Know your transformers more accurately.

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JYK-I

Transformer On-load Tap-changer Tester

Preface

1.Sincerely thank you for using our products. You will therefore receive our comprehensive technical support and service guarantee.

2.The operation manual is applicable to JYK-I transformer OLTC (on-load tap-changer) parameter tester.

3.Please read the operation manual carefully before using the product; in addition, properly keep the operation manual for future reference.

4.Please operate the product strictly according to the steps required in the operation manual. Improper use may endanger personnel safety.

5.If you have any doubts while reading this operation manual or using the instrument, please consult our company.

Table of Contents

1.Overview

Power transformer is one of the main equipments in the power supply network, and its working state is related to the operational safety of the entire power supply network. The working state of the OLTC as a moving part of a transformer will directly affect the operational quality of the transformer.

The traditional method for testing the switching performance of OLTC: after the switching part of the OLTC in a transformer is hoisted out and connected with a light oscillograph, turn the transmission mechanism with a handle; when the gunlock is about to release, manually start the light oscillograph; after the OLTC completes switching, stop operation, observe the record result, and judge the working quality of the OLTC.

JYK-I transformer OLTC parameter tester developed by our company uses the brand new test principle and microcomputer, so that site working personnel can test the performance of various transformer OLTCs without need to dismantle transformers and hoist OLTCs; in addition, the transition process waveform and parameters are displayed and printed, thus judging the quality of OLTCs.

2. Performance Characteristics

1. Powerful functions; realizable measurement of the parameters such as transitional waveform, transition time, transition resistance, three-phase simultaneity, etc.
2. Use large screen TFT LCD + touch screen characterized by hierarchical Chinese menu and simple, fast and convenient operation.
3. Intelligent test and result analysis; functions such as zooming in/out of waveforms, automatic conversion of tapping position No.
4. Three-way independent constant current sources
5. Six-way independent signal processing, high-speed A/D conversion, high-speed sampling at 100 kHz, real reflection of parameter change
6. There is a large capacity FLASH memory in the instrument, which can store 50 sets of data and achieve filing, retrieval and analysis at any time.
7. The instrument is provided with a perpetual calendar to show date and time; in addition, the time during test can be printed automatically.
8. The instrument is provided with a standard U disk interface, where data can be transmitted to U disks, thus making for the computer to manage data.
9. The instrument is provided with a high speed thermal printer, which can print the test results involving waveform, transition time, transition resistance, three-phase simultaneity time, etc.
10. The instrument is equipped with an automatic discharge circuit and an overvoltage protection circuit.

Specifications (see Table 1)

Table 1:

Parameter		Index
Power output		DC 3A/1A/0.4A/0.1A
Working power supply		AC220V(±10%) 50Hz±1Hz
Resistance resolution		0.01Ω
Transition resistance range		0.2Ω～7Ω（3A）
		0.5Ω～20Ω（1A）
		2Ω～50Ω（0.4A）
		20Ω～200Ω（0.1A）
Measuring accuracy	**Transition Resistance**	±(5%+0.2Ω)
	Simultaneity time	±(0.2%+0.5ms)
Sampling frequency		100kHz
Transition time range		0~240ms
Time resolution		0.1ms
Working temperature		0℃~40℃
Working humidity		≤85%RH
Outside dimension		360mm×280mm×160mm
Weight		4.6kg

