HTBYC-3000　Transformer Tester Tester

User's Manual

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Contents

Ⅰ、Product Overview

The On-load Switch Characteristic Tester is the only moving part which is connected with the circuit of the transformer, so more and more attention has been paid to the detection of the tester. It is required to check the operation sequence of the tester, measure the switching time, and so on in the " Electrical equipment handover and preventive test procedures ". The instrument is mainly used to measure the transition waveform, the transition time, the transient resistance value, the three-phase synchronization of the transformer tester.

Ⅱ、Function features

- The instrument output current is big, the weight is light;
- Two output current, wider range, higher stability;
- It automatically calculate the transition resistance values and transition time values;
- With perfect protection circuit and high reliability;
- 5.7 inch large LCD display, easy for on-site operation;
- With U disk storage function for storing more data and waveform.
- Independent keyboard and shuttle center operations make the operation more efficient and convenient.

Ⅲ、Technical parameter

Current	1.0A、0.5A
Range	transition resistance：0.5Ω～20Ω(1.0A)、0.5Ω～40Ω(0.5A)
	transition time：2ms～250ms
Precision	transition resistance：±(5%+3)
	transition time：±(0.1%+3)
Storage mode	U disk storage, local storage
Dimension	345mm×295mm×175mm
Weight	5kg

Ⅳ、Operation condition

Temperature	-10℃～50℃
Humidity	≤85%RH
Power supply	AC220V±10%
Frequency	50/60±1Hz

Ⅴ、Panel description

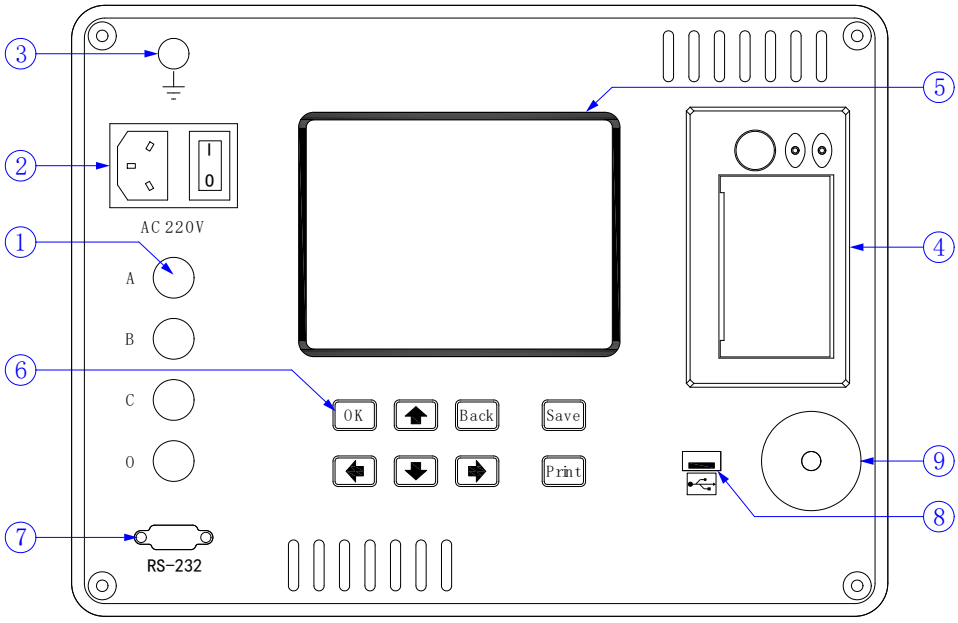


Figure 1 Instrument panel

1.Terminals: Used to connect the test leads (see the following wiring method for specific wiring).

2.AC 220V ： position with power socket, switch and fuse.

3.Grounding terminal: ground terminal of the instrument. The ground terminal of the instrument must be grounded before using.

4.Printer : Thermal printer, printing measurement results.

5.LCD screen: 320×240 dot matrix LCD display, displaying the operation interface.

6.Keyboard: ↑、↓、←、→ button , used to switch between selected options in the interface.
execute the current selection option.
return to the previous interface in any state.
a shortcut key associated with storage operation.
a shortcut key associated with print operation.

