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ZC-206 Transformer Winding Deformation Tester (SFRA)

User Manual V2.0



❖KVTESTER ELECTRONICS TECHNOLOGY CO., LTD.❖

Dear Customers,

Thank you for purchasing our ZC-206 Transformer Winding Deformation Tester (SFRA) . Before you use the product for the first time, please carefully read this Manual which can help you skillfully use the Tester.



Our aim is to improve our products continuously, so that the product you use may be a little bit different from the Manual. In case of any changes, we will inform you in the attached sheets! Thanks for your understanding. If anything is unclear, please contact the After-Sale Service Department in our company, and we will certainly meet your requirements.



Since the I/O terminal, testing column and etc. may carry voltage, electric spark may be produced when you insert and unplug the test lead, power socket and etc.. Please do be careful of electric shock and avoid hazards. Pay attention to your personal safety!

Prudent Warranty

For the products manufactured by our Company, if the defects appear within one year from the date of delivery, we can provide free services and repairs; if the defects appear more than one year after delivery, we can provide life-long paid maintenance services.

◆ Safety Requirements

Please carefully read the following safety precautions so as to avoid personal injury and prevent the product or any other products connected thereto from being damaged. In order to avoid the possible dangers, the product can only operate within a specified range.

Only the qualified technicians can implement the maintenance.

— Prevent Fire or Personal Injury

Use appropriate power cables. Only the dedicated power cables which conform to the specifications of the product can be used.

Correct connection and disconnection. When the test lead is connected to the charged terminal, please don't connect or disconnect the test lead at will.

Earth the product. In addition to be earthed using the power line, the earthing rod on the shell of this product must also be earthed. In order to prevent electric shock, the earthing conductor must be connected to the ground. Before the connection to the input or output terminal of the product, please make sure that the product has been properly earthed.

Pay attention to the rated values of all terminals. In order to prevent fire or electric shock, please pay attention to all the rated values and marks of the product. Before the connection, please read this Manual so as to gain more insight into the information on rated values.

Never operate the product without an instrument cover. If the cover or panel has been removed, never operate the product.

Use appropriate fuses. Use the fuses of the type and rated value specified for the product.

Avoid touching the exposed circuits or charged metal. When the product is electrified, never touch the exposed contacts or parts.

In case of suspected failure, never operate the product. If you suspect the product is damaged, please contact the maintenance personnel for examination and never operate the product.

Never operate the product in a humid environment.

Never operate the product in an explosive environment.

Keep the surface of the product clean and dry.

— Safety Terminology

Warning: Warning messages indicate the conditions or practices that may cause loss of life or personal injury.

Caution: Caution messages indicate the conditions or practices that may cause the damages to the product or other properties.

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I. Preface

Transformer Winding Deformation Tester based on the measurement of the windings characteristic parameters inside the transformer, the tester using the world's developed countries sound internal fault frequency response analysis (FRA) method, able to make an accurate internal transformer fault judgment.

After the completion of the design and manufacture transformers, coils and its internal structure to be finalized, therefore a transformer coil winding, if the voltage level, method of winding are the same, each coil corresponding parameters (Ci, Li) is determined. Thus the frequency domain response characteristics of each coil also will determine, among the corresponding three-phase coil has a comparable frequency spectrum.

It occurs inter-turn, phase short circuit during the test or collision during transport, causing the coil relative displacement, and during operation under short circuit and fault conditions due to the tension caused by the electromagnetic, coil is deformed, it will make the distribution parameters of the transformer windings changes. Thus influent and change the existing frequency domain transformer frequency response feature, that frequency response amplitude changes occur and resonance frequency shift, etc. Transformer Winding Deformation Tester applies to the internal structure of fault detection 63kV ~ 500kV power transformers.

II. Instrument function

FRA quantization process transformer internal winding parameters response changes in the different frequency domain, according to the value of the change magnitude, frequency response magnitude change, regional and response trends, to judge the transformer internal windings degree of change, in turn, can determine whether the transformer has been severely damaged, need to overhaul measurement.

For the running transformer, regardless of whether there is a saved frequency domain feature picture in the past, by comparison the difference between fingerprints of fault transformer coil can also judge the degree of fault. Of course, if you save a set of transformer windings original

characteristic graph easier for the operation of transformers, maintenance and inspection after the accident analysis and provide a strong basis more accurate.

Test data automatic analysis system, horizontal compare the similarity of A,B ,C, the results as below:

① conformance is very good

② conformance is good

③ conformance is bad

④ conformance is very bad

Vertical compare A-A、B-B、C-C, obtain the original data to compare the winding deformation with the test data in the same phase, the results as below:

①normal

②slight deformation

③moderate deformation

④serious deformation

III. Products features

(1) Hardware cassette mechanism adopts DDS (from America), can correctly detect the breakdown: distortion, swell, shift, tilt, inter-turn short circuit deformation and contacting short circuit inter-phase.

(2) High-speed, dual channel, 16-bit A/D sampling (the wave from curve will change obviously if change the tapping switch during the field tests), use precision, high stability components, the same phase repeat test, measurement repetition rate >99.5%.

(3) The device with two measurement system: linear scan and sectional scan.

(4) In the process of testing, only the connecting bus of the transformer needs to be dismantled, and the transformer is not required to be suspended and disassembled.

(5) When the transformer is measured, the signal input and output leads arbitrarily connect, which has no influence on the measurement results. The wiring personnel can stay on the transformer oil tank, and do not have to go down and lighten the labor intensity.

⑹ The amplitude frequency characteristics conform to the national technical index of the amplitude frequency characteristic tester. The abscissa (frequency) has: linear division and logarithmic, so the printed curve can be either a linear graduation curve or a logarithmic graduation curve, and the user can choose it according to actual needs.

⑺ The software can adjust the output signal range, the maximum amplitude peak ± 10V, auto adjust sample frequency.

⑻ The instrument has kinds of frequency linear sweep frequency measurement system measurement function. The linear scan frequency measurement max frequency is 2MHz. The frequency scanning interval are 0.25kHz, 0.5kHz and 1kHz, providing more analysis for transformer deformation.

⑼ To provide historical curve comparison and analysis, multiple historical curves can be loaded at the same time, and any curve can be selected for transverse and longitudinal analysis. Equipped with expert intelligent diagnosis system, it can automatically diagnose the state of transformer windings, load 6 curves at the same time, automatically calculate the relevant parameters of each curve, diagnose the deformation of windings automatically, and give the diagnostic conclusions.

⑽ The software management is powerful, fully considering the needs of on-site use, and automatically preserving environmental condition parameters, so as to provide basis for transformer winding deformation diagnosis. The measurement data is automatically analyzed, and the electronic document (Word) is saved, and it has the function of color printing to facilitate the user to produce the test report.

IV. Technical parameters

⑴ Scanning mode

① Linear scan measurement range: (1kHz) - (2MHz).

② Sectional scan measurement range: (0.5kHz)-(1MHz)

(0.5kHz)-(10kHz) (10kHz)-(100kHz)

(100kHz)-(500kHz) (500kHz)-(1000kHz)

(2) Amplitude measurement range: (-100dB)～(+20dB).

(3) Amplitude measurement accuracy: +20dB～-60dB ±1dB

-60dB～-100dB ±2dB

(4) Scan frequency accuracy: 0.01%.

(5) Signal input impedance: 1MΩ.

(6) Signal output impedance: 50Ω.

