Quality is the lifeblood of industrial products; every screw is the object we concerned.

TE5660 CT Turns Ratio & Volt-Ampere Characteristics Tester

Brief Introduction:

This device is applied to automatic test CT Volt-Ampere characteristics and curve, 5%, 10% error curve, turns ratio, polarity, and auto storage, printing, also can output a high current to carry on the secondary loop full group equipment tests.

The instrument itself output current, voltage, can meet most of the CT testing requirements, when test a large CT, you can buy an external high voltage generator, or an external high current generator to achieve the same effect.

Appearance and configuration:

Main features:

◆ Full automatic Tester: only need a digital set, and set the maximum output test voltage, the maximum output current and the step length, the device will automatically step-up from zero gradually. Automatically record the entire process of test data and automatically display Volt-Ampere curve, eliminating manual voltage regulator, manual recording, organizing, describing curves and other tedious labor. This device is fast, accurate, simple, and convenient.

◆ Powerful function: a single power input, 220V or 380V power adaptive. Standalone operation can make the test of curves test with 5% and 10% error, volt-Ampere characteristics and turns ratio polarity of current transformer; it can be connected to the computer or read the test data through the computer.

◆ Non-contact testing, high security: Full computer-based devices, it can automatically test, and need not manual contact the test product after set. Keeping the operator far away from high voltage circuit, to ensure the safety and high reliability.

◆ The device also with the features of high capacity output, large-screen LCD, high capacity storage, rotation mouse and so on.

Technical Parameters:

Power supply	AC 220V±10%， 50 / 60Hz			
Service condition	Ambient temperature：-25℃ - +65℃			
Dimensions	420×300×270mm			
Weight	36Kg			
Device Host	Input voltage	Output range	Measurement range	Measurement Accuracy
	220V	0～650V, 0～20A	0～650V, 0～20A	<0.5%
	Input voltage	Output range	Measurement range	Measurement Accuracy
	220V	0～1200V, 0～20A	0～1200V, 0～20A	<0.5%
Device host high current generator	Input voltage	Output range	Measurement range	Measurement Accuracy
	220V	0～600A	0～600A	Measurement accuracy of turns ratio < 0.5%
External voltage booster/current generator	Input voltage	Output range	Measurement range	Measurement Accuracy
	220V	0～1650V(1A), 0～5A	0～1650V(1A), 0～5A	<0.5%
	220V	0～900A	0～900A	Measurement accuracy of turns ratio < 0.5%
	440V	0～1200V(20A), 0～20A	0～2200V，0～5A	<0.5%
External manual voltage regulator	Input voltage	Output range	Measurement range	Measurement Accuracy
	440V	0～1200V(20A), 0～20A	0～1200V(20A), 0～20A	<0.5%

WUHAN TESTYLE TECHNOLOGY CO., LTD.
Address: International Enterprises Center II, Guan Shan Road II, East Lake High-tech Development Zone, Wuhan
Tel.:+86-27-87797003
Fax: +86-27-6784 5319
Website: http://www.hvtester.com
Email: hvtester@yahoo.com

ISO 9001Quality System Certification Enterprise
Registration No.06905Q10393ROS

Measurement equipment manufacturing license
Made in Hubei:01000301

TE 5660

CT 变比级性伏安特性综合测试仪

CT Turns Ratio & Volt-Ampere Characteristics Tester

说

明

书

User Manual

武汉特试特科技股份有限公司

WUHAN TESTYLE TECHNOLOGY CO., LTD.

地址: 武汉市东湖高新技术开发区关山二路特 1 号国际企业中心 II －2

Address: International Enterprises Center II, Guan Shan Road II,

East Lake High-tech Development Zone, Wuhan

电话: +86-27-87797003

Tel.: +86-27-87797003

传真: +86-27-6784 5319

Fax: +86-27-6784 5319

网址: http://www.hvtester.com

Website: http://www.hvtester.com

E－MAIL: hvtester@yahoo.com

第一章 概 述

Caption Ⅰ General Introduction

产品简介

Product Profile

TE5660 CT 变比级性伏安特性综合测试仪是专门为继电器保护专业试验电流互感器伏安特性、变比测试及极性判别而设计，还可作变压器极性判别测试，是一台多功能试验仪器。

TE5660 CT Turns Ratio & Volt-Ampere Characteristics Tester is design dedicated to the relay protection professional test current transformer Volt-Ampere characters, turns ratio test and polarity discrimination, also can carry on transformer polarity discriminant test, which is a multi-function testing instruments.

本仪器采用基于 SOPC 技术的高性能 CPU 作为核心处理单元，数据采集采用高精度测量集成电路，内置微型打印机可打印测试数据和曲线，测试数据还可以通过 USB 或串口输出，一人操作即可完成全部测试工作，操作简便。机箱采用计算机辅助设计，箱体铝制喷塑处理，抗电磁干扰能力强，坚固耐用，外观新颖。整机重量轻，便于移动，还注重了产品的人性化设计，是精心设计的测试仪器。

The instrument adpots high performance CPU as core processing unit which based SOPC technology, data acquisition with high precision measurement integrated circuit, the built-in micro printer can print a test data and curve, the test data can also through the USB or serial ports output, one operator can finish all the test work, simple operation. The case adpots the computer aided design, the aluminum coating processing, strong anti-electromagnetic interference ability, durable, novel appearance. The light weight, convenient to move, but also pay attention to the design of products, is carefully designed test equipment.

本款伏安特性变比极性测试仪具有以下技术特点：

This model Turns Ratio & Volt-Ampere Characteristics Tester has the following technical characteristics:

1．**自动测试** Automatic test

仅需设定最高测试电压、最大电流和步长，装置将自动从零逐步升压，自动地将伏安特性曲线测试、描绘、显示，无需人工手动调压、记录、整理、描曲线等繁琐劳动。快捷、简单、方便,无需专门培训，易操作。

Users only need to set the maximum test voltage, maximum current and step length, the device will gradually automatically boost voltage from zero, and test automatically Volt-Ampere Characteristics curve, describe, and display, no need to manual voltage regulation, records, arrangement, tracing curve tedious work. Quick, simple and convenient, without special training, easy to operate.

2．功能全面 Comprehensive functions

可测试保护 CT 伏安特性、5％和 10％误差曲线、变比、极性。

This device is applied to automatic test CT Volt-Ampere characteristics, 5%, 10% error curve, turns ratio, polarity.

3．安全性高 High safety performance

全微机化装置，参数设定好后完全不需人工接触而全自动进行测试。测试人员远离高压

电路，从而确保测试人员安全，可靠性高。

Full-microcomputer device, after set well the parameters users need not to artificial contact and it automatic testing. Users away from high voltage circuit, so as to ensure the personnel security and high reliability.

4．使用方便 Easy to use

⑴操作简单方便, 采用先进的一键飞梭进行操作。取消面板按键、开关、控制旋钮等各种常规控件。

(1) Simple and convenient operation, the use of advanced a key shuttle operation. Cancel the panel button, switch, control knob and all kinds of other conventional controls.

