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变压器空负载容量测试仪

Transformer Integrated Tester

• 产品使用说明 •

Product Usage



武汉科迪电气设备有限公司

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武汉科迪电气设备有限公司
Wuhan Kedi Electric Equipment Co., Ltd.

一、功能特性

Functional characteristics

- 1、可测量变压器的空载电流、空载损耗、短路电压、短路（负载）损耗、容量。

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

- 2、三表法实验方法。

Three Methods.

- 3、做三相变压器的空载、负载试验时，仪器能自动判断接线是否正确，并显示三相电压、电流的向量图。

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.

- 4、单机可以完成 1600KVA 以下的配电变压器全电流下的负载实验；在三分之一额定电流下可完成 2500KVA 以下的配电变压器的负载试验（在三分之一的额定电流下，仪器可换算到额定电流下的负载损耗参数。

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.

- 5、所有测试结果均自动进行相关校正。仪器可自动进行诸如：波形校正、温度校正、非额定电压校正、非额定电流校正等多种校正，使测试结果准确度更高。

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.

- 6、320x240 大屏幕、高亮度的液晶显示，全汉字菜单及操作提示实现友好的人机对话，触摸按键使操作更简便，宽温液晶带亮度调节，可适应冬夏各季。

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.

7、 自带实时电子钟，自动记录试验的日期、时间利于实验结果的保存、管理。

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

8、 面板式热敏打印机，可现场快速打印试验结果。

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

9、 数据（试品设置、测量结果、测试时间等）具备掉电存贮及浏览功能，可以存储 500 组实验结果，能与计算机联机传送数据。

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.

10、 允许外接电压互感器和电流互感器进行扩展量程测量，可测量任意参数的被试品。

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

二、主要技术指标

The main technical indicators

1、测试项目

Test Item

◇ 三相电压有效值：Uab、Ubc、Uca；

RMS phase voltage

◇ 三相电压交流平均值： \bar{U}_{ab} 、 \bar{U}_{bc} 、 \bar{U}_{ca} ；

Average value of three-phase AC voltage

◇ 三相电流有效值：Ia、Ib、Ic；

Three-phase current RMS

◇ 空载损耗及空载电流百分比：Po、Io%；

Percentage of no-load loss and no-load current:

- ◇ 负载损耗、阻抗电压百分比及短路阻抗： P_t 、 e_{kt} 、 Z_t ；

Load loss, impedance voltage, and the percentage of short-circuit impedance:

- ◇ 任意指定温度的负载损耗、阻抗电压百分比及短路阻抗；

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

- ◇ 实际变压器容量和判定容量。

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

2、主要技术参数

Main technical parameters

- ◇ 电流测量范围：100mA ~ 60A，测量精度 0.2 级；

Current measurement range: 100mA ~ 5A, accuracy class 0.2;

- ◇ 电压测量范围：10V ~ 650V，测量精度 0.2 级；

Voltage Range: 10V ~ 650V, accuracy class 0.2;

- ◇ 外加互感器可以拓宽仪器的测量范围；

External transformer can broaden the scope of measurement instruments;

- ◇ 频率测量范围：40 ~ 65Hz，测量精度 0.2 级；

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

- ◇ 电源输入：AC220V ± 10%；

Power Input: AC220V ± 10%;

二、面板说明

Panels Description



图 1 测试仪面板图

Figure 1 Tester panel

- 1、 液晶显示屏：用于汉字显示，指导操作，直观读数； LCD screen
- 2、 保险盒：保护仪器正常工作； Fuse
- 3、 接地柱：与大地连接，保证人身安全； Earthing
- 4、 面板式打印机：打印测量结果； Printer
- 5、 测量变压器容量接线端子； Connection port of transformer capacity
- 6、 测量变压器空载负载损耗接线端子 port of transformer no-load and load
- 7、 AC220V 电源插座，充电时及使用外部电源时使用； Charge electrical outlet
- 8、 充电开关； Charge switch
- 9、 仪器工作电源开关； Power switch;
- 10、 操作键盘：用于设备的实验操作。 Keyboard

四、操作说明

Operating Instructions

1、键盘使用方法 Keyboard use

“OK”键选择当前的输入，“取消”可以消除刚才的错误输入，“↑”“↓”“←”“→”则可以方便的实现光标的移动。“切换”键为备用键。键盘的下方为0~9的数据键，在数据输入时，通过这些数字键可以方便的输入数据。