7. RS-232： Communication between the instrument and the computer before leaving the factory.

8. U S B : USB device is connected” will display when U disk is inserted , then data can be stored in the U disk.

9.Shuttle center: similar to the keyboard and used to operate the instrument. Rotating the shuttle center is equivalent to the "↑, ↓, ←, →" key, and pressing is to "OK".

Ⅵ、Operation instructions

6.1 Connections

（1） No winding connection method

Respectively connect the yellow, green and red test clamps to the voltage regulating switches X1 (A1), Y1 (B1), Z1 (C1), and short the three terminals of X2(A2)、Y2(B2)、Z2(C2)respectively. The black test clamp is connected to the neutral point. The other end of the test lines are

connected to the corresponding terminals of the instrument. Compared with winding test and no winding test, the former action time is longer, about 3-7 ms. For example: the wiring method of getting the waveform when the moving tap moves from tap 4 to tap 5 in no winding test is shown in Figure 2.

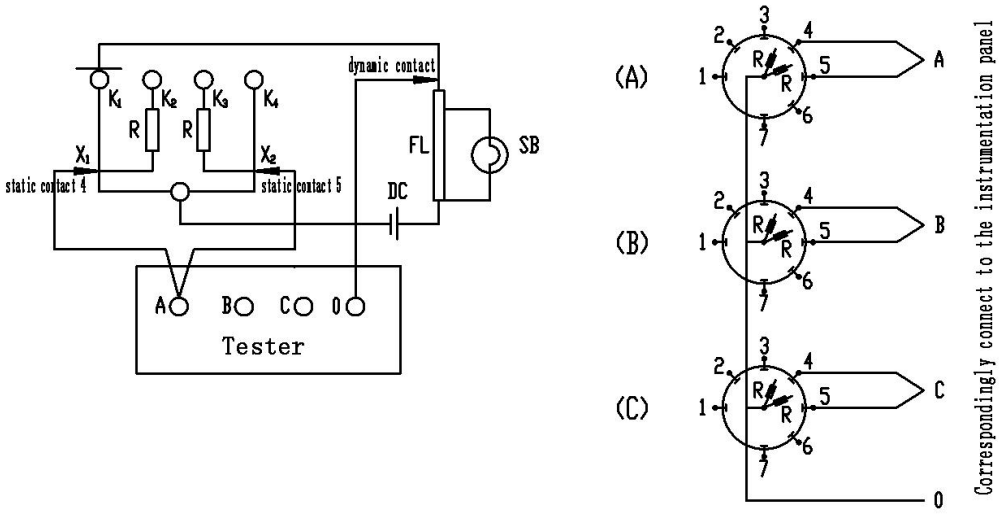


Figure 2

（2） Connection method of transformer with Y type connection and neutral point leads on voltage regulating side

Remove the three phases leads of the test transformer, and short-circuit the non test ends (usually in the middle and low voltage side) with ground. Clip the test clamps of yellow, green, red and black line to the three phases(A, B, C)and neutral point of the casing of the measured transformer voltage regulating side (usually high side). Then respectively connect the other end of these lines to the instrument A, B, C, N terminals. (see figure 3A)