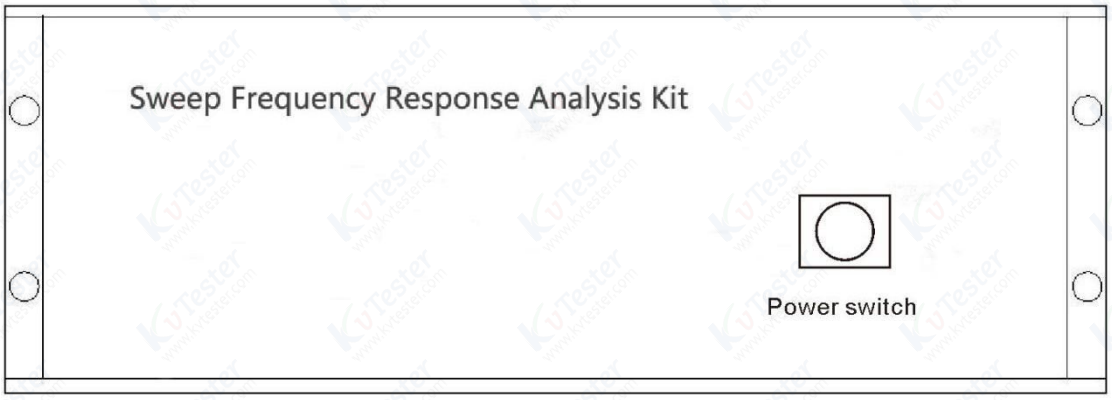
(7) Co-phase repetitive rate: 99.5%.

(8) Instrument dimension: 300*340*120mm.

(9) Device box dimension: 310*400*330mm.

(10) Weight: 10KG.

V. Panel layout



Picture 1 Front panel



Picture 2 Rear panel

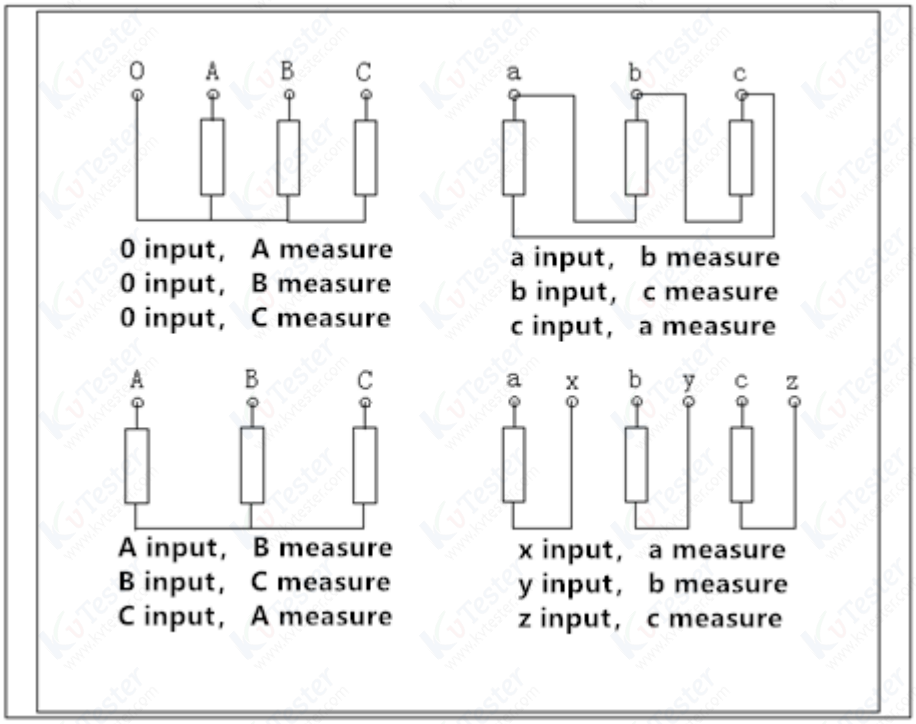
(1) A hidden fuse in a power outlet.

(2) USB connects notebook laptop.

(3) Measuring signal port: the color of the K9 outlet is in accordance with the color of the external standard of the measuring cable, please connect according the color.

VI. Instrument wiring guidance

1. Overview of the wire connection mode



Picture 3

The commonly used transformer detection wiring mode is shown in picture 3. The SFRA is mainly composed by host and a laptop. It consists of three measuring cables, measuring clamp and grounding wire.

The samples and the host uses 50 Ω high frequency coaxial cable connection, the sweep frequency signal by the output port (excitation output), signal clip (yellow) inject the signal to the sample by connecting cable; signal measuring clip (green) gets the signal from the sample, transmission through cable to (response input); To obtain the synchronous reference signal

from the injection point of the test product by the signal measurement, and transmit it through the cable to the input (reference input). The shielding layer of the test case and the test cable must be reliably connected and well grounded. The large transformer usually uses the connecting point of the iron core grounding casing and the oil tank as the common grounding point, and the transformer shell is grounded.

2. Three phase Yn measurement connection

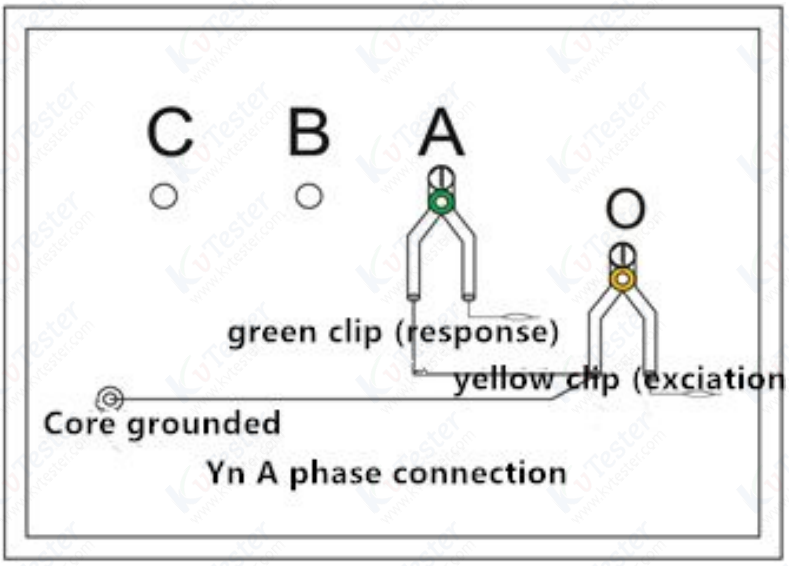
2.1 A phase measurement connection

2.1.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

2.1.2 The yellow clip is defined as the input, clamp at the 'O' point of Yn, the green clip is defined as the measurement, and clamp at the A phase.

