

ZCVF-6000KVA/1000KV

Variable Frequency Resonance Test System

User Manual V2.0



Dear customers,

Thank you for purchasing the test unit of variable-frequency series resonance of our company. Please carefully read the operation instruction before you use this product for the first time, which will help you to use the instrument skillfully.

Our purpose is to continuously improve and perfect our products; therefore, there maybe some little difference between this product you use and operation instruction. We will inform you in attached pages for any modification. Thanks for understanding! Please contact the after-sales department of our company for anything unclear, and we will meet your requirements.

Warning!

As there maybe some voltage at input/ output terminals and testing stem, some electric spark may be generated when you are inserting and pulling the testing line and power socket; watch out for electric shock; avoid electric shock hazard and take care of personal safety!

Careful guarantee

Products manufactured by our company can be replaced for any defect within 3 months after delivery date. Products can be repaired freely for any defect within one year (including one year). Products can enjoy a paid maintenance service for life for any defect over one year.

Safety requirements

Please read the following safety precautions to avoid personal injury and prevent this product or other connected products from being damaged. This product only can be used within the specified scope to avoid possible risk.

This product only can be repaired by qualified technician.

—Avoid fire or personal injury!

Use proper power line. Only the power line specialized for this product or in accordance with this product specification can be used.

Connect and disconnect correctly. Please do not connect or disconnect the testing line casually when the testing line is connected with electrical terminal.

Product earthing: The earthing stem of product enclosure must be earthed except that this product is earthed through the earthing conductor of power line. The earthing conductor must be connected with ground to avoid electric shock. Please be sure that this product has been earthed correctly before connecting the input or output terminal of this product.

Pay attention to rated values of all terminals. Please pay attention to all rated values and marks of this product to avoid fire or electric shock. Please read the operation instruction of this product before connecting it, to know more information about rated value.

Please do not operate when there is no cover plate of instrument. Please do not operate this product if the cover plate or panel has been dismantled.

Please do not operate this product for any suspicious fault. Please ask the maintenance personnel to inspect this product and do not continue operating it for any damage doubt.

Please do not operate this product under humid environment.

Please do not operate this product under explosive environment.

Please keep the product surface clean and dry.

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Chapter I Product Introduction

The device is mainly need 10kv, 35kv cable, electric generators, as well as 110 kv and below for all the main electrical equipment such as transformers, bus switch ac withstand voltage test of the design and manufacture. The reactor is designed in more than one separately, which not only can meet the test condition requirements for equipment with high voltage and low current, but also can meet requirements for low-voltage alternating-current withstand voltage test of 10kV cable. Possessing a wider application scope, it is the ideal withstand voltage equipment for prefecture-level, municipal-level and county-level high-voltage test departments as well as power installation and repair & testing engineering units.

This unit mainly consists of variable-frequency power supply, exciting transformer, reactor and capacitive voltage divider.

1.1 Advantages for series resonance's application in electric system

- ◆ The power capacity needed is reduced greatly. The series resonance power supply is used for generating high voltage and high current by making use of resonant reactor and capacitor resonance of test object; the power supply only needs to provide for parts with active consumption in the whole system; therefore, the power needed for test is only $1/Q$ of test capacity.
- ◆ The weight and volume of equipment is reduced greatly. It does not only leave out the cumbersome high-power pressure regulating device and common high-power power frequency testing transformer in the series resonance power supply; furthermore, the resonant excitation power supply only needs $1/Q$ of test capacity, which is $1/10$ - $1/30$ of common test unit and reduces the system weight and volume greatly.
- ◆ The waveform of output voltage is improved. The resonant power supply is filtering circuit of resonant mode, which can improve the waveform distortion of output voltage, obtain good

sinusoidal waveform and effectively prevent the wrong breakdown of harmonics peak value to test object.

- ◆ The large short-circuit current is prevented from burning fault point. When the insulation weakness of test object is broken down under series resonance condition, the circuit gets tuning-off immediately and the loop current reduces to $1/Q$ of normal test current rapidly. When the withstand voltage test is carried out by means of parallel resonance or testing transformer, the breakdown current can rise for dozens of times immediately; the short-circuit current and breakdown current differ for dozens of times by comparing them. Therefore, the series resonance can effectively find insulation weakness, meanwhile, there is not any worry for large short-circuit current to burn fault point.
- ◆ There is not any restoring over-voltage. As the resonance condition will be lost when the test object is broken down, the high voltage will disappear immediately, the electric arc will burn out instantly; the restoring process of this voltage is a long intermittent oscillating process with energy accumulation, and power supply is easily cut off before reaching flashover voltage; furthermore, there is not any restoring over-voltage.

1.2 Our company variable frequency resonance system main Functions and technical features

- ◆ The unit possesses the overvoltage, overcurrent, zero start, system detuning (flashover) and other protective functions. The protective value of over voltage and over current can be adjusted as per requirements of customers. The protective function of flashover also can remember voltage value of flashover when there is a flashover of test object, which can be used for test analysis.
- ◆ The weight of single piece of whole unit is very light with no more than 40kg, which can be convenient for field service.
- ◆ There are three working modes for this unit, which is convenient for users to flexibly select according to field condition and improve the test speed.

Three working modes **are fully automatic mode, manual mode and the mode with automatic**

tuning and manual boosting.

- ◆ It can save data with data number of figure, which is convenient for users to identify and search.
- ◆ The frequency starting poing can be set casually within specified scope and the frequency sweeping direction can be selected upward or downward during the automatic frequency sweeping process of the unit. Meanwhile, the large LCD screen can show scanning curve, which is convenient for users to intuitively understand whether they can find the resonance point or not.
- ◆ It adopts DSP platform technology, which is convenient to add or delete functions and upgrade according to customers' requirements, and enables the man-machine interface to become more humanized.

Chapter II Main Technical Parameters

2.1 Technical index

- ◆ Waveform distortion rate of output voltage should be less than 1.0%
- ◆ The permissible continuous working time is to work for 5 minutes at one time under rated condition.
- ◆ Quality factor of unit itself: $Q > 50$
- ◆ Quality factor under full load in test of fire power generator: $Q > 10$ (relating to load)
- ◆ Quality factor under full load in cable test: $Q > 30$ (relating to load)
- ◆ Quality factor under full load in test of main transformer: $Q > 30$ (relating to load)
- ◆ GIS, the quality factor under full load in switch test and other tests: $Q > 50$ (relating to load)
- ◆ Input power supply: single phase of 380V
- ◆ Frequency adjustment range: 20Hz~300Hz
- ◆ Accuracy of system measurement: 1.5%
- ◆ The unit possesses protective functions, such as over voltage, over current and zero start.

2.2 Equipment Compliance Standard

Standard for Hand-Over Test of Electric Equipment and Electric Equipment Installation

Engineering GB50150-2016

High-voltage Resonance Test Unit DL/T 849.6—2004

Reactor GB10229.88

Preventive Test Code for Electric Power Equipment DL/T596-1996

Coupling Capacitors and Capacitor Divider IEC358 (1990)

2.3 Description for main configuration and technical data of equipment

◆ 1 set Variable frequency power supply:

Rated power: 240kVA;

Input voltage: $380V \pm 10\%$ and 45~65Hz

Output voltage: 0~400V adjustable

Output voltage frequency: 30~300Hz

0.1Hz adjustable stepping

Instability degree of frequency $\leq 0.02\%$

Output current: 0~600A

◆ 4 sets High voltage reactor :: 250kV/6A

Rated working voltage: 250kV

Rated working current: 6A

Rated inductance value: 170H

Continuous working time: 60min

Temperature rise should be less than 60°C.

Working frequency: 30~300Hz

◆ 1 set Excitation transformer:

Rated capacity: 240kVA

Rated capacity: 350/400/450V

Output voltage: 5kv; 10kv; 40kv

◆ 1 set Capacitive voltage divider : 1000kV, pure capacitance

Its own capacitance: 1000pF

Working frequency: 30~300Hz

Uncertainty: 1.5%

Rated voltage: 1000kV/1000pF

◆ 1 set test line and accessories:

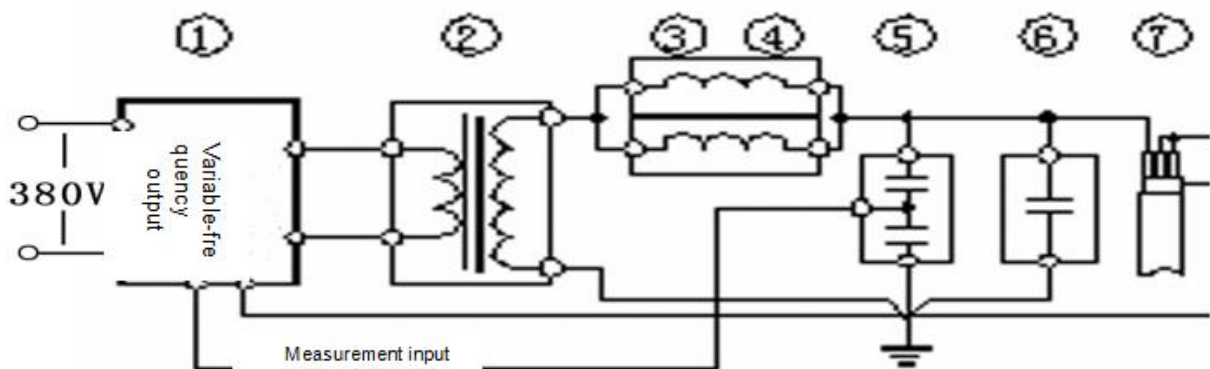
1) 1 set internal connecting line

- 2) 4 reactor insulation base
- 3) 1 set reactor support
- 4) 1 set voltage divider stent
- 5) 1 set reactor top ring
- 6) 1 set divider top ring
- 7) 7 set reactor waist ring
- 8) 2 sets Voltage divider waist ring
- 9) 1 piece operation instruction
- 10) 1 piece test report

Chapter III Equipment Application

3.1 Alternating current withstand voltage of crosslinked ethylene cable

Wiring diagram for withstand voltage test of cable



- ① Variable-frequency power supply ② Exciting transformer ③ Reactor
④ Reactor ⑤ Divider ⑥ Compensating capacitor ⑦ Tested cable

3.1.1 The length for 110kV cable of 630mm² shall be no more than 1.5km. The test voltage is 128kV and the test frequency is 30Hz~300Hz.