4. Panel Function Description

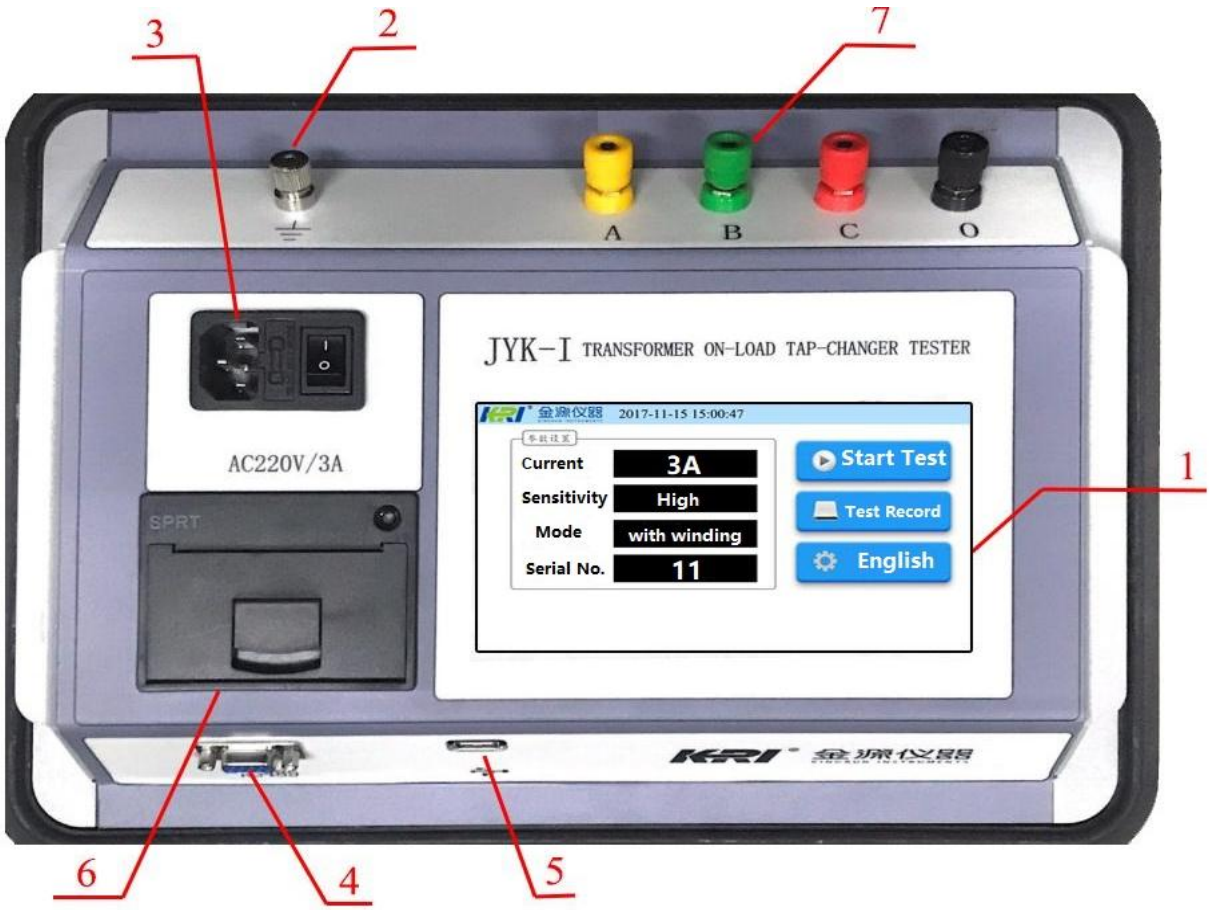


Figure 1

1. Display: it shows menu, operation tips, test state and measurement result.
2. ⏚ Instrument grounding terminal
3. AC220V Power socket with switch and fuse box
4. Communication: Communication with the upper computer
5. U disk The data stored in the instrument can be transmitted to a U disk.
6. Printer
7. Connecting terminals A, B, C and O, which are connected with the yellow, green, red and black test lines respectively

5. Operation Method

1. Turn on the power switch. The instrument shows the welcome interface for 2s and then the main menu, shown in Figure 2. Relevant operation can be performed by lightly touching the corresponding icon or name.

2.Test:

2.1 Parameter: as shown in Figure 2: lightly touch the parameter setting area on the left of the screen to set the test parameters.

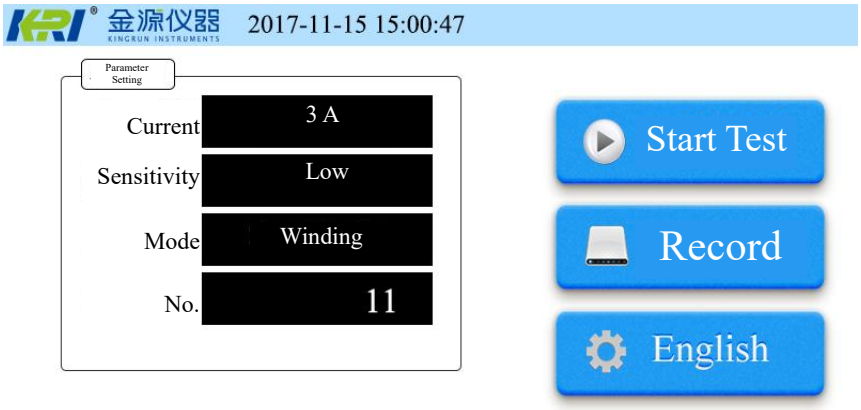


Figure 2

2.2 Charging: after the parameters are well set, lightly touch “Start Test”. Then the instrument begins to charge the sample and enters the charging interface, as shown in Figure 3. If you lightly touch "Exit" at this time, you can go back to the main interface. After data stabilization, lightly touch the "Action Switch". Then the instrument enters the measurement state, and here the OLTC can be switched, as shown in Figure 4.

“Tapping Direction” button is used to set the tapping switching direction; “Tapping Position” button is used to set the tapping position being tested currently.

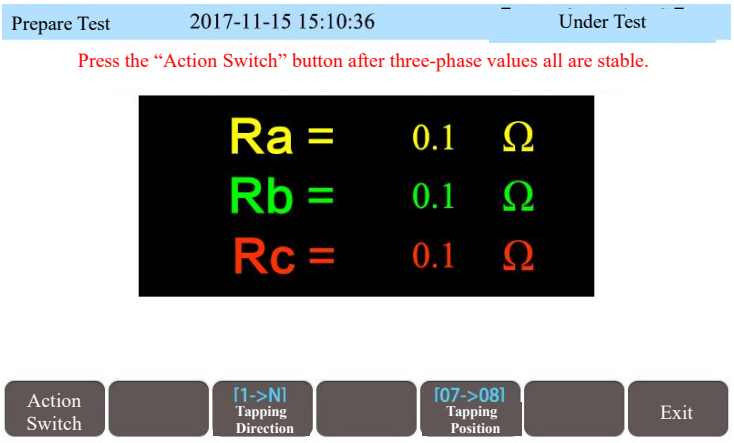


Figure 3

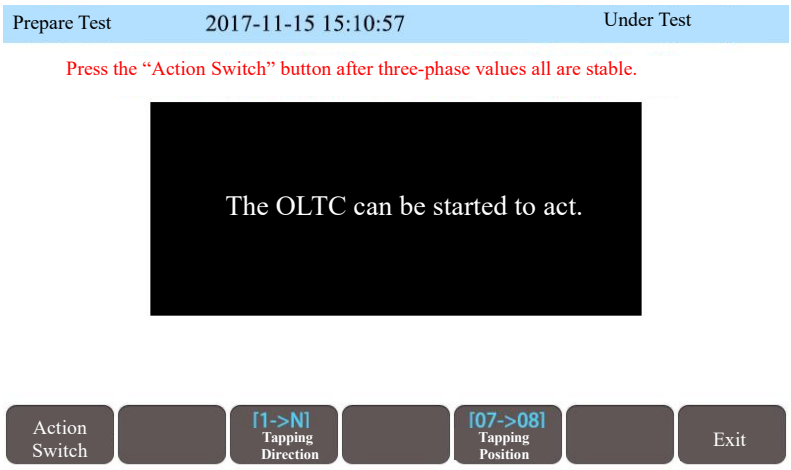


Figure 4

2.3 The instrument will automatically capture the action of the OLTC and process waveforms. After OLTC switching completion, the instrument will show the processed waveforms on the interface, See test data "Menu 1"
as shown in Figure 5.

