

# **ZX-BRL Transformer Capacity Loss Parameters Tester**



## CONTENT

1、 Instrument characteristics	- 2 -
2、 Technical index	- 2 -
3、 Panel layout	- 3 -
4、 Basic concepts	- 4 -
5、 Operation methods	- 4 -
5.1 the main menu interface	- 4 -
5.2 Capacity test interface	- 5 -
1) Experimental wiring method	- 5 -
2) Interface operation	- 6 -
5.3 Load test interface introduction	- 9 -
1) Experimental wiring method	- 10 -
2) Interface operation	- 11 -
5.4 NO-Load test interface introduction	- 12 -
1) Experimental wiring method	- 12 -
2) Interface operation	- 13 -
5.5 Historical data	- 15 -
5.6 System settings	- 15 -
6、 battery maintenance and charging	- 16 -
7、 Matters needing attention	- 16 -

## 1、 Instrument characteristics

- 1、 The capacity of all kinds of distribution transformers can be measured
- 2、 7 Inch Touch color LCD display, large screen, high brightness, full Chinese characters menu and operation prompt to realize friendly man-machine conversation.
- 3、 Internal power supply, automatic generation of three-phase high-power test power supply.
- 4、 The software comes with digital keyboard and can freely select measurement parameters.
- 5、 It can measure the no-load current, no-load loss, short circuit voltage and short circuit loss of all kinds of transformers.
- 6、 Through no-load test, the model of the transformer under test can be accurately determined , Include: S7、 S9、 S11、 S13、 S15、 SCB9、 SCB10、 SCB11。
- 7、 Capacity measurement range: 20kVA~100000kVA。
- 8、 Battery remaining power percentage indication function。
- 8、 The user can print the test data at any time through a micro printer。
- 9、 For transformer test results, a large amount of historical data can be stored。
- 11、 Low power design, long time no operation of instruments, instruments automatically reduce brightness, printer power saving control, when you need to print, the printer is energized.

## 2、 Technical index

### Input characteristics

Active part:

Voltage measurement range: 0~10V

Current measurement range: 0~10A

Passive part:

Voltage measurement range: 0 to 750V, automatic switching range within the instrument

Current measuring range: 0~100A, all automatic switching range.

### Accuracy:

Voltage: + 0.5%

Current: + 0.5%

Power: + 0.5% ( $\text{Cos } \phi > 0.2$ ), + 1% ( $0.02 < \text{Cos } \phi < 0.2$ )

working temperature: - C ~ +40 C

Charging power: AC 160V~260V

insulation: 1, voltage and current input to the shell insulation resistance than 100M.

The work of housing between the power input end bearing frequency 2kV (RMS). The experiment lasted 1 minutes.

