

Dear Client,

Thank you for purchasing our UHV-321 Transformer Capacity Load No-load Tester. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.



Our aim is to improve and perfect the company's products continually, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix. Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.



The input/output terminals and the test column may bring voltage, when you plug/draw the test wire or power outlet, they will cause electric spark. PLEASE CAUTION RISK OF ELECTRICAL

SHOCK!

Company Address:

- ◆ T4, No. 1, High-tech 2 Road, East Lake High-tech Development Zone, Wuhan
- ◆ Sales Hotline: 86-27- 87492243
- ◆ After Service Hotline: 86-27- 87459656
- ◆ Fax: 86-27- 87803129
- ◆ E-mail: qiao@hvtest.cc
- ◆ Website: www.cnuhv.com

◆ **SERIOUS COMMITMENT**

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ **SAFETY REQUIREMENTS**

Please read the following safety precautions carefully to avoid body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specification of this produce.

Connect and Disconnect Correctly

When the test wire is connected to the live terminal, please do not connect or disconnect the test wire.

Grounding

The product is grounded through the power wire; besides, the ground pole of the shell must be grounded. To prevent electric shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with

the input/output port.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Circuit and Charged Metal

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Failures

If you encounter operating failure, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry

— **Security Terms**

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

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I. Functional characteristics

Measure the transformer load current, load loss, short-circuit voltage, short circuit (load) losses, capability.

II. Three Methods

Do three-phase transformer no-load, load test, the instrument can automatically determine the wiring is correct, and shows three-phase voltage and current vector map.

Single machine can do the following 100KVA distribution transformer full load current experiment; in one third of the rated current, complete 250KVA distribution transformer load the following test (in one third of the rated current, the instrument can be converted to load loss under rated current parameters, the machine is mainly used in the test bed with integrated supporting the use of transformers.

All the related test results are automatically corrected. Instrument can automatically such as: the waveform correction, temperature correction, non-rated voltage correction, calibration, and other non-rated current correction, so that more accurate test results.

320x240 large screen, high brightness LCD display, full Chinese menu and operations to achieve prompt and friendly man-machine dialogue, touch buttons make the operation more convenient, wide LCD with brightness adjustment, can be adapted to the various summer and winter season.

Comes with real-time clock, automatically recording test date, time, the preservation of favorable results, management.

Panel-type thermal printer, the scene quickly print test results.

Data (test sample set, the measurement results, the test of time, etc.) with power-down storage and browsing features, you can store 500 set of experimental results with computer on-line data transfer.

Allows an external voltage transformer and current transformer for extended range of measurement, any measurable parameter is the test product.

III. The main technical indicators

1. Test Item

- ✧ RMS phase voltage: U_{ab} 、 U_{bc} 、 U_{ca} ;
- ✧ Average value of three-phase AC voltage: $\sqrt{3}U_{ab}$ 、 $\sqrt{3}U_{bc}$ 、 $\sqrt{3}U_{ca}$;
- ✧ Three-phase current RMS: I_a 、 I_b 、 I_c ;
- ✧ Percentage of no-load loss and no-load current: P_0 、 $I_0\%$;
- ✧ Load loss, impedance voltage, and the percentage of short-circuit impedance: P_t 、 U_{ekt} 、 Z_t ;

Any given temperature, load loss, the percentage impedance voltage and short circuit impedance;

Any given temperature, load loss, the percentage impedance voltage and short circuit impedance;

2. Main technical parameters

Capacity measuring range : 30kVA ~ 31500kVA

Current measuring range: 0 -100A auto-switch the measurement range

Current measurement accuracy: $\pm (0.2\% + 3\text{digits})$

Voltage measurement range: Line Voltage 0-750V; phase voltage 0-450V, auto-switch the measurement range

Voltage measurement accuracy: $\pm (0.2\% + 3\text{digits})$

Insulation resistance: $> 100M\Omega$

Leakage current: $< 3.5\text{mA}$

Dielectric strength: the power connection on the chassis can withstand: 1500V

External transformer can broaden the scope of measurement instruments;

Frequency Range: 40 ~ 65Hz, accuracy class 0.2;

Power Input: AC220V \pm 10%;