(1) The cable length is 1.5km; the cross sectional area is 630mm²; the corresponding capacitance range is 0.402μF; the maximum withstand voltage test value is 128kV.

(2) Resonant frequency: $1/6.28 \times \sqrt{56.67 \times 0.402 \times 10^{-6}} = 32.6\text{Hz}$

Test current at maximum tested capacitance under 32.6Hz: $32.6 \times 6.28 \times 0.402 \times 10^{-6} \times 128 \times 10^3 = 10.5\text{A}$.

(3) Equipment selection: variable-frequency control source of 240kW, three sets reactors in parallel connection of 250kV/6A, exciting transformer of 240kVA (5kV/48A) , voltage divider of 250kV.

3.1.2 The length for 220kv cable of 1000mm² shall be no more than 2km. The test voltage is 216kV and the test frequency is 30Hz~300Hz

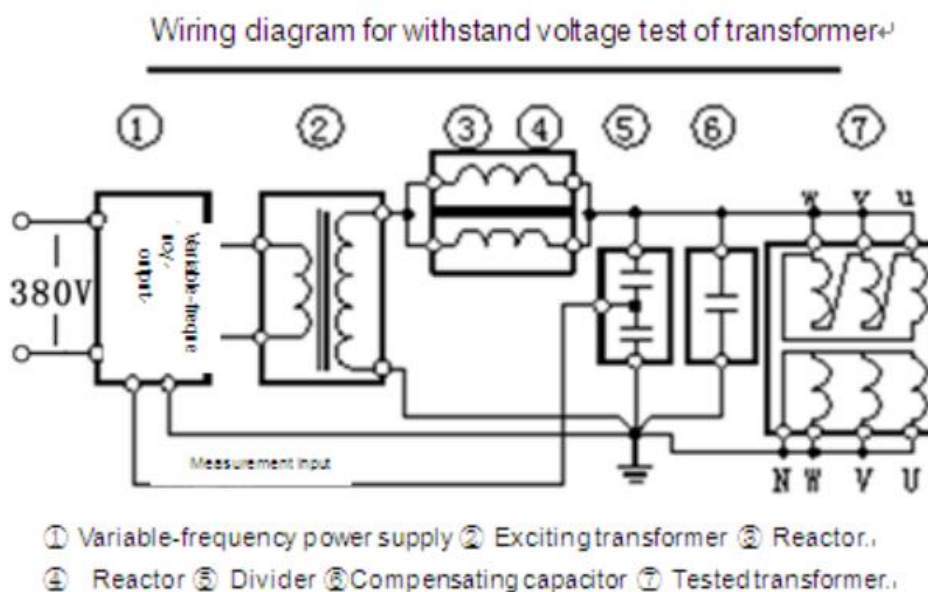
(1) The cable length is 2km; the cross sectional area is 1000mm²; the corresponding capacitance range is 0.36μF; the maximum withstand voltage test value is 216kV.

(2) Resonant frequency: $1/6.28 \times \sqrt{56.67 \times 0.36 \times 10^{-6}} = 35.24\text{Hz}$

Test current at maximum tested capacitance under 35.24Hz:
 $35.24 \times 6.28 \times 0.36 \times 10^{-6} \times 216 \times 10^3 = 17.22\text{A}$

(3) Equipment selection: variable-frequency control source of 240kW, three sets reactors in parallel connection of 250kV/6A, exciting transformer of 240kVA (10kV/24A) , voltage divider of 250kV.

3.2 Alternating current withstand voltage test of transformer, switch and so on



3.2.1 Alternating current withstand voltage test of main electrical equipment of transformer substation at 750kV and below voltage class. The test frequency is 30Hz~300Hz. Usage mode of reactor: all reactors in series

(1) 750kV switch: The corresponding capacitance is 20000pF. Maximum withstand voltage test value: 1000kV

(2) Resonant frequency: $1/6.28 \times \sqrt{680 \times 0.02 \times 10^{-6}} = 45.9\text{Hz}$

Test current at maximum tested capacitance under 45.9Hz:

$$45.9 \times 6.28 \times 0.02 \times 10^{-6} \times 680 \times 10^3 = 3.9\text{A},$$

(3) Equipment selection: variable-frequency control source of 240kW, four sets of series reactors of 250kV/6A, exciting transformer of 220kVA (40kV/6A), voltage divider of 1000kV.

So the samples with small capacitance of switch bus and other fractures all can be tested.

Equipment combination Test object		Four reactor 1500kVA/250kV	Output terminal selection of exciting transformer
Meet cable of 220kV/1000mm ² (test voltage of 216kV, test time of 60min)	Length under 666m	Use one reactors	10kV
	Length 666m~1333km	Two reactors in parallel	10kV
	Length 1333m~2000km	Three reactors in parallel	10kV
Meet cable of 110kV/630mm ² (test voltage of 128kV, test time of 60min)	Length under 666m	Use one reactor	5kV
	Length 666m~1333km	Two reactors in parallel	5kV
	Length 1333m~2000km	Three reactors in parallel	5kV
Meet Substation system of 750kV (test voltage of 1000kV, test time of 1min)		Four reactors in series	40kV

Chapter IV Variable Frequency Power Supply Detailed Usage Introduction

4.1 General Description of equipment

4.1.1 Power

Connect the single phase of 220V or three phase of 380V with “Input” of variable-frequency directly. When the power is 220V, connect the input two phases of A and C. when the power is 380V, connect the three phases of A, B and C.

4.1.2 Description of operation panel

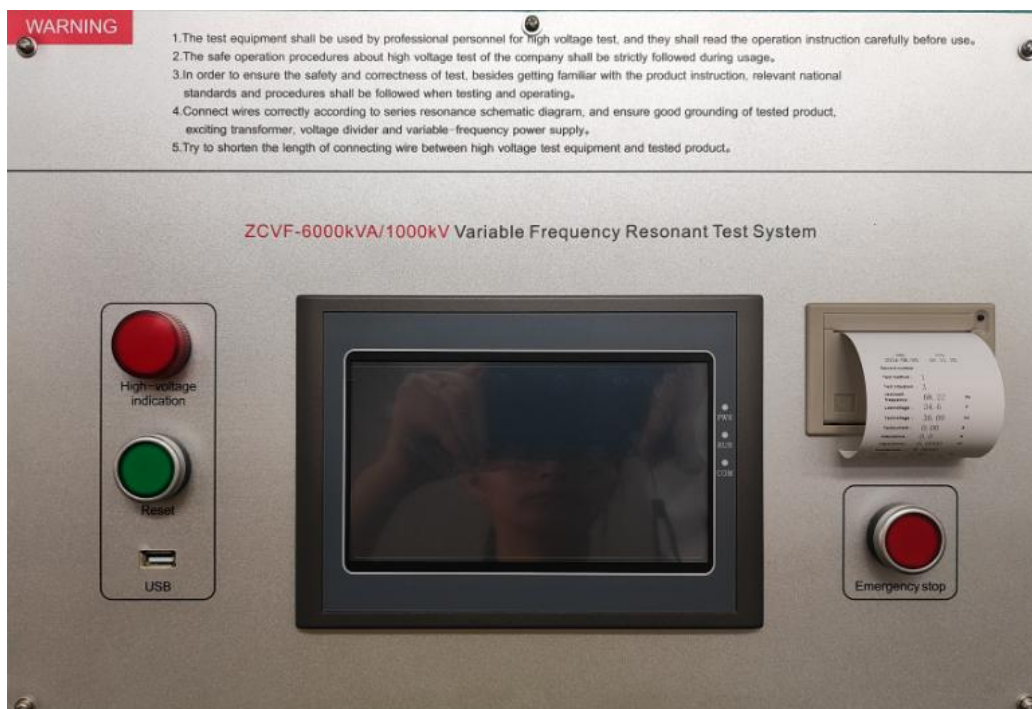


Figure 1

- **Power switch** is responsible for power supply or disconnection of computer.
- **Reset** is responsible for fault reset after load detuning, overheating of variable-frequency

power supply and other protective actions.

- **Stop** is the emergency interrupting button for emergency conditions.
- **Voltage divider signal** is used for connecting low-voltage arm of voltage divider with maximum voltage of 100V and input impedance of 100M.
- **Earthing** is used for safe earthing of the system.
- **Liquid crystal display** is used for displaying various parameters, waveforms and menus of the system.
- **USB** is used for uploading test data.
- **Input:** When the power is 220V, connect the input two phases of A and C. when the power is 380V, connect the three phases of A, B and C.
- **Output:** the output of variable-frequency power supply to input of exciting transformer

4.1.3 Switch on the power supply

- Switch on “Power switch” after powering on the operation cabinet. The liquid crystal display will be lighted to display.
- Notice: The operating fans of openings at both sides of the instrument mean that the power devices within the instrument are working normally; or it means the internal part of instrument is overheating or the instrument was not reset at last test. The power supply should be cut and the instrument should be still placed at ventilation places for about 1 hour; restart the power supply after the temperature in internal part reduces properly.
- Please contact manufacturers immediately when fans are not started regularly.
- Please do not disassemble the instrument by yourself provided that there is some

irreversible faults at the equipment.

4.2 Touch screen display

The control screen of variable-frequency power supply is full-touch screen. You can operate it by slightly clicking the place for operation on the screen.