Tester dimension: 32cm \* 24cm \* 13cm

Net weight: 3kg

### 3、 Panel layout

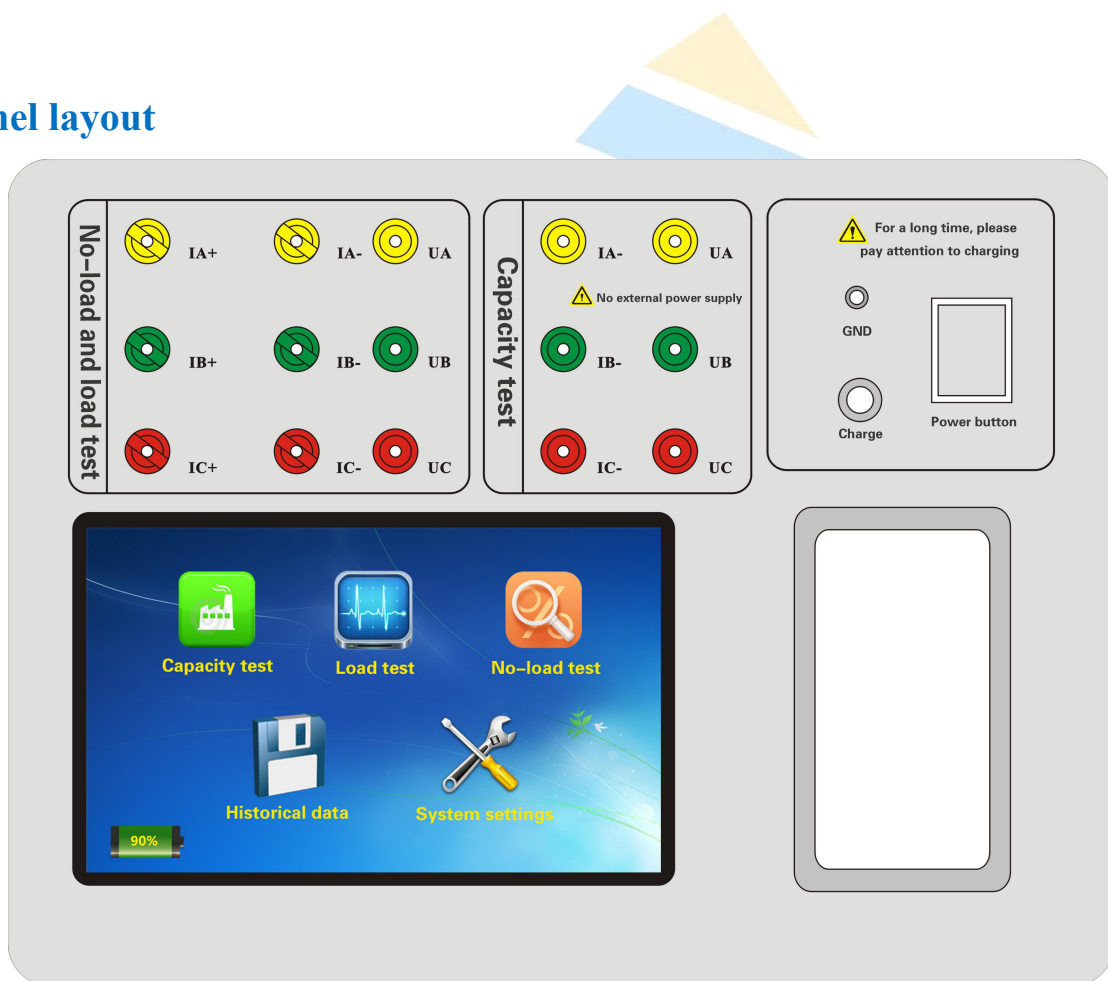


Figure 1: Panel layout

As shown in Figure 1: the top panel part from left to right with the input terminal characteristics test (Ia positive and negative input terminal, Ib positive and negative input terminal, Ic, Ua, Ub positive and negative input terminal, and Uc), the terminal and the ground terminal, charging power supply socket and switch capacity test; panel bottom part are 7 inch color touch screen and printer. Note that

the operation must ensure that the terminal is correct, otherwise it may affect the test results, and even damage the instrument.

## 4、 Basic concepts

- A. capacity test: by using some necessary data to determine the actual capacity value of a transformer, to check whether the transformer transformer nameplate capacity is true.
- B. no-load test: the rated voltage of the sine wave frequency is applied from one winding of the transformer (usually from the two low voltage side), and the other windings are open to measure no-load current and no-load loss. If the test condition is limited, the supply voltage is less than the rated voltage, rated voltage in non experimental conditions, the error of this test method is large, generally only used to check the transformer has no fault, only the test voltage reaches the rated voltage of the 80% can be used to test the no-load loss.
- C. load testing (also called short circuit test): low voltage high current transformer side artificial short circuit, high voltage side coil from the rated junction into the test voltage and the rated frequency, the winding current reaches the rated value, voltage and measuring the input power and the applied (i.e. short circuit loss and short circuit voltage) and current value.

## 5、 Operation methods

LCD interface has thirteen main screen, including the main menu and twelve functional interface, the following are described in detail.

### 5.1 the main menu interface

When the instrument is switched on, it enters the main menu, and the interface is shown in figure 2:

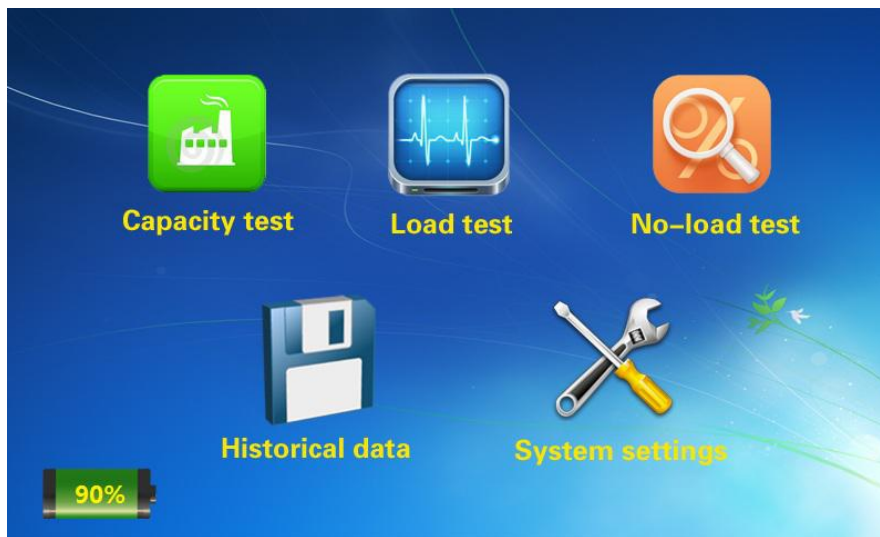


Figure 2, the main menu interface

The main menu has five options, namely, capacity test, load test, no-load test, and historical data. You need to select the touch icons, voltage amplitude and residual energy percentage of the bottom display date and time, the internal battery current, which can grasp the battery instrument, understand the instrument whether to charge to avoid not timely charging in the field can not be operated normally.

The uses of each function option are:

- A. Capacity test: used to measure transformer capacity value.
- B. Load test: load test of three-phase power transformer using external.
- C. No-load test: three-phase power transformer no-load test using external.
- D. Historical data: View saved records test results.
- E. System settings: parameter setting instrument, and the factory production

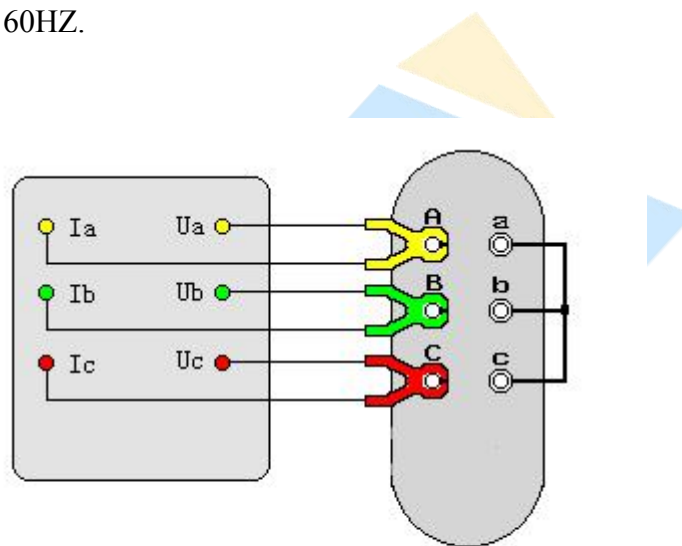
The operation method and instrument wiring method of each interface are introduced below.