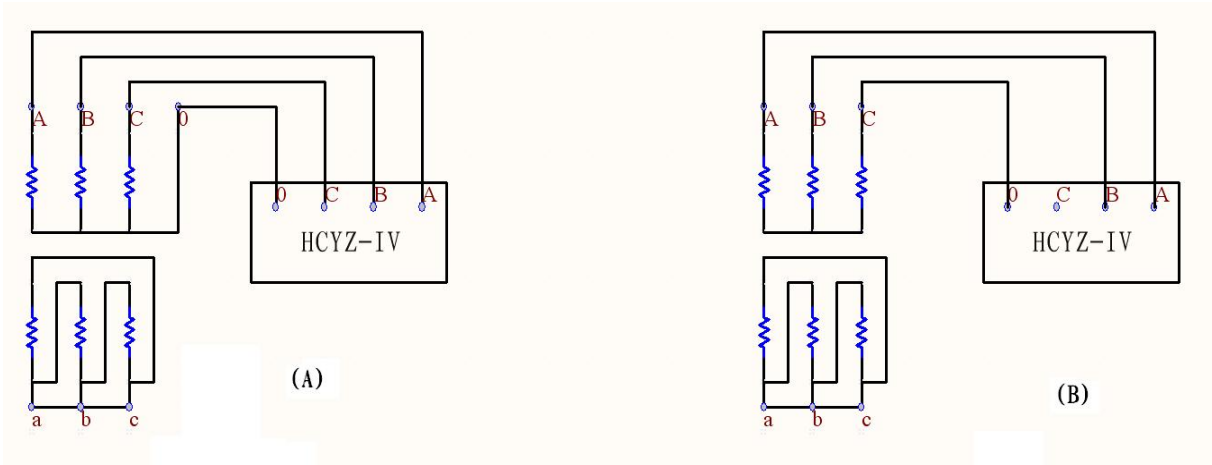


Figure 3

(3)Connection method of transformer with Y type wiring and without neutral point leads on voltage regulating side.

The neutral point of this kind of sample can not be drawn without hanging the cores, so testing on each two phases is needed. For example, test on A and B phase, and take C as the neutral point, whose connection method is shown in figure 3B. The operation steps are same with winding test method, except only two groups of waveform and data display on the LCD screen. The data analysis method is same with that of transformer which has neutral point leads,

but the transition resistance value needs to be converted. Assume the measured value is R’ , and the actual value is R, then R is 1/3R’ in two phase measurement (R equals to 1/2R in single-phase measurement). After A and B have been tested, A can be seen as neutral point to measure B and C, or regard B as a neutral point to measure A and C. The connection method and data analysis are all the same.

（4） The connection method of transformer with Δ type wiring on the voltage regulating side:

Test connection method is shown in figure 3, and the operation procedure and test analysis are similar to that of other transformers, but the transition resistance values need to be converted. Assume the measured value is R’ , and the actual value is R, then R equals to R' in two phase measurement, and R is 2/3 R' in single phase measurement.

6.2 Boot interface

Connect the line, turn on the power supply to the boot interface (see Figure 4).

Press " ↑、↓、←、→" key or rotate the shuttle center to change the selected item. Press the "OK" key or the shuttle center to enter the selected item. Press "SAVE" directly into the data management interface. Parameters and data measurement can be set in the "StartTest" interface , and history data stored in the tester are available in "data management"; instrument time can be set in the "TimeSet". “Calibrate” with a password is used to calibrate the instrument before the factory, and do not use.

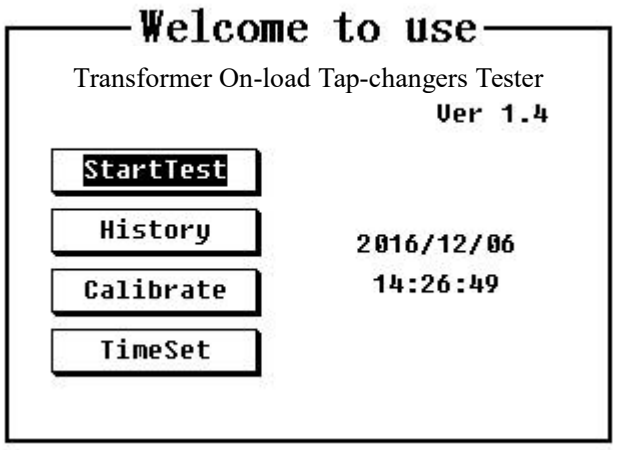


Figure 4 Boot interface

6.3 Parameter set interface

Select the "StartTest" in boot interface to enter measurement parameters set interface, as is shown in Figure 5. The current option is “Start” and press the " ↑、↓、←、→" key or rotate the shuttle center to change the current option. Press the “OK” key or the shuttle to carry out the operation. Parameters in "Current" and "Winding"can be directly modified by the “OK” key. For the "Trigger" and "SeriaNum" option , press the “OK” key is to enter parameter modification mode, in which press" ↑、↓、←、→ "key or the shuttle to modify the parameter values rather than switching interface elements. After parameter modification is completed, press the “OK” key again to exit modification mode, meanwhile press" ↑、↓、←、→ "key or rotate the shuttle to go back switching current selection mode; For the "Start", and " Back", when press the“OK” key or the shuttle center, it will point to the corresponding interface. Select“Start” to point to the

waiting trigger interface shown in figure 6, and press “Back” to go into boot interface.