2.1.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

2.1.4 The wiring of the above connection completes the A phase connection of the three-phase Yn, as in picture 4.



Picture 4

2.2 B phase measurement connection

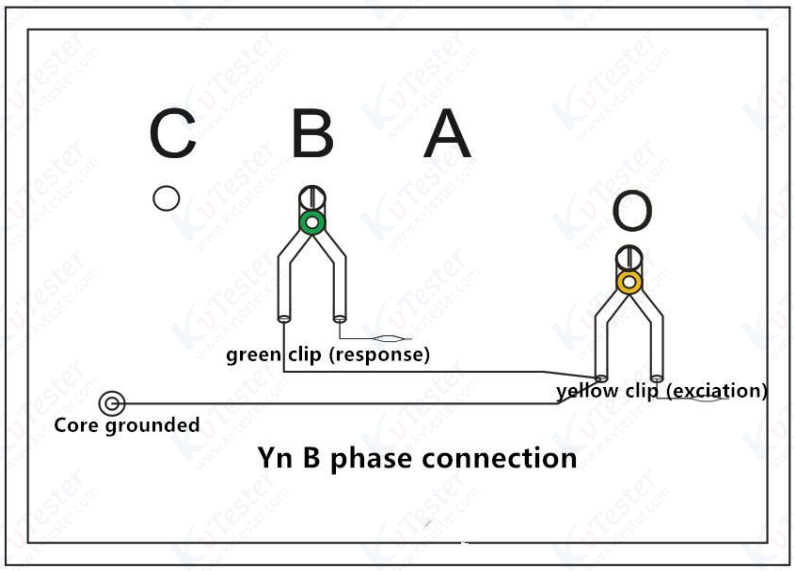
2.2.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

2.2.2 The yellow clip is defined as the input, clamp at the 'O' point of Yn, the green clip is

defined as the measurement, and clamp at the B phase.

2.2.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

2.2.4 The wiring of the above connection completes the B phase connection of the three-phase Yn, as in picture 5.



Picture 5

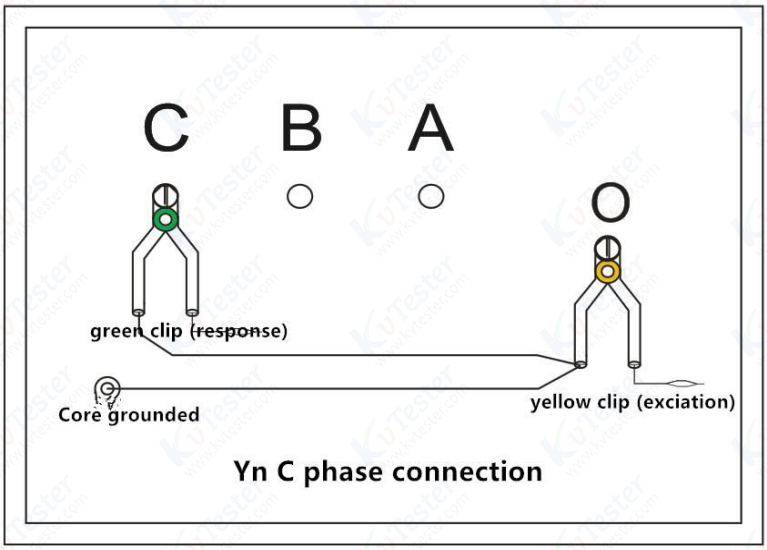
2.3 C phase measurement connection

2.3.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

2.3.2 The yellow clip is defined as the input, clamp at the 'O' point of Yn, the green clip is defined as the measurement, and clamp at the C phase.

2.3.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

2.3.4 The wiring of the above connection completes the C phase connection of the three-phase Yn, as in picture 6.



Picture 6

3. Three phase Y measurement connection

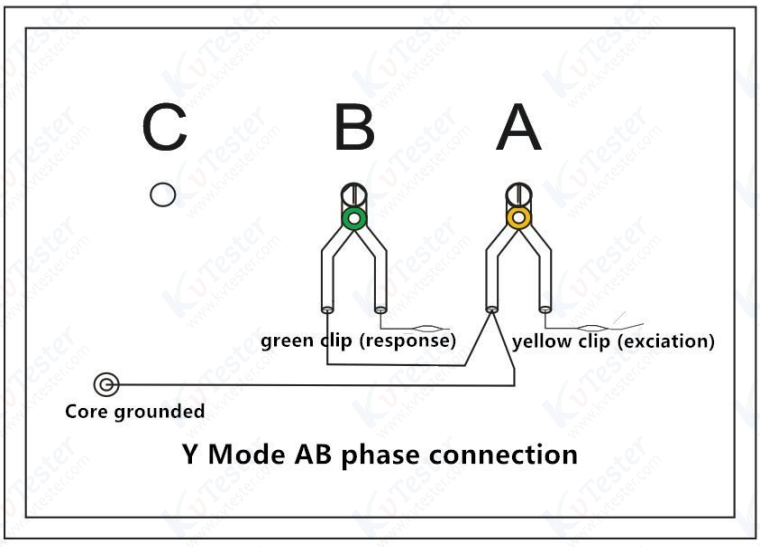
3.1 AB phase measurement connection

3.1.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

3.1.2 The yellow clip is defined as the input, clamp to the phase A of Y, the green clip is defined as measurement, and clamp to the B phase.

3.1.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

3.1.4 The wiring of the above connection completes the AB phase connection of the three-phase Y, as in picture 7.



Picture 7

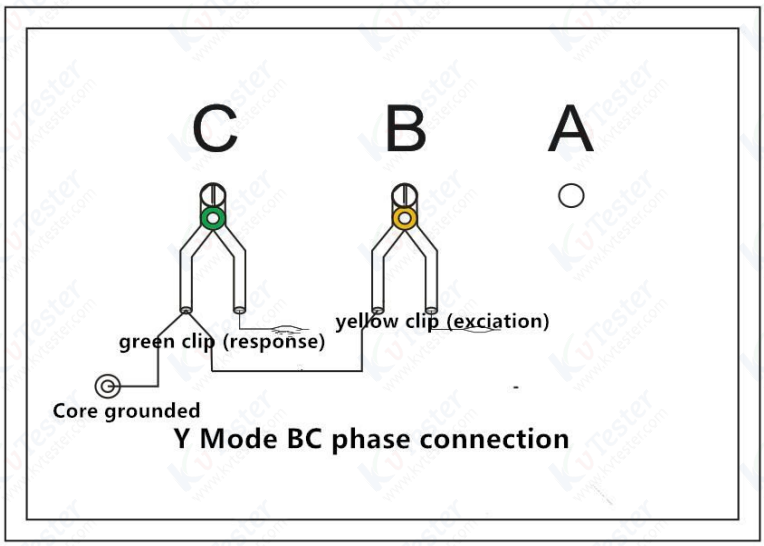
3.2 BC phase measurement connection

3.2.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

3.2.2 The yellow clip is defined as the input, clamp to the phase B of Y, the green clip is defined as measurement, and clamp to the C phase.

3.2.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

3.2.4 The wiring of the above connection completes the BC phase connection of the three-phase Y, as in picture 8.



Picture 8

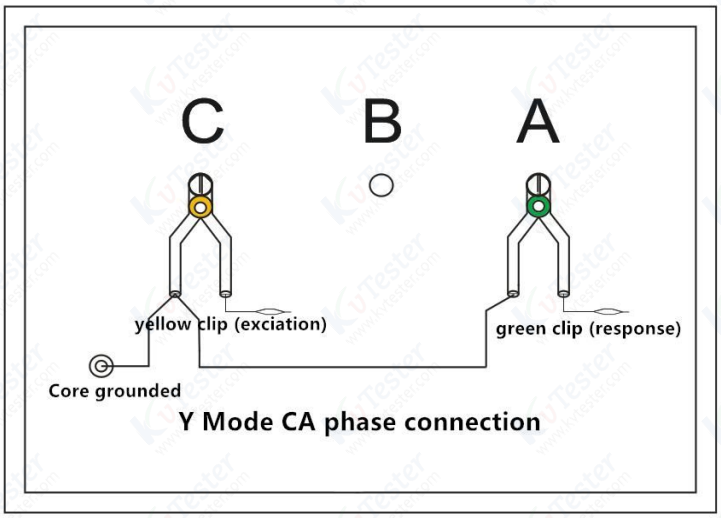
3.3 CA phase measurement connection

3.3.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

3.3.2 The yellow clip is defined as the input, clamp to the phase C of Y, the green clip is defined as measurement, and clamp to the A phase.