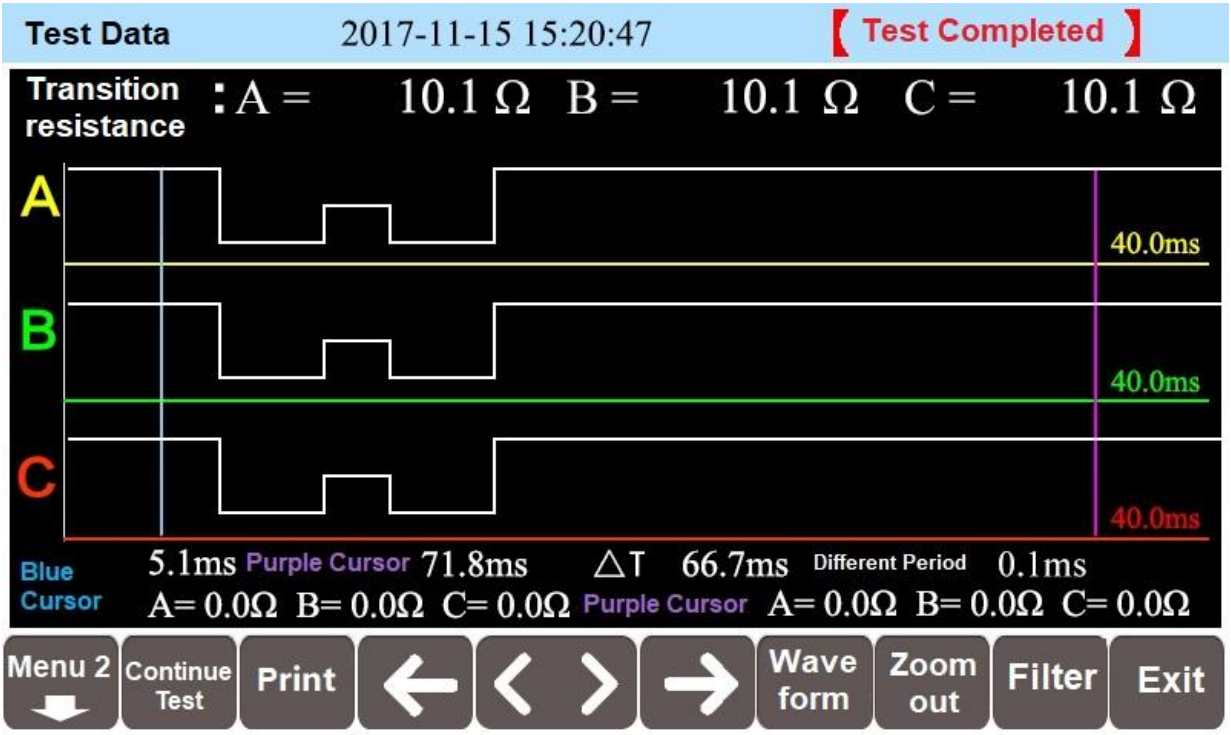


Figure 5

（1）Moving and switching of cursors and waveforms: there are two cursors on the waveform display interface. Lightly touch the "Waveform" button to set the "Waveform", "Blue Cursor", and "Purple Cursor" to the movable state. Lightly touch "←" or "→" below to quickly move the cursor or waveform left or right. Lightly touch "<" or ">" below to slowly move the cursor or waveform left or right.

（2）Continuous test: lightly touch "Continue Test" to enter the test interface directly to start the next test.

（3）Waveform zooming: lightly touch “Zoom” to zoom in and out the waveform.

（4）Waveform storage: in Menu 2,lightly touch “Save” to store the tested waveform data in the internal memory of the instrument.refer figure 7.

（5）Print: lightly touch "Print" to print waveforms and data.

（6）Waveform processing: lightly touch the “Fliter” button to display the waveforms with different filtering effects.

（7）Waveform Interception: As shown in Figure 6, tap the Wave key, switch to Blue Cursor, and press ← or → and < or > keys to adjust the blue cursor to the start of the waveform. Then click the "Blue Cursor" button, switch to "Purple Cursor" and adjust the end position of the purple cursor waveform. Press the Zoom in button to complete the intercept of the waveform.