⑵ 配有 RS232 通信接口和 USB 接口，可以联接电脑进行操作。单机操作的数据可以保存，也可上传至电脑或 U 盘保存，在其它计算机上显示、打印。

(2) Equipped with RS232 communication interface and USB interface can be connected to the computer operation. Single machine operation data can be saved, also can be uploaded to the computer or U disc save, in other computer display, print.

⑶ 本机自带大容量存储器至少可保持 45 组测试数据，也可通过 USB 接口连接存储器对多组测试数据进行存储以备日后查询处理。

(3)The instrument with mass memory device can maintain at least 45 test data, and also to test more memory data storage for future query processing through a USB connection.

⑷ 自带大屏幕 LCD、全汉化图形界面,测试时直接显示伏安曲线图，清晰，直观。系统自带打印机，可随时打印伏安特性曲线及测试数据。

(4) With large screen LCD, and the localization graphic interface, testing directly display Volt-Ampere curve graph, clear, direct. System comes with printers, can print Volt-Ampere characters curve and test data at any time.

5． 可扩展性强 Extensibility

⑴ **可外接调压器进行试验** 若装置单机的输出电压、电流不能满足要求，也可以采用用户自备的调压器与装置连接进行测试。外接调压器试验接线和测试方法非常简单。

(1) External voltage regulator to carry on test

If the single device output voltage and current cannot meet the requirements, also can connect the device to your own voltage regulator to test. External voltage regulator experimental wiring and test method is very simple.

⑵ **可选外接升压器、升流器** 选配的外接升压器最高可升至 2200V(1.2A)，选配的升流器可升至 900A。采用外接升压器可用于做 500KV 等级 1A 电流互感器的伏安特性试验。

(2) The optional external step-up transformer and high current generator , the external step-up transformer up to 2200 V (1.2 A), the high current generator up to 900 A. The external step-up transformer can be used to do 500 KV level 1 A current transformer's Volt-Ampere characters test.

⑶ **输出容量大** 单机伏安特性试验最大输出高达 1200V(2.5A)，短时可达 20A。采用外接调压器最大输出可达 1200V、电流最大可达 20A；变比测试最大单匝电流高达 600A。

(3) Large output capacity single Volt-Ampere characters test maximum output up to 1200 V (2.5 A), short time can up to 20 A. The external voltage regulator maximum output up to 1200 V, current maximum of 20 A; Turns ratio test maximum single turns current up to 600a

6． 金属机箱美观，抗电磁干扰能力强，坚固耐用。

Beautiful metal chassis and anti-electromagnetic interference ability, strong and durable.

第二章　　装置技术参数和硬件结构

Caption Ⅱ Device technical parameters and hardware structure

2.1　装置技术参数 Device technical parameters

	输入电压 Input voltage	输出范围 Output range	测量范围 Measurement range	测量精度 Measurement Accuracy
装置主机 Device host	220V	0～650V, 0～20A	0～650V, 0～20A	<0.5%
装置主机 Device host	400V	0～1200V, 0～20A	0～1200V, 0～20A	<0.5%
装置主机升流器 Device host high current generator	220V	0～600A	0～600A	变比测量精度 ＜0.5% Measurement accuracy of turns ratio< 0.5%
外加升流升压器 External high current generator and set up transformer	220V	0～1650V(1A)，0～5A	0～1650V(1A)，0～5A	<0.5%
	220V	0～900A	0～900A	变比测量精度 ＜0.5% Measurement accuracy of turns ratio< 0.5%
	400V	0～2200V(1.2A)，0～5A	0～2200V，0～5A	<0.5%
外接手动调压器 External manual voltage regulator	400v	0～1200V(20A)，0～20A	0～1200V，0～20A	<0.5%

装置工作电源 Device work power supply	AC 220V±10%，50 / 60Hz	工作环境温度 Ambient temperature	-25℃ – +65℃
测量用功率电源 Power frequency power supply for measurement	AC 220V 或 AC 380V AC 220V or AC 380V	体积、重量 Volume & weight	420×300×270mm³，36Kg

表一 figure 1

2.2 装置基本结构及组成 The device basic structure and composition

装置主机包含全自动升压器、内置升流器、微机控制系统、320×240 点阵大屏幕全汉化 LCD、微型打印机、操作一键飞梭、RS232 和 USB 等部分组成。装置主机可以直接用于做 CT 伏安特性、变比、极性等试验。伏安特性试验最大输出达 1200V、20A；变比测试和一次通流测试时最大电流达 600A。

Device host containing automatic set up transformer, built-in high current generator and microcomputer control system, 320 x 240 dot matrix big screen LCD, mirco-printer, operate a key shuttle, and USB & RS232 etc. components. Device host can be used directly to CT Volt-Ampere characters, turns ratio, and polarity etc. Volt-Ampere characters test maximum output of 1200 V, 20 A; Turns ratio test and primary current injection test maximum currentof 600 A.

如果装置主机输出电压、电流范围不能满足要求，如测试额定电流 1A 的 CT 的伏安特性要求测试电压高达 1500～2000V，装置单机不能升至此高电压，此时可以采用选配的外部升压器进行试验，将装置主机输出电压接至外部升压器，进行二次升压至 1650～2200V。外部升压器内带有测量电路，采用信号线缆将其与主机信号接头连接即可。

If the device host output voltage, current range can't meet the requirements, such as A test rated current 1 A CT's Volt-Ampere characters required test voltage up to 1500 ~ 2000 V, single device is not able to rise so far high voltage, right now can use selected external set up transformer to test, connect the device host voltage to the external set up transformer to carry on the secondary set up voltage to 1650 ~ 2200 V. External set up transformer with measurement circuit, and connect the signal cable to the host signal joint.

如果装置主机内置升流器输出电流范围或功率不能满足要求，此时可以采用选配的外部升流器进行升流，将装置主机单机输出电压接至外部升流器，其输出电流可达 0～900A、3000VA，可用于大变比 CT 或较长线缆测量变比的情况。外部升流器内带有测量环节，采用信号线缆将其与主机信号接头连接即可。

If the device host built-in high current generator output current scope or the power can't meet the requirements, at this time can use external high current generator to generate current, connect the device host output voltage to the external set up transformer , its output current to 0 ~ 900 A, 3000 VA, can be used for large turns ratio CT or longer cable measurement turns ratio. External high current generator with measuring link, and connect the signal cable to the host signal joint.

2.3 装置面板结构说明 Device panel structure instruction

2.4 液晶显示及一键飞梭说明 Liquid crystal display and a key shuttle instruction

装置采用进口高亮度 320×240 点阵大屏幕液晶显示屏。试验的全过程及试验结果均在显示屏上显示，全套英语操作界面，清晰美观，直观方便。

Device USES the import high brightness 320 x 240 dot matrix LCD display screen. The whole process of experiment and test results are shown on the screen, full of English language operation interface, clear and beautiful, intuitive convenient.

操作控制采用国际先进的一键飞梭，全部数据及试验过程均由一键飞梭在显示屏上设定。操作简单方便，无需专门培训，极易掌握。

The operation control adopt international advanced a key shuttle, all data and test process setted by a key shuttle and display on the LCD. Simple operation, without special training, is extremely easy to master.