## 5.2 Capacity test interface

### 1) Experimental wiring method

Capacity tester equipped with three test clamp (yellow, green and red), each hand are led two test lines with a thick line, a thin, thick line to the current terminal on the instrument panel capacity test terminal of the corresponding color (Ia, Ib, Ic), the instrument panel wire voltage terminal receiving capacity the amount of test terminals of the corresponding color (Ua, Ub, Uc), the pliers head according to the color are respectively clamped in high voltage side of each phase of the tested transformer terminal, low voltage side of transformer to use special short short circuit wiring is good. This transformer capacity test connection method is to use the instrument's own three-phase power supply to test the transformer capacity . For foreign transformers, the instrument is a three-phase test power source which outputs 60HZ.

As shown in figure 3:



**Our instruments Transformer**

Figure 3 wiring diagram of capacity test

## 2) Interface operation

When you click on 'capacity test', enter the capacity test settings screen. As shown in figure4

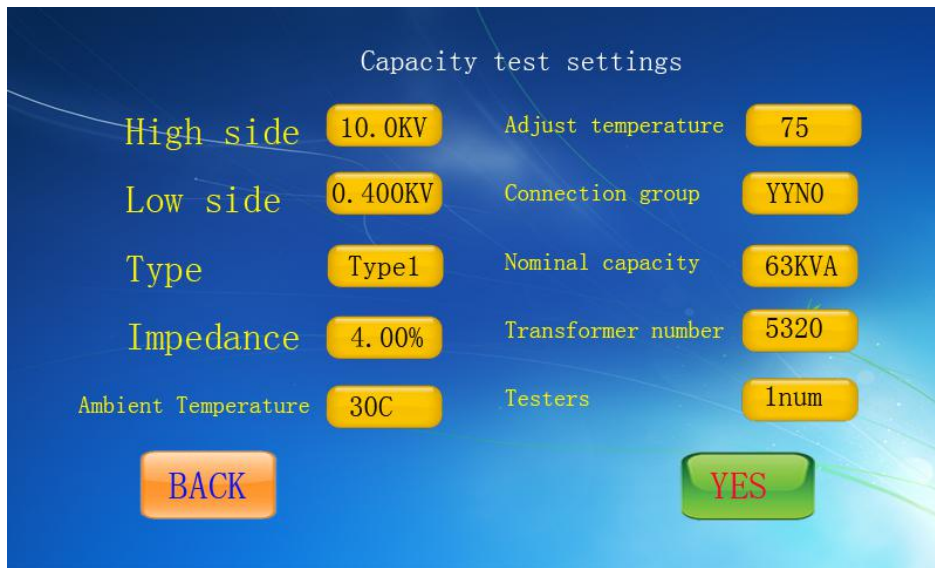


Figure 4. Capacity parameter setting

Capacity test set interface figure, item: a voltage, the voltage two times, the type of transformer, impedance voltage, current temperature, temperature correction, connection group, nominal capacity, transformer number, test personnel. Click OK to start the test. Click back to return to the main interface

The meanings and functions of each parameter are as follows:

- High side: Is a voltage transformer high voltage, voltage rated voltage transformer test refers to the value of the pressure side. Used to distinguish transformer with different voltage levels; parameters of the same capacity and different voltage level transformer short-circuit test value is different; to achieve accurate judgment, you must enter the rated voltage of the high voltage side of the transformer test. Click on the Yellow input box, the instrument pops up the digital keyboard, enter a voltage value, the default is 10KV.
- LOW side: The two voltage transformer low voltage, click on the yellow box, pop-up instrument digital keyboard, two input voltage value, the default is 0.4KV.
- Type of transformer: refers to the different types of transformer. (transformers, not form) there are 8 main types, 1 oil without excitation voltage distribution, 2 oil without excitation voltage of electric power, 3 oil OLTC distribution, 4 oil OLTC power, 5 dry without excitation voltage distribution, 6 dry without excitation voltage power. 7 dry load voltage, power distribution, 8 dry



OLTC power. Click the Yellow input box, and the drop down menu appears, and then click the appropriate transformer type. The default type is 1 (i.e., 1 oil type, no excitation, voltage regulation, power distribution).

- Impedance :The impedance voltage, the default value is 4%, if not, need to enter the correct value, otherwise the capacity measured value will not be correct.
- Ambient temperature :The current temperature,input current measured transformer body temperature, for the correction of test result of temperature, because the capacity is the main basis for judging transformer short circuit test data including the impedance voltage and short circuit loss, according to the actual data we measured, according to the requirements of correction to the rated short-circuit loss numerical condition, then find the actual capacity of tested transformer; the first is non correction of the rated current, while the national standard short circuit loss of the transformer shall be in the environment temperature is 75 DEG C (for oil immersed transformer, dry according to different requirements were 100 C, 120 C and 145 C) when, so the data are rated conditions is the value at 75 DEG C standard. In order to determine the capacity accurately, the test result must be corrected to 75 degrees centigrade. Therefore, the accuracy of the current temperature directly influences the judgment of capacity.
- Adjust temperature: Oil short-circuit loss calibration temperature of 75 degrees, dry according to the different requirements of temperature correction were 100 C, 120 C and 145 C.
- The connection group: according to the internal wiring of the transformer can be divided into Yyn0, Dyn11, Yzn11, Yd11, Ynd11 five, due to loss of transformer parameters of different connection groups are different, so only to clear the transformer connection group can accurately judge the measured transformer type
- The nominal capacity: the default minimum 30KVA, used to find the standard load loss value, if the input is not correct, will affect the standard form of transformer loss and capacity test to determine the interface.