IV. Panels Description

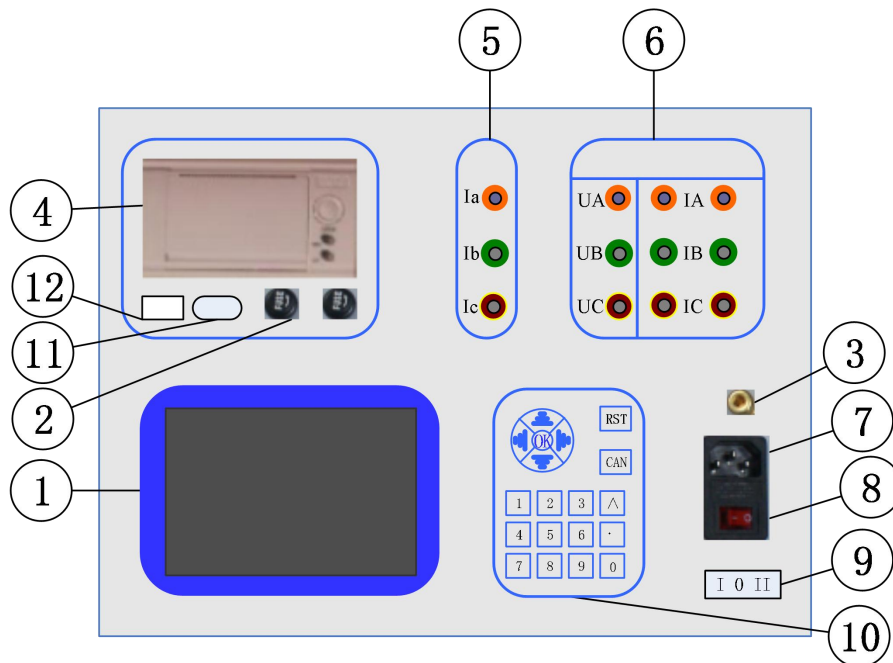


Figure 1 Tester panel

1. LCD screen
2. Fuse
3. Earthing
4. Printer
5. Connection port of transformer capacity
6. Connection port of transformer no-load and load
7. Charge electrical outlet
8. Charge switch
9. Power switch;
10. Keyboard

11. RS232

12. USB

V. Operating Instructions

1. Keyboard use

"OK" button to select the current input, "Cancel" the error can be eliminated just enter, "↑" "↓" "←" "→" can facilitate the realization of the cursor's movement. "Switch" button to spare key. The bottom of the keyboard data from 0 to 9 keys, the data input by the numeric keys can be easily input data.

2. Introduce the main interface

The main interface as shown below, consists of 6 modules.

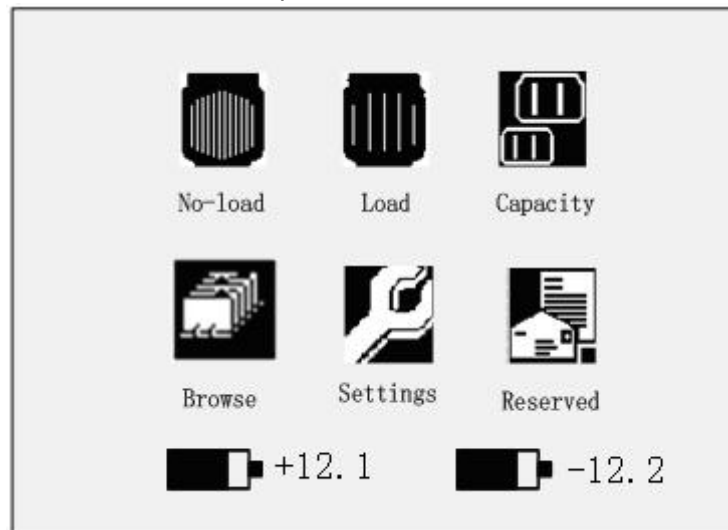


Figure 2 The main interface

No-load test: the menu can be measured in the single-phase transformers, three-phase transformer no-load loss.

Load Test: In this menu, you can determine single-phase transformers, three-phase transformer load losses.

Test product parameters: the default transformer parameters on modify, add, delete and other operations.

Data view: on the stored data to view, delete and other management.

System Settings: Set the current system time.

Factory settings: This feature manufacturers for debugging.

3. No-load test process description

According to the test method for dual-table method or three tables, reference back of the corresponding wiring diagram correctly, and then reconnect the power supply load tester.

On the main screen select the load test, load test setup interface is displayed as below:

No-load		Type&Cap: <u>S</u> <u>30.0</u>
Style	<input type="radio"/> Uniphase	<input checked="" type="radio"/> Triphase
Method	<input checked="" type="radio"/> Two-watt	
Rated LV Voltage	<u>400.0V</u>	
Rated LV Current	<u>454.7A</u>	
PT when no-load test	<u>1.000</u>	
CT when no-load test	<u>1.000</u>	
<input type="button" value="Begin"/>		<input type="button" value="Exit"/>

Figure 3 Load Test Settings page

Save the page when setting the last test, inspect, modify the settings page it consistent with the current testing transformer.

In Figure 3, the cursor to select the "Start Test" and press OK key to enter the no-load test the following test data page:

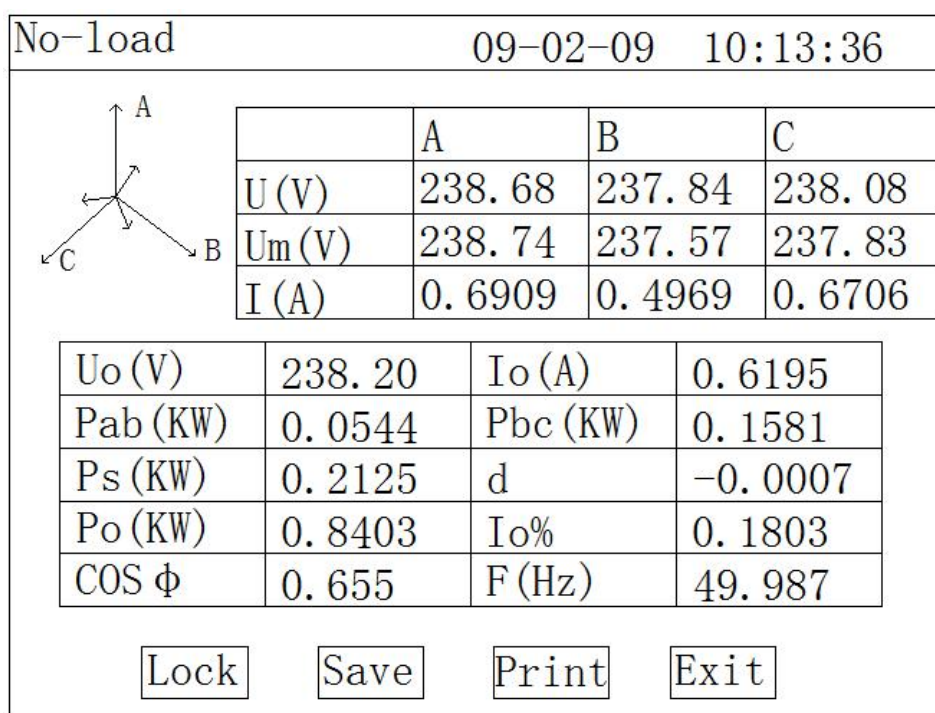


Figure4 Load Test test data page

This page shows the full load test results of all tests: U_o (V) for the three-phase line voltage (dual-table method) or phase voltage (when the three-table method) of the average, P_m (KW) for the current voltage the measured power, d is the voltage waveform distortion factor, P_o (KW) for the corrected load loss, I_o% for the no-load current percentage.

Left side of the test voltage and current vector, if the connection is wrong, the page says "connection error, check off"; by slowly increasing the test voltage booster, when U_o (V) is equal to the rated voltage no-load test (low-pressure side of the transformer for the 400V, no-load test, two-table method, the test voltage U_o was 400V, three-table method load test, the test voltage U_o was 230V), to stop boost. Move the cursor to "lock" button, press OK button to lock the current test results, then "lock" button to "re-test" button.

In the page's "Save" to save the results to the current random storage; "Print" to print through the printer, the current test results

Note: The step-up the process, we should always pay attention to U_o and I_o, in addition to avoid over-voltage, but also to guard against abnormal test test sample over current damage to equipment

or the test product

In Figure 8 by "re-test" will be re-tested on the current transformer, press the "exit" is back to Figure 3, the main interface of system functions.

4. Load test process description

According to the test method for dual-table method or three tables, reference back of the corresponding wiring diagram correctly, and then reconnect the power supply load tester.

On the main screen select the load test, load test setup interface is displayed as below:

Load	Type&Cap:	<u>S</u> 30.0
Style	<input type="radio"/> Uniphase	<input checked="" type="radio"/> Triphase
Method	<input checked="" type="radio"/> Two-watt	
Rated LV Voltage		<u>400.0V</u>
Rated LV Current		<u>454.7A</u>
Rated HV Voltage		<u>10.0KV</u>
Rated HV Current		<u>18.19A</u>
PT when no-load test		<u>1.000</u>
CT when no-load test		<u>1.000</u>
<input type="button" value="Begin"/>		<input type="button" value="Exit"/>

Figure 5 Load Test Settings Page

Save the page when setting the last test, inspect, modify the settings page it consistent with the current test transformers, with particular attention to check the number after the 5 values "â€"â€"represent the capacity of the high pressure side of the rated current, current transformer Variable ratio, to avoid setting is incorrect or test current overrange.

In Figure 9, select the "Start Test", enter the load test the test data interface:

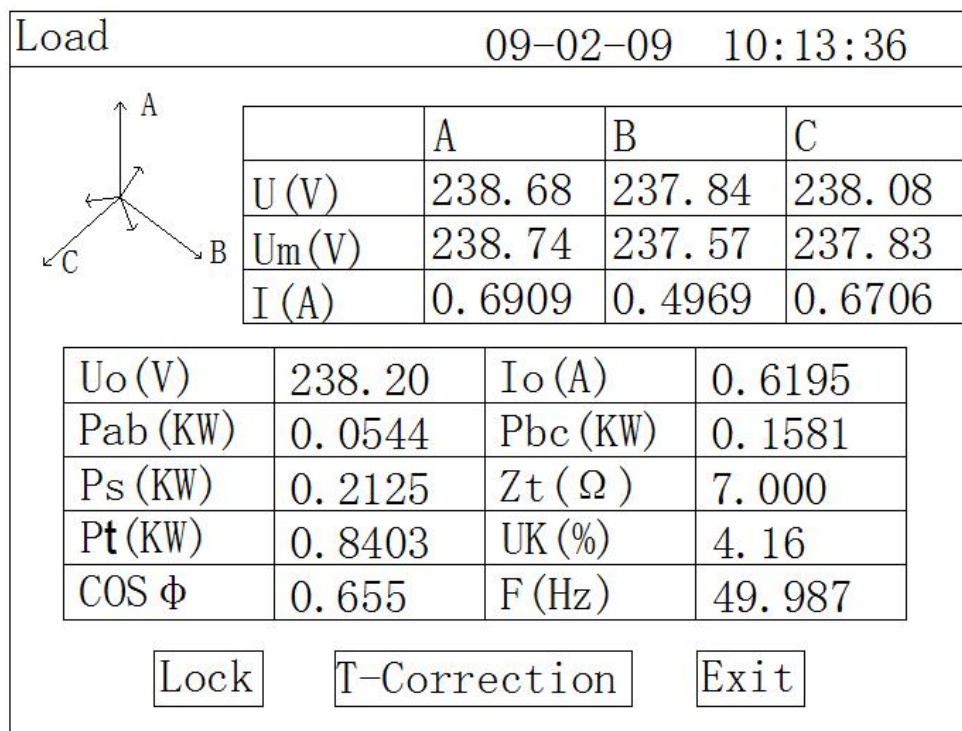


Figure 6 test data load test page

This page displays the current temperature load test all the test data: I_o (A) the average for the three-phase current, P_m (KW) for the current measured under voltage power, P_t (KW) for the current temperature correction to the rated current reproduced when the loss, Z_t (Ω) for the current temperature of the short circuit impedance, U_k% for the current temperature, the percentage of short-circuit voltage.

Left side of the test voltage and current vector, if the connection is wrong, the page says "connection error, check off"; by slowly increasing the test voltage booster, when I_o (A) test current equal to the load test, stop boost. Move the cursor to "lock" button, press OK button to lock the current test results, then "lock" button to "re-test" button.

Note: The step-up the process, we should always pay attention to U_o and I_o, in addition to avoid over-voltage, but also to guard against abnormal test test sample over current damage to equipment or the test product.

In Figure 10 Select the "temperature correction" to show the temperature correction interface:

Load T-Correction	
HV-winding Resistance	<u>0.0000</u> Ω
LV-winding Resistance	<u>0.0000m</u> Ω
T when measure resistance	<u>15</u> $^{\circ}\text{C}$
Temperature	<u>15</u> $^{\circ}\text{C}$
Corrected Temperature	<u>75</u> $^{\circ}\text{C}$

	Uk (%)	Zt (Ω)	Pt (W)
T-aimed	73.581	233.59	191.71
Equation	73.581	233.59	121.03

Figure 7 the results of temperature calibration load page

The page parameters is the last trial setting, inspection, modification to the test items are consistent with the current, the instrument provides two temperature correction algorithm: temperature coefficient method and the national standard formula, the formula see these two algorithms behind the appendix.

In the page's "Save" to save the results to the current random storage; "Print" to print through the printer, the current test results.

On the main screen select the capacity test, capacity test setup interface is displayed as below:

Capacity-test Setup		N0. : <u>0000000</u>
Type	<input type="radio"/> One-phase	<input checked="" type="radio"/> Tri-phase
Model	<u>S7/9/11/13/SH</u>	
HVS Rated Voltage	<u>13.2KV</u>	
HVS Tap Switch	<u>Mid</u>	
Impedance Voltage	<u>4.0000%</u>	
Temperature	<u>25</u> $^{\circ}\text{C}$	

Figure 8 the page of capacity set

Save the page when setting the last test, inspect, modify the settings page it consistent with the current test transformers, then press “begin” to enter the test volume measurement state.

Capacity Result			
	A	B	C
U (V)	6. 64	6. 66	6. 68
I (A)	0. 300	0. 294	0. 291
Sm (KVA)	392KVA	Sg (KVA)	400KVA
Pt (KW)	6. 22KW	Pkt (KW)	6. 90KW
Pgb (KW)	7. 22KW	Load Error	10%
Ukt (%)	4. 61%		
<div style="display: flex; justify-content: space-around; gap: 20px;"> Repeat Save Print Exit </div>			

Figure 9 the page of capacity result

Sm: Actual measurement of transformer capacity

Sg: The measured transformer capacity to the national standard archiving standard transformer capacity.

Pt: Transformer load loss measurement.

Pkt: Transformer load loss correction.

Pgb: GB transformer load loss.