- Current：The constant current output by the instrument during the test.
- Winding：with winding, namely the tester are connected to the transformer winding; without winding, namely a single tester.
- Trigger：It is assumed that the tester is activated when a voltage jump exceeding this value is detected during the measurement. It’s the "sensitivity" of the instrument , if set too high, there will be no trigger, and if set too low, false trigger likely to be caused.
- SeriaNum：Tap-changer number defined by users.

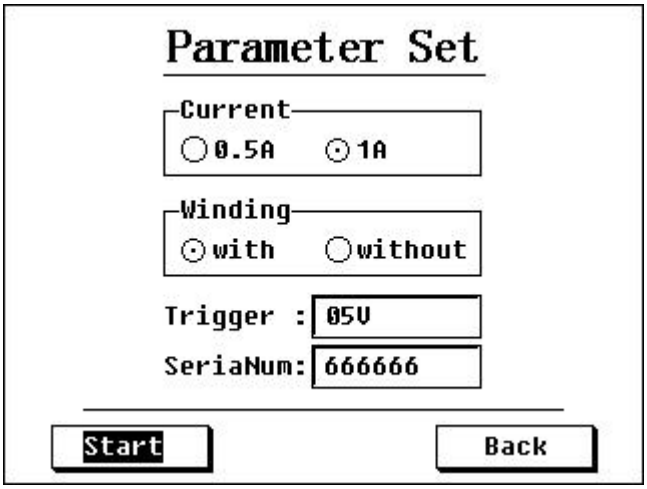


Figure 5 Parameter set interface

6.4Interface of waiting for trigger

Press the “Start”of the parameter set interface to go to interface of waiting for trigger, all the methods of switching and modifying interface elements are same as that of the parameter set interface.

The direction parameter to change direction of the tap from high to low or low to high. If the tap position is set from 07 to 08, the direction is positive and when the direction is reversed, the tap position is from 08 to 07. Press the "Back" key to the parameter set interface.

The real-time resistance (approximately 25 ohms corresponding to 1A, approximately 50 ohms corresponding to 0.5 A) between the instrument terminals A0, B0, and C0 are shown in the upper half of the interface. During the test, do not press “Activate” before the resistance values become stable(namely the winding have been fully charged), then “Please activate” will display, and begin to capture tap-changer action, meanwhile the tested tap-changer can be activated. Waveform analysis interface will be turned after the tester capturing the tap-changer action waveform.

The static resistance value is very important now, so we must wait for its stability. The greater transformer capacity is, the longer it needs to stabilize, which is about tens of seconds to a few minutes.