4.2.1 The liquid crystal display interface after starting up the computer is shown in Figure 2

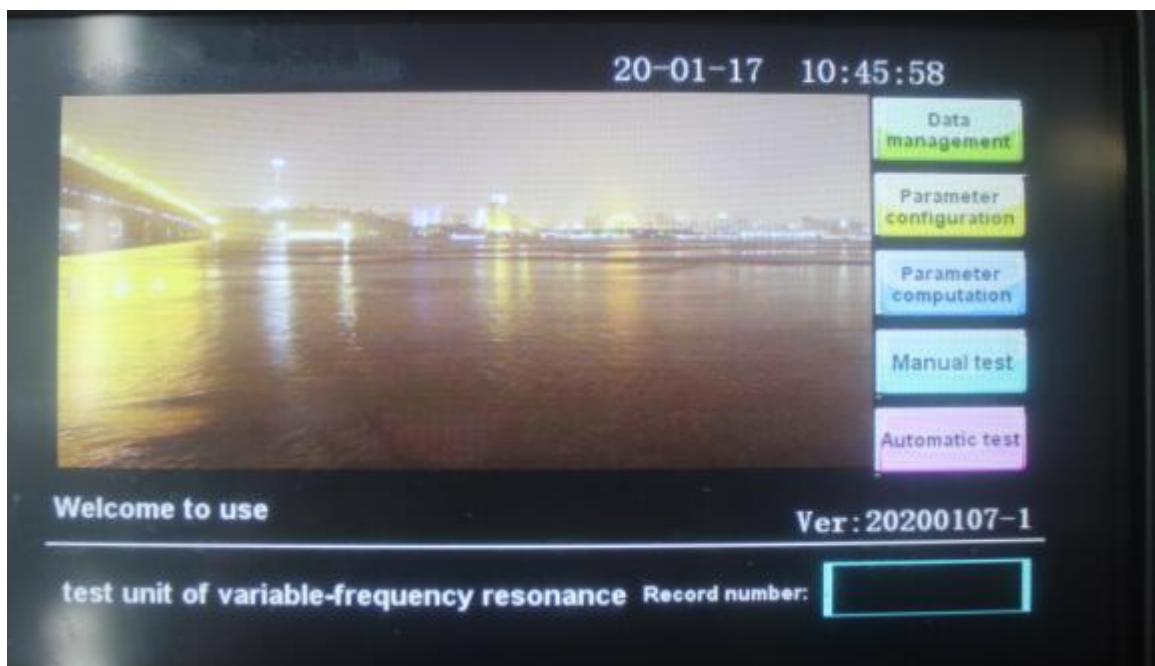


Figure 2

- **Automatic test** is the automatic test mode;
- **Manual test** is the full-manual test mode and semi-automatic test mode;
- **Parameter configuration** is the configuration for various test parameters;
- **File management** is to check and output test record;
- **Parameter computation** is the conversion between inductance, capacitance and frequency; the

third constant can be worked out with two known constants.

4.2.2 Configuration of test parameters: Various parameters of current test must be set correctly before each test! The liquid crystal display interface after clicking “Parameter configuration” is shown in Figure 3

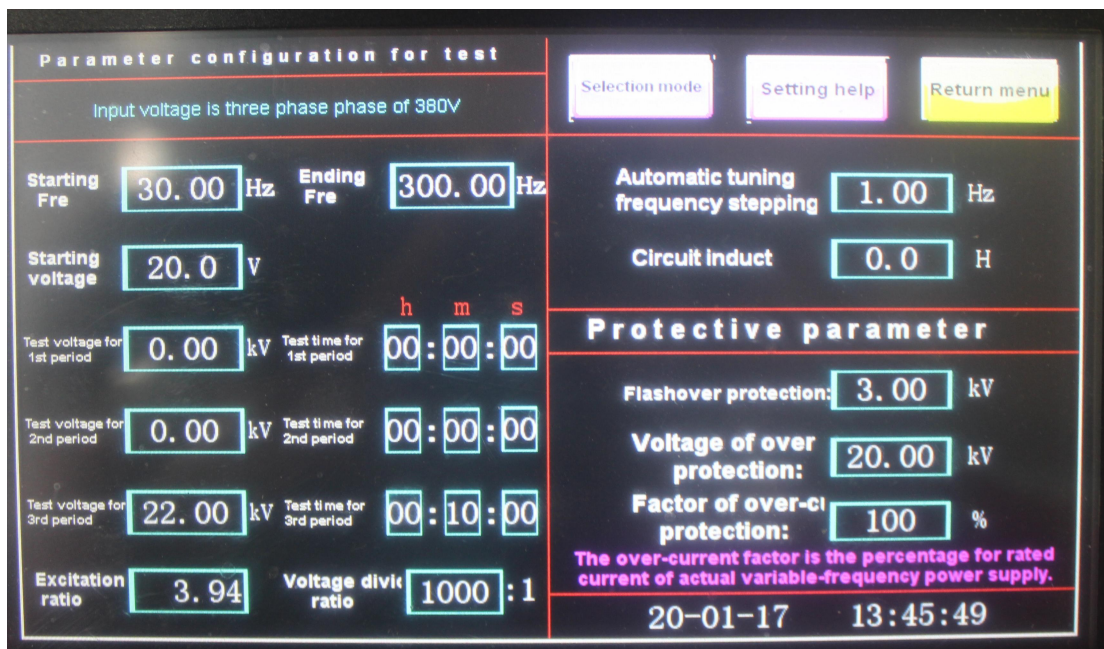


Figure 3

- **Starting frequency:** the maximum lower frequency limit is 20Hz and the minimum upper frequency is 200Hz for the starting frequency of automatic tuning.
- **Ending frequency:** the maximum lower frequency limit is 200Hz and the minimum upper frequency is 300Hz for the ending frequency of automatic tuning. The “Starting frequency” should not be set higher than “Ending frequency”. It is proposed to scan by adopting 30Hz~300Hz for the first test. It can be selected to scan within proper frequency bands to reduce test time provided that the probable frequency band has been known already.

- **Starting voltage** is the initial value of output voltage for setting tuning.

1. The initial values of test object with lower Q values should be set as 30~40V, such as generator, motor and aerial bus.
2. The initial values of test object with higher Q values should be set as 20V, such as power cable, transformer and GIS, etc.

- **Test voltage and test time for different periods** are used for setting the maximum value of withstand test' voltage and withstand voltage time.

1. "Test voltage for different periods": If the withstand voltage test is not divided into different periods, you should only set the test voltage and test time for the first period; test voltages and test times for other periods are set as 0.
2. If the test is divided into different periods, you can finish setting by respectively clicking the corresponding test voltage and test time.

- **Exciting transformer ratio** is to select the ratio of tap voltage and original edging voltage of exciting transformer in test. For example: When the tap of exciting transformer is 5kV in test, the excitation ration is $5/0.4=12.5$ for exciting transformer of 45kVA/5/10/20kV/0.4kV.

- **Voltage divider ratio** is the partial voltage ratio. The voltage divider is divided into upper and lower sections, which input 2500 when the voltage divider's partial pressure ratio is 2500:1. When double section is used, the voltage divider partial pressure ratio is 5000:1, input 5000.

- Notice: The secondary voltage for capacitive voltage divider shall be no more than 100V if the capacitive voltage divider is not the matched one. It will display voltage for surpassing 100V.

- **Automatic tuning frequency stepping** is the frequency stepping for automatic scanning frequency in automatic test. The frequency stepping must be set in automatic test; or there will be not scanning frequency in automatic test. The frequency stepping can be set under 2Hz; the found resonance point is not the best one and the test voltage may not rise if the

frequency stepping is set too high.

- **Circuit inductance and circuit capacitance** can be set when the inductance and capacitance in loop are known; they can not be set when the inductance and capacitance in loop are unknown. The record data in file management can display the value of the other item when any item is set; both items will not be displayed if they are not set.
- **Flashover protection** is the protective voltage for breakdown. The breakdown protection will be more sensitive as the flashover protection value gets smaller; there would be some false operations sometimes. Under normal circumstances, the value can be set as 3kV when the maximum voltage of equipment is less than 150kV; the value can be set as 5kV when the maximum voltage of equipment is less than 150~300kV; the value can be set as 8kV when the maximum voltage of equipment is less than 300~500kV; the value can be set as 12kV when the maximum voltage of equipment is less than 500~800kV. The value is a theoretical value and it can be set on itself according to field requirements.
- **Voltage of over-voltage protection** is used for setting the limit value of test voltage; the test will be stopped automatically when the voltage surpasses the limit value to protect test equipments and test object. The value is set as 10% higher than test voltage in general.

Factor of over-current protection is used for setting the maximum value for output current of variable-frequency power supply. It is set as 100% in general.

It also can be set as 150% for a short period; it is mainly used for protecting power devices of variable-frequency power supply from being burnt out.
- **Setting help** refers to some prompt help in setting.
- **Return menu** means returning back to main menu, shown in Figure 2.
- **Selection mode:** You can select automatic test or manual test by clicking “Selection mode” after setting test parameters; there is no need to select automatic test or manual test

returning to main menu, shown in Figure 4.

