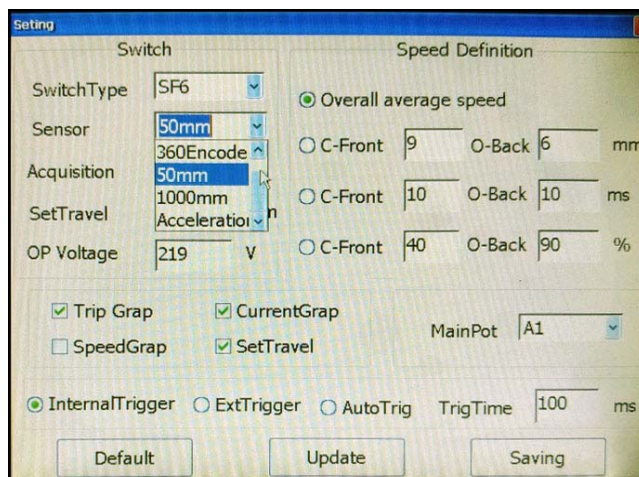


Figure 21

- Acquisition: refers to the length of the contactor's test signal acquisition time, the general default is 1s, the maximum 200s, click 1s this place, pop up the digital keypad, then enter the required value, click Enter to confirm. As shown below:

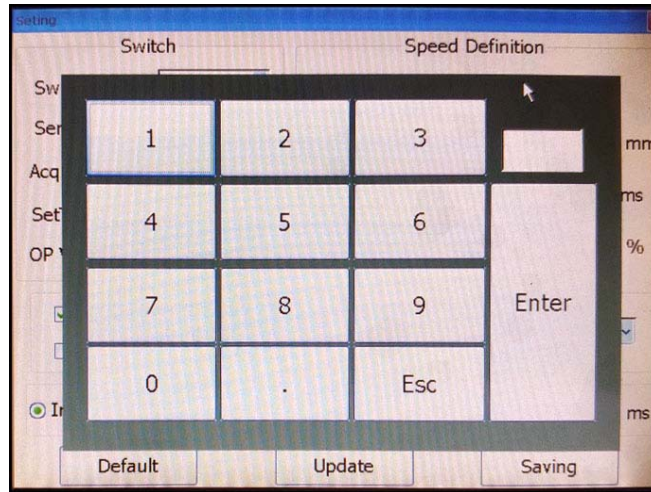


Figure 22

- Set Travel: To set total travel (open distance + beyond distance)
- Operation Voltage: Measuring range DC 35~265V adjustable.
- Total travel average speed: If you don't know the specific speed definition, generally if vacuum switch to select this item, SF6 circuit breaker is generally selected is the latter: before close 90%, after open 90% arm of the total travel percentage.

After all the setting is completed, click to quite.

Use information

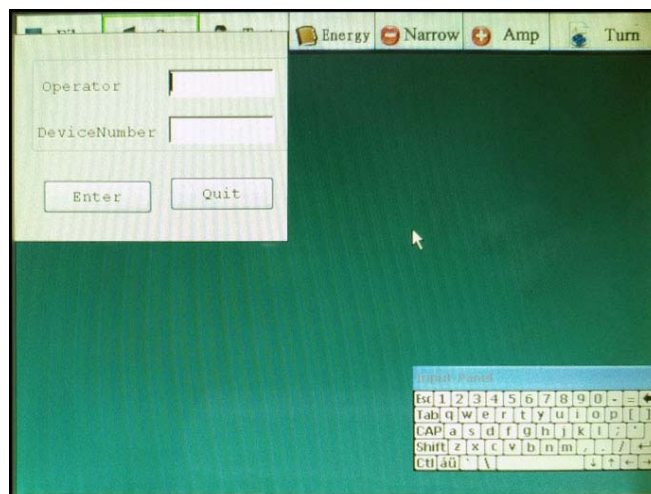


Figure 23

- Use keyboard menu to input
- After completed to click "enter".