2.5 装置侧板结构说明 Device side plate structure instruction

装置侧板上安装有装置工作电源插口（带保险）和散热风机。

Device sides plate are installed power supply socket (with fuses) and cooling fan.

Note

装置侧板工作电源插口为装置内部电子电路用电源，固定为 AC220V。而面板上交流功率电源输入为试验用功率电源，可为 AC220V 或 AC380V，二者并不连通，不可混淆使用。

Device sides plate power supply socket is for internal electronic circuit power source, fixed for AC220V. And the panel ac power sources input is experiment power sources, AC220V or AC380V is optional, these two can not connected, please do not use confusion.

第三章 单机运行软件操作方法

Caption Ⅲ Single machine run software operating methods

3.1 一键飞梭使用方法 A key shuttle operate method

一键飞梭的功能类似计算机上使用的一键飞梭，它有三种操作：**“左旋”，“右旋”，“按下选定”**。使用一键飞梭的这三种操作可以用来移动光标、数据输入和操作选定等。

The function of a key shuttle similar to computer’s a key shuttle, it has three kinds of operations: "left rotate", "right rotate ", "press select". Use the three operation of a key shuttle can move the cursor, data input and operating selection etc.

移动光标： 您可以通过旋转一键飞梭移动光标位置，当光标移到某一选项上需要选定时，“按下”旋钮即可选定此项。

Move the cursor: you can rotate through a key shuttle move the cursor position, when the cursor to the one option to selected, "press" knob can choose this.

数据输入： 当需要修改数据时，请将光标移动到需要修改数据的选项上，按下一键飞梭，即进入数据的百位或十位修改操作（光标缩小至被修改的这一位上），左旋或右旋一键飞梭即进行该位的增减操作。按下一键飞梭确认该位的修改，并进入下一位的修改，同样左旋或右旋一键飞梭进行该位的增减。逐位修改完毕后，光

标增大为全光标，即退出数据的修改操作，此时一键飞梭可将光标移走。
Data input: when need to modify data, please move cursor to need to modify data options, press the key shuttle, namely into the data of one hundred or ten modify operations (cursor shrinks to the modified ones), levorotatory or dextral a key shuttle to increase or decrease in the operation. Press a key shuttle to confirm that the modified ones, and into the next revision. By bit modification, the cursor increase for full cursor, namely the exit of the data modify operation, right now a key shuttle can go to move the cursor.

3.2 主菜单 Main menu

连接好装置侧板上的交流 220V 电源，打开面板上的电源开关，液晶屏蓝色背光亮，装置进行自检，自检完毕进入伏安特性测试仪汉化主菜单。

Connect the device sides plate ac 220 V power supply, open the panel the power switch, LCD blue back light, the device self-check, and then into Volt-Ampere characters tester localization main menu.

主菜单有伏安特性、变比试验、消磁、一次通流、U 盘存储和 PC 通讯六项可选项（如图 3-1）。旋动一键飞梭将光标移到某一项上，按下旋钮即可进入此项试验的设置界面。
The main menu has Volt-Ampere characters, turns ratio test, Degaussing, primary current injection, U disk storage and PC communications six option (as shown in figure 3-1).Rotate a keyshuttle to move the cursor to a certain, press down trial knob to enter the set interface.

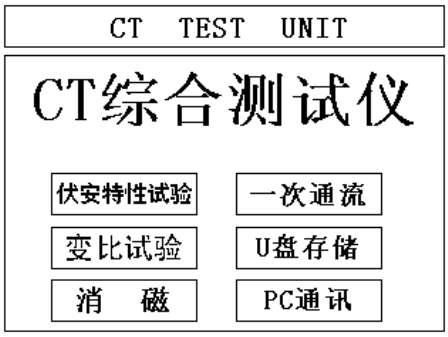


图 3-1

3.3 伏安特性试验 Volt-Ampere Characteristics Test

3.3.1 伏安特性试验的软件界面 Software interface of Volt-Ampere Characteristics Test

在主菜单界面，一键飞梭将光标移动到 伏安特性试验 选项上，按下一键飞梭即可进入伏安特性试验设置界面（如图 3-2）。光标移动至 返回 ，按下一键飞梭即可返回主菜单。

In the main menu interface, a key shuttle will cursor movement to Volt-Ampere characters test options, press a shuttle button to enter Volt-Ampere characters test set interface (as shown in figure 3-2). Cursor movement to return, press a key shuttle can return to the main menu.

界面参数说明：Interface parameter instruction

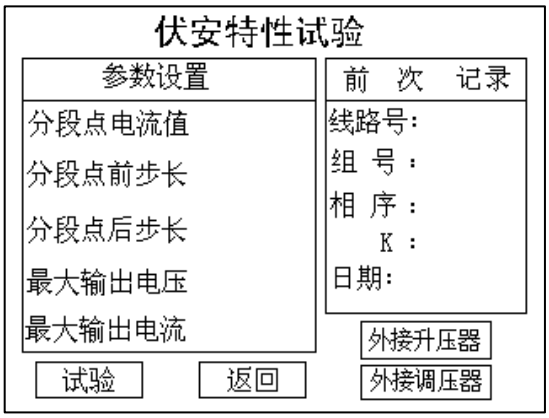


图 3-2

历史记录： 以前第 x 次做完伏安特性试验后保存的数据。

分段点电流值： 试验时为使伏安特性曲线的拐点前和拐点后的曲线打点分布合理，特设置一个分段点，在此点前后分别以两种不同电流步长进行试验。该分段点电流值根据估计值或根据所测拐点值来设定，范围（0 ～ 20）A。

分段点前（后）步长： 分段点前（后）的步进电流步长，范围（0.001 ～ 2.000）A。

最大输出电压：电流互感器二次侧的所能承受的最大电压，范围 （0 ～ 2200）V。

History record: the stored data of the x times after Volt-Ampere characters test.

The current value of segmentation point: In order to make the rbis before and after the inflection point of Volt-Ampere Characteristics distribute reasonable,specially set a segmentation points, before and after in this point in two different current step length for the test respectively.

According to estimate the value or the inflexion point to judge segmentation point current value, range (0 ~ 20) A.

The segmentation point before (after) step length: stepping current step length before (after)segmentation, range (0.001 ~ 2.000) A.

Maximum output voltage, The maximum withstand voltage of the two sides of current transformer, range (0-2200) V.

最大输出电流：电流互感器二次侧的所能承受的最大电流，范围（0 ～ 20）A。

试验： 仅使用单机进行试验时，按此键开始试验。

外接调压器试验：若采用外接调压器进行试验时，按此键开始试验。

外接升压器试验：若需外接升压器进行试验时，按此键开始试验。

Maximum output current, The maximum withstand current of the two sides of current transformer, range (0 ~ 20) A.

Test: only use single machine to test, press this button.

External voltage regulator test: if you use external voltage regulator to test, press this button.

External set up transformer test: if you need external set up transformer to test, press this button to test.