"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、主界面介绍

Introduce the main interface

主界面如下图所示，由6个模块组成。

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

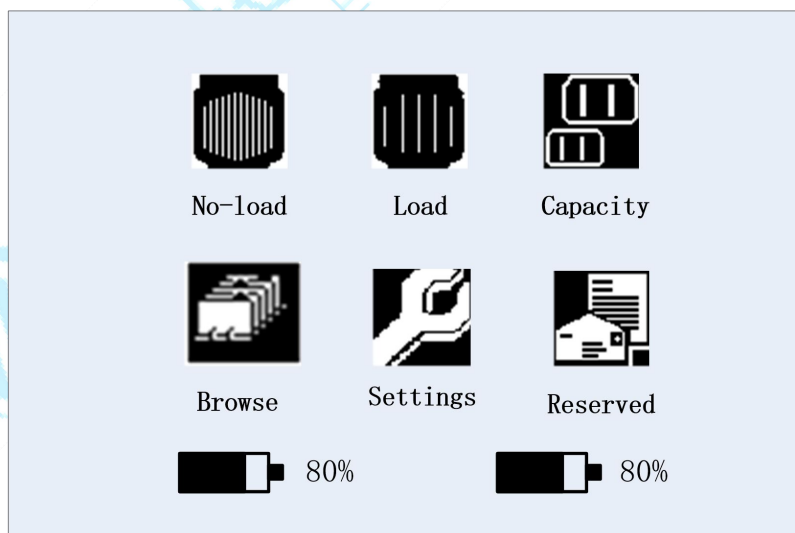


图2 测试仪开机主界面

Figure 2 The main interface

1) 空载试验：在该菜单中可以测定单相变压器、三相变压器的空载损耗。

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

2) 负载试验：在该菜单中可以测定单相变压器、三相变压器的负载损耗。

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

3) 容量测试：测试变压器容量。

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

4) 数据浏览：对存储的数据进行浏览，删除等管理。

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

5) 系统设置：设置当前的系统时间。

System Settings: Set the current system time.

6) 厂家设置：该功能为厂家生产调试用。

Factory settings: This feature manufacturers for debugging.

3、空载试验过程介绍

No-load test process description

1) 根据试验方式为双表法或是三表法，参考后面对应的接线图进行正确接线，然后接通测试仪的工作电源。

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.

2) 在主界面中选择空载试验，则显示空载试验设置界面如下图：

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

No-load Setup	Model & Cap: S0900315
Type:	<input type="radio"/> Uni-phase <input checked="" type="radio"/> Tri-phase
Measuring method	<input checked="" type="radio"/> Tri-watt
Rated LVS voltage:	400.0V
Rated LVS current:	454.7A
PT turn ratio:	1.000
CT turn ratio:	1.000
Begin	Exit

图 3 空载试验设置页面

Figure 3 Load Test Settings page

该页面保存上次试验时的设置值，检查、修改该页面中的设置值使其与当

前试验变压器一致。

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

- 3) 在图 3 中，光标选择“开始试验”，按 OK 键进入如下的空载试验测试数据页面： 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:

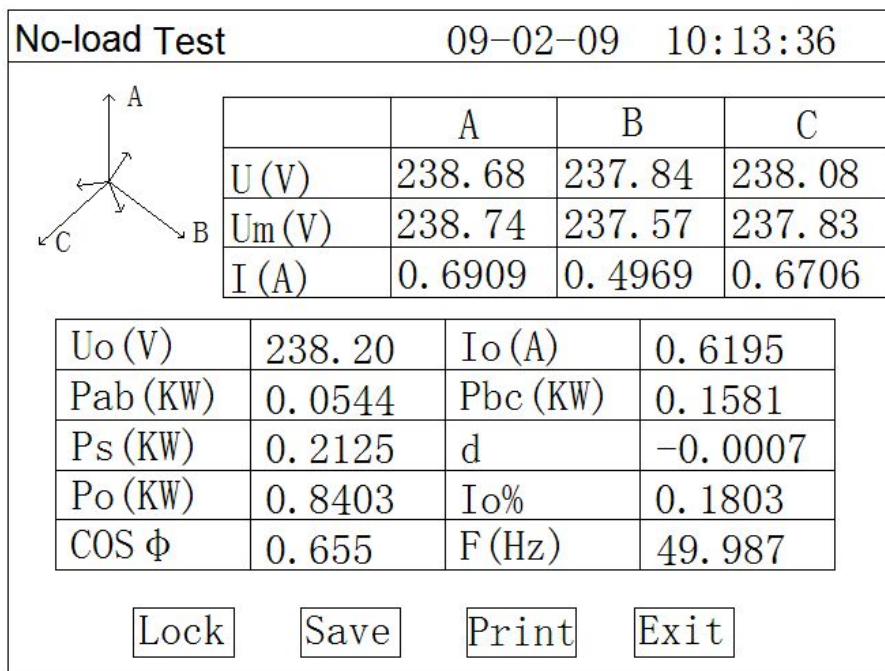


图 4 空载试验测试数据页面

Figure4 Load Test test data page

该页面完整的显示了空载试验的所有测试结果： U_o (V) 为三相线电压（双表法时）或相电压（三表法时）的平均值， P_m (KW) 为当前电压下的实测功率， d 为电压波形畸变系数， P_o (KW) 为校正后的空载损耗， $I_o\%$ 为空载电流百分比。

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.

左上侧为试验电压、电流的向量图，如果接线错误，该页面提示“接线错误，请关机检查”；通过升压器缓慢增加试验电压，当 U_o (V) 等于空载

试验的额定电压时（低压侧为 400V 的变压器，双表法空载试验时，试验电压 U_0 为 400V，三表法空载试验时，试验电压 U_0 为 230V），停止升压。移动光标到“锁定”按钮，长按 OK 键锁定当前测试结果，此时“锁定”按钮变为“重测”按钮。

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_0 (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_0 was 400V, three-table method load test, the test voltage U_0 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.

在该页面的“保存”把当前的结果保存到随机的存储器上；“打印”则通过打印机打印当前的测试结果。

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

注意：升压的过程中，要时刻关注 U_0 与 I_0 ，除避免过压外，更要提防试品异常时试验电流过大损坏仪器或被试品。

Note: The step-up the process, we should always pay attention to U_0 and I_0 , in addition to avoid over-voltage, but also to guard against abnormal test test sample over current damage to equipment or the test product

4) 在图 8 中按“重测”则将重新对当前变压器进行测试，按“退出”则回到图 3 系统功能的主界面。

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、负载试验过程介绍 Load test process description

1) 根据试验方式为双表法或是三表法，参考后面对应的接线图进行正确接线，然后接通空负载测试仪的工作电源。

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.