3.2.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

3.2.4 The wiring of the above connection completes the CA phase connection of the three-phase Y, as in picture 9.



Picture 9

4. Three-phase △ measuring connection

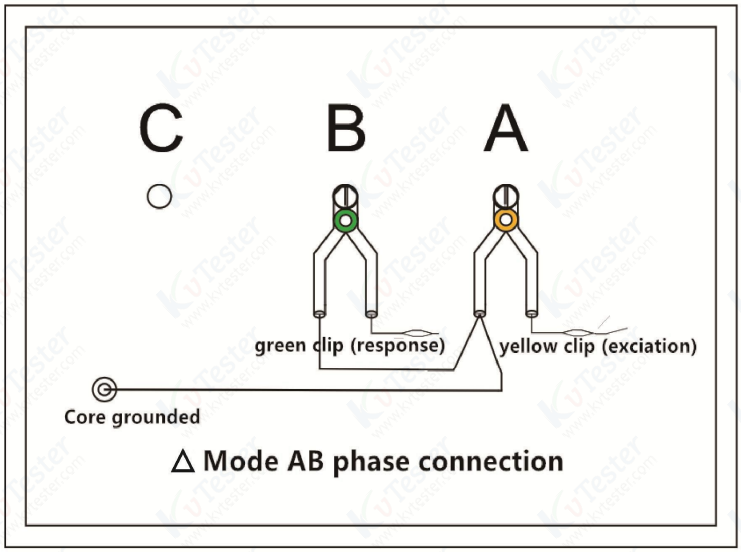
4.1 AB phase measurement connection

4.1.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

4.1.2 The yellow clip is defined as the input, clamp to the phase A of △, the green clip is defined as measurement, and clamp to the B phase.

4.1.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

4.1.4 The wiring of the above connection completes the AB phase connection of the three-phase △, as in picture 10.



Picture 10

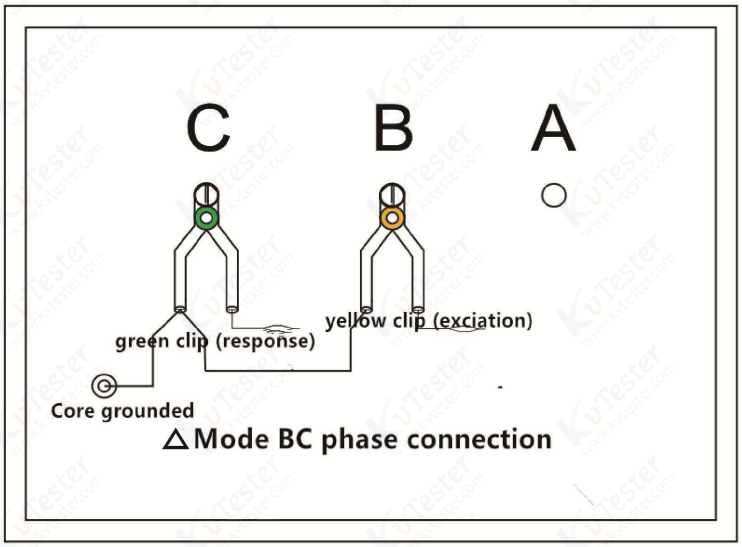
4.2 BC phase measurement connection

4.2.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

4.2.2 The yellow clip is defined as the input, clamp to the phase B of △, the green clip is defined as measurement, and clamp to the C phase.

4.2.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

4.2.4 The wiring of the above connection completes the BC phase connection of the three-phase △, as in picture 11.



Picture 11

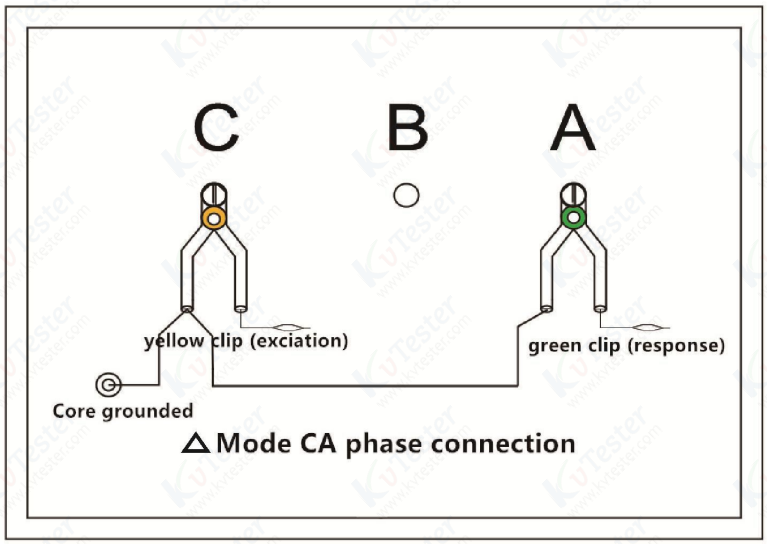
4.3 CA phase measurement connection

4.3.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

4.3.2 The yellow clip is defined as the input, clamp to the phase C of △, the green clip is defined as measurement, and clamp to the A phase.

4.3.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

4.3.4 The wiring of the above connection completes the CA phase connection of the three-phase △, as in picture 12.



Picture 12

5. Single phase X, Y, Z measurement connection

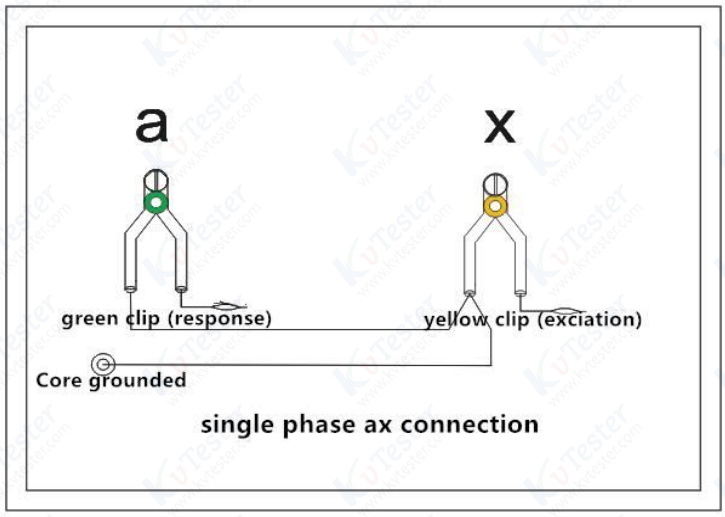
5.1 single phase X measurement connection

5.1.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

5.1.2 The yellow clip is defined as the input, clamp to the single-phase x, the green clip is defined as measurement, and clamp to the a.