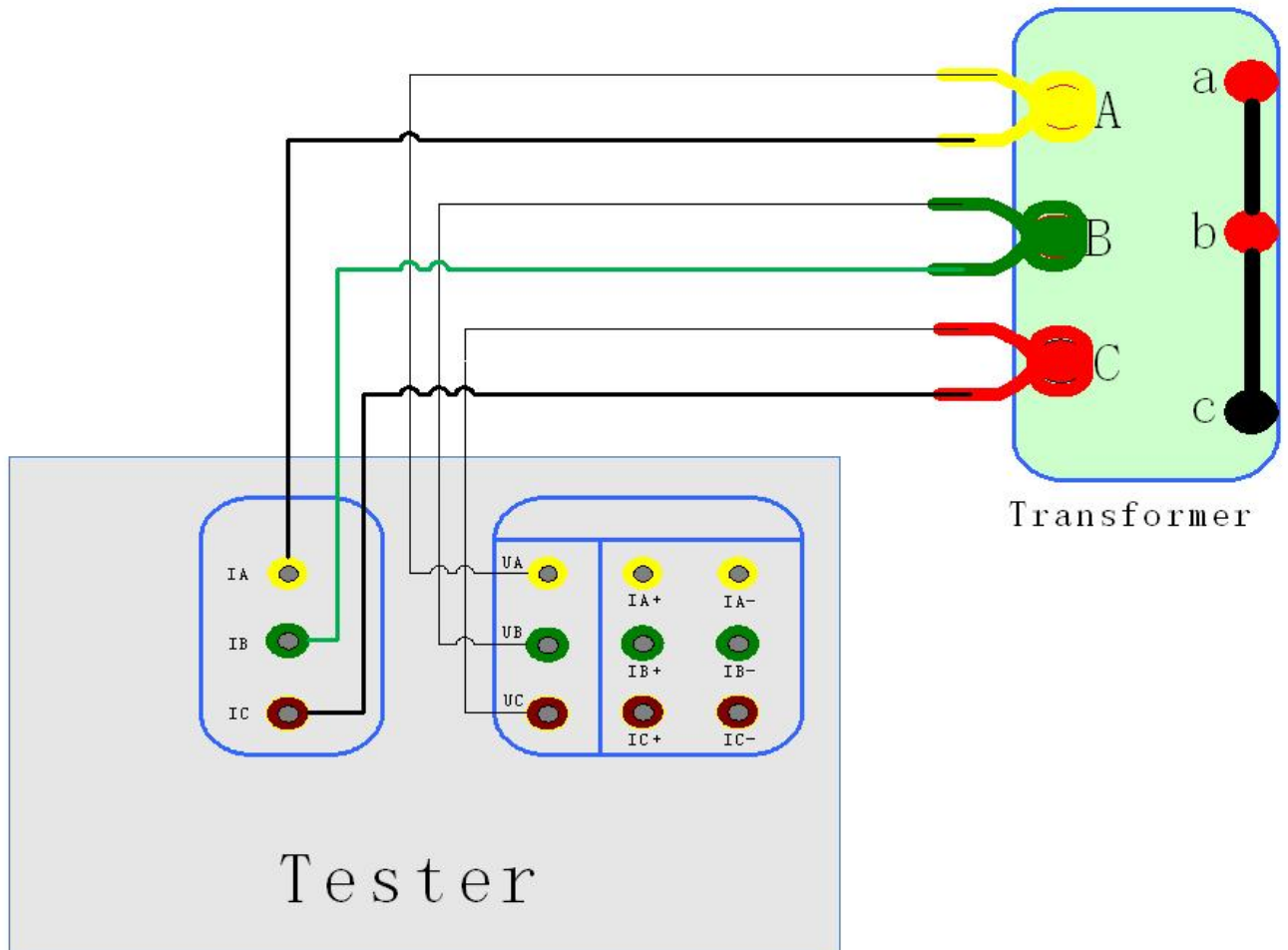
Error: Compared with the national standard error of the load loss