2) 在主界面中选择负载试验，则显示负载试验设置界面如下图：

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

Load Setup	Model & Cap: S0900400
Type:	<input type="radio"/> Uni-phase <input checked="" type="radio"/> Tri-phase
Measuring method	<input checked="" type="radio"/> Tri-watt
Rated LVS voltage:	400.0V
Rated LVS current:	454.7A
Rated HVS voltage:	10.0kV
Rated HVS current:	18.19A
PT turn ratio:	1.000
CT turn ratio:	1.000
Begin	Exit

图 5 负载试验设置页面

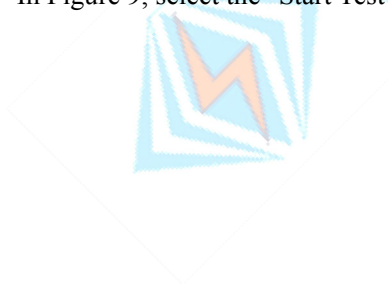
Figure 5 Load Test Settings Page

该页面保存上次试验时的设置值，检查、修改该页面中的设置值使其与当前试验变压器一致，尤其要注意检查编号的后 5 位所代表的容量值、高压侧额定电流、电流互感器变比等，避免设定值错误或者试验电流超量程。

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 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.

3) 在图 9 中选择“开始试验”，进入负载试验测试数据界面：

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



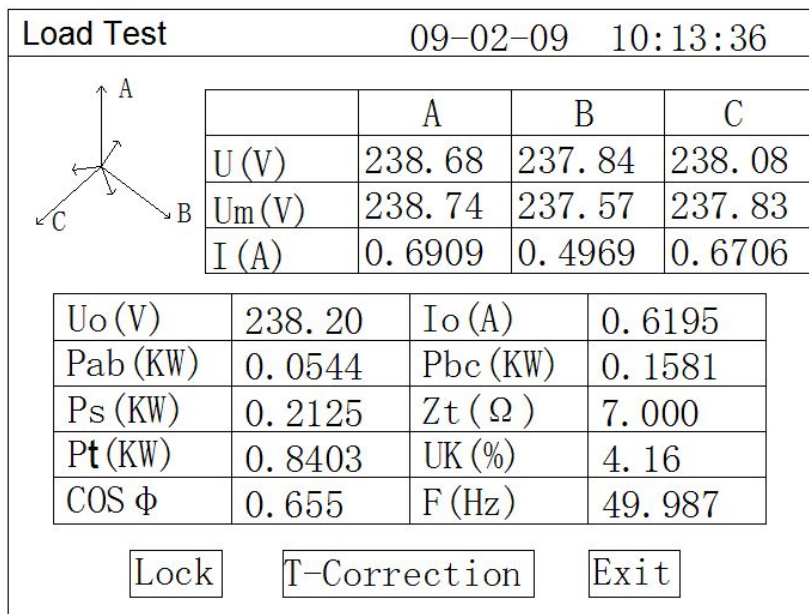


图 6 负载试验测试数据页面

Figure 6 test data load test page

该页面显示负载试验时当前温度下的所有测试数据： I_o (A) 为三相电流的平均值， P_m (KW) 为当前电压下的实测功率， P_t (KW) 为当前温度下校正到额定电流时的复载损耗， Z_t (Ω) 为当前温度下的短路阻抗， $U_k\%$ 为当前温度下的短路电压百分比。

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.

左上侧为试验电压、电流的向量图，如果接线错误，该页面提示“接线错误，请关机检查”；通过升压器缓慢增加试验电压，当 I_o (A) 等于负载试验的试验电流时，停止升压。移动光标到“锁定”按钮，长按 OK 键锁定当前测试结果，此时“锁定”按钮变为“重测”按钮。

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.

注意：升压的过程中，要时刻关注 U_o 与 I_o ，除避免过压外，更要提防

试品异常时试验电流过大损坏仪器或被试品。

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.

4) 在图 10 种选择“温度校正”，显示温度校正界面：

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

T-Correction

HV Resistance 2.849 Ω

LV Resistance 4.178 m Ω

T when measure resistance 10 $^{\circ}\text{C}$

T-object 10 $^{\circ}\text{C}$ T-aimed 75 $^{\circ}\text{C}$

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

图 7 负载结果温度校正页面

Figure 7 the results of temperature calibration load page

该页面的参数设置值为上次试验的设置值，检查、修改使其与当前被试品一致，本仪器提供两种温度校正算法：温度系数法和国标公式法，这两种算法的公式见后面附录。

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.

在该页面的“保存”把当前的结果保存到随机的存储器上；“打印”则通过打印机打印当前的测试结果。

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

5、容量测试过程介绍

1)、在主界面中选择容量测试，则显示容量测试设置界面如下图：

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

Capacity Setup		No.: 00000001
Type:	<input type="radio"/> Uni-phase	<input checked="" type="radio"/> Tri-phase
Model:	S7/9/11/13/FJ	
Rated HVS voltage:	10kV	
Tap of high voltage:	1st	
Impedance voltage:	4.000%	
PT turn ratio:	1.000	
CT turn ratio:	1.000	
Object temperature:	10°C	
Begin		Exit

图 8 容量测试设置界面

Figure 8 the page of capacity set

2)、该页面保存上次试验时的设置值，检查、修改该页面中的设置值使其与当前试验变压器一致，然后按开始试验即可进入容量测量状态。

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.