When all the parameters are set, click the OK button on the LCD to start the test, as shown in figure 5:

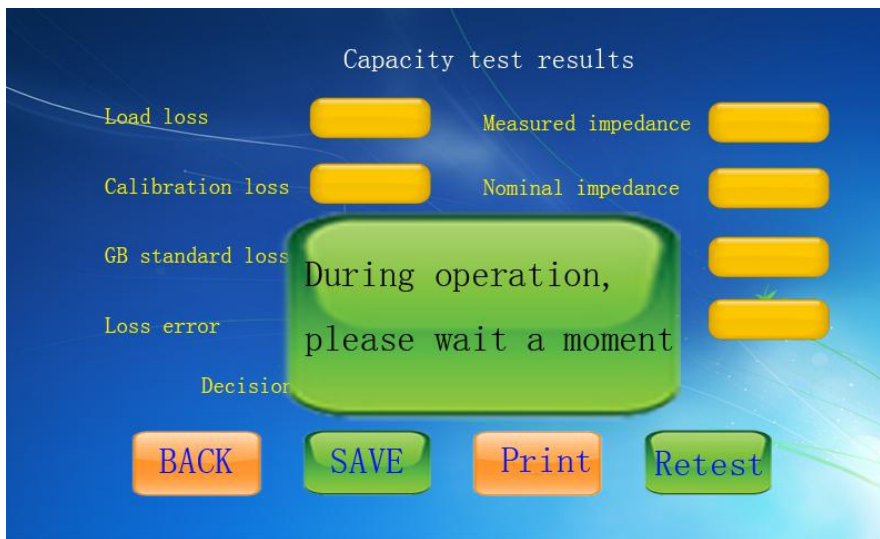


Figure 5, capacity test (in progress)

When the test is completed, the test results are displayed, as shown in figure 6:

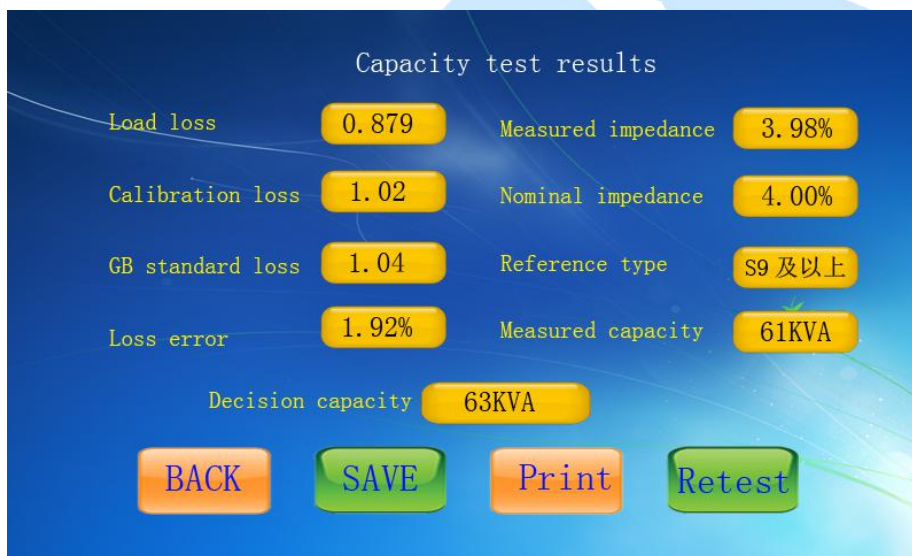


Figure 6, capacity test results

There are four alternative operating personnel next, select the SAVE test results will be saved into the internal memory, Print test results will be printed by printer, select BACK from the test interface of the return to the main interface; select Retest to measure.

### 5.3 Load test interface introduction

## 1) Experimental wiring method

The load loss of transformer three-phase three wire power measurement: three-phase power supply test is applied from the high voltage side of the transformer low voltage side with special short wiring good short circuit, three test clamp (yellow, green and red), each hand are led two test lines with a thick line, a thin, thick line connected to a current terminal fine, connected to the terminal voltage, three-phase terminal three pliers are respectively connected on the high-voltage side of the transformer wiring, as shown in figure 7.

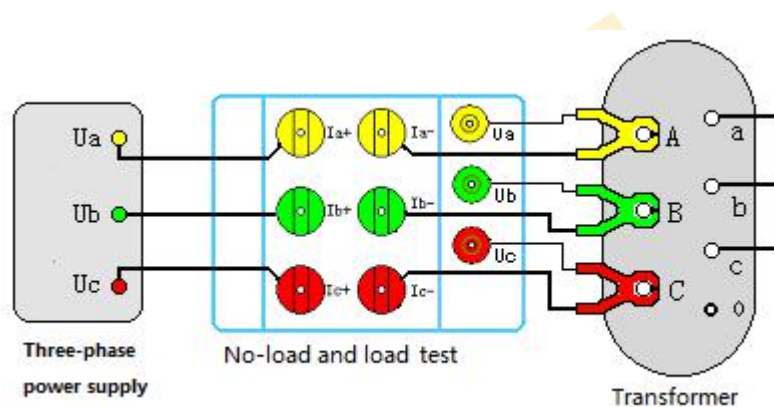


Figure 7, three-phase power transformer short circuit loss measurement

If you use PT and CT measurements, refer to the wiring below:

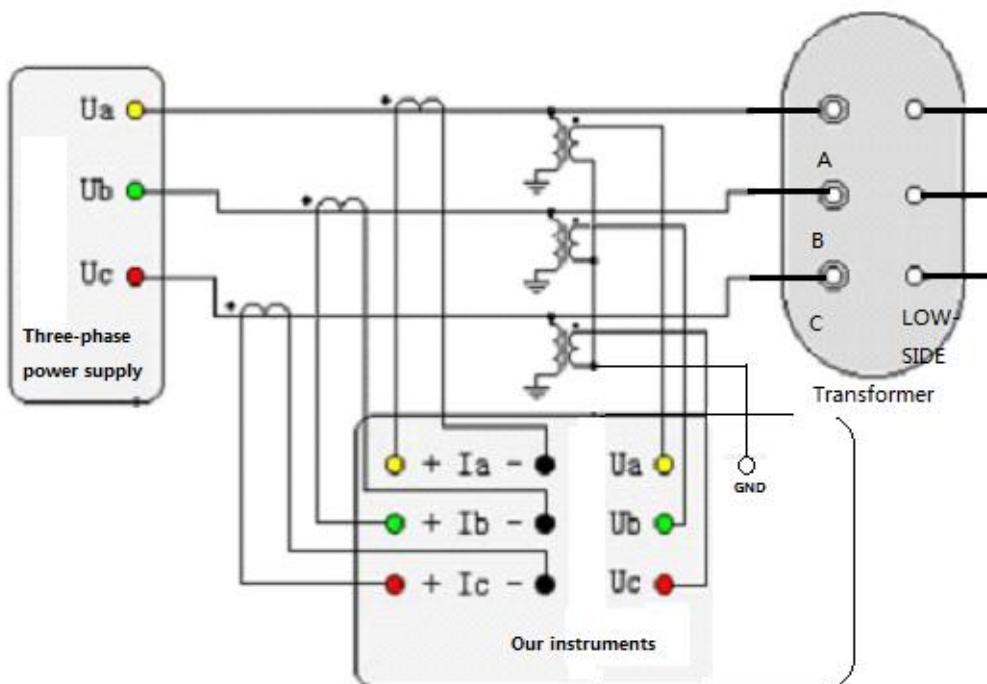


Fig. 8 schematic diagram of PT and CT connection for measuring short circuit loss of transformer by three-phase power supply

## 2) Interface operation

The three-phase load test interface is shown in figure 9:

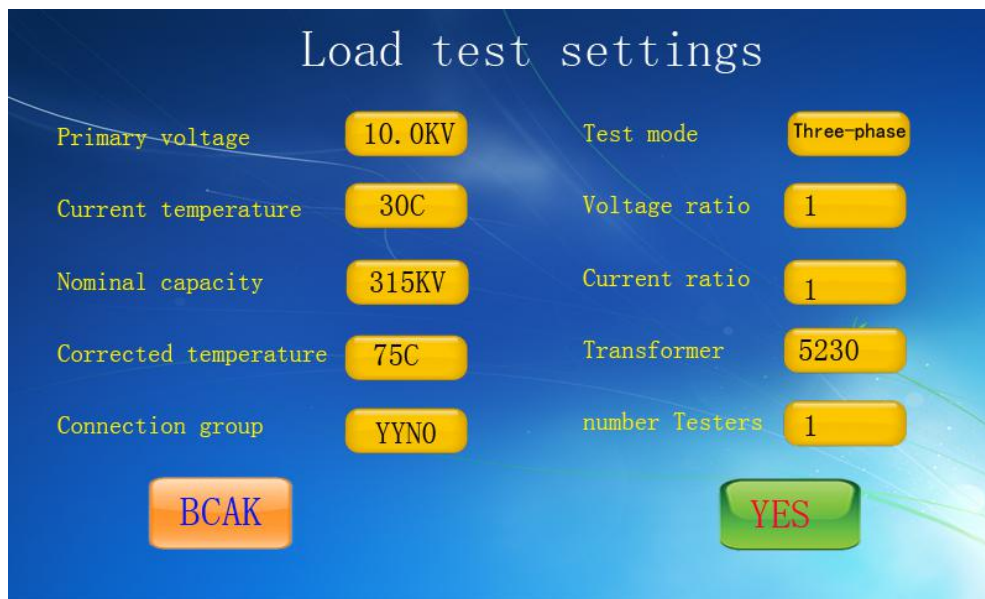


Figure 9, three-phase load test settings

- Primary voltage: Is a voltage transformer high voltage, voltage rated voltage transformer test refers to the value of the pressure side. Used to distinguish transformer with different voltage levels; parameters of the same capacity and different voltage level transformer short-circuit test value is different; to achieve accurate judgment, you must enter the rated voltage of the high voltage side of the transformer test.
- Current temperature : ambient temperature
- The nominal capacity: used to calculate the capacity of error
- The temperature correction: according to the type of transformer input temperature calibration. The routine is 75 degrees
- The test mode: three element method, the instrument can not adjust the internal fixation
- The voltage ratio: the ratio of voltage sensor PT, without the use of sensor is 1

After all the parameters are set, click on the YES button on the LCD to start the test