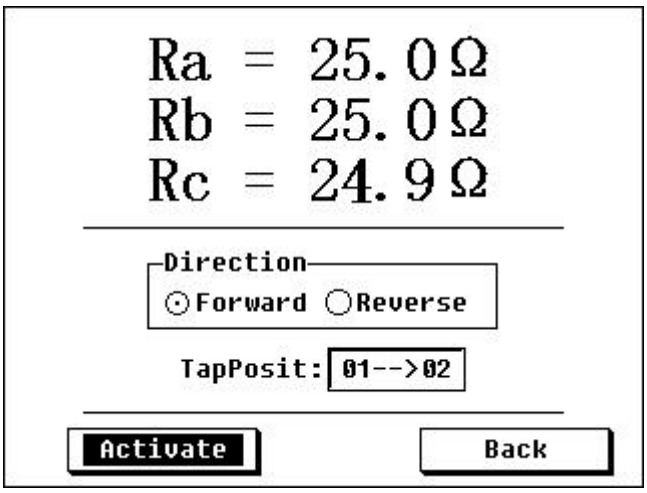


Figure 6 Interface of waiting for trigger

6.5 Waveform Analysis Interface

Waveform analysis interface is shown in Figure 7, the top of the Ra, Rb, Rc are transition resistance (the average resistance value of the two resistance scales), and the bottom right value of each curve is the transition time(the time difference of the two time scales). There are 6 waveform analysis button on the right side of the screen. The interface analyze waveform mainly by changing scale position. As the scale position changes, the corresponding transition resistance and transition time values also change. There are eight sets of scales in total, respectively “three phase time ","three phase resistance"," phase A time"," phase A resistance"," phase B time"," phase B resistance", "phase C time"," phase C resistance"(switch by pressing “Three ”and “Resis”shown in the figure), to analyze different parameters. Each set has “Rule 1” and “Rule 2” for analysis. Each button function is as follows:

- Three: Display text will switch circularly among “three phase”，“A phase”，“B phase”，“C phase”when cursor is in this option and press “OK” button or shuttle center, at the same time, the scales in the waveform display area will correspondingly switch.
- Resis: Display text will switch circularly among “time”and “resistance”when cursor is in this option and press OK key or shuttle center. At the same time, the scales in the waveform display area will correspondingly switch between “time ruler” and “resistance ruler”.
- Ruler1：Command will switch circularly between selected and unselected when OK key or shuttle center is pressed. In the selected state, the movement of ruler 1 will respond to pressing “↑、↓、←、→” button or rotating shuttle center, among which operating “↑、↓”button means fine tuning (1 cell each time), and operating “←、→”button is coarse adjustment (10 cells each time). The waveform parameters that are represented by the ruler will change as well.
- Ruler2：Operation method is same with "Ruler 1", but the ruler belongs to Ruler 2.
- Zoom：also with "selected" and "unselected" two states. In the state of “selected”,

curve-scale will respond to pressing "↑、↓、←、→" key or rotating the shuttle center, meanwhile zoom multiples will show on the top.

- Move：Operation method is same with that of "zoom", but curve movement will respond to the operation, and the starting position of the waveform will show on the top .
- Save：Store the current waveform and analysis of the data, and you will be prompted whether to store in memory or U disk (Figure 8). The data stored in the memory can be viewed, analyzed in data management interface, and then transferred to U disk. Data in U disk can be viewed and analyzed on the upper PC machine again.
- Print：Print: print the display waveform, measurement parameters and the analyzed data results on the current screen. If the waveform has been zoomed or moved, the display is not a complete waveform, so the print waveform is not complete. During printing, the print prompt box is shown in Figure 9, which does not respond to any other operations in the period.
- Back：Return to the parameter set interface.
- Retest：Return to the interface of “wait for the trigger” to quickly start the next measurement.

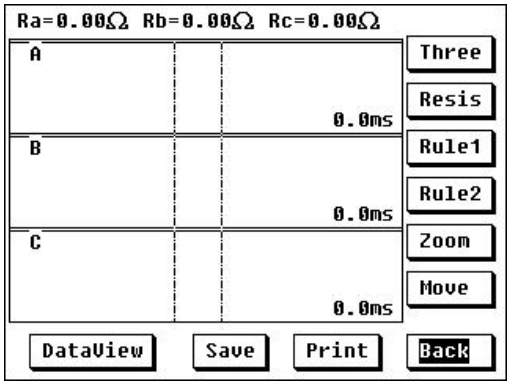


Figure 7 Waveform Analysis Interface

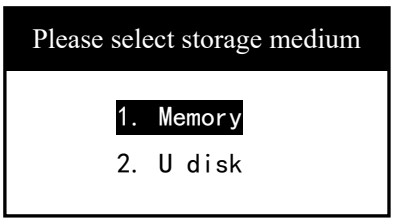


Figure 8 Storage medium selection interface

Figure 9 Print prompt box

6.6 Data management interface

Data management interface is turned to after selecting data management in boot interface (Figure 10).