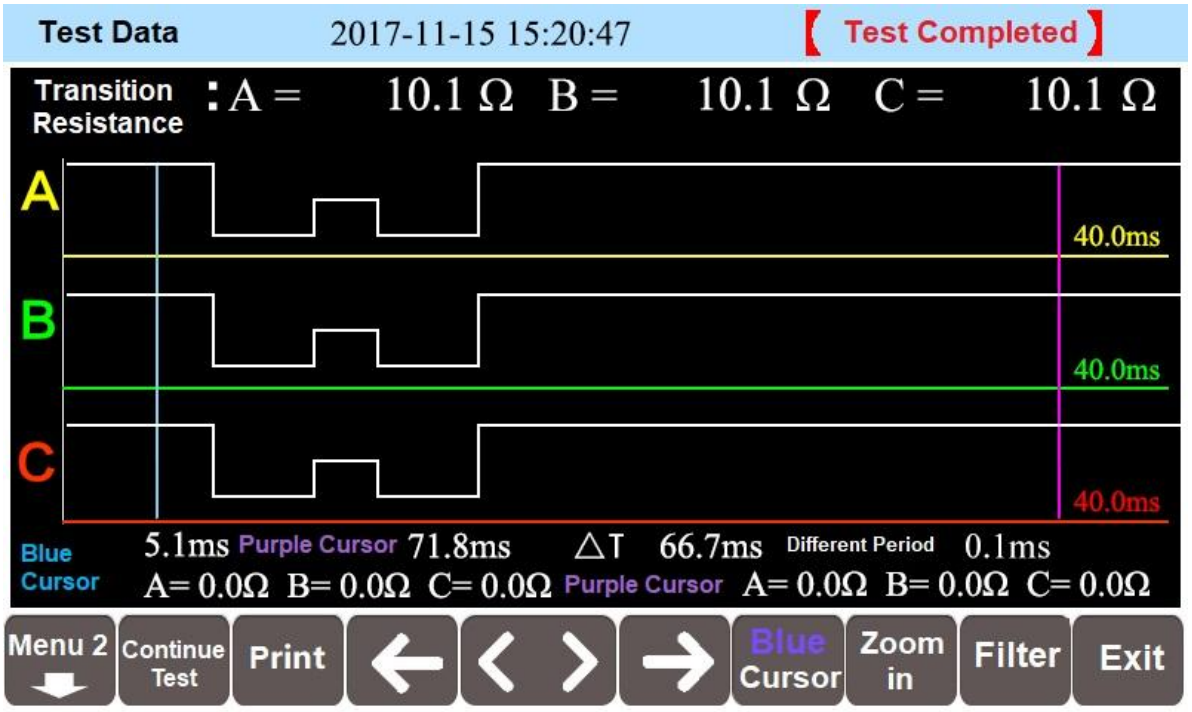


figure 6

（8）Waveform manual selection: tap the "Menu 2" button, menu into the manual interface. Figure 7.

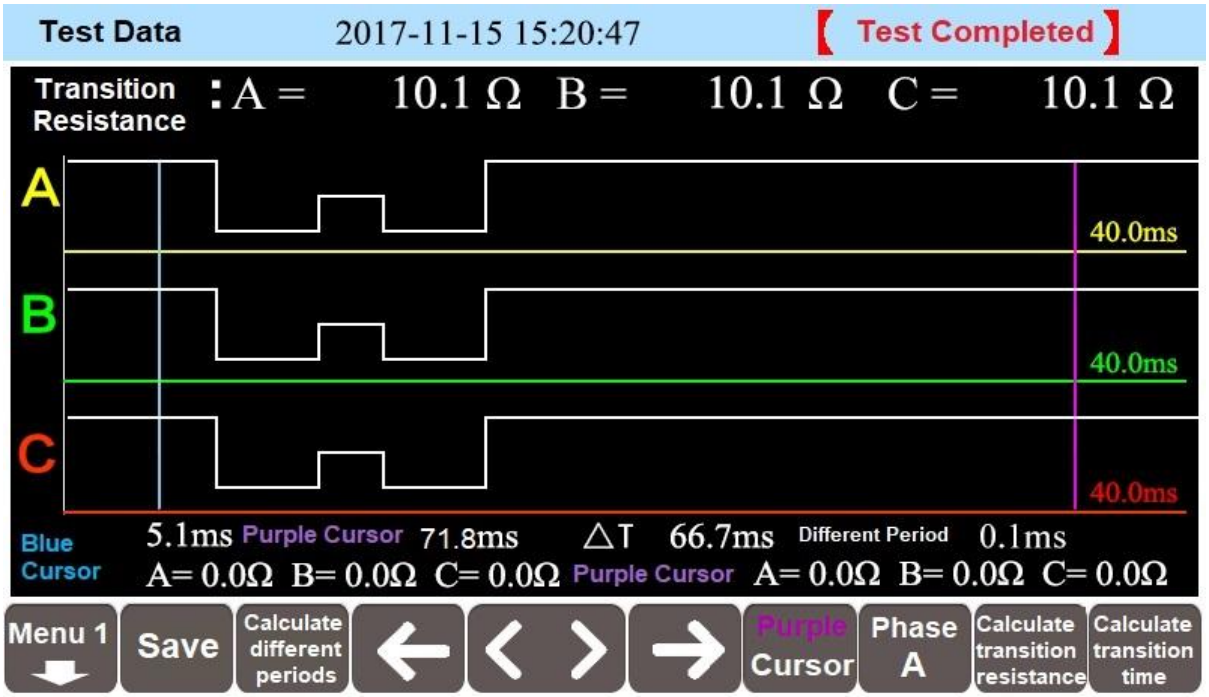


Figure 7

a) Calculate transition time: Tap the Wave button, switch to Blue Cursor, and adjust the Blue Cursor to the A-phase waveform start position by pressing the ← or → and < or > buttons. Then click the "Blue Cursor" button, switch to "Purple Cursor" and adjust the end position of the A-phase waveform of the purple cursor. Select the key "A phase" and the point "Calculate Transition Time" button, at which point the time with the two cursors is displayed as the A phase time. According to the above method, adjust the cursor to B phase, C phase waveform start and end position, key select "B phase" and "C phase" to calculate the transition time of B and C phase respectively.

b) Calculating the transition resistance: select the phase of the calculated resistor ("A phase," "B phase," "C phase") tap the "Calculate transition resistance" button, calculate the average resistance of the waveform between the blue and purple cursors, shown as the transition resistance of the selected phase.

c) Calculate the different period times: use the blue and purple cursors to select the starting position of the first and last waveforms in the test waveform. Point calculate different periods button. The time between the two cursors is calculated as a different period time.

d) Print: When the waveform and data manual selection is complete, return to Menu 1 and press the Print button to print the selected waveform.

Illustrate：

Transition resistance: The transition resistance value calculated automatically for the instrument based on the test waveform.