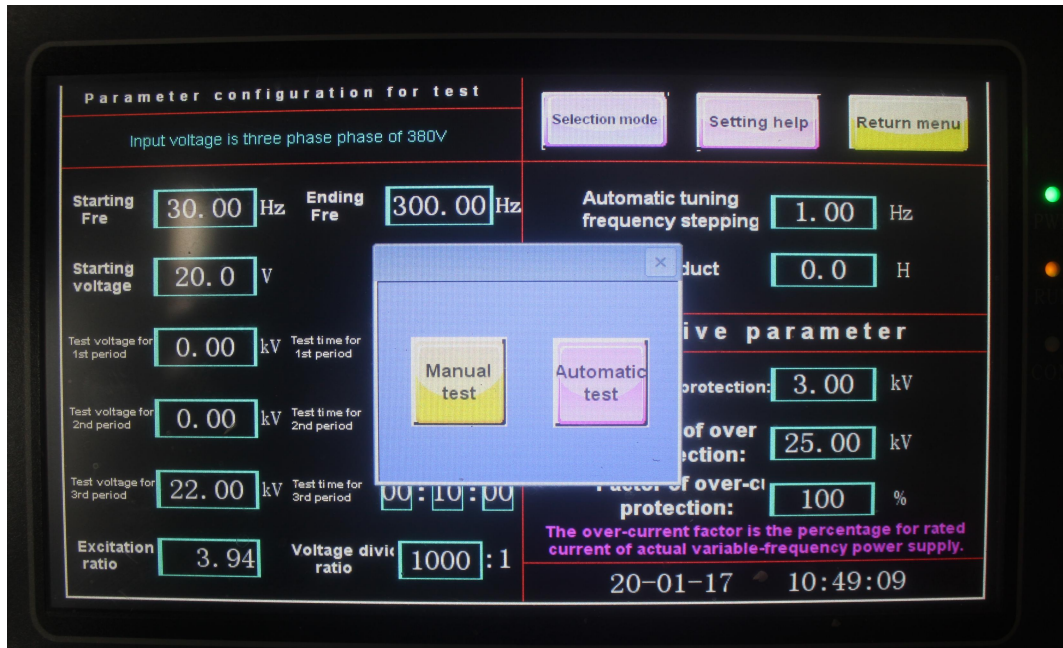


Figure 4

Chapter V Universal Operation Description

Universal operation step

Connect test loop correctly according to wiring diagram and related requirements. Set on-site warning marks for test. Set various test parameters correctly.

5.1 Automatic Test

Click “**Automatic test**” after entering into interface of Figure 2 or 4. Click “**Start test**” after entering into interface of Figure 5. Then the tuning, voltage rising, timekeeping and voltage descending can be carried out automatically.

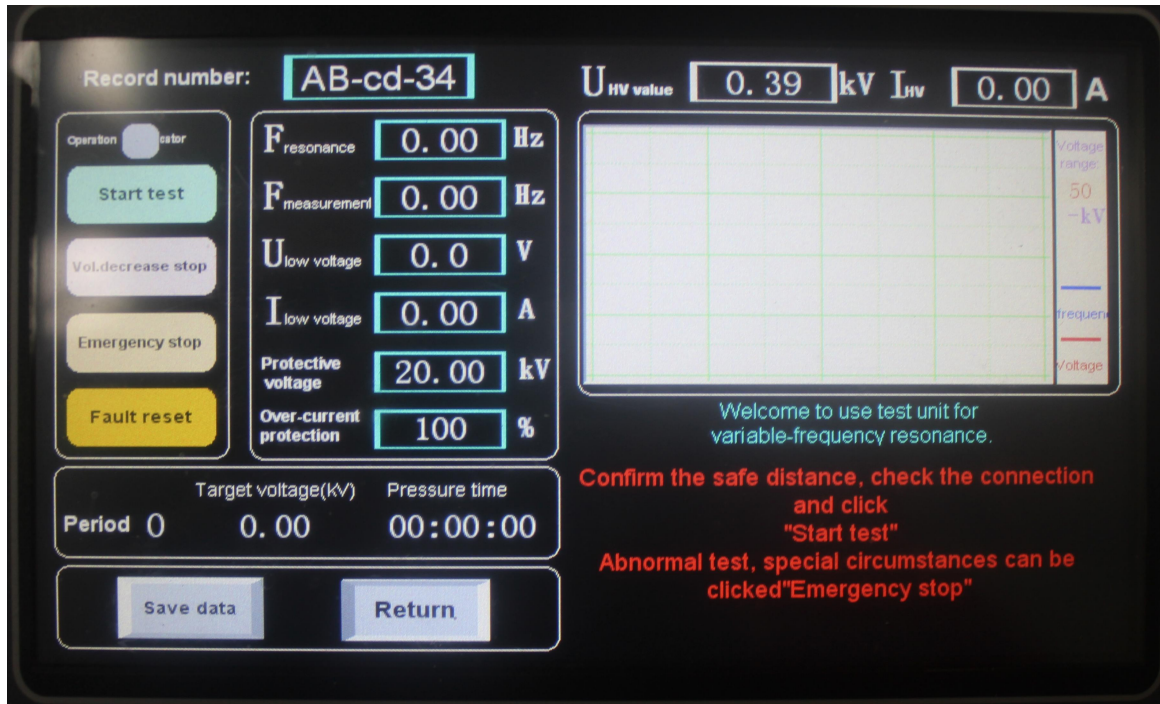


Figure 5

The interfaces will be shown in following: Tuning

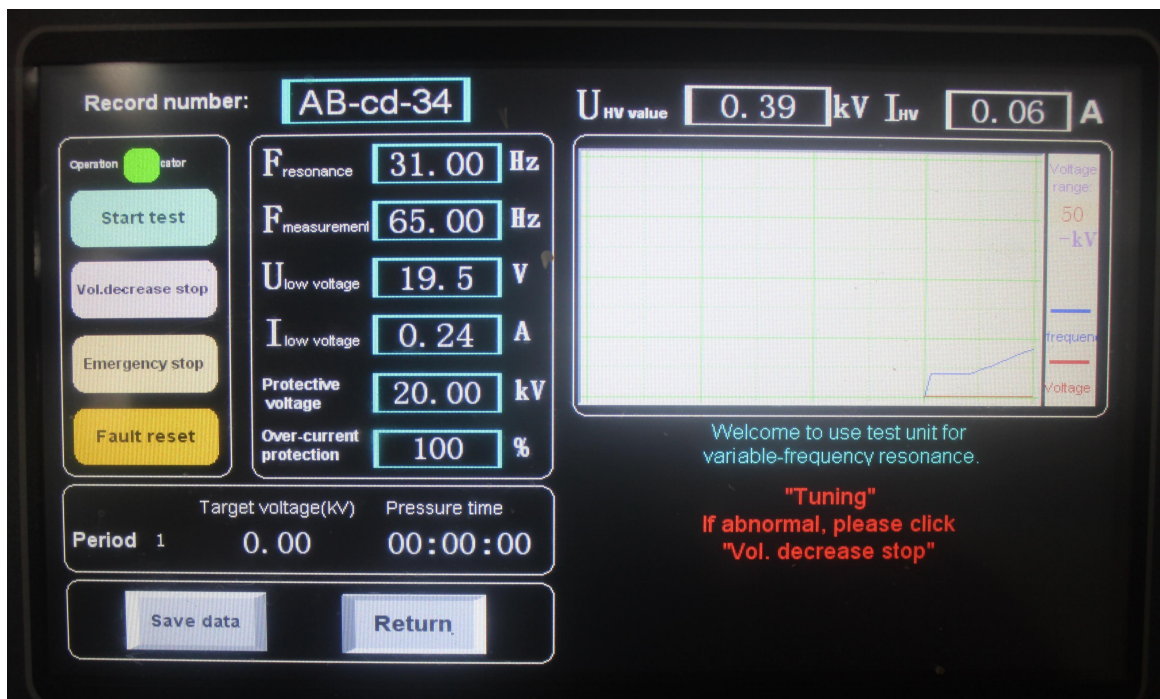


Figure 6

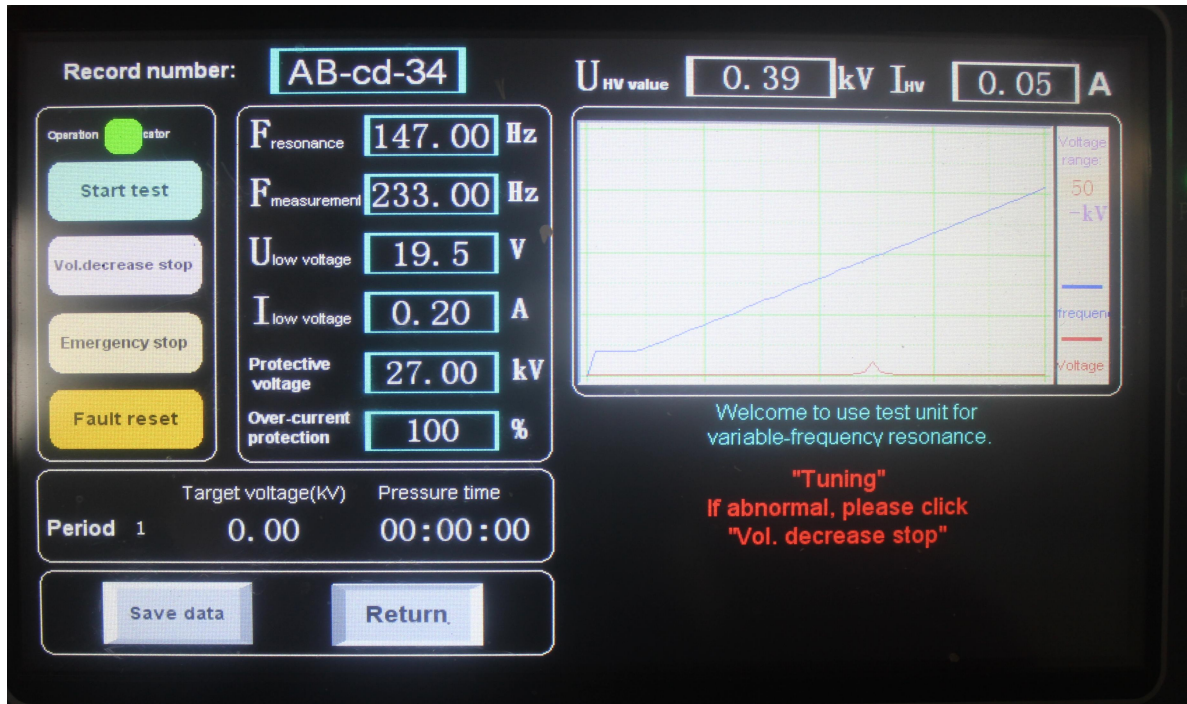


Figure 7

Timekeeping:

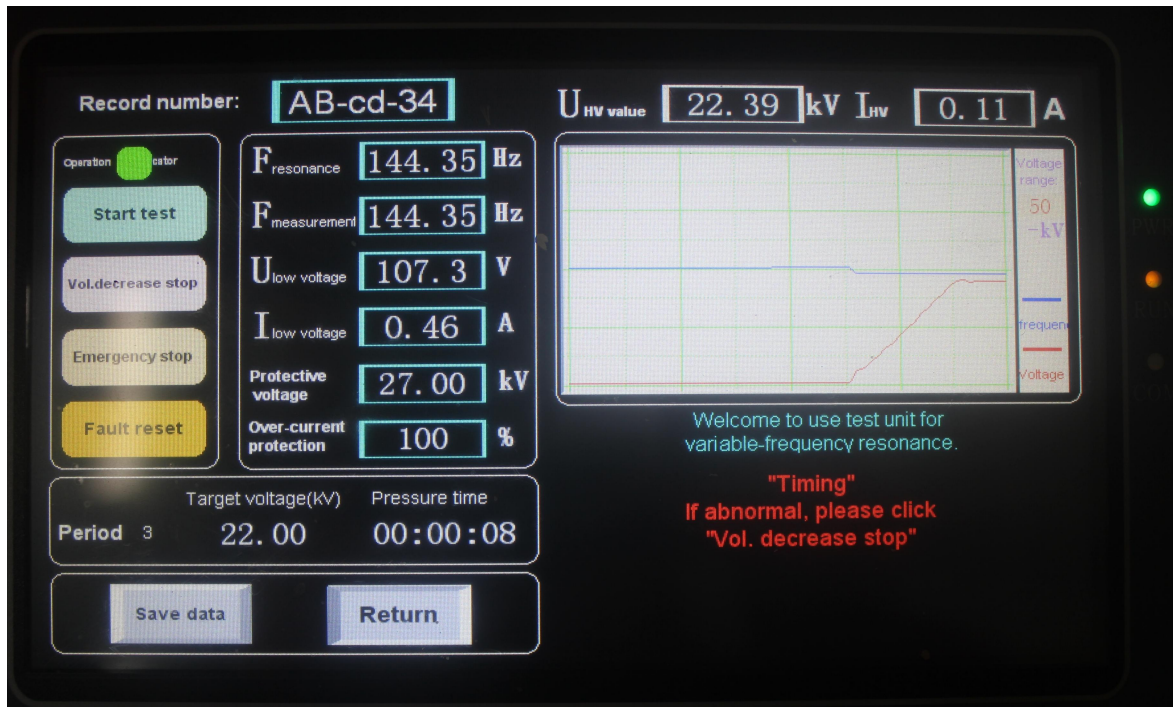


Figure 8

Voltage descending:

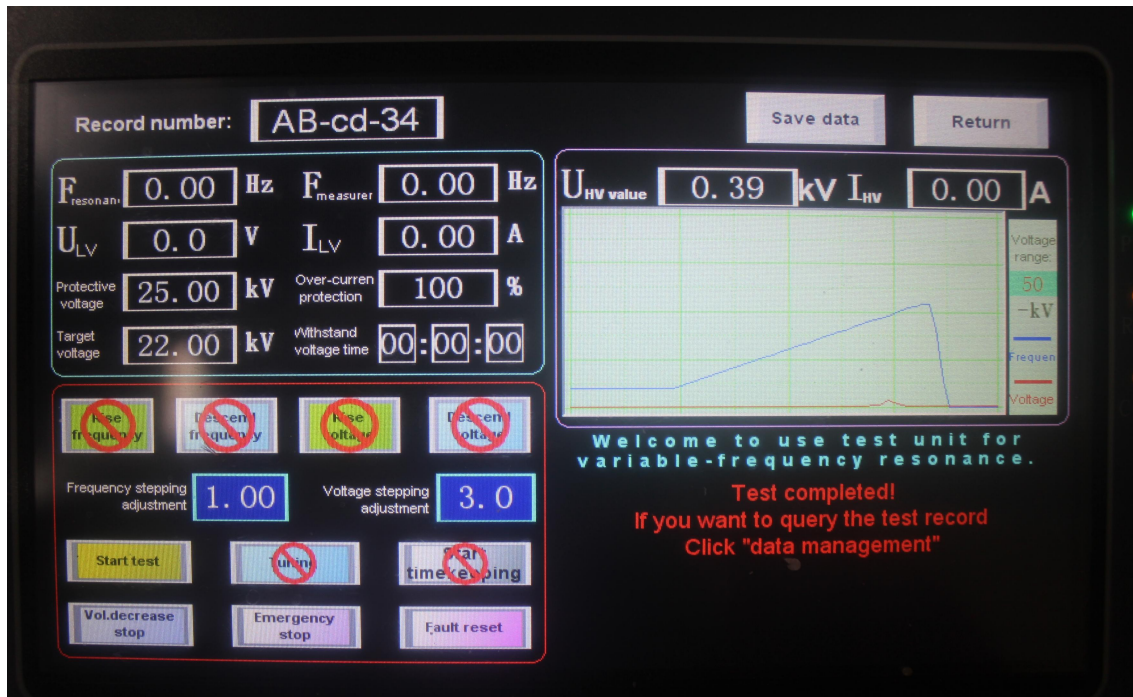


Figure 9

If there is some protective action during the test, there will be related interfaces shown in Figure 10 and 11.

Over-voltage protection:

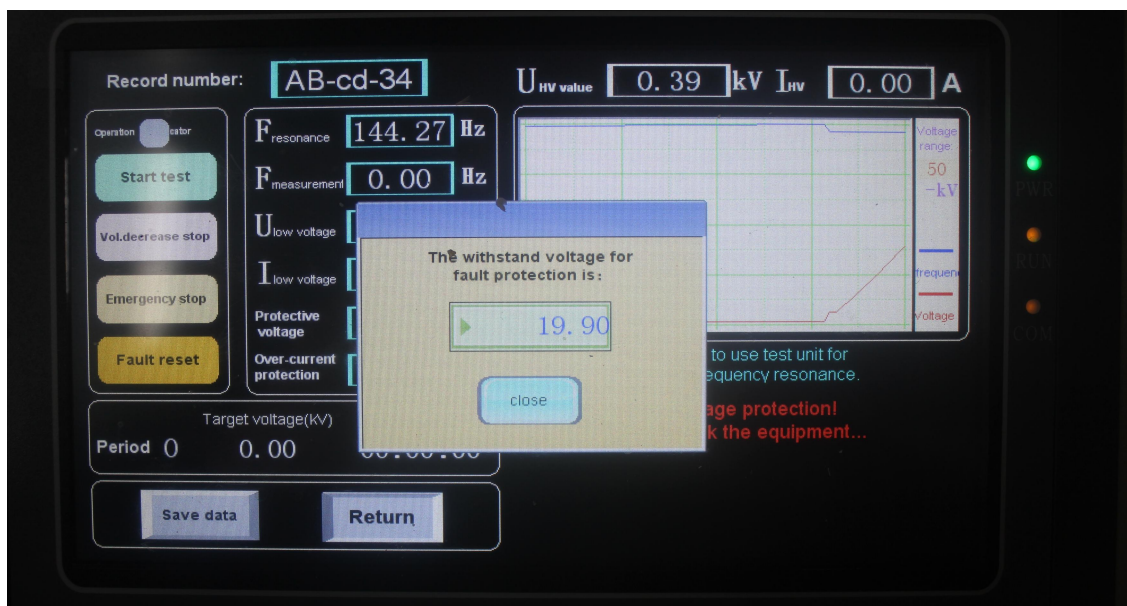


Figure 10

Flashover protection:

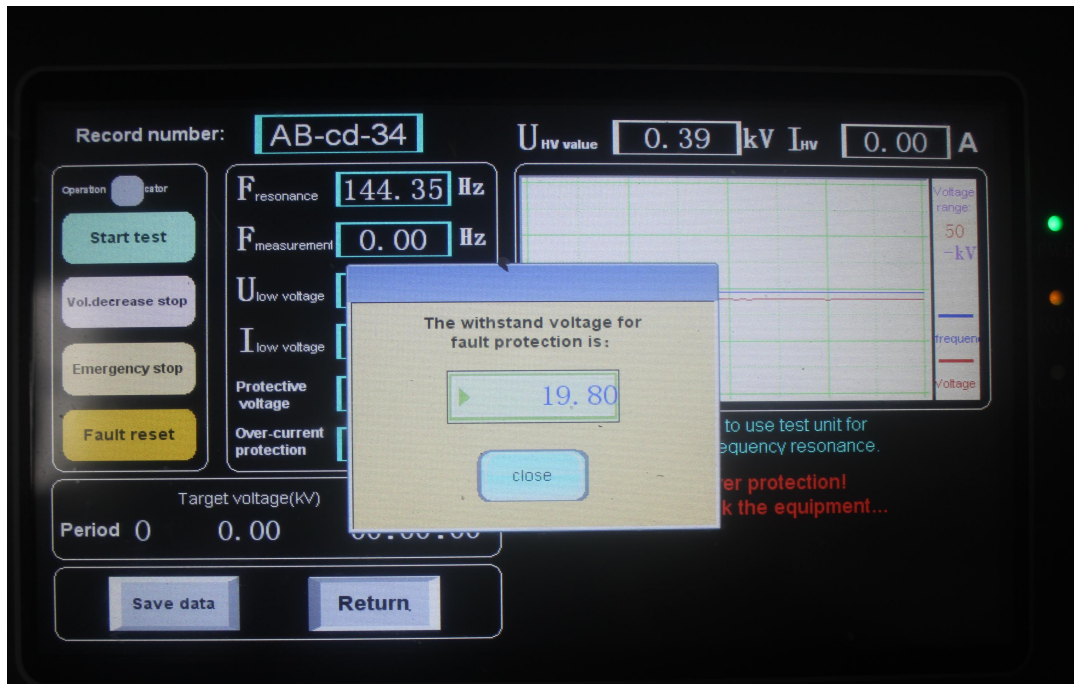


Figure 11

5.2 Manual Test/Semi-automatic Test

Click “Manual test” after entering into the interface of Figure 2 or 4; Click “Start test” after entering into the interface of Figure 12. Then, the manual/ semi-automatic frequency modulation and manual voltage rising can be carried out.