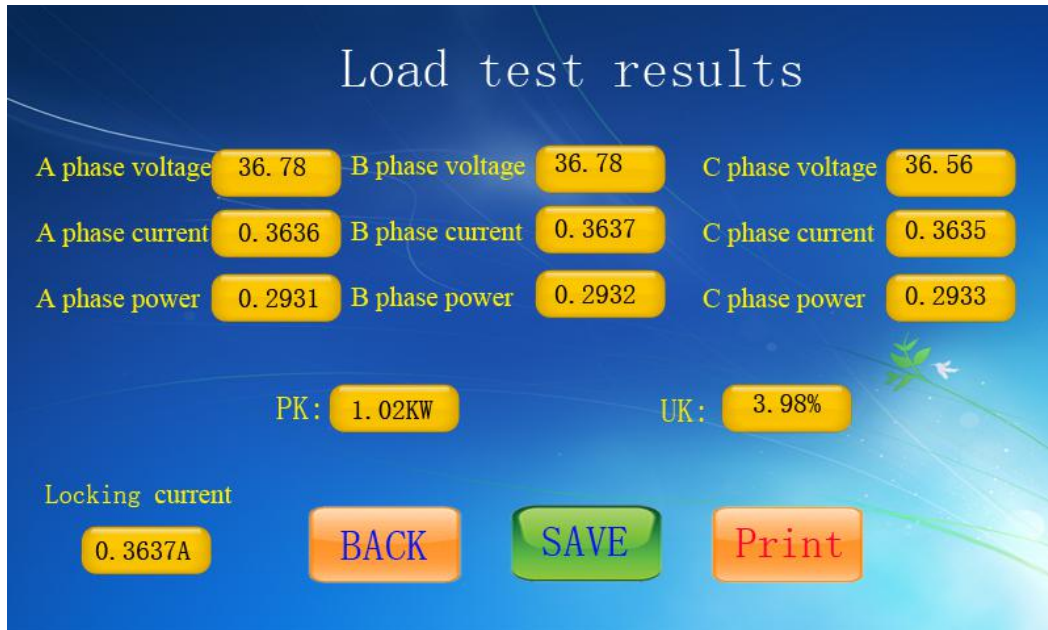


Figure 10, three-phase load test results

Show the three-phase voltage value test screen ( $U_{ab}$ ,  $U_{ac}$ ,  $U_{cb}$ ), three-phase current value test ( $I_a$ ,  $I_b$ ,  $I_c$ ), three measured power value ( $P_a$ ,  $P_b$ ,  $P_c$ ), short circuit automatic target current value, correction loss to rated current value under the condition of  $P_k$ , corrected to the impedance voltage rated current under the condition of  $U_k$  value.

There are three alternative operating personnel next, select the SAVE test results will be saved into the internal memory, Print test results will be printed by printer, select BACK from the test interface of the return to the main interface.

## 5.4 NO-Load test interface introduction

### 1) Experimental wiring method

The no-load loss of transformer power measurement: non transformer testing terminal is open, three test clamp (yellow, green and red), each hand are led two test lines with a thick line, a thin, thick line connected to a current terminal, wire connected to the terminal voltage, three-phase terminal three pliers are received on the low voltage side of transformer, wiring according to figure



11:

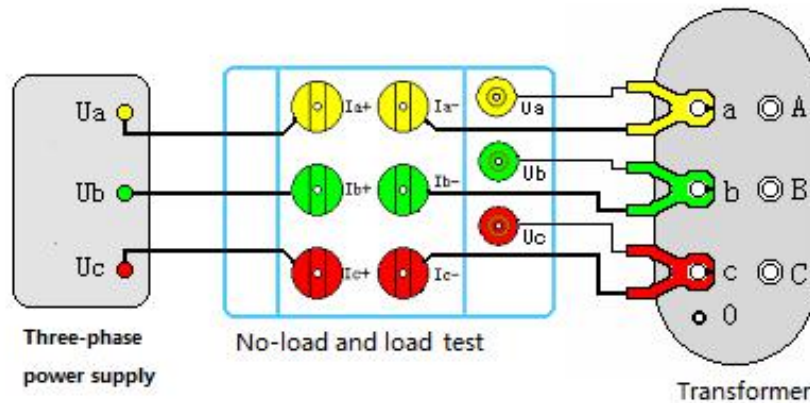


Figure 11, three-phase power supply transformer no-load loss measurement  
If you use PT and CT measurements, refer to the wiring below:

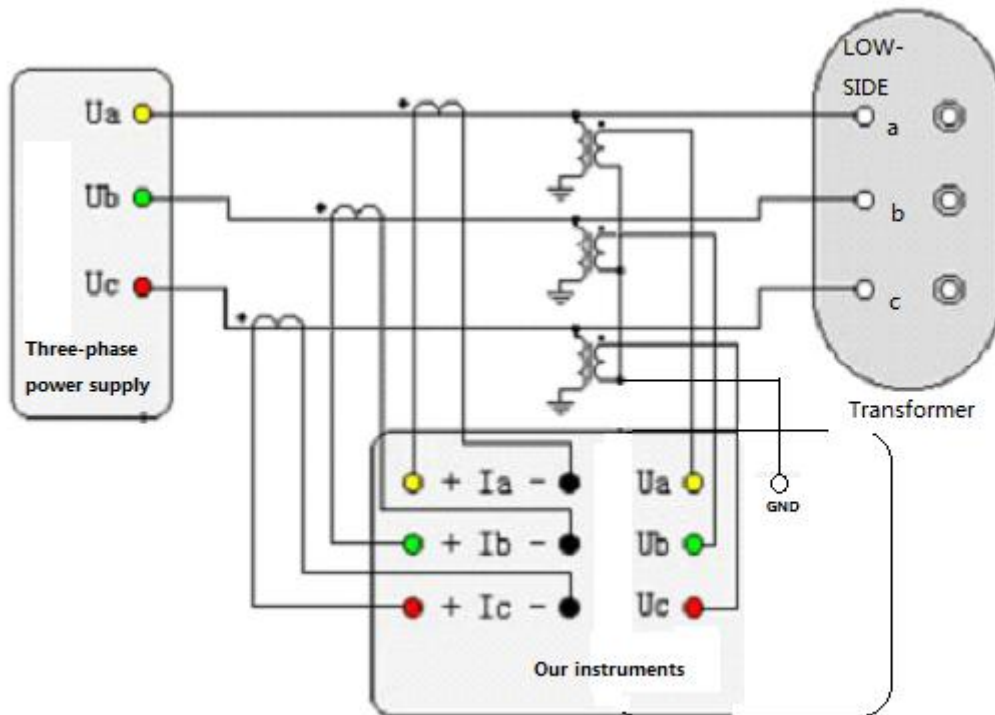


Fig. 12 schematic diagram of three-phase power supply for PT and CT connection of three phase transformer no-load loss