Ukt: Measured impedance voltage

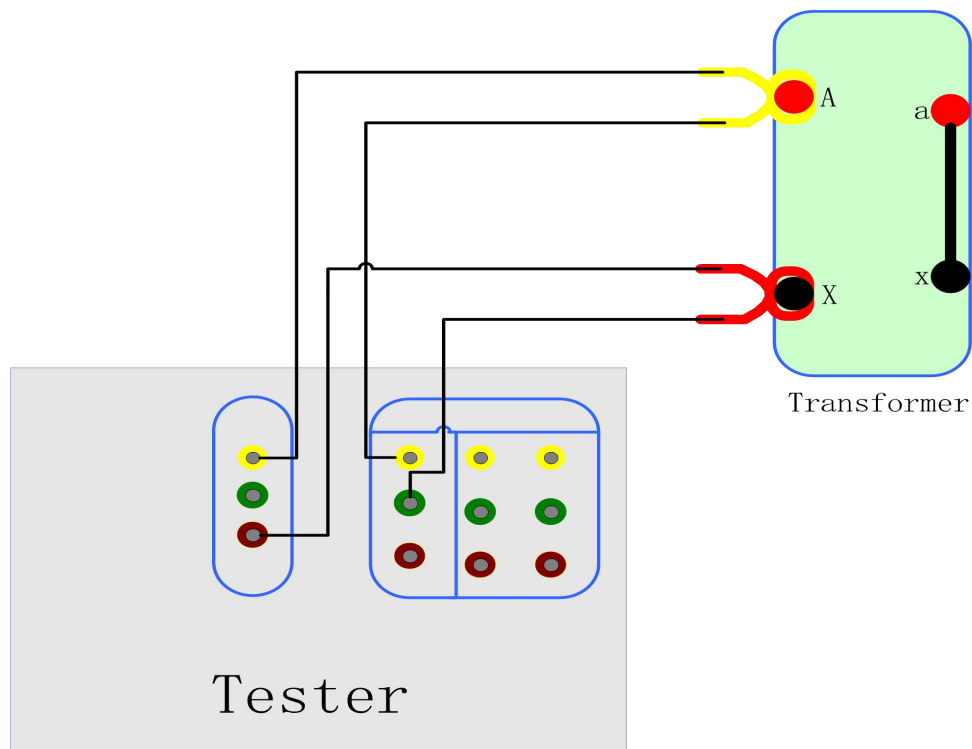
VI. Appendix

1. Test wiring diagram

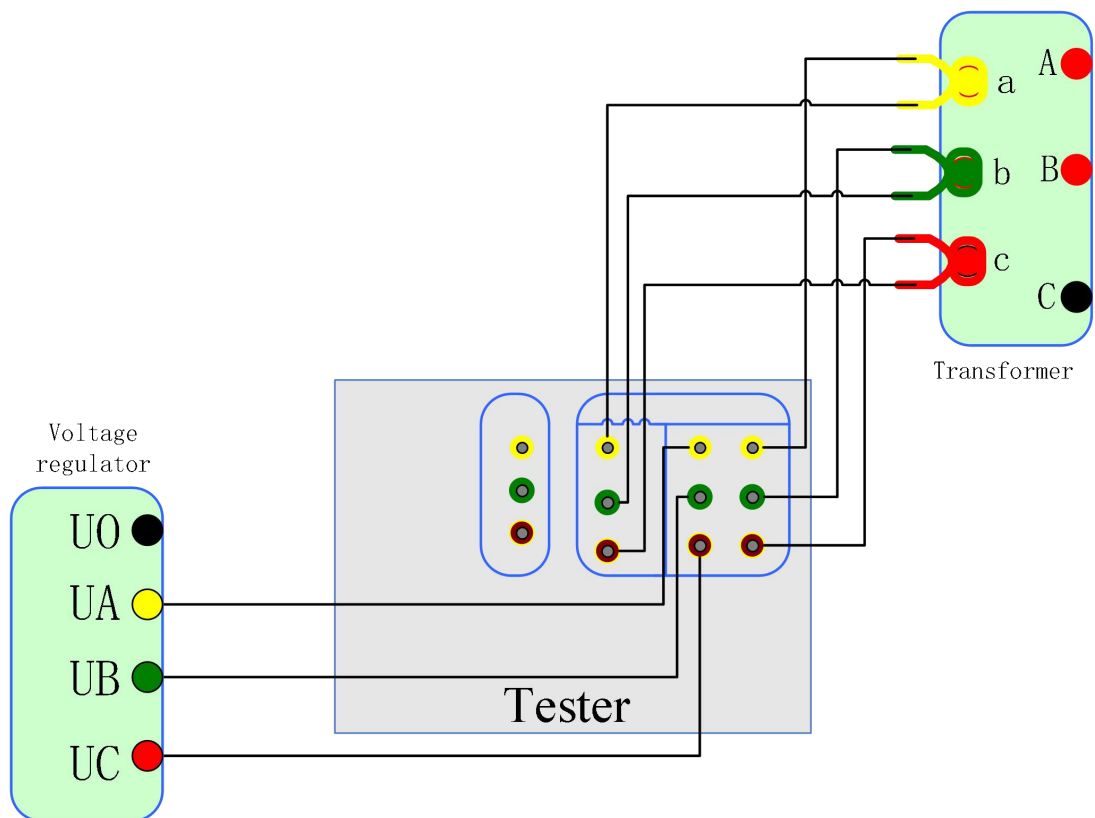
a. Triphase transformer capacity test connection diagram



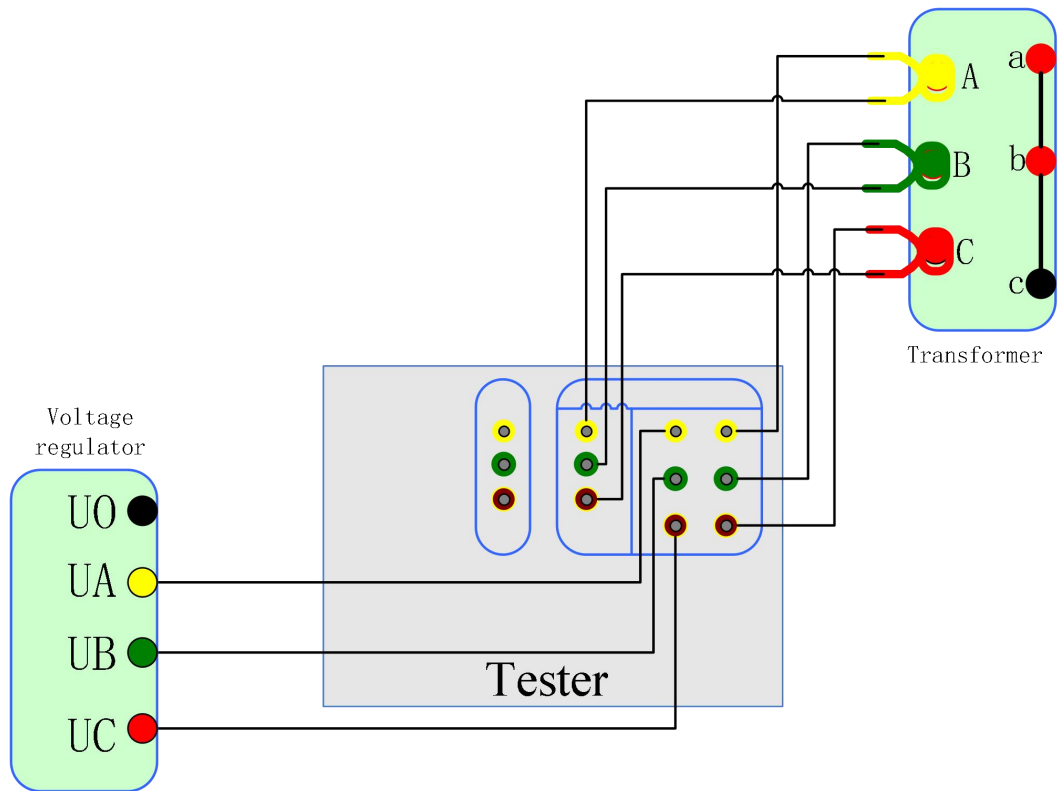
b. Single-phase transformer capacity test connection diagram