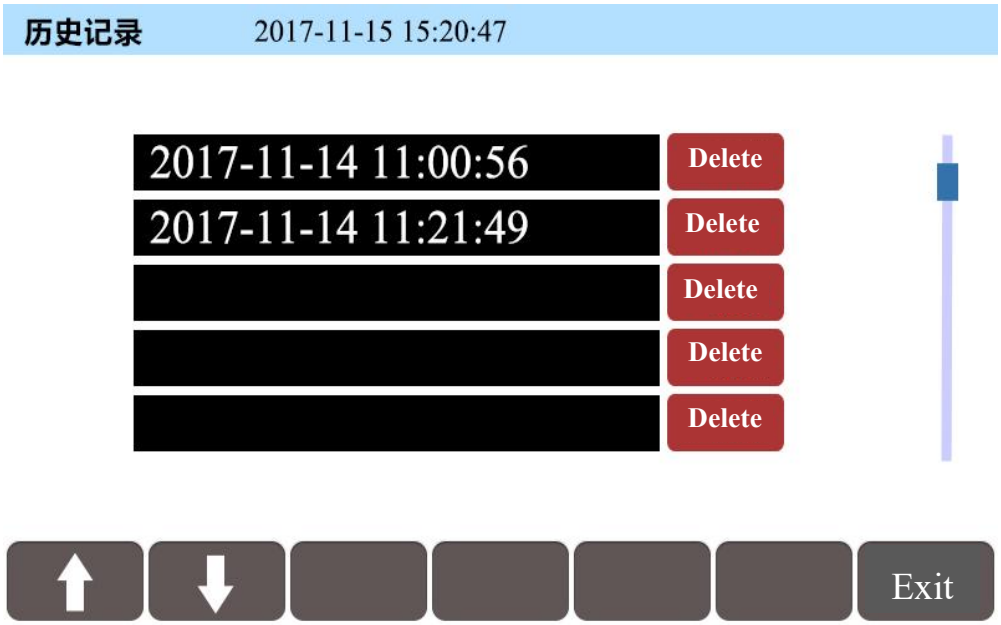
Blue cursor time: The time relative to the screen origin of the current blue cursor position.
Purple cursor time: The time relative to the screen origin of the current purple cursor position.

△T: The time between the blue and purple cursors.

Blue cursor resistance: The resistance value for the current blue cursor corresponding to the waveform position.
Purple cursor resistance: The resistance value for the current purple cursor corresponding to the waveform position.

3. Data

3.1 Data record: select a data record in the main menu, and lightly touch the "Historical Record" on the right side to view the stored test data, as shown in Figure 8. Lightly touch the corresponding record to view waveforms.



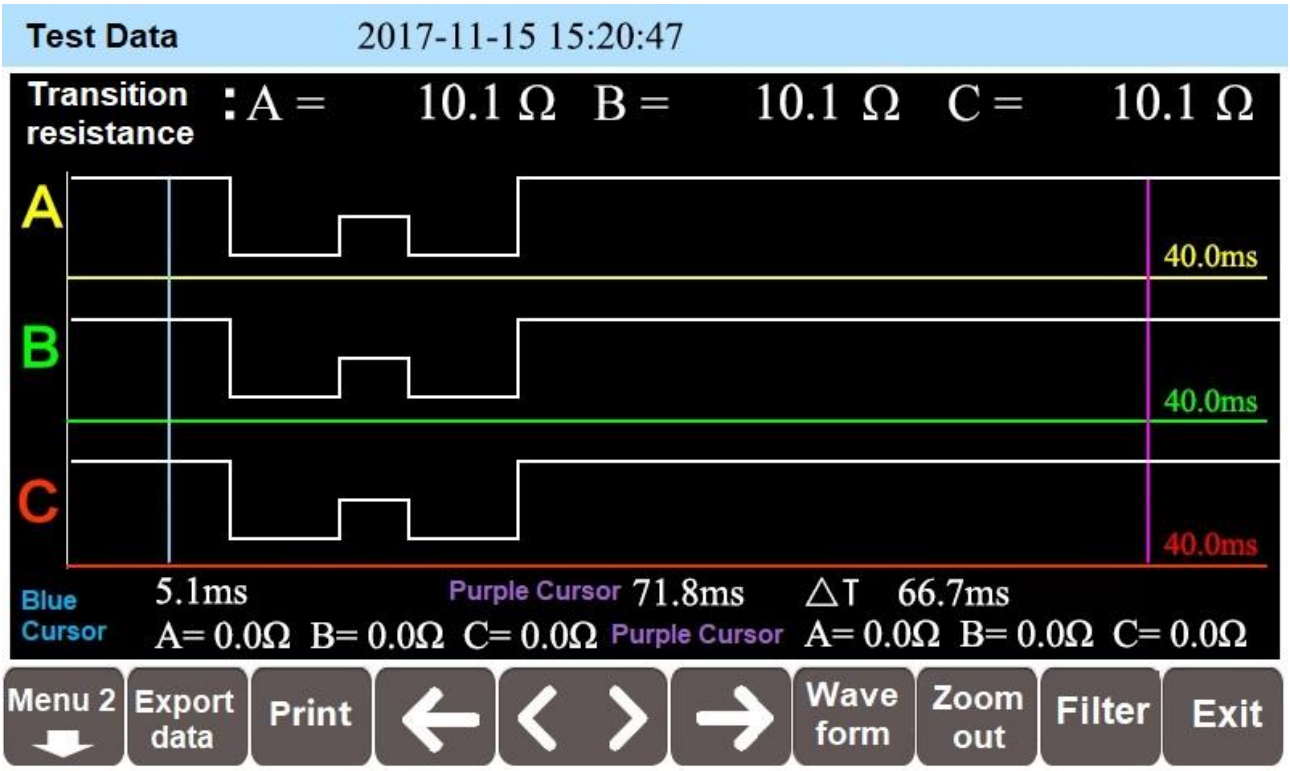


Figure 8

3.2 Data export: after inserting a U disk, lightly touch “Export Data” to save the current record into the U disk.

3.3 Delete record: lightly touch the "Delete" button to permanently delete the current record.

4. Clock

Lightly touch the clock display position on the main interface to enter the clock setting interface.See Figure 9.