3)、容量测试结果如下： Capacity result:

Capacity Test Result			
	A	B	C
U(V)	6.64	6.66	6.68
I(A)	0.300	0.294	0.291

Sm	392kVA	Sg	400kVA
Repeat	Save	Print	Exit

图 9 容量测试仪结果

Figure 8 the page of capacity result

- ◇ 判定容量：把测得的变压器容量归档到国标规定的标准变压器的容量。
- ◇ 实测容量：该项显示实际测量的变压器的容量。
- ◇ 负载损耗：当前测试条件下实际测得的短路（负载）损耗。
- ◇ 国标损耗：如测得容量归档，则显示所归档位的变压器国标短路（负载）损耗值。
- ◇ 校正损耗：将测得的负载损耗校正到额定试验条件下所得到的短路（负载）损耗值。
- ◇ 损耗误差：校正损耗与国标损耗的误差百分数。
- ◇ 阻抗电压：当前试验条件下的被试变压器的阻抗电压。

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.

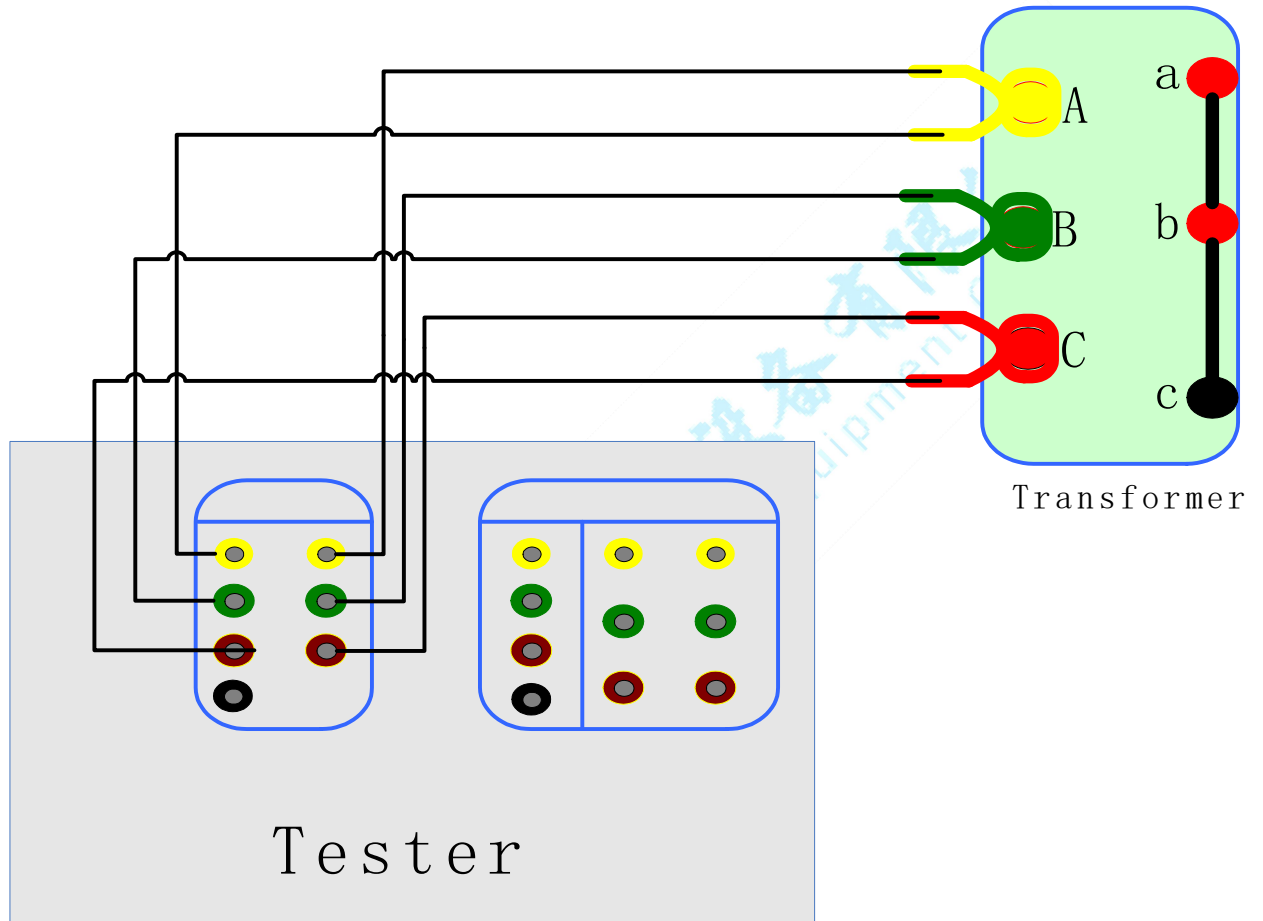
Error: Compared with the national standard error of the load loss

Ukt: Measured impedance voltage.