说明：为了使作出的伏安特性曲线测试点均匀连贯，特设定一分界点，该分界点前按一个步长进行试验，分界点后按另一个步长进行试验。该分界点即为分段点。该点数值可大可小，一般根据估计或测试得出，不一定等于真实拐点，当然越接近越好。

说明：设置最大输出电压和最大输出电流可对电流互感器进行保护，在试验过程中，一旦电压或电流超出设定值，测试仪将自动断路保护电流互感器。

Note: in order to make a Volt-Ampere characters curve test points well-distributed and coherent, specially set a segmentation points, before and after this segmentation point in two different current step length for the test respectively.

This point namely is segmentation points. That point numerical but can small, general according to

estimated or tests, not equal to real inflection point, of course, the closer the better.

Note: set maximum output voltage and maximum output current to protect the current transformer,during test once the voltage or current beyond the set value, tester will automatically open circuit to protect current transformer.

3.3.2 伏安特性试验 Volt-Ampere Characteristics Test

设置好最大输出电压、最大输出电流数据和理论拐点、拐点前步长、拐点后步长等参数后，旋转一键飞梭，将光标移动至 试验 选项，即可准备进行试验。若按下 返回 ，即退出伏安特性试验回到主菜单。

Set technical parameters such as maximum output voltage, maximum output current data and theory inflection point, the step length before and after this segmentation point etc. , rotate a key shuttle, move the cursor to test options, can prepare for the test. If press return, namely exit Volt-Ampere characters test and return to the main menu.

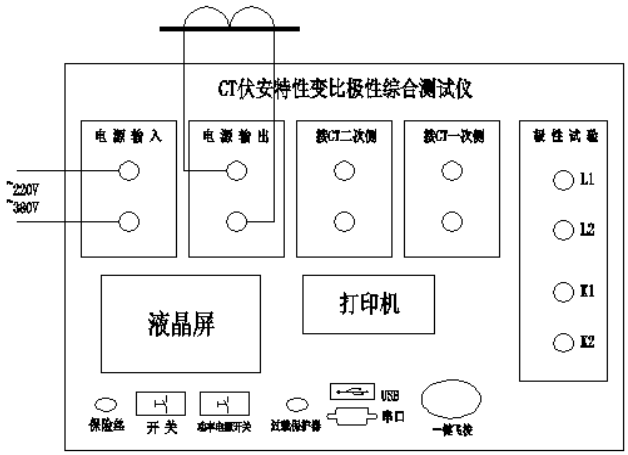


图 3-3

3.3.2.1 使用装置单机试验 Single device test

(1)、试验的接线 test wiring

使用装置单机进行试验的原理接线图如图 3-3。当交流功率电源输入端子接 AC220V 电压时，交流电压输出为 0~650V，当输入端子接 AC380V 电压时，交流电压输出 0~1200V。

Single device for testing principle as shown in figure 3-3.When AC power input terminal AC220V, voltage AC voltage output is 0 ~ 650 V, when the input terminals AC380V voltage, AC Voltage output 0 ~ 1200 V.

注意 1：使用装置单机试验时请勿连接外部调压器，以免电压过高损坏装置。

注意 2：做伏安特性试验时，极性和变比试验的端子请不要接线。

注意 3：切勿将输入功率电源接到电压输出端子，以免损害装置。

Note 1: please do not connect single device test with external voltage regulator,to avoid high

over-voltage damage device.

Note 2: Volt-Amperecharacters test, please don't wiring the terminal of polarity and turns ratio.

Note 3: do not connect input power of power supply to voltage output terminals, in order to avoid damage to the device.

(2)、试验方法 Test method

在伏安特性试验界面上按下 试验 ，（注意不要连接外部调压器），即进入伏安特性试验曲线图界面（如图 3-4），此时装置自动根据电压、电流和步长值逐步增加电压和电流进行测试，每测出一个点将自动在曲线图上标示出来，并记录其数值。

At the interface of Volt-Amperecharacters test press test button,(don't connect external voltage regulator), namely come into the interface of Volt-Amperecharacters test curve (as shown in figure 3-4), at the moment the device will automatically set up voltage and current according to voltage current and step length gradually, after test the point will be marked at the curve, and record its value.

试验过程中，光标会显示在 停止 选项上不停闪烁，直至试验完毕退出自动测试界面，或按下一键飞梭人为中止试验。

During test, the cursor will display at stop button and Kept flashing until the test is over and exsit the automatic test interface, or press the key of shuttle to stop test manually.

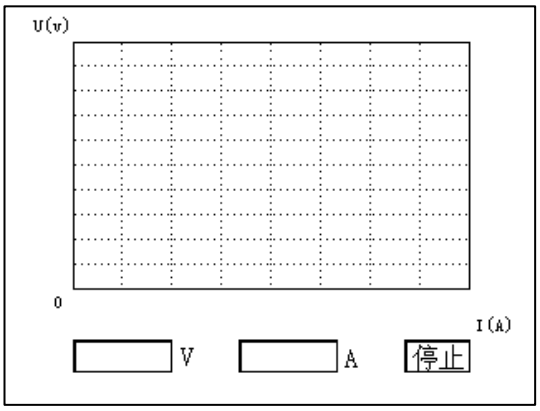


图 3-4

3.3.2.2 使用外部升压器试验 External set up transformer test

(1)、试验的接线 test wiring

测试额定电流 1A 的 CT 要求测试电压高达 1500～2000V，装置单机不能升至此高电压，此时可以采用选配的外部升压器进行试验。外部升压器的原理是将装置输出电压再进行二次升压至 1650～2200V。外部升压器接线方法如图 3-5。

当交流功率电源输入端子接 AC220V 电压时，经外部升压器后交流电压输出为 0～1650V，当输入端子

接 AC380V 电压时，升压后交流电压输出达 0～2200V。

CT (current transformer)with test rated current 1 A requirements test voltage up to 1500 ~ 2000 V, single device can not rise so high voltage, right now can use selected external set up transformer to test. The working principle of device external set up transformer is that making output voltage to a secondary set up to 1650 ~ 2200 V. External set up transformer wiring method is shown in figure

3-5.

When AC power input terminal meet AC220V voltage, the external set up transformer AC voltage output is 0 ~ 1650 V, when the input terminals meet AC380V voltage, after set up voltageoutput AC output is 0 ~ 2200 V.

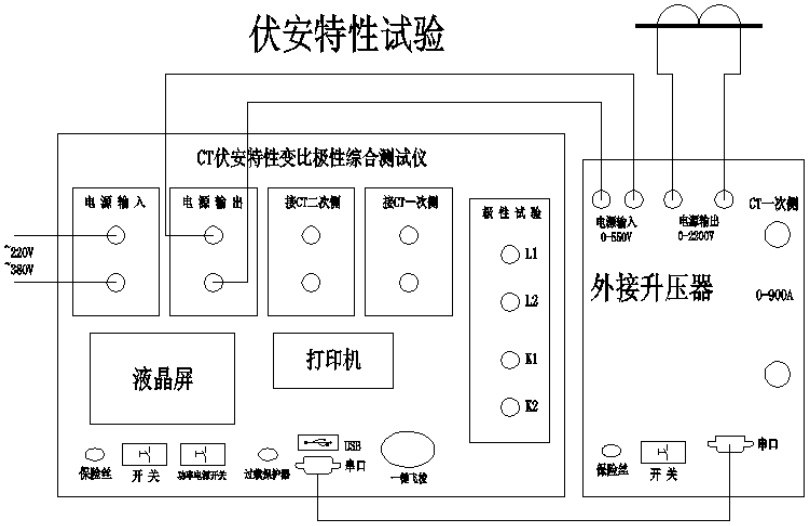


图 3-5

(2)、试验方法 test method

试验方法与装置单机试验的相同，但电压设置范围为 0～2200V，电流设置范围为 0～1.5A。

Testing method is the same as single device, but voltage setting value range 0 ~ 2200 V, current 0-1.5 A.