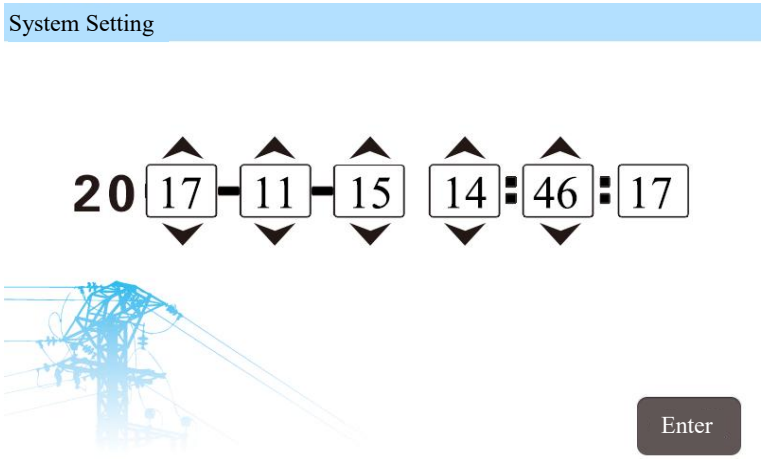


Figure 9

5. Chinese and English interface switching

Lightly touch the “English” button. Then the display interface is switched from Chinese state

to English state. Lightly touch the “Chinese” button. Then the display interface is switched from English state to Chinese state.

6. Test Waveform Description

1. The ideal OLTC transition waveform is shown in Figure 10:

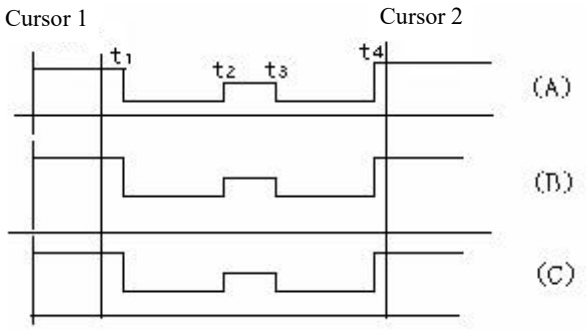


Figure 10 Ideal OLTC transition waveform

t_1 is the time when R_1 resistance is contacted alone.

t_2 is the time when R_1 and R_2 resistances are contacted at the same time.

t_3 is the time when R_1 resistance is released and R_2 resistance is contacted alone.

t_4 is switching completion time.

2. Determine the transition resistance value.

To observe the resistance value of each segment of waveform, it is needed to move cursor 2 to the waveform segment to be observed (a flat and straight position shall be selected), as shown in Figure 8:

The value of transition resistance R_1 can be obtained between t_1-t_2.

The value of transition resistances R_1 and R_2 can be obtained between t_2-t_3.

The value of transition resistance R_2 can be obtained between t_3-t_4.

3. Determine the transition time.

When cursor 1 is positioned at t_1 and cursor 2 is positioned at t_4, the time value displayed at the bottom of the screen is the transition time of OLTC switching.

4. Three-phase simultaneity

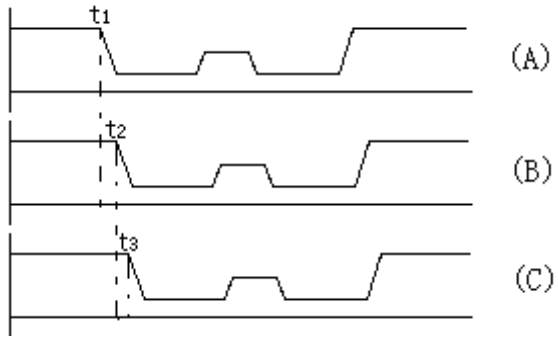


Figure 11 Non-simultaneous three-phase waveforms (assuming that phase A is ahead of phase B, and phase B is ahead of phase C)

The determination of the simultaneity of the three phases such as A, B and C is shown in Figure 9. Cursor 1 can be moved to position t_1, and cursor 2 to position t_2. Then the transition time displayed at this time is the time of phase A ahead of phase B. Similarly, cursor 1 is moved to position t_2, and cursor 2 to position t_3. Then the transition time displayed at this time is the time of phase B ahead of phase C. Cursor 1 is set to position t_1, and cursor 2 to position t_3. Then the transition time displayed at this time is the time of phase A ahead of phase C.

There is no specific regulation on the simultaneity of the three-phase OLTC; in general, the non-simultaneity is no more than 5ms. However, if the three phases of an OLTC are connected in parallel and used as a phase, the non-simultaneity of the three phases of the OLTC is required to be no more than 2ms in general.

7.Equipment Wiring and Special Measuring Method

1. On-load voltage regulation winding star type wiring has neutral point: the wiring method is shown in Figure 10:

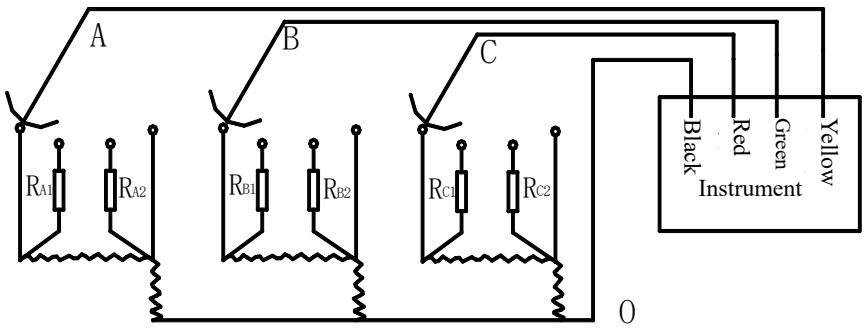
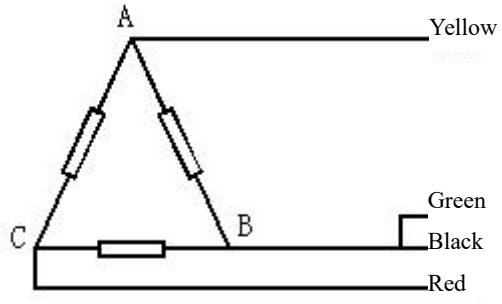


Figure 12

2. On-load voltage regulation winding corner wiring

2.1 Simultaneous measurement of two phases: (See Figure 13)



Wiring diagram in case of measuring ab and bc

Measure AB and BC: the yellow line is connected to A, the red line to C, the black line to B, and the green line to the black line.