## 2) Interface operation

The three-phase no-load display interface is shown in Figure 11 and figure 13:

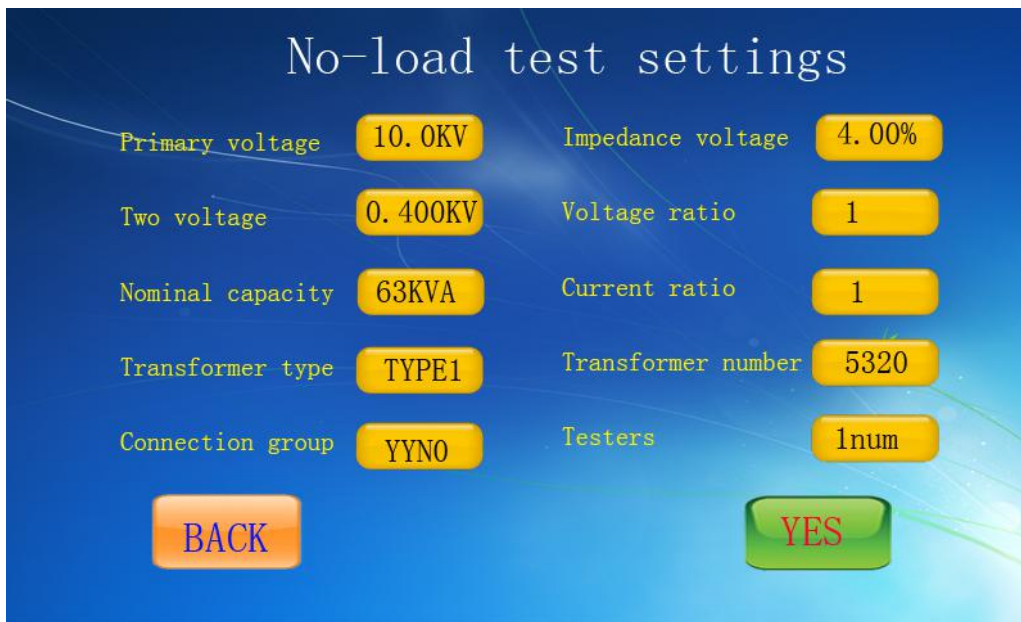


Figure 13, three-phase no-load real-time data

Parameter settings like no-load settings, after all parameters are set, click on the button on the LCD button to start the test. In Figure 14, you can see the phase data and test results of the real time refresh.

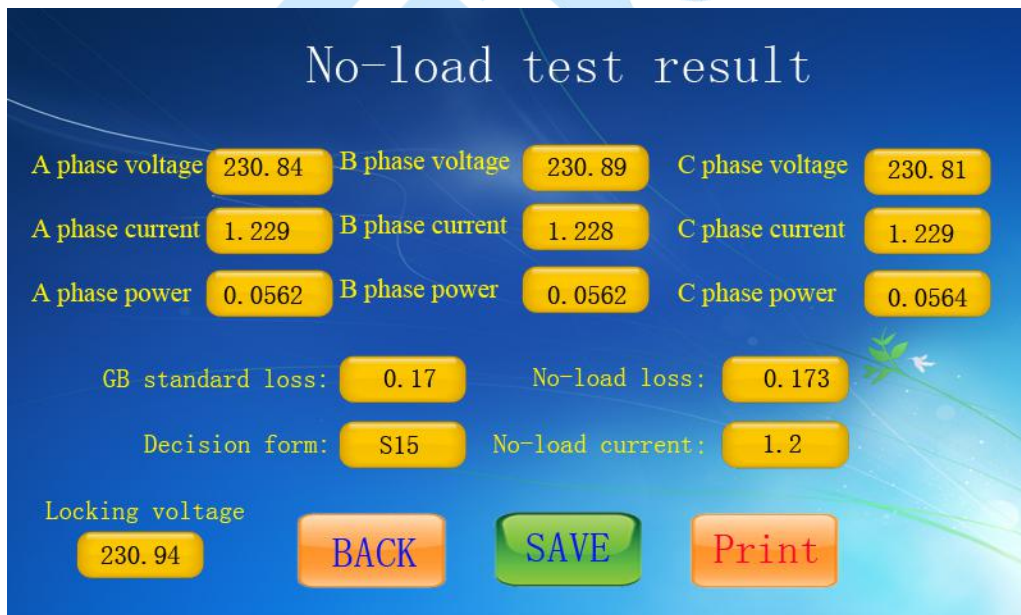


Figure 14, three-phase no-load test results

The three-phase no-load test process is divided into two steps: A, connect the test line, with the regulator slowly boost, until it reaches the rated voltage value; B voltage to lock the voltage value,

the instrument will determine the test results and the calculated results. Figure 13 shows the real-time data in the test process, constantly refresh, including the actual measured voltage, current, power, three-phase average voltage, no-load current percentage, no-load loss, etc.. Results include judging form (energy consumption level of the transformer), the measured no-load loss, no-load loss correction to the rated conditions, the tables to the standard correction loss, loss of GB loss percentage error, the no-load current to the rated condition correction percentage, no-load current value, percentage of GB no-load current value, measured the percentage the percentage of the no-load current GB no-load current percentage error.