3.3.2.3 使用外接调压器试验 external voltage regulator test

(1)、试验的接线 test wiring

如果装置单机某些参数如输出电压、电流等不能满足要求，此时可以采用用户自备的外接调压器进行试验。其接线方法如图 3-6。

If output voltage, current and other technical parameters of the single device can not meet the demands, at the moment users can use his own external voltage regulator for the test. The wiring method as shown in figure 3-6.

外接调压器试验时装置自动断开内部输出，完全采用外接的调压器提供的电流进行测试。

When the external voltage regulator is testing, the device will automatically disconnect internal output, completely using external voltage regulator provide current to test.

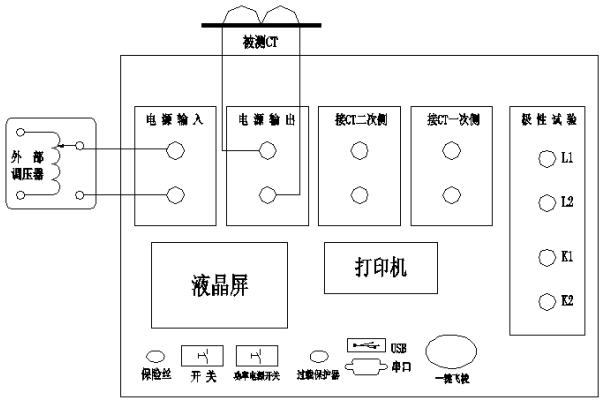


图 3-6

(2)、试验方法 test method

在伏安特性试验界面上按下 外接调压器 ，即进入伏安特性试验曲线图界面。外接调压器试验装置无法自动进行升压，只能靠人工手动转动外部调压器的调压转盘进行升压。试验时，手动慢慢转动调压转盘，同时观察屏幕上显示的当前电压、电流值。当电压或电流值达到所设定的数值时停止升压快速回零。在升压过程中装置自动记录各测量点处的电压、电流值，并在曲线图中打点标示出来。

In the interface of the Volt-Ampere Characteristics Test press external voltage regulator, namely into Volt-Ampere characters test curve interface. External voltage regulator test device can't automatically boost,only can rely on manual rotation of the external voltage regulator to boost voltage by voltage regulating wheel. During test, manual slowly rotate voltage regulating wheel, and observe voltage & current value on the screen. When the voltage or current value up to set value it will stop boost and fast back to zero. In the process of test the device automatic recording the voltage and current value of all points, and mark in the curve graph.

试验过程中，交流输出电压不断的升压以步进电流值为步长进行测试，并在伏安坐标上标示出相应的点，当电流达到最大输出电流时或电压达到最大输出电压时，仪器会自动停止试验并显示出伏安特性测试曲线。

In the process of test, AC output voltage set up voltage constantly, and take step current value as step length to test, and coordinates in Volt-Ampere identify the corresponding point, when the current or voltage up to maximum output current or output voltage, the instruments will automatically stop test and shows coordinates characters test curve.

试验过程中，光标会显示在 停止 选项上不停闪烁直至按下一键飞梭才结束退出试验。

In the process of test, the cursor will display in stop, all options will flash until press a key of shuttle to end and exit test.

3.3.2.4 测试结果操作说明 test result operation instruction

试验结束后，屏幕显示出伏安特性测试曲线（如图 3-7）。该界面上各操作功能如下：

After testing, and the Volt-Ampere characters test curve will display on the screen (as shown in figure 3 to 7). The operation function of the interface as follows:

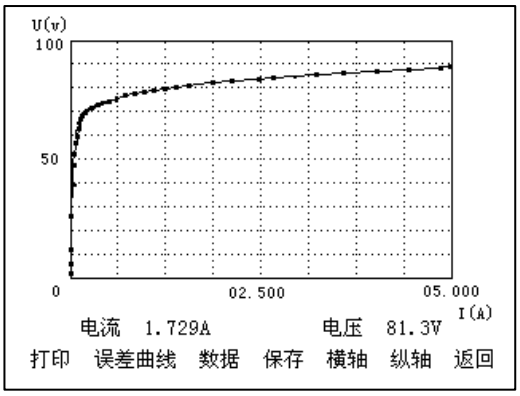


图 3-7

打印：一键飞梭将光标移动至 打印 选项,按下一键飞梭即可用仪器自带的面板微型打印机将当前测试的曲线以及数据组打印出来。

Print: a key shuttle will move the cursor to print options, press the button can print the current test curve and data by panel micro printer.

保存：一键飞梭移动至 保存 选定，界面上弹出的被试 CT 参数对话框（如 3-8 图），设置好各参数后，按下 确定 即可将当前所测数据保存在内存中。以后在伏安特性主界面上选 “前 X 次 记录”即可调出查看，也可直接上传至 PC 机保存。

注意： 刚保存的数据保存在“前 1 次记录”中，所有数据往前推一组。内存中最多能保存 45 组数据，如超过 45 组数据，将按先入先出原则冲掉最老的数据。

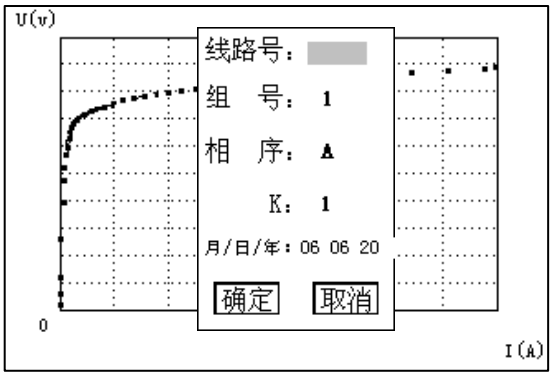


图 3-8

返回：光标移动至此选项，按下即退出该界面。

Save: a key shuttle move to save selected, interface to pop up on CT parameter dialog box (such as 3-8 figure), set up the parameters, and press ok to the current test data stored in memory. Then you can review through choose"X times record" on the main interface of Volt-Ampere characters, may also directly upload to PC storage.

Note: the data just to save stored in "the first record", all data to push forward. Memory can most save 45 sets of data, if more than 45 set of data, the oldest data will disappear fellow the first in first out principle .

Return: the cursor moves to the options, press then exit the interface.