5.1.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

5.1.4 The wiring of the above connection completes the single-phase X connection, as in picture 13.



Picture 13

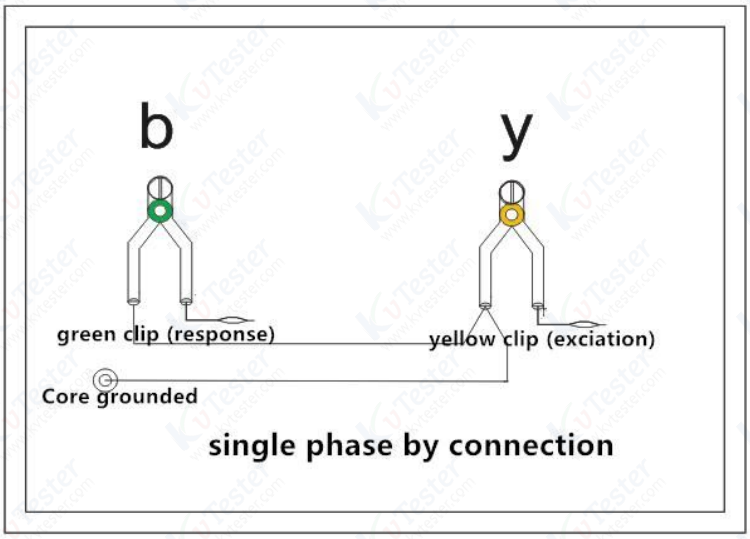
5.2 single phase Y measurement connection

5.2.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

5.2.2 The yellow clip is defined as the input, clamp to the single-phase y, the green clip is defined as measurement, and clamp to the b.

5.2.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

5.2.4 The wiring of the above connection completes the single-phase Y connection, as in picture 14.



Picture 14

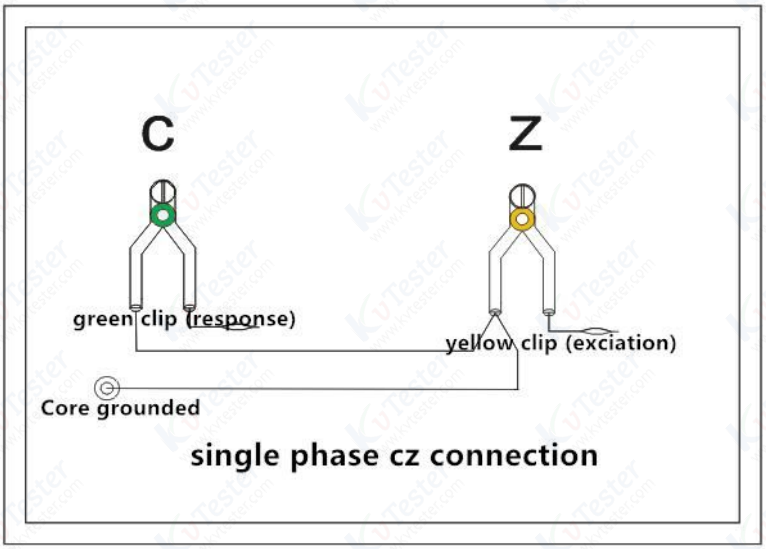
5.3 single phase Z measurement connection

5.3.1 The measurement system is grounded with one point, and the core of the transformer is grounded.

5.3.2 The yellow clip is defined as the input, clamp to the single-phase z, the green clip is defined as measurement, and clamp to the c.

5.3.3 The ground line connection network is in turn inserted from the green clip ground line hole to the yellow clip ground line hole, and then connects one ground line to the iron core.

5.3.4 The wiring of the above connection completes the single-phase z connection, as in picture 15.



Picture 15

Attentions:

The instrument should be preheated for 15 minutes before test. If the temperature is lower in winter, the preheating time should be lengthened properly to ensure the normal measurement of the instrument.

Pay attention to the grounding line strictly according to the schematic diagram. Especially, the ground clamp of the response signal must be connected by the connecting line with the ground clamp of the excitation signal, then the grounding wire of the excitation signal is connected with the core of the iron to ensure the correct direction of the signal current.

VII. Software installation instruction

1. Introduction of software environment and U-disk file

1.1 Brief introduction of software function

This supporting software is an important test tool for the instrument host on the computer. It can be used after copy all the contents of the disc to the local computer, so that the test personnel can further analyze and measure the measured data.

1.2 Features of software

Support 2 - dimensional display and 3 - dimensional display random switching.

One key automatically analyzes test results and generates WORD reports.

Support all Windows series operating systems, fast running, easy to use.

1.3 Operating environment

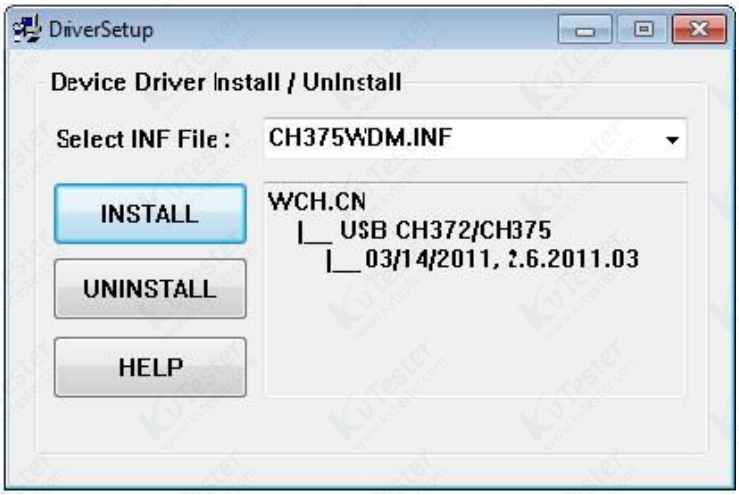
The hardware requirements: it is recommended to use CPU Celeron 533 or above, 512MB memory or above, 1GB hard disk space or above.

Supporting software: Win98, Win2000, XP, Win2003, Vista, Win7, Win8, and other Windows. Microsoft Office 2000 or above (must include Excel, Word).

2. USB drive installation

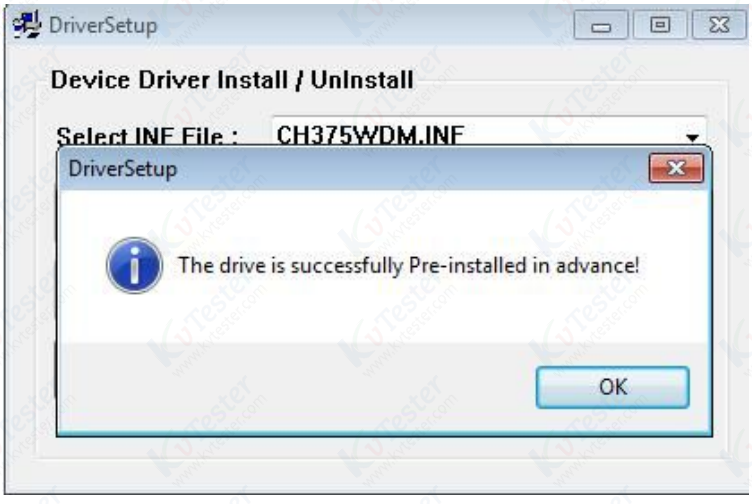
2.1 confirm that the power of the tester is on. After the USB connection is correct, locate the "CH372" folder in the random U-disk. After double click and open the folder, double click to run "CH372DRV.EXE".

2.2 After running, click "Install", such as picture 16.



Picture 16

2.3 complete the installation as picture 17.