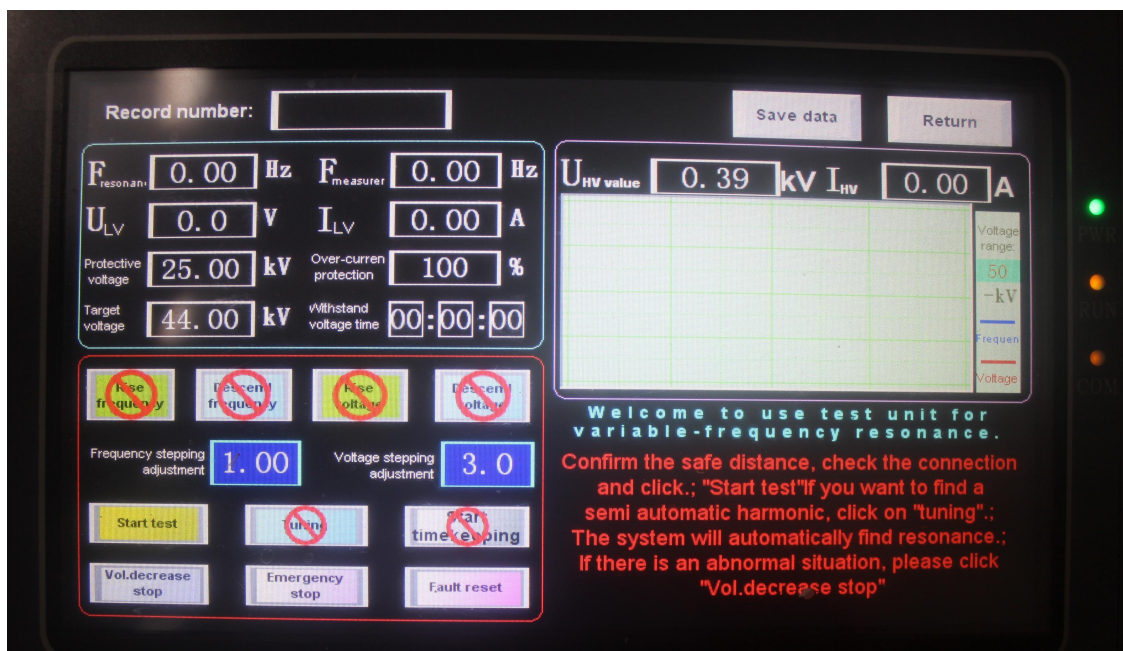


Figure 12

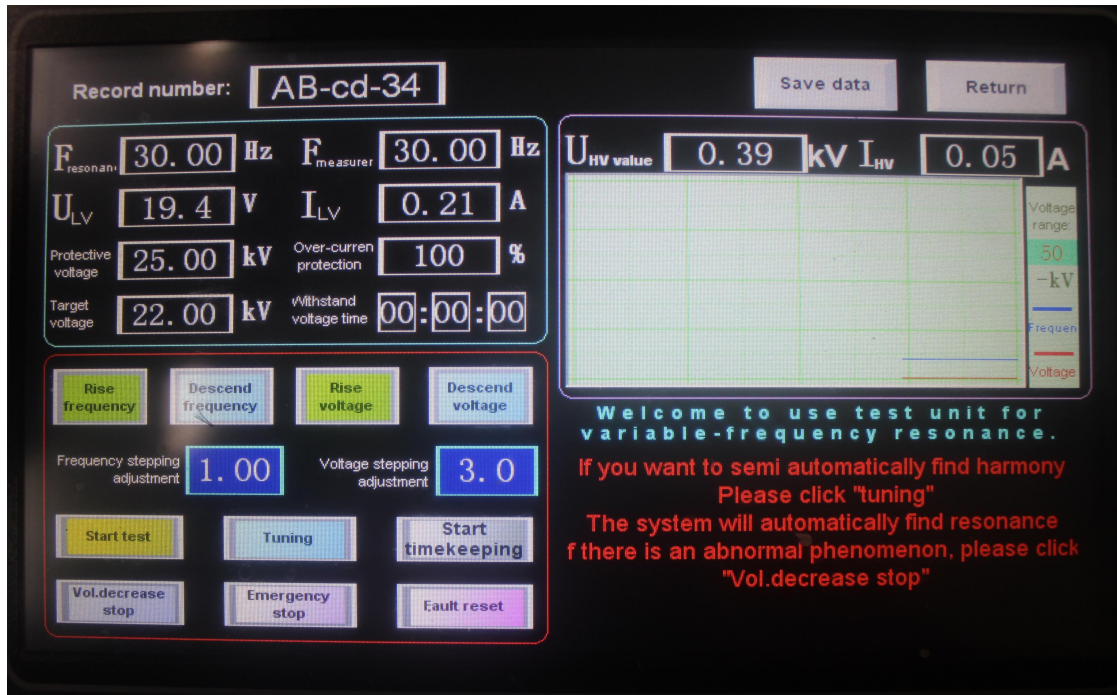


Figure 13

Semi-automatic test: the automatic tuning will be carried out by clicking “Tuning”; Rise voltage manually by clicking “Rise voltage” and “Descend voltage” after finishing tuning. Notice: the “Frequency stepping adjustment” and “Voltage stepping adjustment” should be set in advance before clicking “Tuning”, or the tuning will not be carried out automatically.

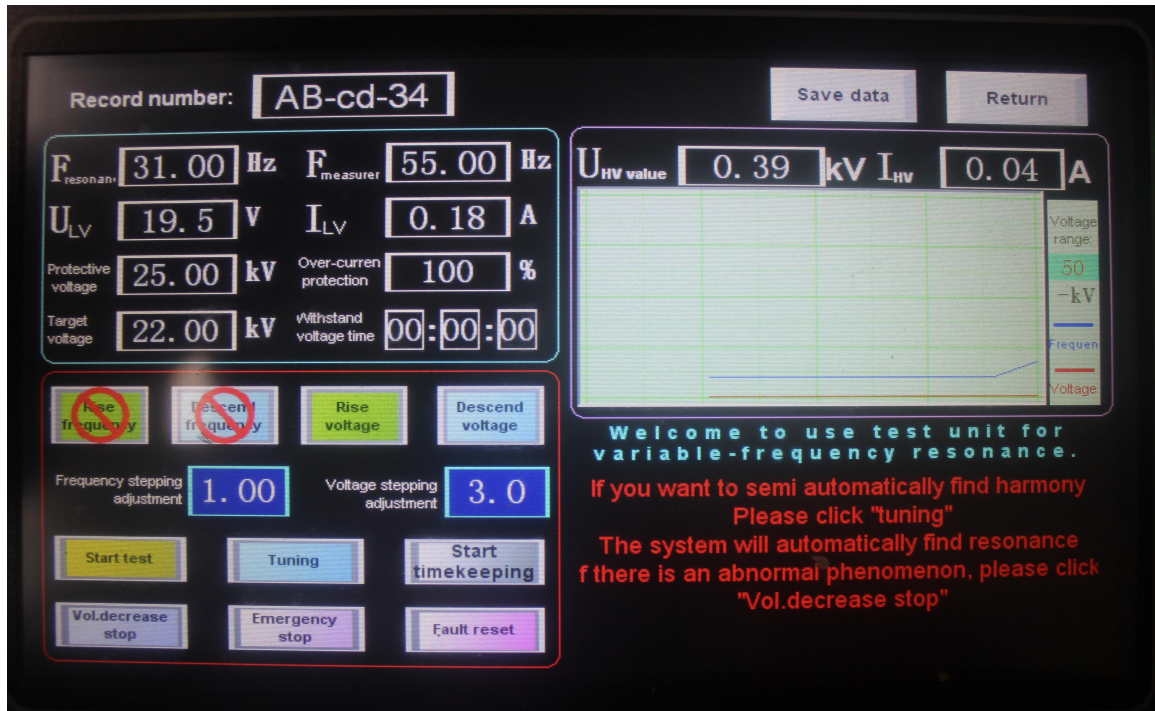


Figure 14

Manual test: the manual tuning will be carried out by clicking “Rise frequency” and “Descend frequency”; Rise voltage manually by clicking “Rise voltage” and “Descend voltage” after finishing tuning. Notice: the “Frequency stepping adjustment” and “Voltage stepping adjustment” should be set in advance before clicking “Rise frequency”, “Descend frequency”, “Rise voltage” and “Descend voltage”; or the “Rise frequency”, “Descend frequency”, “Rise voltage” or “Descend voltage” shall not be clicked.