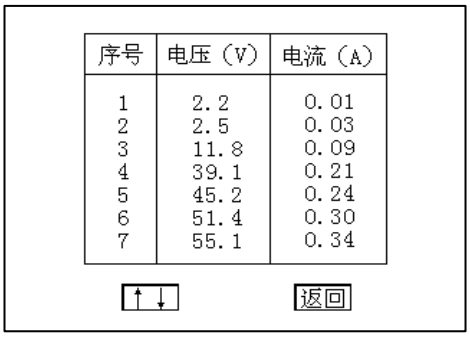


图 3-9

数据：一键飞梭将光标移动至 数据 选项按下一键飞梭，屏幕上将显示伏安特性试验的测试数据列表（如图 3-9）。

Data: a key shuttle will move cursor to data options, press a key shuttle, and the screen will show test data list of Volt-Ampere characters test (as shown in figure 3-9).

注意：在此界面中，如果数据太多，可将光标移动到 ↑↓ 项，按下一键飞梭，通过左旋、右旋一键飞梭滚动显示试验数据。浏览数据完毕，光标移动至 返回 ，按下即退回到伏安特性试验曲线界面。

Note: in this interface, if the data is too much,you can move cursor to ↑↓ , press a key shuttle, through the rotate forward left and right display the test data. Browse the data, cursor moves to return, press that returned to Volt-Ampere characters test curve interface.

横轴：一键飞梭将光标移动至 横轴 选项，按下一键飞梭即可出现竖线光标，可以根据一键飞梭的旋转方向左右移动，同时在屏幕下方显示对应的电压电流值(伏安曲线)或在屏幕右上角显示对应的电流倍数和阻抗值(误差曲线)。

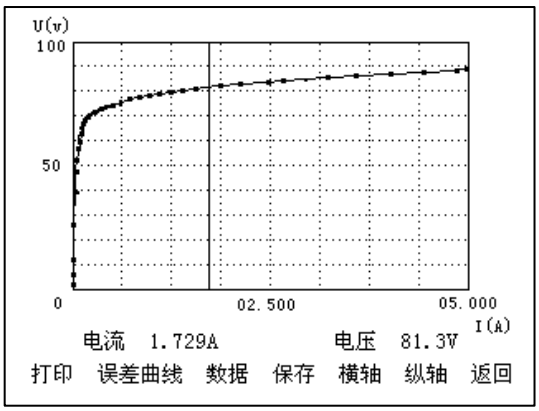


图3-10

The horizontal axis: a key shuttle will move cursor to the horizontal axis of the options, press a key shuttle can appear vertical cursor, and according to a key of the shuttle direction of rotation move around, and in the screen shows the corresponding voltage below current value (Volt-Ampere curve) or in the top right hand corner shows the corresponding current times and impedance values (error curve).

按下一键飞梭即可退出光标状态。如图 3-10 **纵轴：** 一键飞梭将光标移动至 纵轴 选项，按下一键

飞梭即可出现横线光标，可以根据一键飞梭的旋度转方向上下移动，同时在屏幕右上角显示对应的电压 电流值(伏安曲线)或电流倍数和阻抗(误差曲线)。

按下一键飞梭即可退出光标状态。

Press a key shuttle can exit the cursor state. As shown in figure 3-10

The vertical axis: a key shuttle will move cursor to the vertical axis options, press a key shuttle appear horizontal line cursor, and according to a key of the shuttle direction of rotation move up and down, and in the screen shows the corresponding voltage below current value (Volt-Ampere curve) or in the top right hand corner shows the corresponding current times and impedance values (error curve).

Press a key shuttle can exit the cursor state.

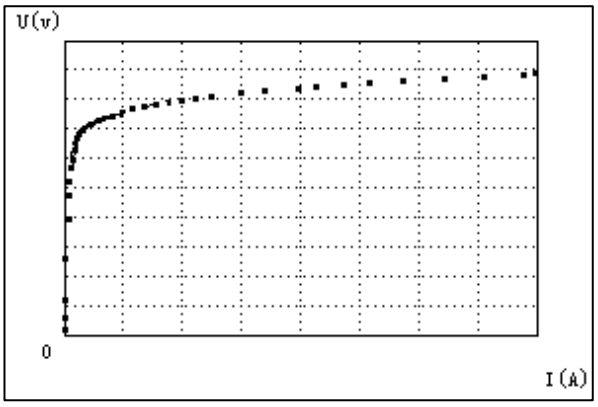


figure 3-10

3.3.3 误差曲线 error curve

在伏安特性曲线图界面上，一键飞梭将光标移至

误差曲线 选定，屏幕上将显示伏安特性试验的误差曲线的设置（如图3-11）。In Volt-Ampere characters graph interface, a key shuttle to move the cursor to

Error curve selected, and the screen will show the setting of the error curve of Volt-Ampere characters test (as shown in figure 3-11).

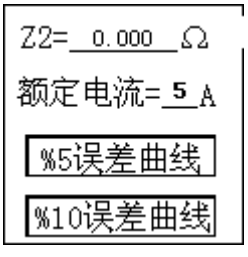


图 3-11

误差曲线参数框说明：Error curve parameter box explaination:

Z2：CT 二次侧阻抗值

Z2：CT secondary side impedance values

额定电流：CT的二次侧额定电流Rated current: CT secondary side rated current

5%误差曲线：将光标移动至 5%误差曲线 选定，自动得出 5%误差曲线结果并显示数据。
5% error curve: Move the cursor to 5% error curve selected, automatic draw 5% error curve results and display the data.

10%误差曲线：将光标移动至 10%误差曲线 选定，自动得出 10%误差曲线并显示数据。如图 3-12
10% error curve: Move the cursor to 10% error curve selected, automatic draw 10% error curve results and display the data.. As shown in figure 3-12

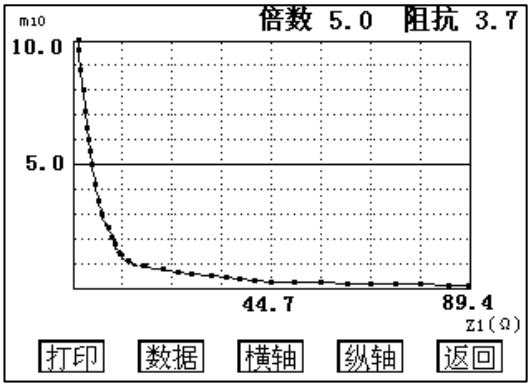


图 3-12

3.3.4 查阅以前所保存的测试数据Refer to previous stored test data

请进入伏安特性试验设置界面，将光标移动至 前 x 次 选项上，按一下一键飞梭后，左旋或右旋一键飞梭,选定哪 1 次，再次按一下一键飞梭后，即将该次的试验数据调出查阅，数据调出后所显示的曲线和数据列表及其操作方法与刚测试得出的结果完全相同，调出后可同样进行打印操作。

Please enter Volt-Ampere characters test set interface, move the cursor to before x times options, after press a button the shuttle, rotate left or right a key shuttle, then selected, once again, you can access to data for reference,and curve, data list and operation method after load data are all the same with the just tests results, after load data can also carry on printing operations.