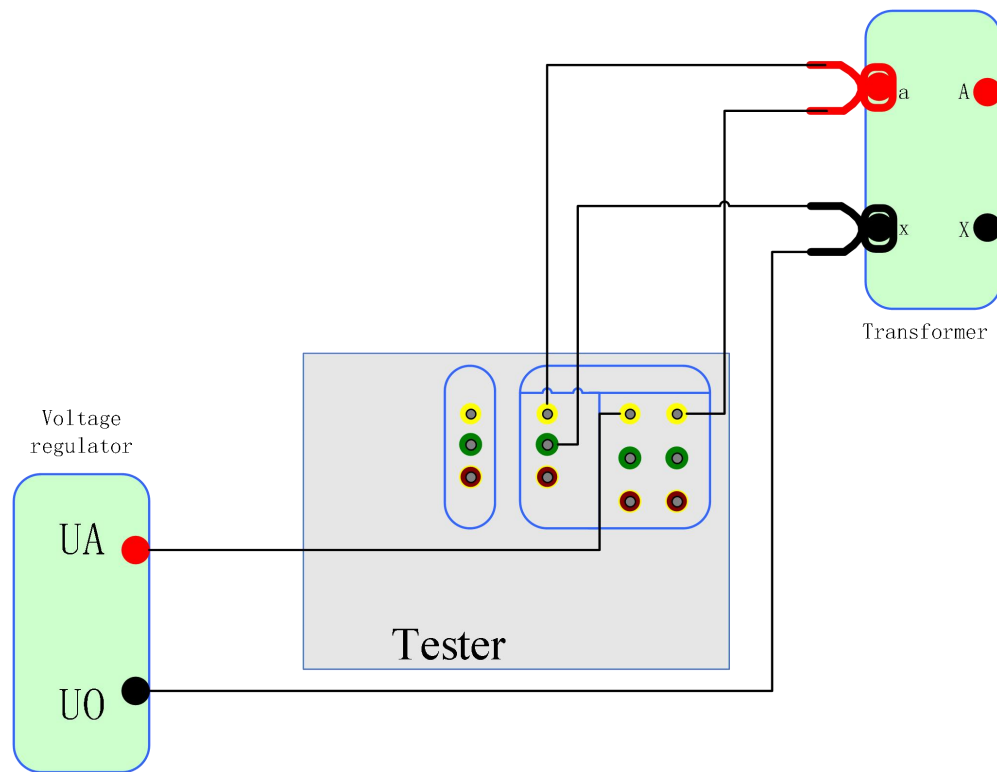
c. Triphase transformer no-load test connection diagram



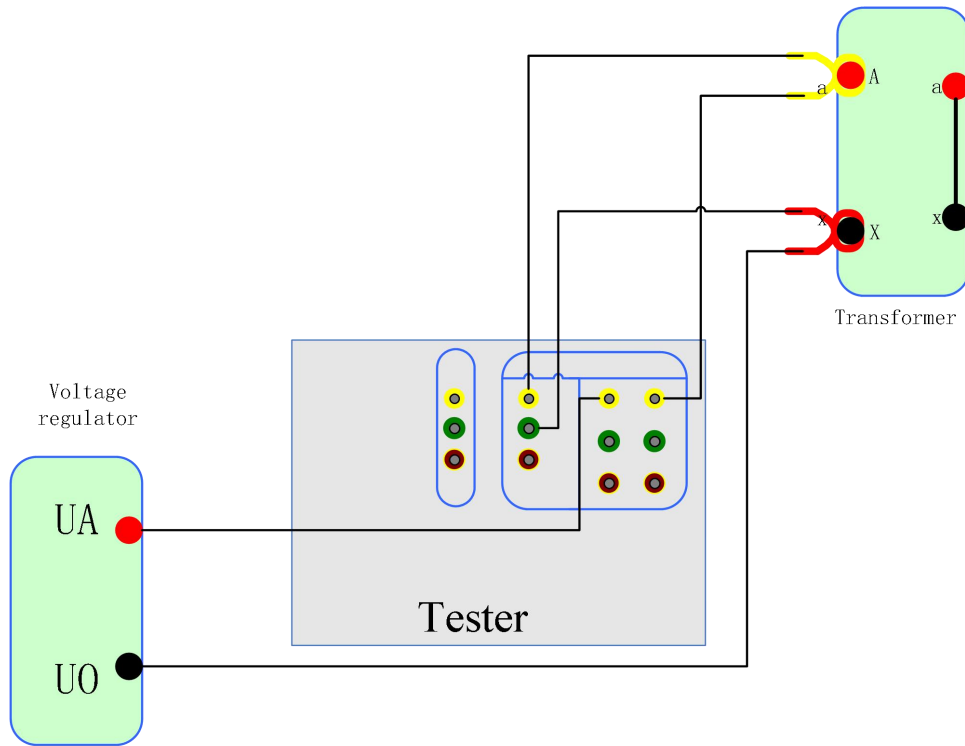
d. Triphase transformer load test connection diagram