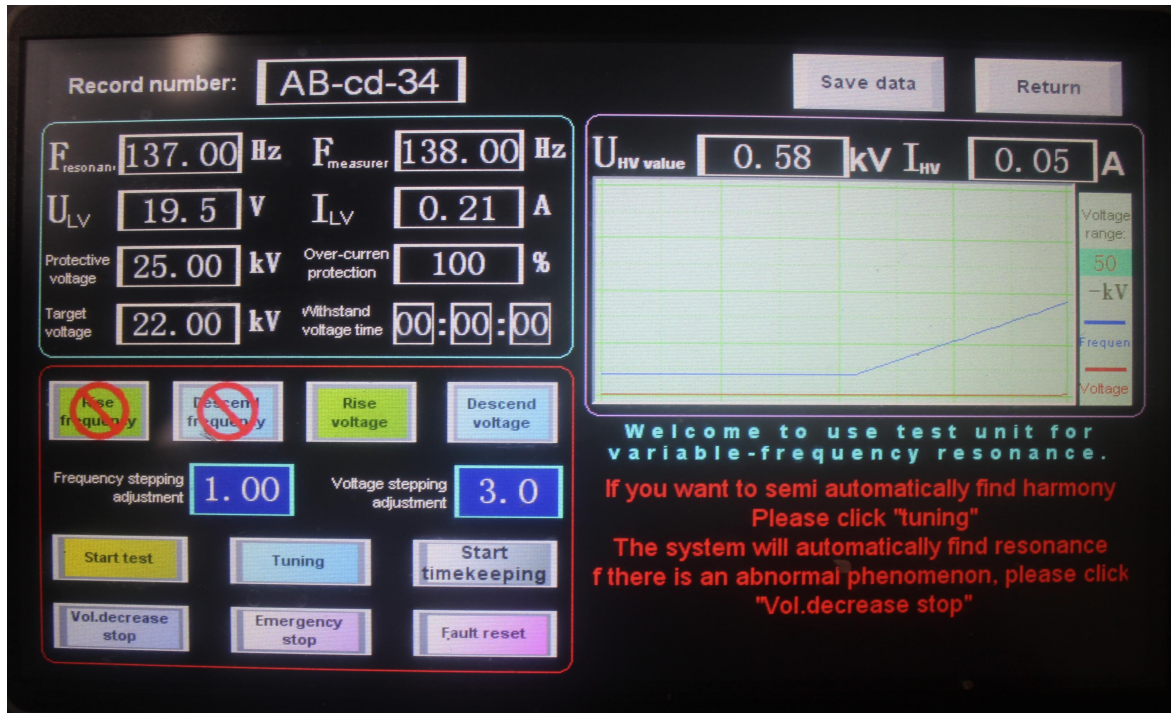


Figure 15

5.3 Data inquiry and output test result

Enter material interface by clicking “**File management**” after entering into the interface of Figure 2; then records for all previous tests can be consulted, shown in Figure 16.

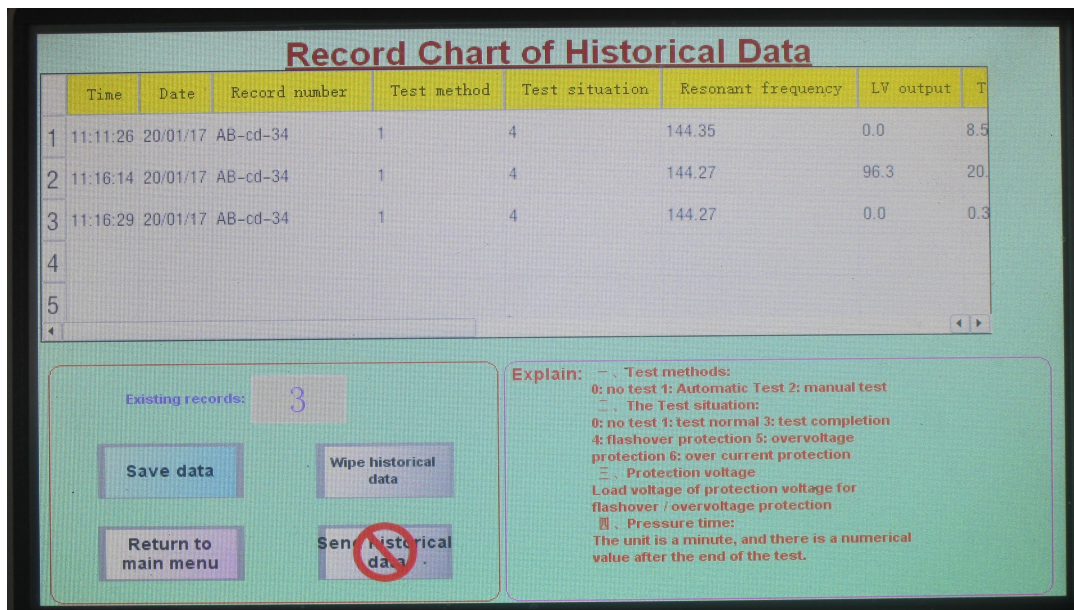


Figure 16

The test value can be saved only by clicking “Save data” in automatic test or manual test. The real-time data shall not be saved for not clicking “Save data”. After inserting U flash disk into USB interface, the historical data can be saved in U flash disk by pulling out of U flash disk after 1 min after clicking “Send historical data”. The historical data can be generated into “Excel” file on computer through the self-programmed software of our company.

Chapter VI Common Trouble Shooting

6.1 Universal notes

1. This test equipment should be operated by professional high-voltage testers. Please read the operation instruction carefully and carry out repeated operation trainings before using it.
2. The number of operators shall be no less than 2. Operators should strictly abide by safety operation regulations relating to high-voltage test of our company before using the equipment.
3. In addition to getting familiar with the instruction book for this product, the test must be strictly operated according to related national standards and regulations.
4. Various connection wires shall not be connected improperly, or it will damage test devices.
5. As the output voltage in using this unit is high voltage or super-high voltage, it should be earthed reliably and pay more attention to operation security.

6.2 Common fault causes and troubleshooting

1. The fan cannot be started:

- 1) The “Fault reset” is not pressed after emergency stop, fault protection and detuning protection;
- 2) The internal temperature is too high; the power element is of thermal protection;

Removal method: turn off power supply of the equipment; place the equipment still for about 30 minutes; restart the power supply; restart the equipment by pressing “Reset” on equipment’s panel.

Please contact the manufacturer if the fan still cannot be started. The equipment shall not be disassembled!

2. The automatic tuning cannot be completed and the resonance point cannot be found.

Phenomenon:

The tuning curve is a fully straight line. The equipment prompts that there is not any resonance point after finishing tuning.

Reason:

The loop earthing is bad and the test loop is connected falsely. Some device of the unit is of open circuit.

Elimination methods:

- 1) Check whether the earthing device is reliable or not and whether there is some breakage on the earthing connection line;
- 2) Check the on-off of high-voltage and low-voltage coils for exciting transformer;
- 3) Check the on-off of each reactor;
- 4) Check the on-off of single line for voltage divider;
- 5) Check the on-off of high-voltage/ low-voltage capacitance arm for voltage divider;
- 6) Check the on-off of compensation capacitor if there is not resonance point for voltage rising of the unit itself;

Please contact the manufacturer if there still is not any resonance point under the condition that all parts are normal. The instrument shall not be disassembled!

3. The voltage cannot be increased to test voltage.**Phenomenon:**

- 1) The tuning curve is a straight line with lower peak;
- 2) The primary voltage is higher, while the high voltage is lower in the test;
- 3) The primary voltage has reached rated voltage and the voltage descends automatically for loop even when the high voltage has not reached test voltage.

Reason:

- 1) The reactor does not match with the capacitance of test object. The resonance point is not found exactly;
- 2) The loss of test object is higher, while the Q value is too low;
- 3) The output voltage of high voltage for exciting transformer is lower;
- 4) The high-voltage connection line is too long or the high-voltage corona prevention line is not adopted.

Elimination methods:

- 1) Put the compensation capacitor back to test loop and increase the loop capacitance;
- 2) Try to connect as many reactors as possible in series and increase the loop capacitance;
- 3) Increase the output voltage of exciting transformer;

- 4) Carry out a drying treatment to test object to improve the insulation strength of test object and reduce the power loss of loop;
- 5) The high-voltage corona prevention line should be adopted for higher voltage output for equipment in general; or change the common high-voltage output line to shorter connection line, which should be no more than 5 meters in general.

Please contact the manufacturer if the problem is still not dealt with after all treatments. The instrument shall not be disassembled.

Chapter VII Resonant system capacity selection

Test current: $I=2\pi fCU\times 10^{-3}$ (A)

Frequency selection (HZ)

1. Generator---50HZ, select 50HZ
2. Transformer---45~65HZ, select 45~65HZ
3. GIS, switch, bus---30~300HZ, select 45HZ
4. Power cable: 30~300HZ, select 35HZ

Voltage selection (KV)

The maximum test voltage should be determined as per regulations' requirements.

Capacitance selection (uf)

The maximum capacitance should be determined according to test object.

Maximum capacity of the unit: $P=UI\times 1.25$ (KVA)

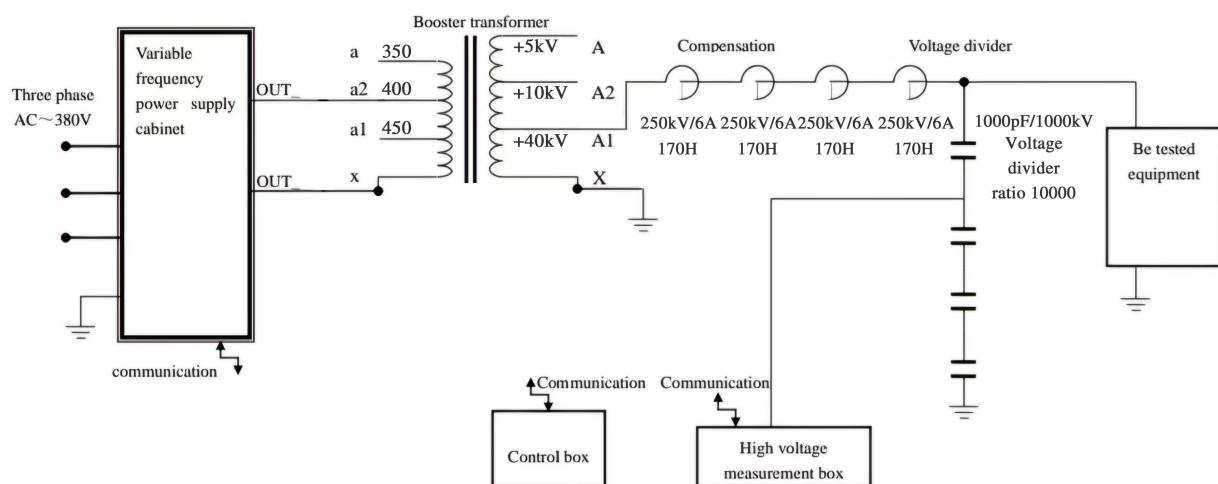
Chapter VIII Packing List

Serial No.	Equipment Name	Model and Specification	Unit	Quantity	Remark
1	Variable frequency power supply	ZCVF-240KW/380V	Set	1	
2	Excitation transformer	JLB-240kVA/5/10/40kV/0.35/0.4/0.45kV/0.4kV	Set	1	
3	High voltage reactor	DK-1500kVA/250kV	Set	4	
4	Capacitive voltage divider	FRC-1000kV/1000pF	Set	1	Including Aluminium case
Accessories					
5	Power input line	95mm ² *5m	Pcs	3	Black
6	Power output line	95mm ² *3m	Pcs	2	Black
7	Excitation variable high pressure silicone wire	60kV*10m	pc	1	red
8	Ground wire	6mm ² *10m	pc	1	Flat copper wire
9	Ground wire	6mm ² *5m	pcs	4	Flat copper wire