3.4 变比极性试验 turns ratio polarity test

3.4.1 **变比极性试验的软件界面** 进入主菜单，旋转一键飞梭将光标移动到 变比试验 选项上，按下一键飞梭即可进入变比极性试验设置界面（如图 3-13）。

Turns ratio polarity test software interface Enter the main menu, rotate a key shuttle move cursor to turns ratio test, press a key shuttle to enter turns ratio polarity test set interface (as shown in figure 3 to 13).

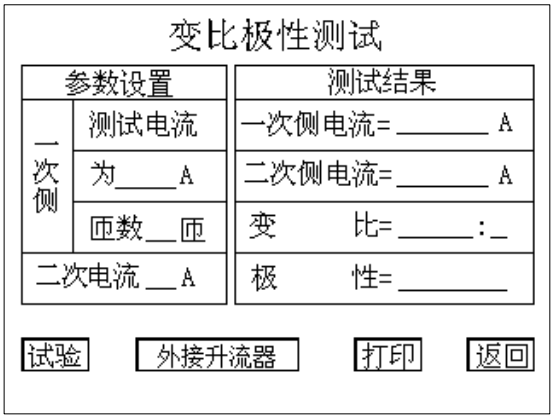


图 3-13

3.4.2 **参数设置**：试验前需设置的参数

parameters Settings: before the test the parameters should be set well

一次侧测试电流：在变比极性测试时，电流互感器一次侧需施加的电流，范围为 0 ～ 600A。

Primary side test current: when turns ratio polarity tests, the current transformer primary side need to exert of current, the range of 0 to 600 A.

匝数：CT 一次侧实际的穿心匝数。

turns : CT primary side practical puncturing turns.

二次侧额定电流：电流互感器二次侧的额定电流，1A 或 5A。

Secondary side rated current: current transformer secondary side rated current, 1 A or 5 A.

试验结果：试验过程中所显示的试验数据 。

Test results: test data displayed in the process of test .

一次侧电流：变比极性试验时一次侧所施加的实际电流。

Primary side current: turns ratio polarity test actual exert current of primary side.

二次侧电流：变比极性试验时二次侧所测得的实际电流。

Seondary side current: turns ratio polarity test actual exert current of seondary side.

变比：变比极性试验根据一次侧和二次侧所测的实际电流计算出的实际变比。

Turns ratio: Turns ratio polarity test, according to primary side and secondary side actual current calculated actual turns ratio.

极性：变比极性试验所测的实际极性（外接升流器时，极性并不能反映其实际状态）

Polarity: actual polarity test from turns ratio polarity test (external high current generator, polarity does not reflect the actual state)

3.4.2 变比极性试验 turns ratio polarity test

3.4.2.1 试验接线 test wiring

变比极性试验的原理接线图如图 3-14。

The principle wiring graph of turns ratio polarity test as shown in figure 3 to 14.

1：变比极性试验中，由于一次侧电流大，请尽量采用较粗和较短连接线，以免一次侧引线电阻过大导致电流升不上去。

Note 1: turns ratio polarity test, due to priamry side current is high, please make use of thicker and short links, in case that primary side lead resistance excessive and current can not go up.

2：做变比极性试验时，伏安特性试验的二次侧输出电压端子请不要接线，也禁止人员接触。

Note 2: when carry on the turns ratio polarity test, please don't wiring Volt-Ampere characteristic test

Secondary side output voltage terminal, also banned personnel contact.

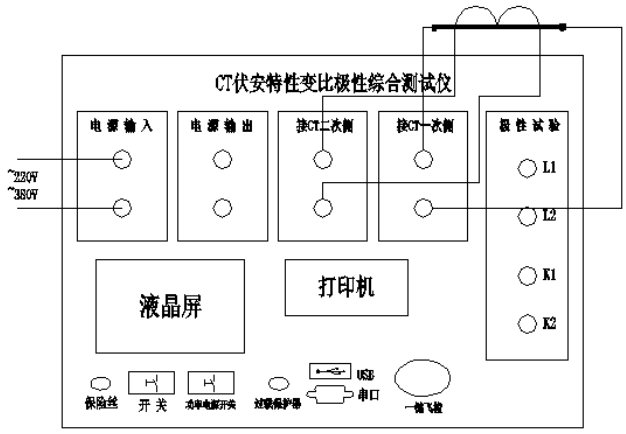


图 3-14

3.4.2.2 试验方法 test method

设置好一次侧测试电流和二次侧额定电流后，旋转一键飞梭将光标移动至 试验 选项，按下一键飞梭，选择 确定 ，即出现下图 3-15 所示试验界面。

Set up primary side test current and secondary side rated current and rotate a key shuttle, cursor move to test options, press a key shuttle, choose OK, namely appear test interface shown in figure 3-15.

试验过程中，光标会显示在 返回 选项上不停闪烁，直至试验完毕退出自动测试界面，或按下一键飞梭人为中止试验。

In the process of test, the cursor will be shown on return options, all flash, until the test out of automatic testing interface, or press a button for shuttle to stop test.

试验开始后，装置输出到电流互感器的一次侧交流电流不断的增加，该一次测电流和二次测测得的电流数值在屏幕上显示。当一次侧电流达到所设定的电流值时，或二次侧电流达到 5A（二次侧额定电流为 5A）或 1A（二次侧额定电流为 1A）时，装置会自动停止试验，并以实际测出的电流，计算得出变比值且显示出极性。以上图所示为例，一次侧所设测试电流为 300.0A，二次侧额定电流 5A。测得一次侧所加电流 301.8A，二次侧电流为 2.515A，变比比值为 600 : 5，极性为正。

After the beginning of the experiment, the device, the output to current transformer is primary side ac current.The increase of the broken, the a measure current and the second measure the measurement of current numerical on the screen Shown. When primary side to current set by the current value, or secondary side to current 5 A (secondary side rated current for 5 A) or 1 A (secondary side rated current for 1 A), the device will automatically stop test, and based on the actual measure of current, calculated turns ratio and it appears that polarity. Shown above as an example, A side test current set for 300.0 A, secondary side rated current 5 A. The primary side for current 301.8 A, secondary side current of 2.515 A, turns ratio for 600:5, polarity is positive.

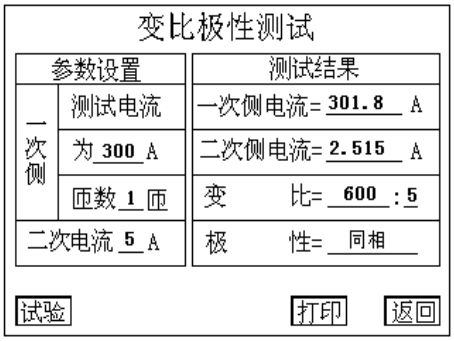


图 3-15

注意： 由于保护 CT 种类太多，其变比范围非常大（从 10 : 5 ~ 30000 : 1），故测量不同 CT 变比时其二次电流范围也很大。为保证测量的精确性，测量时确保二次侧电流升至 0.02～2.5A 范围。

Note: due to protect CT kinds too much, its turns ratio with very large range (from 10:5 ~ 30000:1), so when measured different CT turns ratio the secondary current range is very large too. To ensure the accuracy of measurement, make sure that secondary sidecurrent with the range of 0.02 ~ 2.5 when measurement.