In the data management interface, press the “OK” button or the shuttle center to open the currently selected records(such as the white shown in Figure 10) and go into the data view. Press “Back”to return the boot interface, and press "↑、↓" or rotate the shuttle center to select records. When reached the top / bottom of the page, it will automatically turn to the previous / next page. Press "←、→" to turn pages directly.

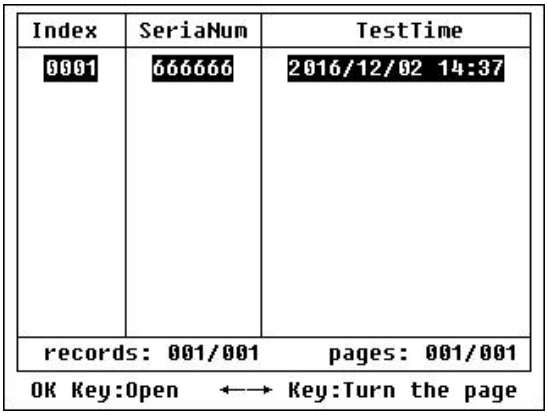


Figure 10 Data management interface

6.7 Data view interface

The data view is divided into "DataView" and "WaveView". The measurement parameters and results of data analysis can be viewed on “DataView” interface. The measurement and analysis of waveform can be viewed on "WaveView" interface.

Interface of“DataView” is as shown in Figure 11. In addition to the data there are four function buttons, which are respectively described as follows:

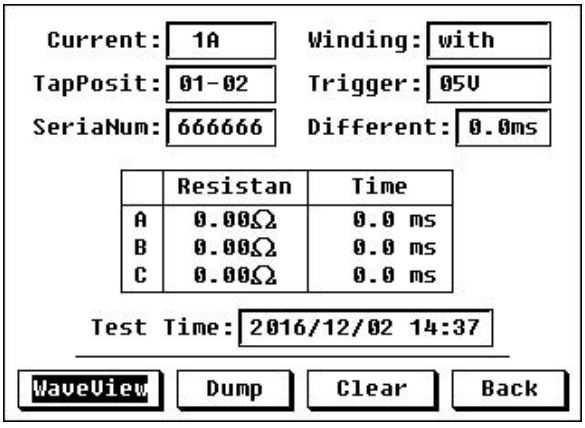


Figure 11 Dataview interface

- Waveview：Go to WaveView interface.
- Dump：Transfer the data to U disk.
- Clear：Delete all the data in memory.
- Back：Return to the data management interface.

Interface of "WaveView”, shown in figure 12, whose operation method is same with that of waveform analysis interface, but DataView, instead of continuing measurement, is used to switch to “DataView”interface. Save operation is to save the analyzed data as a new record (the data will not change).

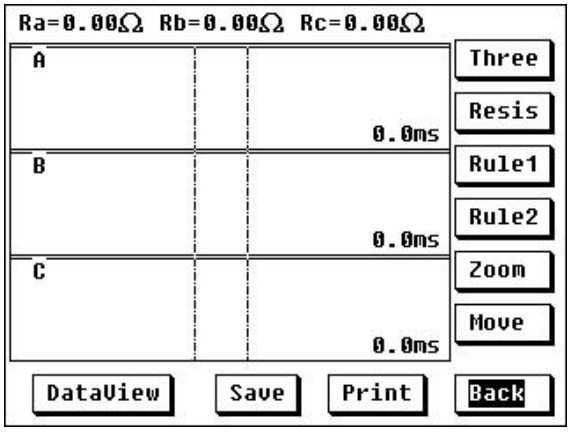


Figure 12 Waveview interface

6.8 Time set

Press the “Time set”of the boot interface to transfer time set interface(see figure 13), whose modifying method is same with the trigger level in the parameter set. Press“OK” to save the the modified value, and “Back” to the reject the modification and directly return.