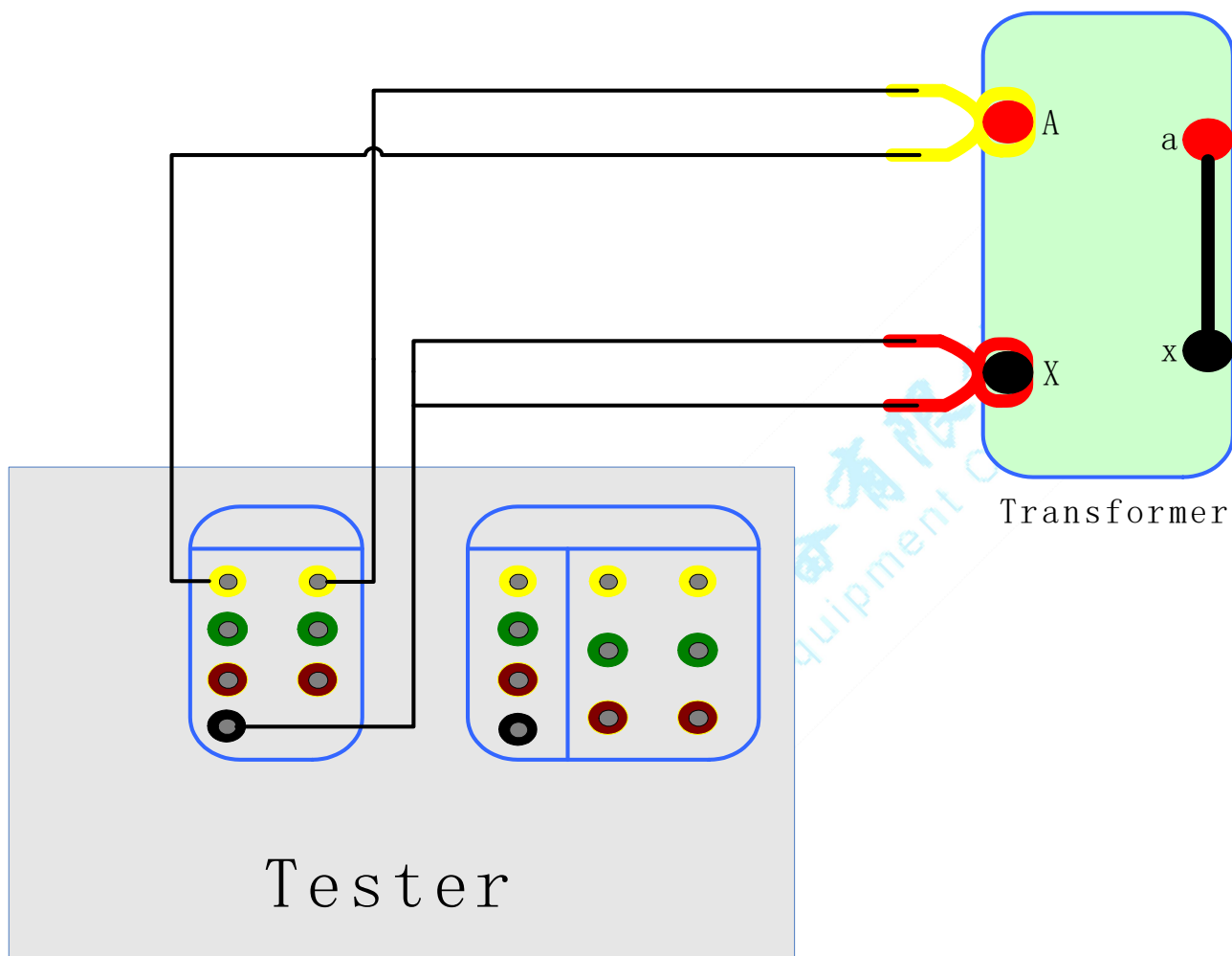
附录 Appendix

1、试验接线图 Test wiring diagram

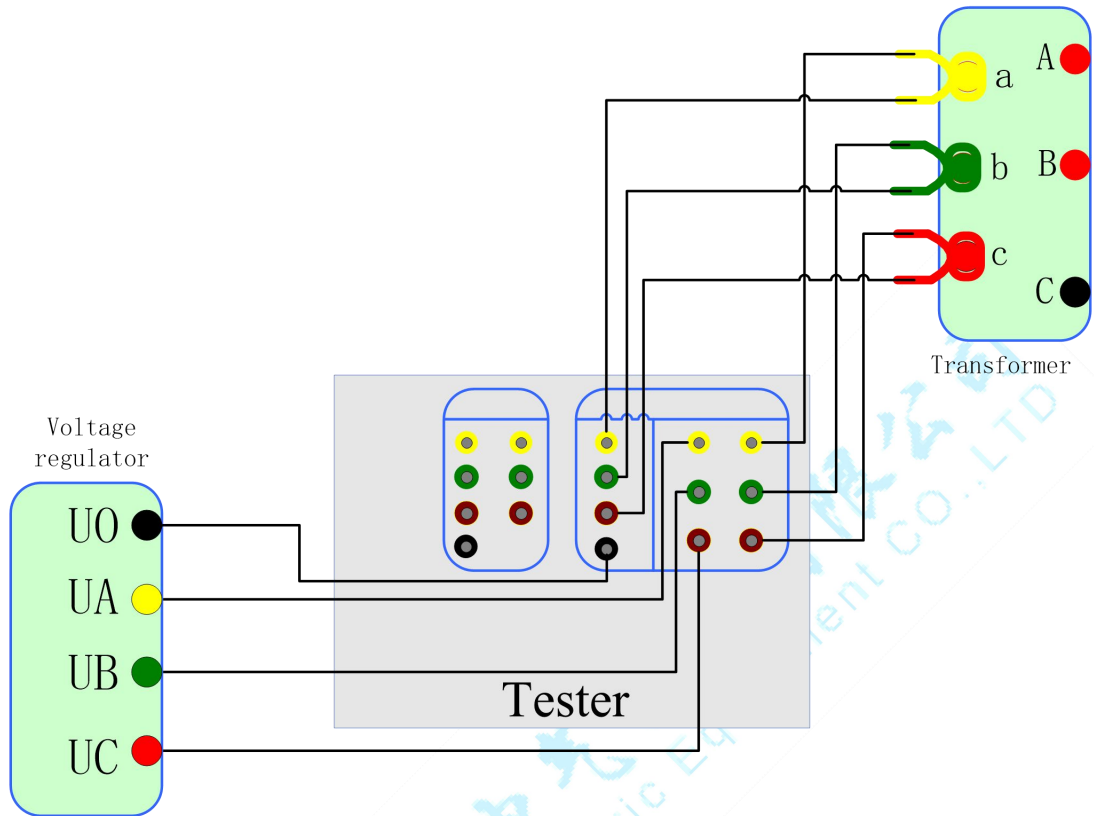
- 1) 三相变压器容量测试接线图：Triphase transformer capacity test connection diagram