Measure BC and CA: the green line is connected to B, the yellow line is connected to A, the black line is connected to C, and the red line is shorted to the black line.

Measure CA and AB: the red line is connected to C, the green line is connected to B, the black line is connected to A, and the yellow line is shorted to the black line.

2.2 Single-phase measurement (see Figure 14)

Measure AB: the yellow line is connected to A, the black line is connected to B, and the green line and the red line are shorted to the black line.

Measure BC: the green line is connected to B, the black line is connected to C, and the red line is shorted to the black line.

Measure CA: the red line is connected to C, the black line is connected to A, and the yellow line and the green line are shorted to the black line.

If the current is relatively small, two or three phases can be connected together in parallel for one-way measurement; in addition, the unused lines shall be shorted with the black line. At this time, the measured resistance value shall be divided by the number of the connected phase(s).

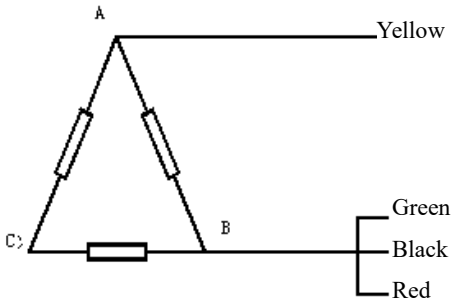


Figure 14 Wiring diagram in case of measuring phase A

3. On-load voltage regulation winding star type wiring has no neutral point.

3.1Schematic of single-phase test wiring (phases A and B) is shown in Figure 15.

For the sample with such structure, the neutral point cannot be led out without core hoisting; therefore, every two phases are tested. If the simultaneity is good, the waveform is similar to Figure 16; if the simultaneity is not good, the waveform is similar to Figure 17, but you can't determine which phase is early or late; in addition, when a breakpoint appears in the

waveform, you can't determine the phase. Sometimes you can make preliminary analysis and judgment through three combinations (AB, BC and CA). Due to the large variation range of transition resistance values during the test, take care to select an appropriate range of the instrument.

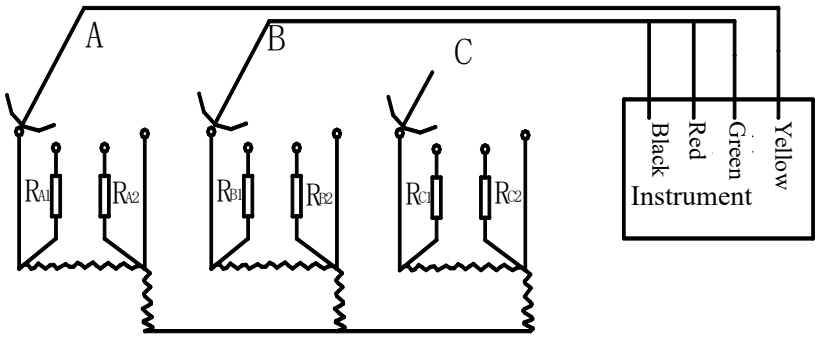


Figure 15 Wiring diagram in case of measuring a single phase

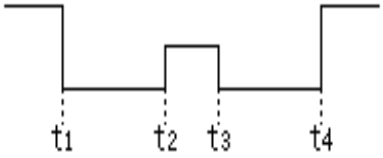


Figure 16 Simultaneity of A and B two phases

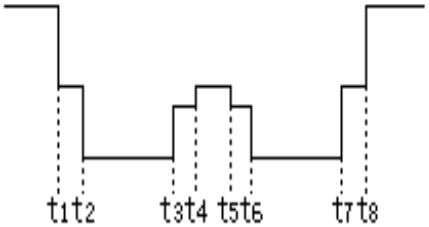


Figure 17 Non-simultaneity of A and B two phases (assuming that phase A is early)

t_1—$R_{A1}+R_{B1}$

t_2—$R_{A1} // R_{A2}+R_{B1} // R_{B2}$

t_3—$R_{A2}+R_{B2}$

t_4—end of switching

t_1—R_{A1} t_2—$R_{A1}+R_{B1}$

t_3—$R_{A1} // R_{A2}+R_{B1}$

t_4—$R_{A1} // R_{A2}+R_{B1} // R_{B2}$

t_5—$R_{A2}+R_{B1} // R_{B2}$ t_6—$R_{A2}+R_{B2}$

t_7—R_{B2} (phase A switching completed)

t_8—phase B switching completed

3.2. The wiring diagram during simultaneous test of two phases is shown in Figure 18:

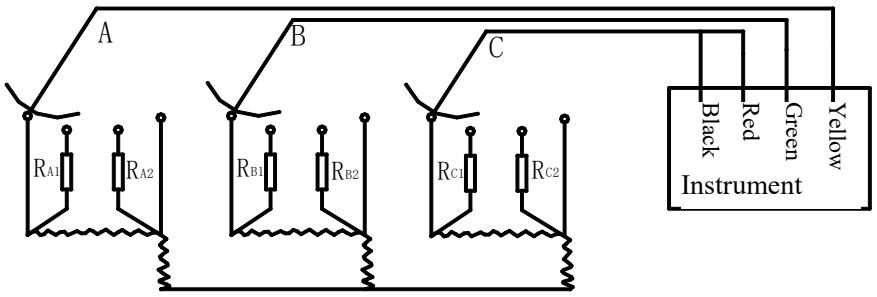


Figure 18 Wiring diagram in case of simultaneous measurement of two phases

When three phases are simultaneous, the waveform graph is shown in Figure 19:

For phase A (assuming that three phases are simultaneous, and the current of phases A and B is identical)

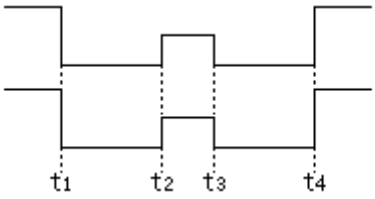


Figure 19 Three-phase simultaneity

t_1—$R_{A1}+R_{C1}\times 2$ t_2—$(R_{A1} // R_{A2})+(R_{C1} // R_{C2})\times 2$

t_3—$R_{A2}+R_{C2}\times 2$

t_3—$R_{A2}+R_{C2}\times 2$ t_4—switching completed

In this test mode, if three phases are not simultaneous, the waveform is more complex than Figure 19.

4. Several notes on the test result

4.1 The measured waveform is often worse than the theoretical waveform during actual measurement and during winding measurement. This is because the oscillation signals caused by the inductance and capacitance parameters of the transformer winding and the mechanical vibration of the tap changer during measurement cause some fluctuations of the measured waveform. This case cannot be avoided during actual testing. Some switch has been used for many years, and its contact points have been heavily oxidized; therefore, the waveform may appear as shown in Figure 20 during test, which is also a normal phenomenon. The switch can be switched more times at this range to thin the oxidation layer and increase the contact area; then the switch is tested with the instrument, and this phenomenon may be avoided.

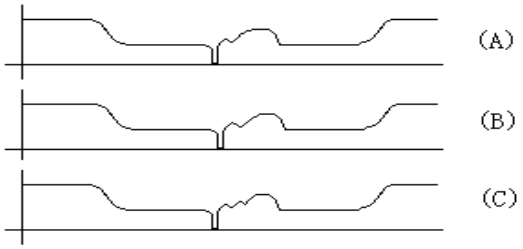


Figure 20 Possible waveform caused by serious oxidization of switch contact points

4.2Another phenomenon is over-range test. If the transition resistance of the test switch is greater than 20Ω and the selected range is 1.0A, the test result will show the waveform shown in Figure 21.

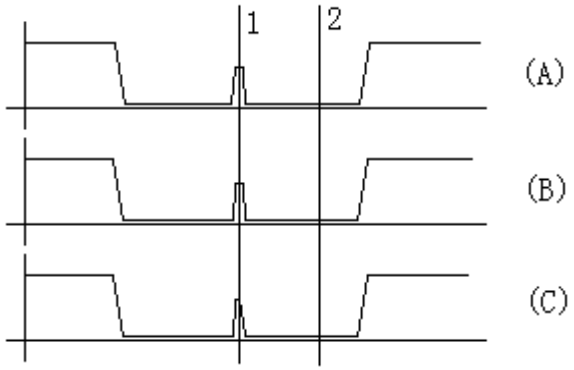


Figure 21 Over-range test waveform

At this time, the transition resistance at cursor 1 may be normal, and the transition resistance at cursor 2 is very large. This is due to over-range, and you just change the range to lower current and then conduct the test again.

The waveform will be closer to the theoretical waveform during no-winding measurement because of no impact of transformer winding distribution parameters.

When the waveform curve measured by the user is not flat and straight, as long as no breakpoint appears (the waveform doesn't return to the top), this is not a switch or instrument test problem.

Sometimes when the switch is switched, there is a momentary breakpoint, and here the waveform is pressed into an approximately flat and straight line. This is due to the processing by the instrument. When you move cursor 2 to read the points of the three-phase waveform curve, you can also see resistance changes in each switching time interval. However, when this case occurs, you had better conduct the test again.

When the waveform has an abnormal down-jump point and the duration is more than 2ms, the resistance value at this position shall be checked. If the resistance value exceeds 100Ω, there is poor contact or looseness very possibly. At this time, conduct repeated tests for judgment.

8.Attentions

1. Be sure to carefully read the operation manual before using the instrument.
2. The instrument operator shall have general knowledge about the use of general electrical equipment or instruments.
3. The instrument can be used both indoors and outdoors. However, when it is used

outdoors, avoid using it at the following places with rain, corrosive gas or too high dust concentration.

4. The protective ground wire of the instrument must be well connected.
5. Be sure to turn on the power switch after connecting all leads well.
6. The test lines can be removed after discharging is completed upon test completion.
7. Do not move test line clamps during testing.
8 .If the current is relatively small, two or three phases can be connected together in parallel for one-way measurement; in addition, the unused lines shall be shorted with the black line.
9. During connection and communication with a computer, the instrument and the computer shall be grounded at the same point.

9.Accompanied Accessories

Name	Qty.	Remarks
JYK-I Principal Unit	1 piece	
Test cable	1 set	13m long, 1 yellow cable, 1 green cable, 1 red cable and 1 black cable
Three-core power line	1 piece	250V/10A
Ground wire	1 piece	2m
Operation manual	1 copy	
Certificate of approval/ warranty card	1 piece	
Fuse	Two pieces	3A
Printing paper	1 piece	Thermosensitive

Packing list	1 piece	

10.After-sales Service

Product shall be repaired and replaced free of charge in case of product quality problem in 2 years from purchase date, guarantee and technical service are provided for whole service life of the product.In case any abnormal condition or fault is found in the instrument, please contact the company in time so that we can organize most convenient treatment plan for you.