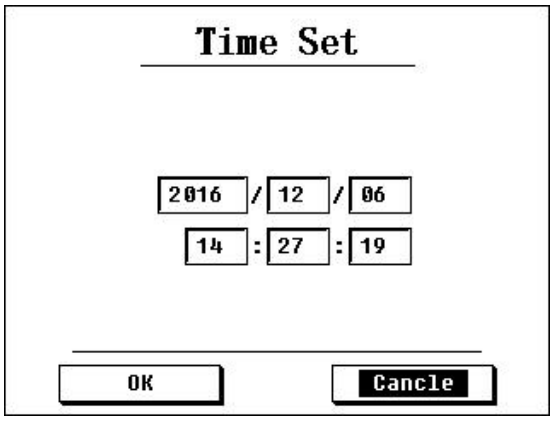


Figure 13 Time set interface

VII Waveform analysis

1.

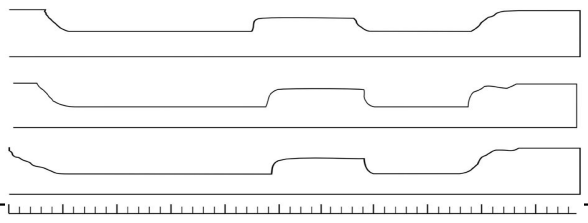


Figure 6.10

According to figure 6.10, the time before bridge is too long, up to 50ms (three times as long as the normal time), and the three phases react the same. This is typical of the fast body energy storage spring aging, so it gets slower.

2.

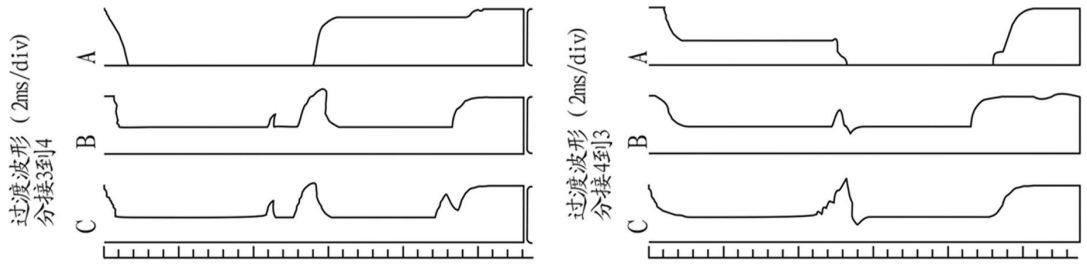


Figure 6.11

According to figure6.11, the A-phase has a symmetrical zero-crossing section from single-to-double (3-4) and double-to-single (4-3), and this section is on the odd side, and the transition resistance v alue is much larger than 50Ω (More than 50Ω can be seen as open). This is a typical transition resistance defect. After hanging the transition resistance on the single side was found broken.

3.

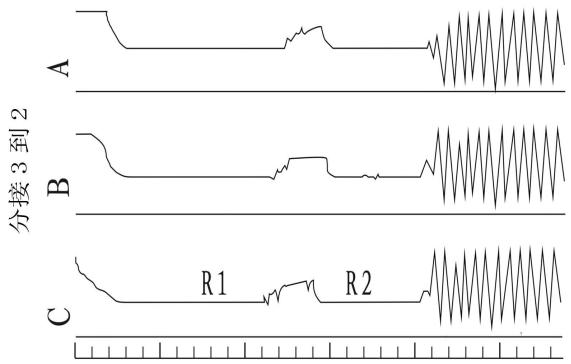
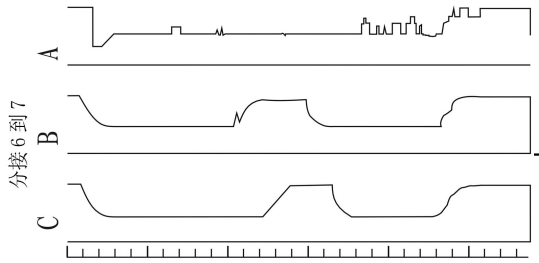


Figure6. 12

The waveform in figure 6.12 is due to the sensitivity is selected too high at the start of the test, and the direction from 3 to 2 (inductance increase) easily lead to shock. Properly reduce the sensitivity and test in the 1-n direction, then you will get normal test results.

4.