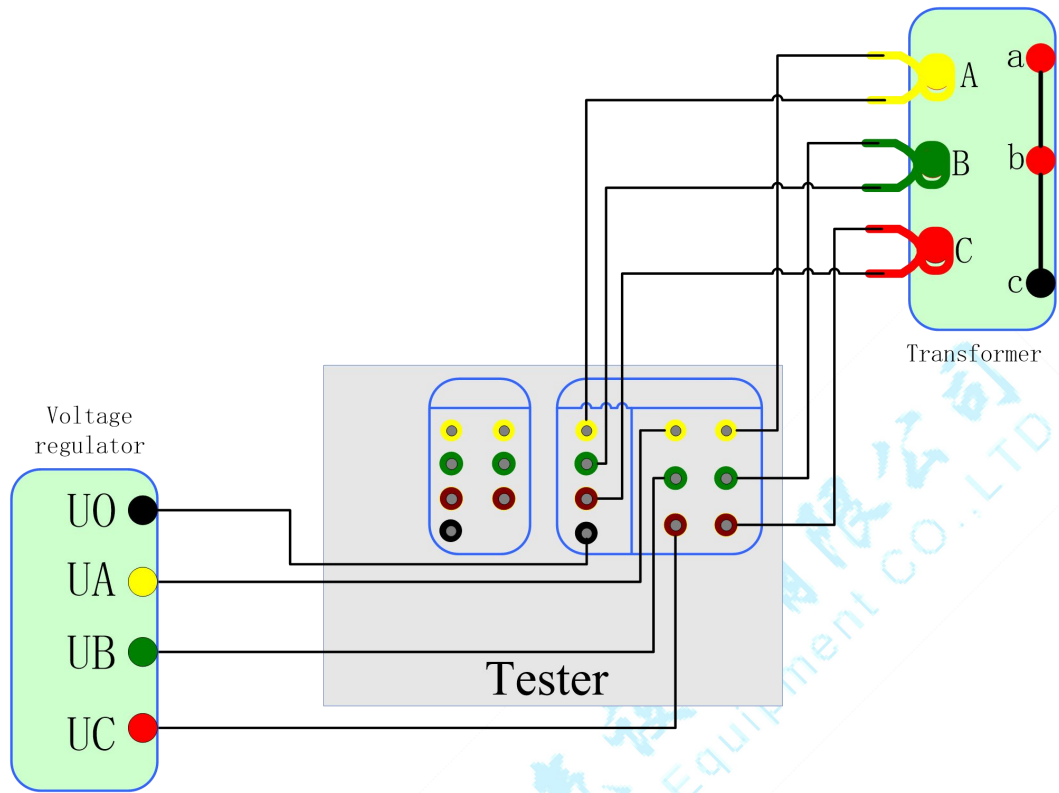
2) 单相变压器容量测试接线图：Single-phase transformer capacity test connection diagram