e. Single-phase transformer no-load test connection diagram



f. Single-phase transformer load test connection diagram



2. Results and theoretical calculations show that formula

"Double-table method" means the two-Wattmeter Test Method for transformer losses by three-phase three-wire connection, "Three Methods" means three wattmeter method for measuring transformer loss test, according to three-phase four-wire connection.

Load test the temperature conversion formula: $u_{kt} \% = \sqrt{u_k^2 + \left(\frac{P_k}{10S_n}\right)^2 \times (K_t^2 - 1)} \times 100\%$

Percentage impedance voltage: $z_t = u_{kt} \times \frac{u_n^2}{S_n}$

Short circuit impedance: $P_{kt} = K_t P_k$

Temperature coefficient conversion formula is: $P_{kt} = \frac{P_k + \sum I_n^2 R_T (K_t^2 - 1)}{K_t}$

GB formula conversion formula is

Symbolic meaning of the formula:

t-correction of the target temperature, ie 75 or 120

T- Current temperature

t_R - The temperature when measuring resistance

K_t - The current ambient temperature conversion to t (75 or 120) degrees temperature

coefficient, $K_t = \frac{235 + t}{235 + T}$

K_R - The measuring resistance to temperature conversion when the temperature coefficient

of the current ambient temperature, $K_R = \frac{235 + T}{235 + t_R}$

U_o - The average of the measured rms phase voltage, $U_o = (U_{ab} + U_{bc} + U_{ca}) / 3$

I_o - The average of the measured RMS phase current, $I_o = (I_a + I_b + I_c) / 3$

P'_k - The total loss measured power transformer, two-table method $P'_k = P_{ab} + P_{bc}$,

three-table method $P'_k = P_a + P_b + P_c$

u_k - The impedance voltage percentage of the current temperature, $u_k = (U_o / U_n) * (I_n / I_o)$

P_k - The current temperature, the conversion to the rated current of the total loss power,

$P_k = P'_k * (I_n / I_o)$

U_n - Rated voltage of the applied voltage test, if the voltage was applied from the high side is

U_{n1} , if the voltage was applied from the low side is U_{n2} .

I_n - Applied voltage side of the rated current, if the voltage was applied from the high side

is I_{n1} , if the voltage was applied from the low side is I_{n2} .

S_n - Rated transformer capacity measured (in KVA).

U_{n1} / U_{n2} - Respectively, the measured high side and low-voltage test transformer rated voltage.

I_{n1} / I_{n2} - Respectively, the measured high side and low-voltage test transformer rated current.

$\Sigma I_n^2 R$ - The transformer being tested high and low pressure side of the three-phase winding

resistance loss (unit: W); "Y" and "D" connection type of resistance loss = $1.5 I_n^2 R_x$. "Yn"

connection type of resistance loss = $3 I_n^2 R_{xn}$, in which R_x - human type high / low pressure

side of the line resistance, R_{xn} - manual type high / low voltage side of the phase resistance

($x = 1$ 或 2).

$\Sigma I_n^2 R_T$ - Converted to the current temperature of the transformer winding resistance loss,

$$\Sigma I_n^2 R_T = K_R * \Sigma I_n^2 R$$

3. Common Troubleshooting

Boot no display: first off, open the socket on the back panel AC 220V fuse box, check the fuse box, you can replace insurance.

The screen suddenly black screen: press the reset button, to start measurement.

Measurement and computation results are not correct: Check the external wiring, whether by manual operation, whether bad or take the wrong line; relevant parameter is incorrect.

Measuring voltage and current display to zero the normal, check whether the current file fuse blown

Quality assurance

Service commitment

The company sold the product warranty for one year, five years, responsible for the maintenance (warranty period of the instrument users to the date of purchase), free maintenance during the warranty period, maintenance fees collected only during the period, the user requires after-sales service call Hotline 15307172868

4. Maintenance Responsibility

The failure or damage caused by user's drop during use or handling.

The failure or damage caused by user's maintenance with other units.

The failure or damage caused by the abnormal voltage.

The failure or damage caused by the force majeure (such as fire, flood, natural disasters, etc.) .

The failure or damage caused by the do not follow the requirements of this manual, free to connect to other devices.

No warranty card, and because the equipment could not confirm the defective product under warranty.