According to figure 6.13, the A phase waveform is chaotic, and the transition resistance value only ranges from 0.3 to 0.5 Ω , which is the same to all courses from 1 to 7. There are broken strands in the tap-changer leads soft connection resulting in A-phase transition resistance being shorted (not completely). After field treatment, the waveform is normal.

VIII Common fault

1. Possible waveform arising from CPU board failure (see figure 6.14)

   Solution: Replace the CPU board

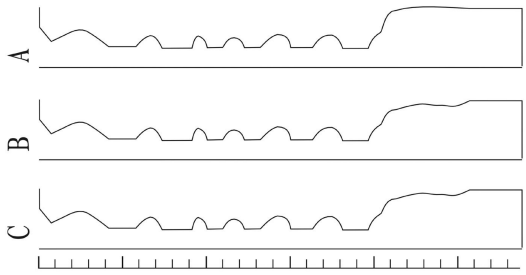


Figure6.14

2. Possible waveform caused by lower instrument power voltage(see figure 6.15)

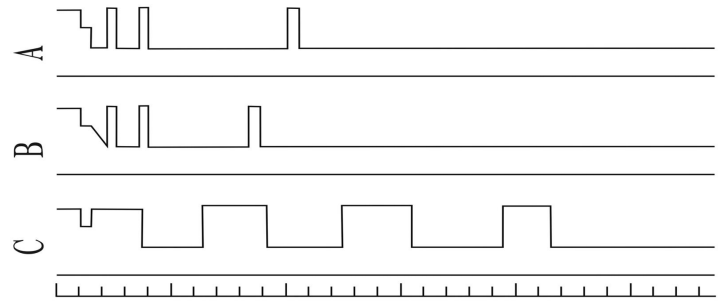


Figure 6. 15

3. Possible waveform resulting from instrument self-excited oscillation(see figure6.16)

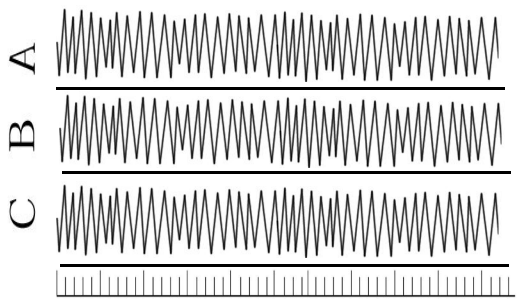


Figure 6.16

Approach: after fully discharging the test and well shorting the non-test winding to the ground, test in a positive direction (from 1 to n); if necessary, adjust the sensitivity, namely the trigger level, of the instrument.

IX Precautions

1. When using the instrument, please follow the instructions and wiring to connect and operate.
2. The instrument grounding line must be connected well, and the transformer low-voltage should be reliably shorted with the ground.
3. Since the instrument measures the frequency from the voltage terminals, the instrument will assume that there is no signal and will not measure if the voltage terminals are not connected or there is no input voltage in the laboratory.
4. The connection buses on both the high and low voltage sides need to be disconnected, the test clamps need to be clamped firmly, and the instrument wiring need to be reliable.
5. You'd better separately supply power for the instrument and the control circuit of the tester.
6. For transformer experiments, the tester test should be placed first. Because the core remanence caused in the resistance test, voltage withstanding test, no-load test, or load test, will directly affect the tester test.
7. When the test waveform is chaotic, make the tap-changers work dozens of times, then continue the test, because there is a certain oxide film on the tap-changers contacts of the transformers newly put into operation or whose on-load taps do not work frequently. Making the tap-changers work more is to remove oxide film and make the test waveform normal.
8. During the waveform analysis process, when the waveform comes out, the instrument will automatically calculate the transition resistance and the transition time of each phase,and the two values are reference.If the waveform does not change regularly, or there are more glitches spike, the instrument resistance ruler and time ruler should be used to analyze the specific transition resistance and time value of each section. You can turn to the reference manual for specific analysis.
9. When there is something wrong in one phase, exchange the two test clamps once again to confirm. For example, the instrument shows wrong with A-phase, change the test clamp of A and B to test again, and the instrument shows problems with B-phase , which proves that the A phase of the transformer have a problem.