3) 三相空载试验接线图 Triphase transformer no-load test connection diagram

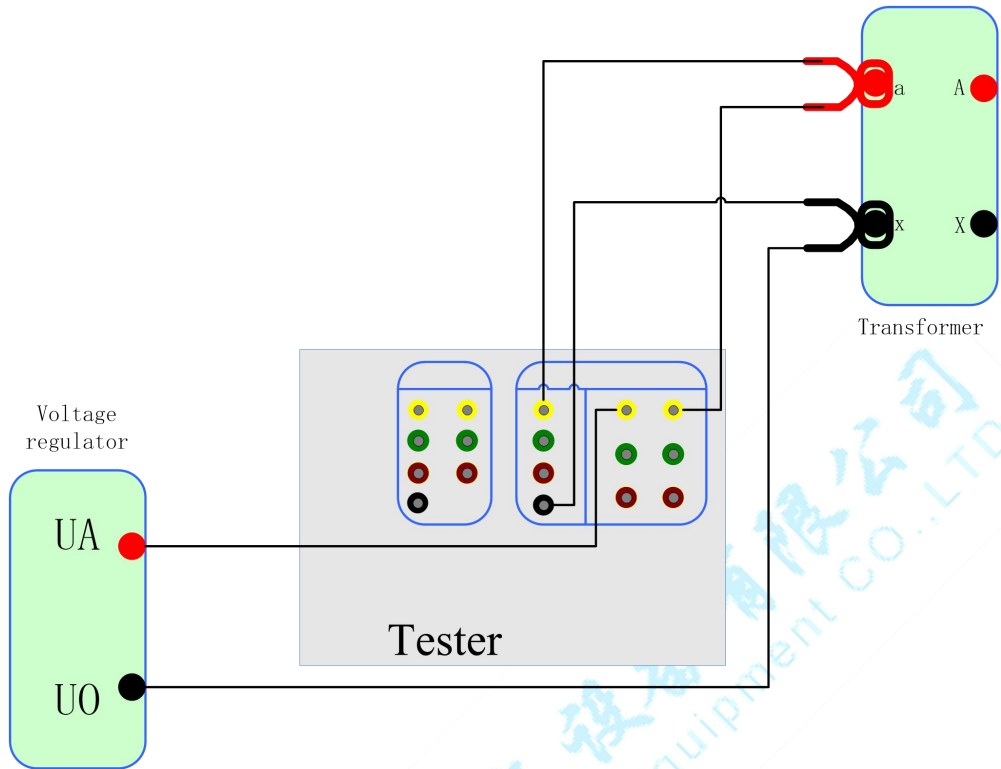


4) 三表法负载试验接线图 Triphase transformer no-load test connection diagram

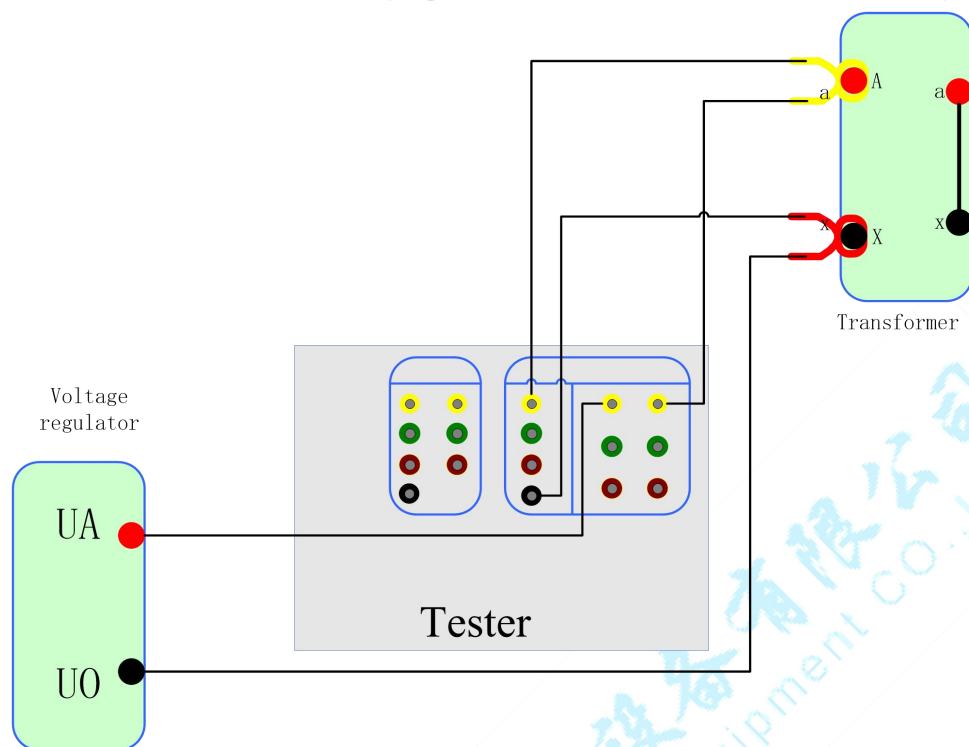


武汉科迪电气设备有限公司
Wuhan Kedi Electric Equipment Co., Ltd.

5) 单相变压器空载试验接线图 Single-phase transformer no-load test connection diagram



6) 单相变压器负载试验接线图 Single-phase transformer no-load test connection diagram



2、 显示结果说明及理论计算公式

Results and theoretical calculations show that formula

- “双表法”指双瓦特表测量变压器损耗试验方法，按三相三线制接线，“三表法”指三瓦特表测量变压器损耗试验方法，按三相四线制接线。

"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.

- 负载试验温度换算公式

Load test the temperature conversion formula

$$\text{阻抗电压百分比: } u_{kt} \% = \sqrt{u_k^2 + \left(\frac{P_k}{10S_n}\right)^2} \times (k_t^2 - 1) \times 100\%$$

Percentage impedance voltage

$$\text{短路阻抗: } z_t = u_{kt} \times \frac{u_n^2}{S_n}$$

Short circuit impedance

$$\text{温度系数法换算公式为: } P_{kt} = K_t P_k$$

Temperature coefficient conversion formula is

国标公式法换算公式为：
$$P_{kt} = \frac{P_k + \sum I_n^2 R_T (K_t^2 - 1)}{K_t}$$

GB formula conversion formula is

上述公式符号含义：

Symbolic meaning of the formula:

t —校正的目标温度，也即 75 或 120

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

T —当前环境温度

T - Current temperature

t_R —测量电阻时的温度

t_R - The temperature when measuring resistance

K_t —当前环境温度换算到 t (75 或 120) 度的温度系数， $K_t = \frac{235+t}{235+T}$

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

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

K_R —将测量电阻时的温度换算到当前环境温度 T 的温度系

数, $K_R = \frac{235+T}{235+t_R}$

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 —实测三相电压有效值的平均值， $U_o = (U_{ab} + U_{bc} + U_{ca})/3$