Stylus Properties

If the menu is misplaced when the touch screen is clicked, character position calibration is performed in this way as below Figure 24:

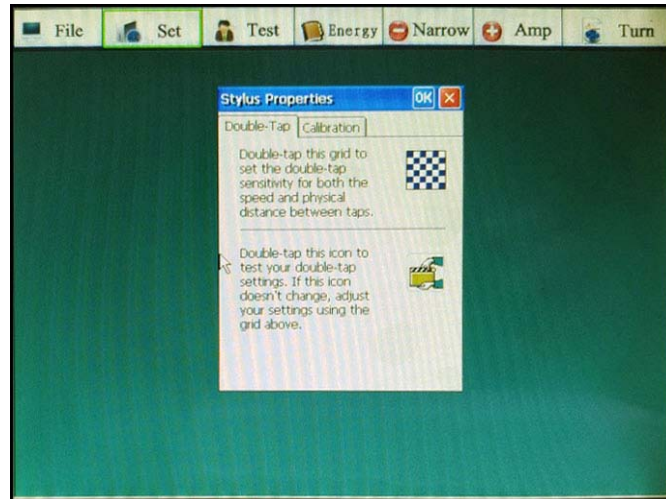


Figure 24

Keyboard/Largekb:

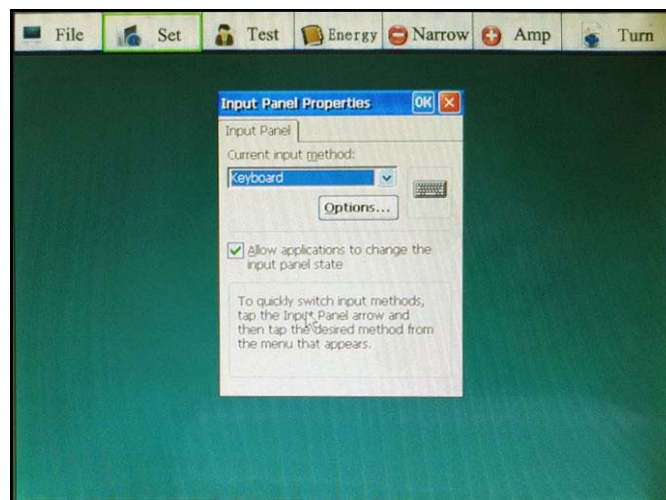


Figure 25

Day/Time: To set date and time.

1. To set year: To click year icon, then click up or down key to select year.
2. To set month: To click month icon, then click up or down key to select month.
3. To set date: To click directly to get current date.
4. To set time: To set hour firstly, click hour, and move up or down. Then set minute by up and down key. After all the setting is done, click OK to save.

C. To click Test as below:

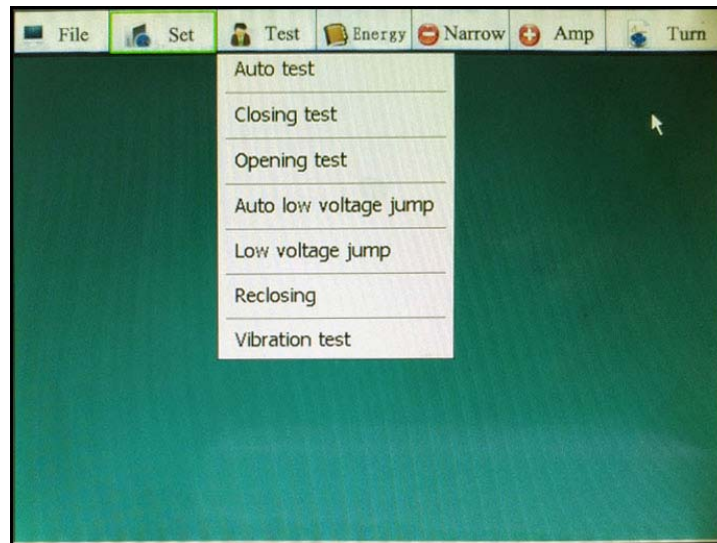


Figure 26

1. Click Auto Test: Auto test refers to measure the close, open, bounce time, bounce times, 3 phase synchronism, open distance, average speed and etc parameters of metal contactors. As below figure 27:

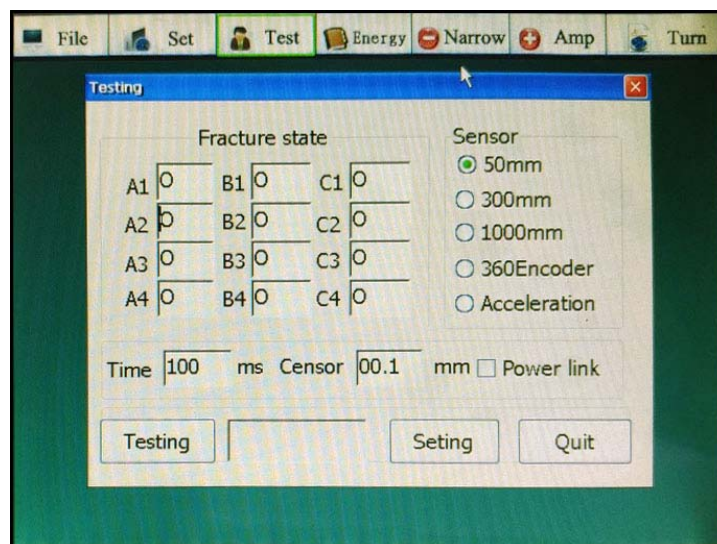


Figure 27

2. Auto Contact Low Jump as below figure 28:

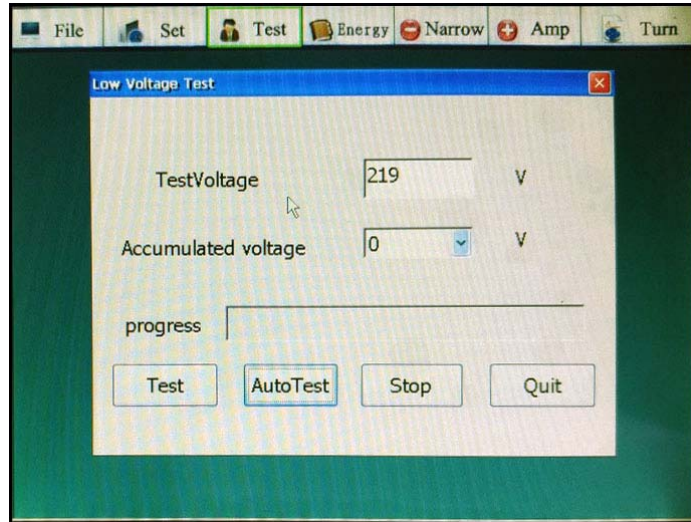


Figure 28

“Auto Contact Low Jump” refers to there has contactor wires during testing, via contactor wire to automatically identify open/close status, and control low voltage action.

“Low Voltage Jump” refers to there have no contactor wires during testing, via internal trigger to add voltage to coil and operate close/open action, as below figure 29:

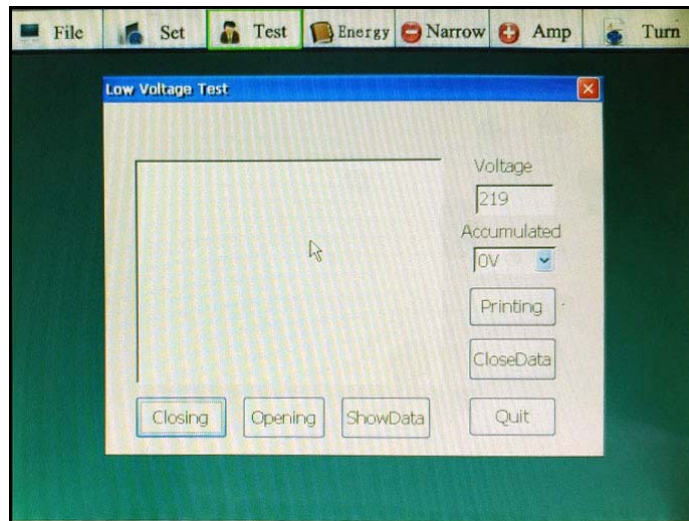


Figure 29

Please set the starting voltage and the accumulated voltage first. If it is open, please click on the **closing**, the voltage value to display in the window, until the circuit breaker closing action, then click **showData** menu, lock the current closing low jump voltage. If it is in the closing status, click on the **opening** until the circuit breaker is opened.

Reclosing: C/O, O/C, O/C/O three status reclosing testing Figure 30.

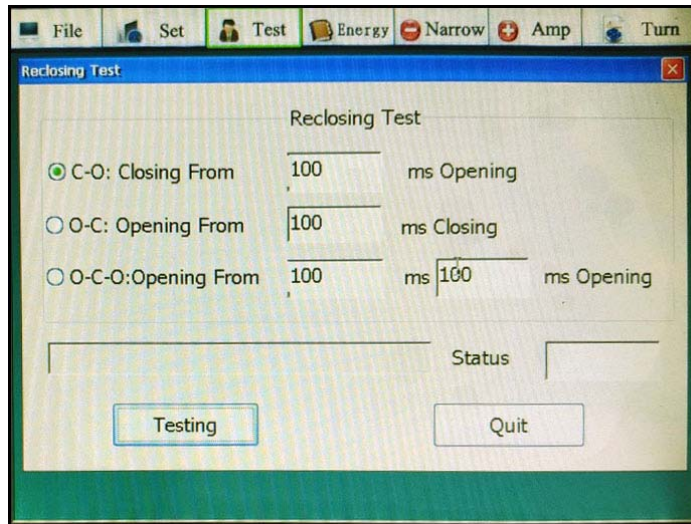


Figure 30

Vibration Test: The vibration state of the switch is measured by the vibration sensor. Operation interface and test graphics as follows Figure 31:

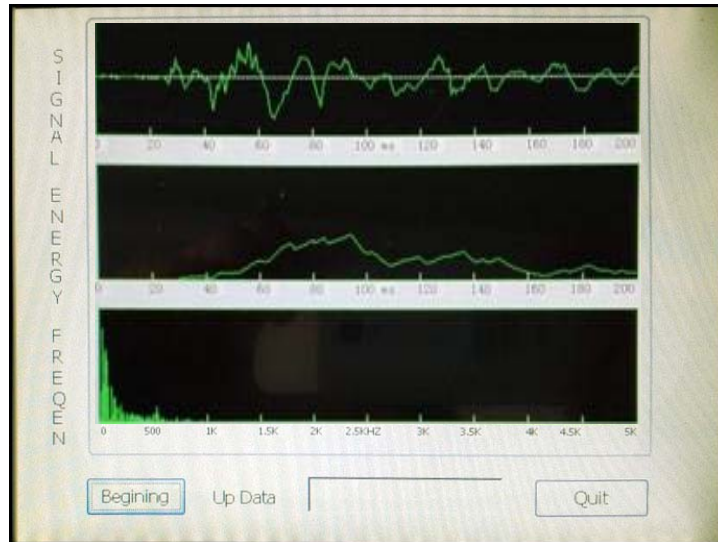


Figure 31

D. Energy Storage:

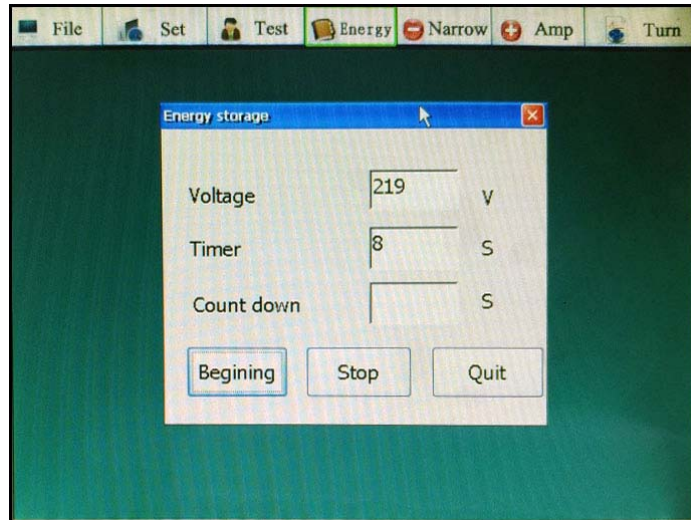


Figure 32

Please first set the energy storage motor, and then set the energy storage time, usually 9 seconds to the maximum input for 20 seconds. The **countdown** menu refers to the remaining time of the energy storage voltage output. After setting, click **Beginning** menu, then the voltage output to the motor energy storage. If the power is still in place after the power is still output, please click **Quit** to exit the energy power off the tester or after energy storage time becomes 0, then proceeding to the next step.

Data Test

1. After all the setting completed, click “Test” as below:

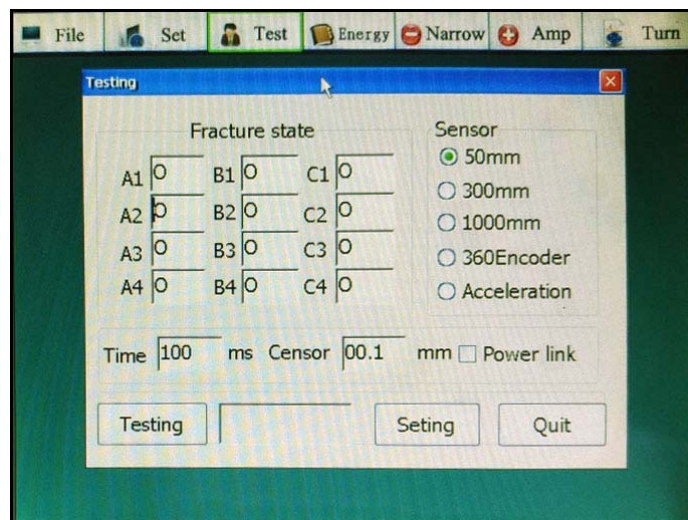
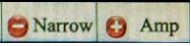


Figure 33

2. The test data's bounce waveform, times, coil current, speed waveform all can be zoom in or out by .

3. Test report form as below figure 34:

	CloseTime	JumpTime	JumpNumber	Same phase	Same Time
A1	42.37 ms	0.91 ms	2	A	0.00 ms
B1	42.65 ms	0.52 ms	1	B	0.00 ms
C1	43.12 ms	2.42 ms	4	C	0.00 ms
				Gap	10.30 mm
				OverTravel	3.70 mm
				Travel	14.00 mm
				Overshoot	2.80 mm
				CloseSpeed	1.05 m/s
				Speed	0.64 m/s
				Voltage	220 V
				Current	1.62 A
				Operator	No.
				Test date:	16.31.9-9-2017

Figure 34

4. To print or save data by clicking “File” menu.

After all the testing completed, can power off the tester directly.

Daily maintenance

1. NCD 1000 is precision and expensive equipment, please use the safe custody, to prevent heavy wrestling, impact. When use at outdoor please put it in the shade operation, in order to avoid long-term direct sunlight in the sun under direct sunlight.
2. When not in use for long time, please store the tester in the temperature $-10\sim 40^{\circ}\text{C}$, the relative humidity of not more than 80%, ventilation, non-corrosive gas indoor. When not in use for long time at wet season, please power on the tester one time every month, each time is about 0.5 hour.