Picture 17

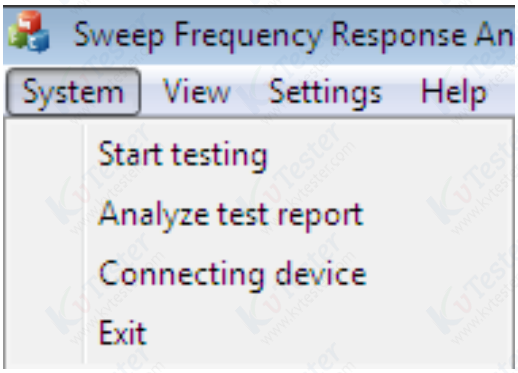
VIII. Software operation instruction

All operations except the wiring of the instrument are done on the computer. After checking the wiring is correct, start the computer power switch. After the normal operation of the computer, restart the main control unit, and the power indicator lamp should be displayed normally. If we only analyze the measured data, no need connects and start the main control measurement unit, and only start the computer. After the computer starts, we double-click the host computer icon to enter the host computer software.

1. Menu bar

Enter into the test software, the top left is the menu bar, and there are four drop-down menus: "system", "view", "Settings" and "help", such as picture18. The following are the specific functions of each menu.

1.1 System



Picture 18

1.1.1 **Began to measure**, began transformer test. However, some parameters need to be set before starting test, it is recommended to start the testing process generally in the measurement area (hereinafter described in detail).

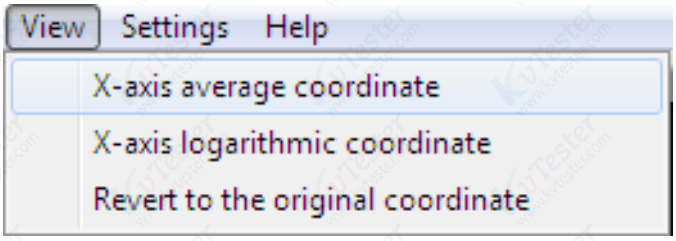
1.1.2 **Analysis the test report**, according to the test curve of current data, show the detailed test report, but the generally before report analysis need to analyzer the analyzed curve and display mode, so that the general curve in the analysis area (explained below) in the display process analysis report.

1.1.3 **Connection device**, if the USB line is not connected when the software is running, the project can be reconnected by selecting this item to confirm that the USB line has been connected and the test instrument has been electrified. It is recommended to run this software

after confirming that the USB line has been connected and the test instrument has been electrified.

1.1.4 **Exit system**, you can choose this project to leave after use.

1.2 View



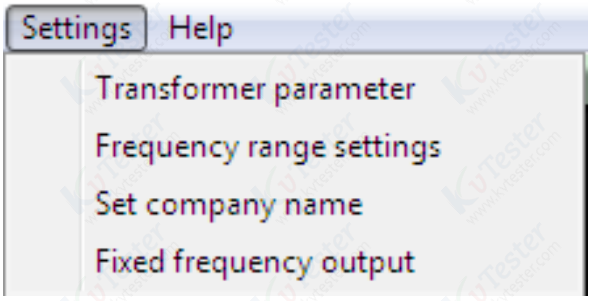
Picture 19

1.2.1 **X axis coordinate system**, the axis X of current test curve and the historical curves frequency in linear increase, at this time, the different frequency segment details can be observed.

1.2.2 **X axis logarithmic coordinate system**, the axis X of current test curve and the historical curves frequency in logarithmic increase at this time the observable curve is in the low frequency section detail.

1.2.3 **Restored to the original X axis coordinate**, and the curve is restored to the original coordinate system state.

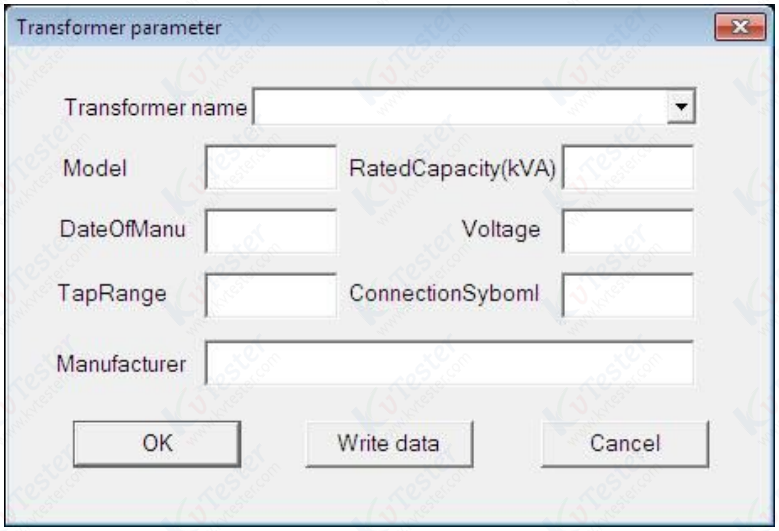
1.3 Setting



Picture 20

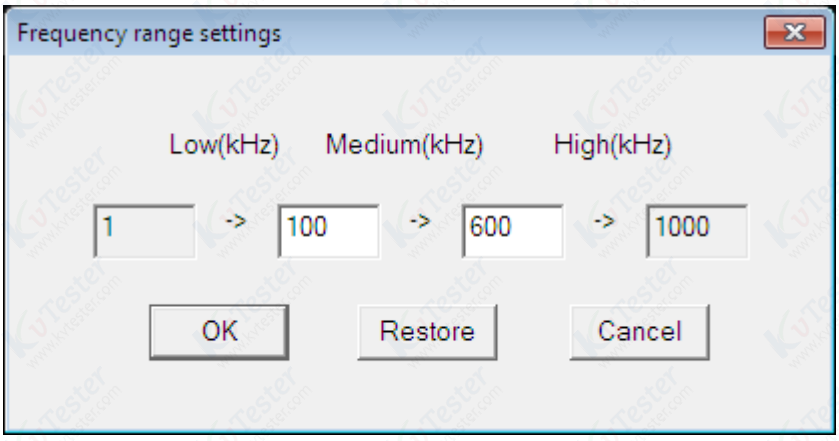
1.3.1 **Set the transformer parameters**, when this item is selected, a dialog box for the parameters of the transformer is opened, such as picture 21. Set the parameters, press "enter" button to save the input data, press "Cancel" to give up the input data, the "write data file" key writes the transformer parameter into the selected history curve file and overwrites the previous transformer parameters. This function is aimed at temporarily setting transformer parameters in

the field test of transformers, and then revising the parameters of the saved transformer after completion of tests.



Picture 21

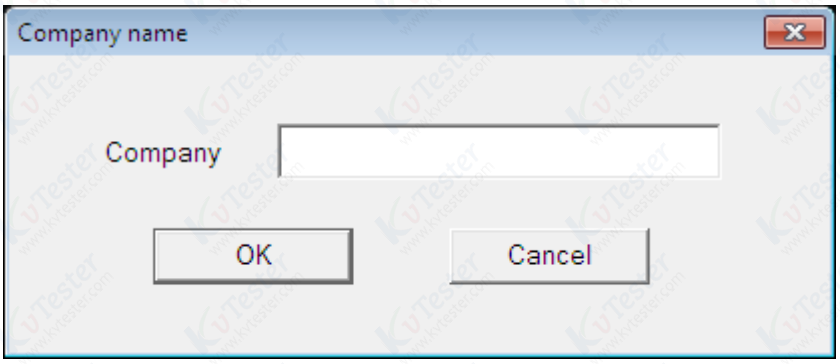
1.3.2 **Band settings**, after selecting this project, will open a dialog box with low frequency, medium and high frequency, such as picture 22. After setting the range of each frequency band, press "enter" button to save the input data, press "Cancel" to give up the input data, and press the reset button to revert to the default frequency band setting. The frequency setting parameters of this project will be reflected only in the print report.