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

I_o —实测三相电流有效值的平均值， $I_o = (I_a + I_b + I_c)/3$

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

P'_k —实测变压器总损耗功率，两表法 $P'_k = P_{ab} + P_{bc}$ ，三表法 $P'_k = P_a + P_b + P_c$

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 —当前温度下阻抗电压百分比， $u_k = (U_o / U_n) * (I_n / I_o)$

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

P_k —当前温度下，折算到额定电流的总损耗功率， $P_k = P'_k * (I_n / I_o)$

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 —施加电压测的额定电压，若电压从高压侧施加则为 U_{n1} ，若电压从低压侧施加则为 U_{n2} 。

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 —施加电压侧的额定电流，若电压从高压侧施加则为 I_{n1} ，若电压从低压侧施加则为 I_{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 —所测变压器的额定容量（单位为KVA）。

S_n - Rated transformer capacity measured (in KVA).

U_{n1} / U_{n2} —分别表示被测变压器高压侧和低压测的额定电压。

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

I_{n1} / I_{n2} —分别表示被测变压器高压侧和低压测的额定电流。

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

$\Sigma I_n^2 R$ ——被测试变压器高、低压侧三相绕线的电阻损耗（单位：W）；

“Y”与“D”型接法的电阻损耗 $=1.5I_n^2R_x$ 。“Yn”型接法的电阻损耗 $=3I_n^2R_{xn}$ ，其中 R_x ——人工键入高/低压侧的线电阻， R_{xn} ——人工键入高/低压侧的相电阻（ $x=1$ 或 2 ）。

$\Sigma I_n^2 R$ - 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 = $1.5I_n^2R_x$. "Yn" connection type of resistance loss = $3I_n^2R_{xn}$, 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).

$\Sigma I_n^2 R_T$ ——折算到当前温度的变压器绕线电阻损耗， $\Sigma I_n^2 R_T = K_R * \Sigma I_n^2 R$ 。

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

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

附录表： Appendix Table:

10KV 级配电变压器主要技术数据 (仅供参考)

10KV level distribution transformer Main technical data (for reference)

容量 (KVA)	额定电流(A)		空载电流(%)				损耗(W)								阻抗 电压 (%)
							S7		S9		S11		SH-M		
							空载	负载	空载	负载	空载	负载	空载	负载	
30	1.73	43.3	2.8	2.1			150	800	130	600					4
50	2.88	72.2	2.6	2.0	0.6	1.5	190	1150	170	870	130	870	34	870	
63	3.64	90.93	2.5	1.9	0.55		220	1400	200	1040	150	1040			
80	4.62	115.5	2.4	1.8	0.55	1.2	270	1650	240	1250	180	1250	50	1250	
100	5.77	144.3	2.3	1.6	0.5	1.1	320	2000	290	1500	200	1500	60	1500	
125	7.2	180.4	2.2	1.5	0.5		370	2450	340	1800	240	1800			
160	9.23	230.9	2.1	1.4	0.45	0.9	460	2850	400	2200	270	2200	80	2200	
200	11.55	288.7	2.1	1.3	0.4	0.9	540	3400	480	2600	340	2600	100	2600	
250	14.4	360.9	2.0	1.2	0.4	0.8	640	4000	560	3050	400	3050	120	3050	
315	18.19	454.7	2.0	1.1	0.35	0.8	760	4800	670	3650	480	3650	140	3650	
400	23.1	577.4	1.9	1.0	0.3	0.7	920	5800	800	4300	570	4300	170	4300	

500	28.8	721.7	1.9	1.0	0.3	0.6	1080	6900	960	5100	680	5100	200	5100	
630	36.4	909.3	1.8	0.9	0.3	0.6	1300	8100	1200	6200	810	6200	240	6200	
800	46.2	1154.7	1.5	0.8	0.25	0.5	1540	9900	1400	7500	980	7500	300	7600	
1000	57.7	1443.38	1.2	0.7	0.25	0.5	1800	11600	1700	10300	1150	10300	340	10300	
1250	72.1	1804.22	1.2	0.6	0.25	0.5	2200	13800	1950	12000	1360	12000	400	12000	
1600	92.3	2309.38	1.1	0.6	0.2	0.5	2650	16500	2400	14500	1640	14500	500	14500	
2000	115.5	2886.75	1.1	0.6	0.2	0.5			2830	17500	1940	17500	600	18000	
2500	144.34	3608.44	1.0	0.5	0.2	0.5			3350	20500	2300	20500	700	21500	4.5

注：SH-M 型为非晶合金铁芯电力变压器

Note: SH-M-type amorphous alloy core power transformer

3、 常见故障排除 Common Troubleshooting

◇ 开机无显示：先关机，打开背板上 AC 220V 插座的保险丝盒，检查保险丝是否烧断，可更换保险。

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

◇ 屏幕突然黑屏：可按复位键，重新开始测量。

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

◇ 测量及运算结果不正确：检查外部接线，是否按说明书操作，是否有接触不良或接错线；相关参数设置不正确。

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.

测量电压正常而电流显示为零，请检查该电流档保险管是否熔断

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

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