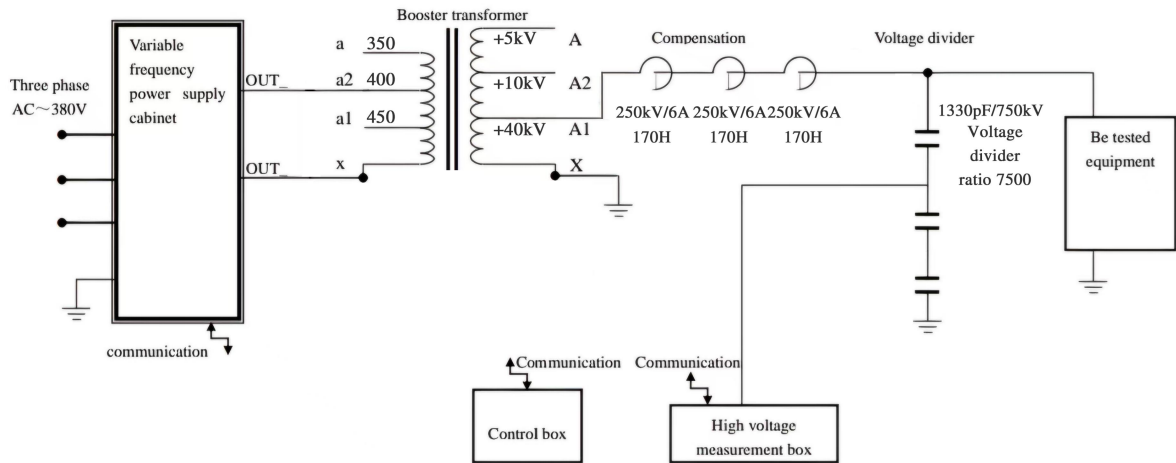
10	Reactor series connect line	10mm2*1m	pcs	4	red
11	Reactor Parallel connect line	10mm2*2m	pcs	8	red
12	Signal line	30m	pc	1	black
13	Reactor top ring	φ2200*500	set	1	
14	Divider top ring	φ2200*600	set	1	
15	Reactor waist ring	φ1505*200	pcs	7	
16	Voltage divider waist ring	φ1400*400	pc	1	
17	Voltage divider waist ring	φ1150*310	pc	1	
18	Reactor Bracket		set	1	including Support bar 8pcs
19	Voltage divider bracket		set	1	including Support bar 8pcs
20	Voltage divider pull rope	750kv	pcs	4	
21	Voltage divider pull rope	1000kv	pcs	4	
22	hose	Φ600*15m	pcs	2	
23	hose	Φ600*8m	pcs	2	

24	Lifting pole		pcs	6	
25	Lifting rope		pcs	2	
26	Shackle		pcs	6	
27	sensor		pcs	2	Free spare parts
28	Switching power supply		pcs	2	Free spare parts
29	Display screen		pcs	2	Free spare parts
30	Signal line		pcs	2	Free spare parts
31	Reactor connection rod		pcs	16	Free spare parts

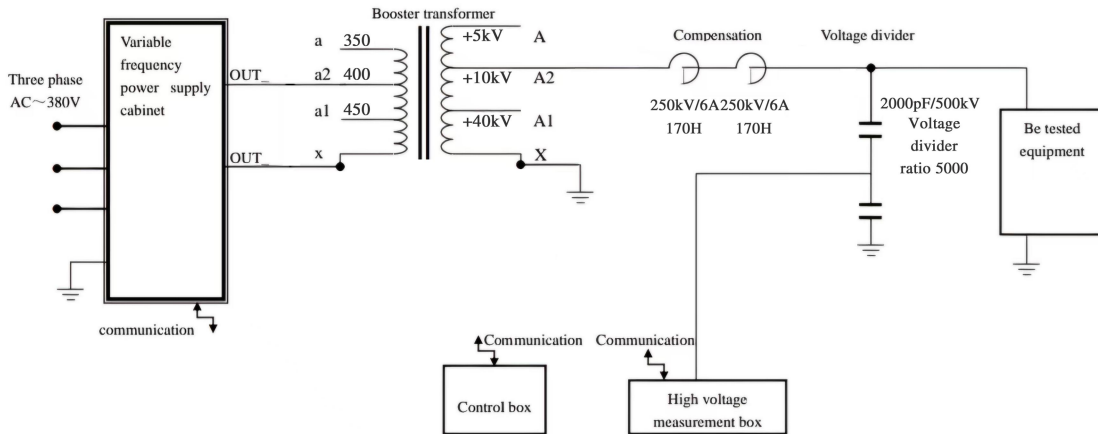
Chapter IX Equipment Wiring Diagram

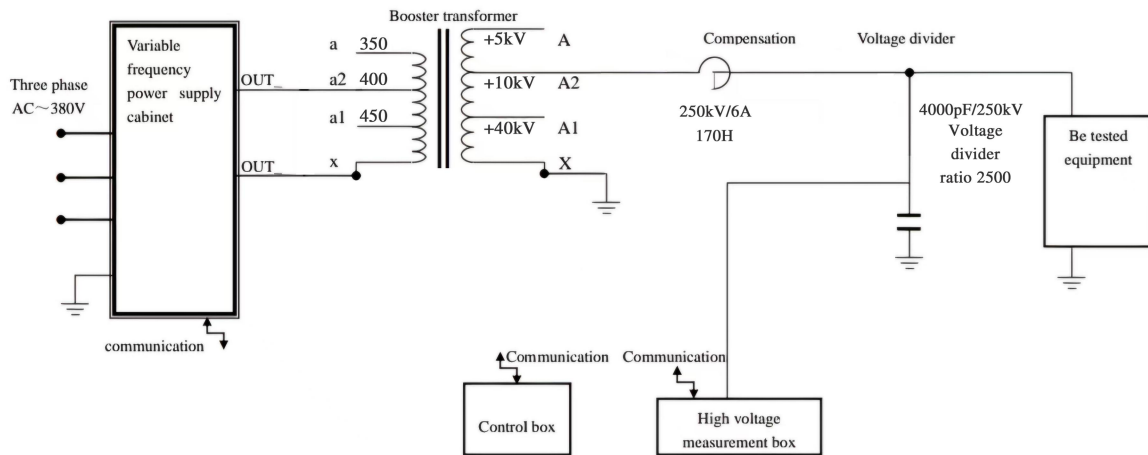


Four Reactors four dividers in series diagram

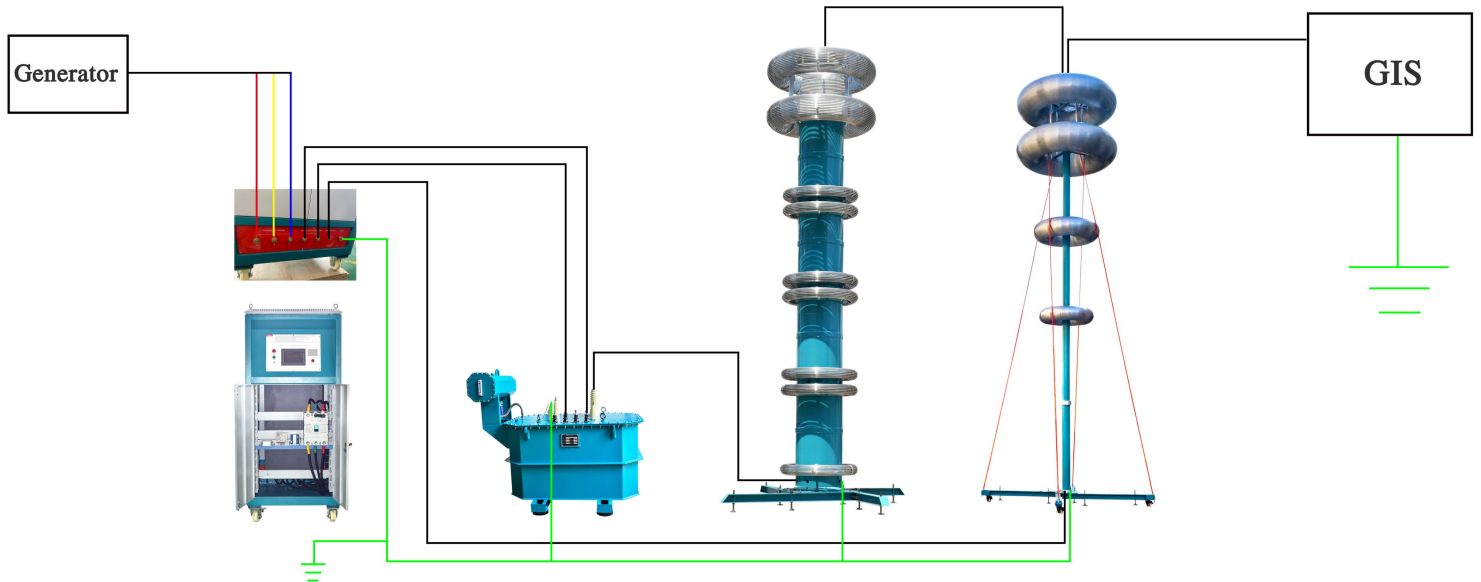


Three Reactors three dividers in series diagram





One reactor one divider diagram



Equipment wiring diagram

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