Picture 22

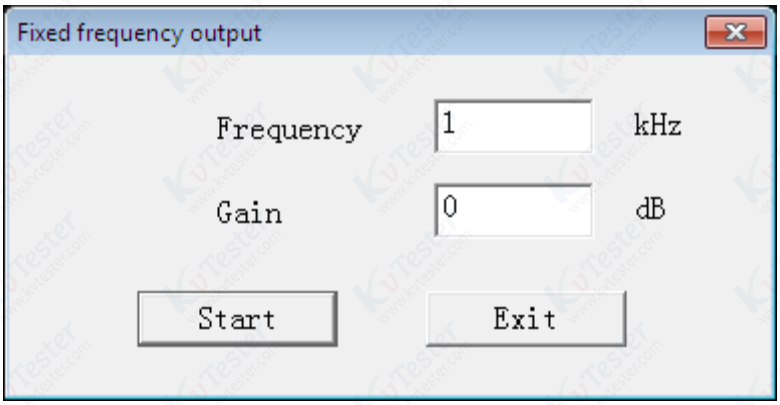
1.3.3 **Set the company name**, when this item is selected, a dialog box is opened for the name of the input unit, such as picture 23. Press the “enter” key to save the input and press the cancel key to give up the input. The unit name for this project is reflected only in the print

report.



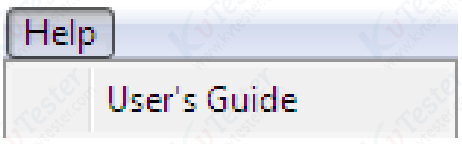
Picture 23

1.3.4 **Fixed frequency output test**, after selecting this item, will open a dialog that requires the input and output frequency, such as picture 24. The selection of "start output" will show the dB value obtained after the output. This function is used to provide an external instrument to detect the accuracy of the frequency and amplitude of the instrument.



Picture 24

1.4 **Help**, you can browse the instruction manuals of SFRA on the computer's.

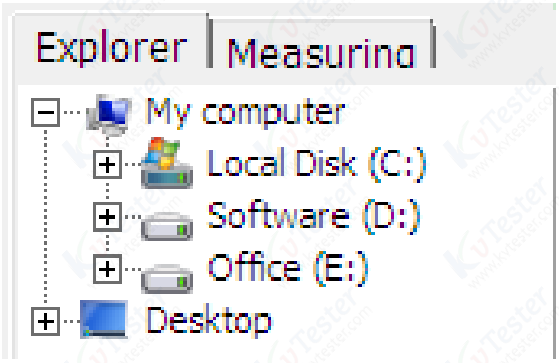


Picture 25

2. Browse

At the bottom of the menu bar, shown in picture 26, browse and measure the area, choose different items, and the content of the area below will change. Select the "Browse" project

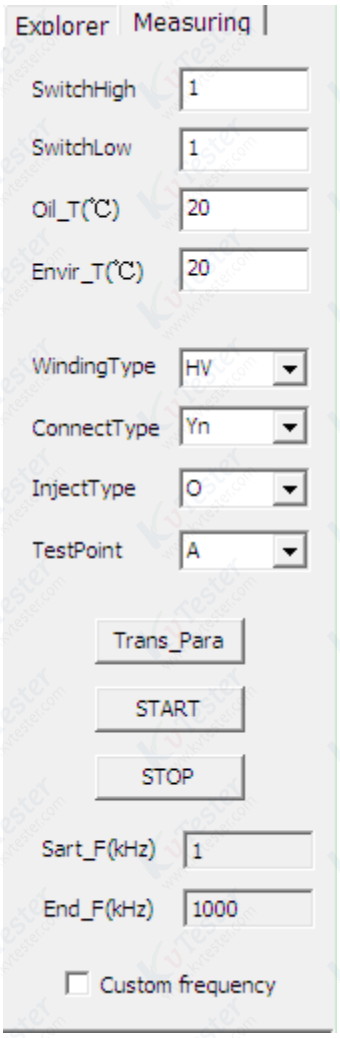
when you look and analyze the curve data file that is completed by the test. At this time, the tree structure of the file system is below, and the saved curve data file can be selected. The specific operation introduction can refer to the software test process.



Picture 26

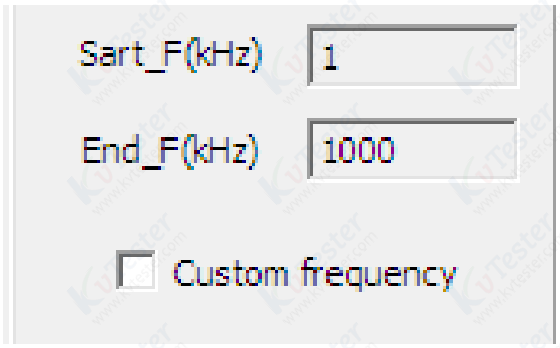
3. Test

When you are ready to test the transformer, choose the "test". Below is the parameter to be entered when measuring the transformer. The transformer parameter is the same with the menu, as shown in picture 27 (Note: if stop measurement during the test, there will be no).



Picture 27

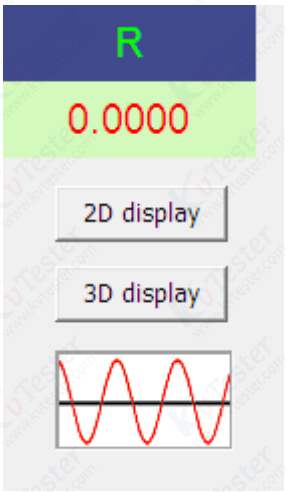
Customized scanning frequency, select "custom scanning frequency", as shown in picture 28, can customize start frequency (start frequency≥ 1KHz) and the end frequency (end frequency ≤2000KHz), range of scanning frequency is 1KHz-2000KHz.



Picture 28

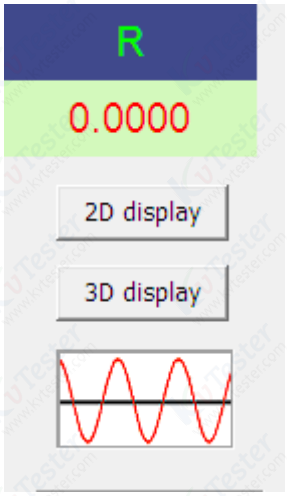
The curvilinear coordinate system, the middle coordinate system is the curvilinear coordinate system, the X axis is the frequency, the Y axis is decibel, the historical curve and the measuring curve are all displayed in this coordinate system.

Two dimensional display, after selecting this project, the current test curve and the view history curve are displayed on the same plane and coincide with the conformance of the curve.



Picture 29

3D display, the current test curve and the history curve are not shown on the same plane. When the consistency of the curve is simultaneously, it will not coincide, and it is more stereoscopic.



Picture 30

4. PC software operation

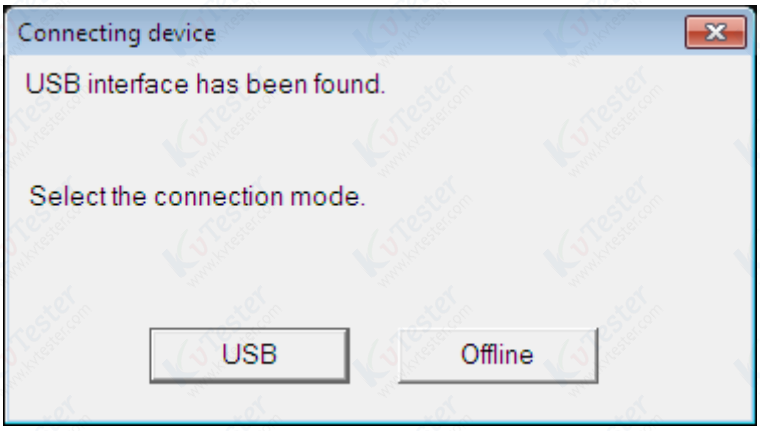
4.1 Device connection

After the test software is finished, and USB driver, wireless Bluetooth driver installation completed, find and double click the test software icon, run the test software.