There are three alternative operating personnel next, select the SAVE test results will be saved into the internal memory, Print test results will be printed by printer, select BACK from the test interface of the return to the main interface.

## 5.5 Historical data

In this screen, check the transformer capacity test results, the data format and capacity test results are the same as shown in figure 15. Click the appropriate option to call the appropriate save data value.

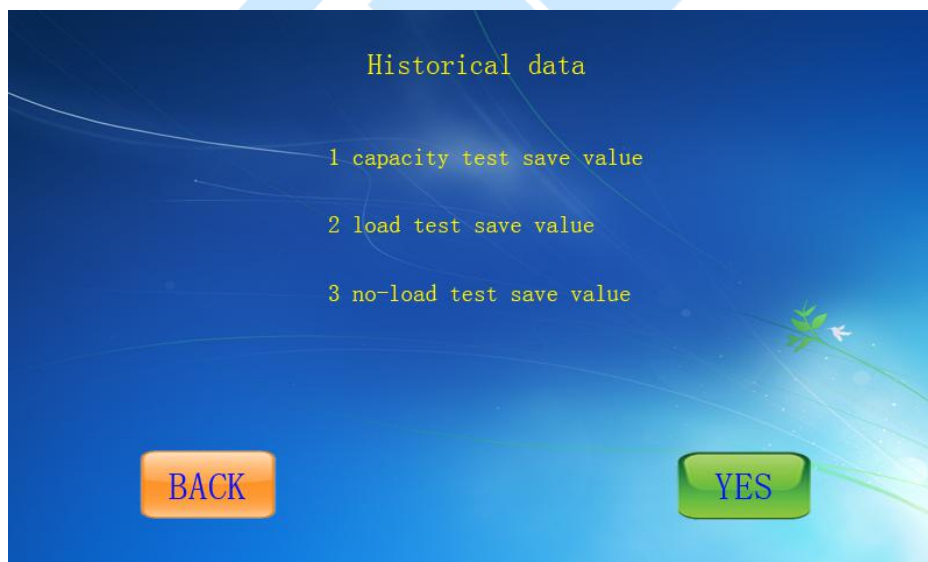


Figure 15, results query interface

## 5.6 System settings

The system is set up for the factory debugging part, the user does not need to adjust in general



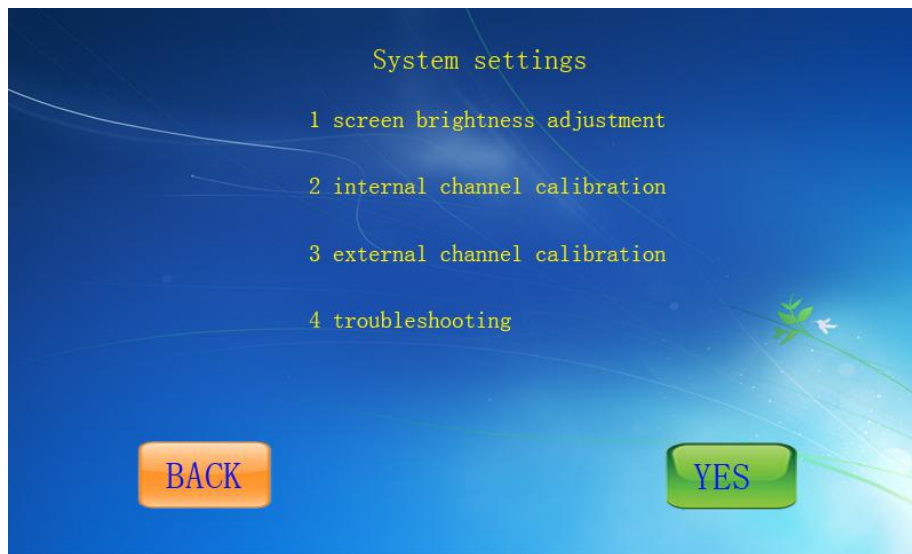


Figure 16, system settings interface

## 6、 battery maintenance and charging

The instrument uses high performance lithium ion rechargeable battery as internal power supply, and the operator can not change other types of batteries at random, so as to avoid damage to the instrument due to level incompatibility.

The device must be charged in time to avoid battery deep discharge affecting battery life, Under the condition of as much as possible every day on one charge of normal use (without long-term best in a month on a single charge), so as not to affect the use and the service life of the battery, charging time should be 4 hours or more, due to the internal charging protection function, can continuous charging of instrument.

## 7、 Matters needing attention

1. in the course of measurement, do not touch the metal part of the test line to avoid electrical injury.
2. measuring wiring must strictly operate according to the instructions, otherwise the consequences.
3. before you test, be sure to check that the settings are correct.
4. it is better to use a power cord with earth wire.
5. do not work under excessive voltage and current conditions.

6. short circuit test, the non pressurized side of the short connector must be good, otherwise it will have an impact on the test results.
7. when doing short-circuit test, if the high voltage or medium voltage side outlet bushing is equipped with an annular current transformer, the two times of the current transformer must be shorted before the test.
8. test wiring work must be carried out in the test line grounding, to prevent induction voltage shock. All short circuits, grounding and leads should have sufficient cross sections and must be securely connected. Test organization work should be tight, communication smooth, in order to ensure the safe and smooth test work.
- 9., when the instrument needs charging, be sure to turn off the power supply (press the "O" for "off"), plug in the power line, the yellow light charging instructions begin flashing, indicating charging into the normal state.
10. when the transformer test 500kVA or 630kVA, must be set to the reference volume, because 500 and 630 in the transformer impedance voltage conversion zone, with the possibility of crossing capacity, in order to avoid misjudgment, set this parameter must be.