4.1.1 USB connection

After running the PC software, there is function selection, as shown in picture 31. When the device is power on, USB connected and USB driver is installed, there will be USB connection mode. Equipped Bluetooth wireless communication device and paired successfully, wireless Bluetooth connection can also be selected. (he Bluetooth connection method is introduced in detail in the use of wireless test software, otherwise it will only be selected offline.)



Picture 31

4.2 Start Test

Enter the software and successfully connected host, first click the "test", then click "transformer parameters", select or fill in the new parameters of the tested transformer according prompts, then confirm the of winding, connection, signal inje

ction, signal measuring terminal, HV/LV switch, oil temperature and environmental temperature of transformer. (the system will automatically select the correct signal injection and signal measuring according to the connection type). When the input is completed, click "start test" to measure. As the file name of the deposit is related to the above input information, please fill in the information carefully. If the transformer parameters are not selected, the system refuses to start the measurement.

Note: the content of all the parameters of the transformer cannot contain space or special characters.

After the measurement is completed, the system will automatically select the parameters of the next phase. After the correct wiring is completed, the next phase can be directly measured pressing the "start test". If we modify the measurement parameters artificially and appear the tested phase, the system will remind automatically, which can prevent the measurement process from being missed. During the measurement process, we can choose the historical data curve in the data file analysis and management window, so that we can compare the curves in the test horizontally or vertically, so as to find possible wiring errors, and stop measuring and correcting in time. During the test, the data display window will track the related data, and can also interrupt the measurement at any time. At the end of the measurement, data will be saved, and the data curve will be displayed in the data file analysis and management window. At this time, the next measurement can be carried out.

4.3 Transfers to the data file

Select "Browse", will appear a data file system tree structure, you can double-click the file name, add the required data files to the file enumeration window, (the bottom part of the software interface). When the file of the enumerated window is selected, the curve data contained in it will be displayed in the curvilinear coordinate system, and the curve measurement data will be displayed in the list of data files. (below the software interface). At the bottom of the software interface,

"clear all data" and "clear selected data" are used to remove files in the file en umeration window (the bottom left of the software interface). The selection of the "analysis test report" will show the test of the first three curves in the selected curve data file.

Tansforme...	Model	WindingType	InjectPoint	TestPoint	SwitchHigh	SwitchLow	TestD...	Oil_T	Envir_T	Co...
1	2	LV	O	A	1	1	2019...	20	22.5	Yn...
1	2	LV	O	B	1	1	2019...	20	22.5	Yn...
1	2	LV	O	C	1	1	2019...	20	22.5	Yn...

Picture 32

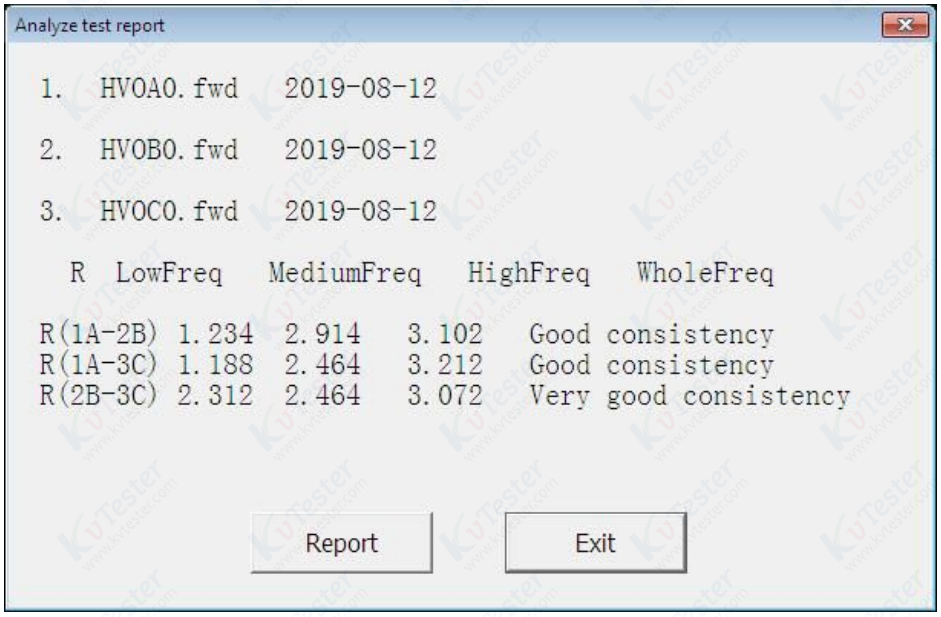
Note: data files with different maximum test frequencies or test frequency steps cannot be transferred together or analyzed together.

4.4 Analysis of data reports

Select the "analysis test report" as picture 33, which will appear as a picture 34 data file report.



Picture 33



Picture 34

On the top of the report, the name of the file and the time to be measured are displayed. In the middle, the correlation coefficients of curves are displayed. They are divided into low frequency, intermediate frequency, high frequency and general conclusions. If the logarithmic coordinate system is chosen, all correlation coefficients are reference numbers, ranging from 0 to 10. The larger the number is, the better the similarity is. If the selection is the average coordinate system, the correlation coefficient of each frequency band is the reference number, the range is between 0 and 10, the larger the number, the better the similarity. The general conclusion will result in different results based on the phase relation of the selection curve. If the two curves are different, according to the correlation coefficient obtained "good agreement" and "consistent" and "poor consistency, consistency is poor" results, if the two curves in phase, according to the correlation coefficient obtained "normal winding", "slight deformation, obvious deformation, severe deformation and other results. Selecting the "output Word report" will generate a test report for a Word document, which can be viewed as a result of the test analysis.

IX. After Sales Service

The tester can be repaired free of charge for any quality defects within one year from the date of delivery. But for quality problems caused by improper operation, or instrument damage caused by improper storage and transportation, our company will only provide the possible repair service, and will charge based on repair cost.

The lifetime repair and technical services will be provided on reasonable charges. For any abnormality or malfunction, please contact our company in time so that we can arrange the most convenient solution.

Appendix. Packing list

Item	Specification	Qty.
1.Host case	310X400X330mm	1
2. Host	DDS scan technology (USA)	1
3. Test cable	High frequency coaxial cable 50/(20m)	1
4. Test clip	Yellow, green	2
5. USB cable	.1.5M	1
6. Power cord	National standard	1
7. Ground wire	5M	2
8. U-disk		1
9.Fuse	0.5A	3
10.Certificate		1
11.Inspection report		1
12.Instruction manual		1

KVTESTER ELECTRONICS TECHNOLOGY CO., LTD.

- Web site: www.kvtester.com
- Address: No.120, Guanggu Road, East Lake New High-tech Development Zone, Wuhan, China
- Email: sales@kvtester.com
- Tel: 0086-27-81778799
- Fax: 0086-27-81778799
- Mobile: 0086-183 0270 5967
- Whatsapp: 0086 183 0270 5967