3.5 消磁 Degaussing

3.5.1 消磁试验的软件界面 software interface of degaussing test

进入主菜单，旋转一键飞梭将光标移动到 消磁 选项上，按下一键飞梭即可进入消磁试验设置界面（如图 3-16）。

Enter the main menu, rotate a key shuttle move cursor to degaussing options, press a key shuttle button to enter degaussing test set interface (as shown in figure 3-16).

消磁的功能是消除互感器二次侧的剩磁参数设置：试验前需设置的参数测试电流：给二次侧加的电流有 1A、5A、10A 三种可选测试结果：实际电流 记录到达设定电流值时的实际电流

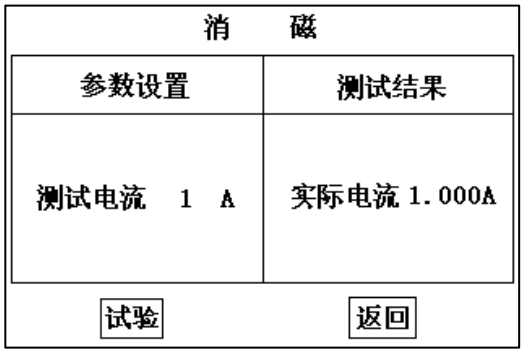


图 3-16

Degaussing function is to eliminate the transformer secondary side residual magnetism parameters settings, before the test should set parameters, Test current to secondary side with 1 A, 5 A, 10 A are optional: the actual current the actual current of record up to setted current

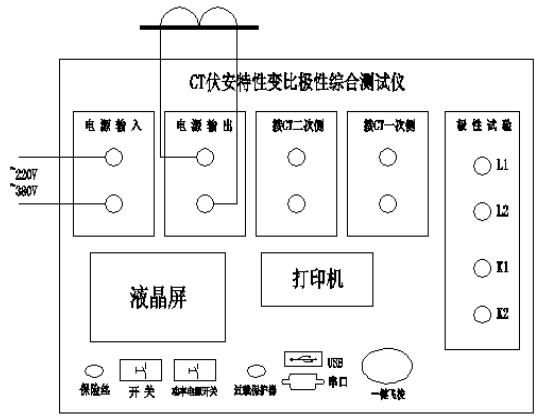


图 3-17

3.5.2 消磁试验 Degaussing test

3.5.2.1 试验接线 test wiring

使用装置单机进行试验的原理接线图如图 3-17。交流功率电源输入端子最好接 AC220V 电压输出接到互感器二次侧。

Use single device for testing principle and the wiring diagram as shown in figure 3-17. Connect AC power input terminal to AC220V transformer secondary side.

3.5.2.2 试验方法 Test method

在消磁试验界面上选择相应的测试电流,有 1A、5A、10A 三种可选,选定后用一键飞梭将光标转至 试验 选项上,按下即进入试验，此时装置自动逐步增加电流进行测试，达到设定值时会自动返回。

In the interface of degaussing test to choose corresponding test current, 1 A, 5 A, 10 A three optional, selected with a key shuttle turn to the cursor test options, press namely into the test, at the moment the device to be automatic gradually increase the current to test, up to set data will be returned automatically.

试验过程中，光标会在 返回 选项上不停闪烁，直至试验完毕退出自动测试界面，或按下一键飞梭人为中止试验。

In the process of test, the cursor will return to keep flashing in the options, until the test is over then exit automatic testing interface, or press a key shuttle to stop test.

3.6 一次通流 primary current injection test

3.6.1 一次通流试验的软件界面

进入主菜单，旋转一键飞梭将光标移动到 一次通流 选项上，按下一键飞梭即可进入一次通流试验界面（如图 3-18）。

一次通流是用来产生一个大电流流过互感器一次侧, 测试实际的二次侧仪表工作是否正常

参数设置：试验前需设置的参数

测试电流：在做一次通流测试时，电流互感器一次侧

所施加的电流，范围为 0 ～ 600A。

持续时间： 到达设定电流时，保持的时间根据需要分为：

0～200A 为 300 秒；200～400A 为 60 秒；400～600A 为 20 秒

Enter the main menu, rotate a key shuttle will move cursor to a on flow option, press a button to enter a shuttle on flow test interface (as shown in figure 3-18).

Once the stream is used to produce a large current through the transformer a side, test the actual secondary side instrument working is normal or not

Parameters Settings: before the test should be set of parameters

Test current: do the flow in A test, current transformer A lateral pressure of current, the range of 0 to 600 A.

Duration: to set the current, keep time according to need is divided into:

0 ~ 200 A for 300 seconds; 200 ~ 400 A for 60 seconds; 400 ~ 600 A for 20 seconds

图 3-18

测试结果： test result

实际电流 实际流过一次侧的电流

The actual current flows through a practical side of current

剩余时间 当实际电流到达设定电流后,就开始从已设定的时间倒计时,当倒计时为 0 时停止测试

The rest of the time when the actual current set to current and begin from already set time countdown, when the countdown reaches 0 stop testing

3.6.2 一次通流试验 primary current injection test

3.6.2.1 试验接线 test wiring

一次通流试验的原理接线图如图 3-19。

1：一次通流试验中，由于一次测电流大，请尽量采用较粗和较短连接线，以免一次侧引线电阻过大导致电流升不上去。

2：做一次通流试验时，伏安特性试验的二次侧输出端子请不要接线，也禁止人员接触。

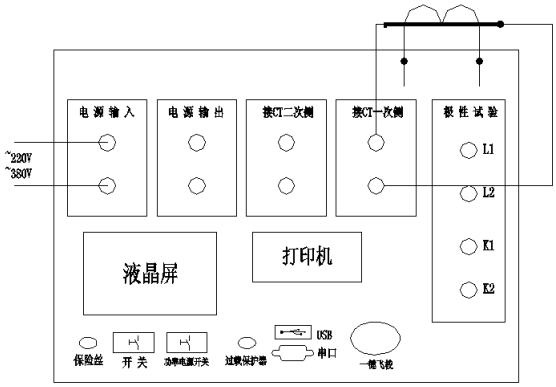


图 3-19

3.6.2.2 试验方法Test method

设置好电流和持续时间后,将一键飞梭移动至 试验 选项, (这时绿色开关应在打开状态)按下一键飞梭即开始试验, 试验过程中,光标会在停止上不停闪烁,直至试验完毕或中途按下一键飞梭人为中止试验。

试验开始后，装置输出到电流互感器一次侧的交流电流不断增加,该一次侧电流数值会在屏幕上显示,当一次侧电流达到所设定的电流值时,将保持此电流值并开始倒计时,倒计时为 0 时结束测试。

Set up current and duration, will be a key shuttle moved to test options, (at this time should be open in green switch) press a button to test the shuttle namely, test process, the cursor will stop in, all flash, until the test or press a button the shuttle human suspends trials.

After the beginning of the experiment, the device, the output to current transformer a side of the ac current increase constantly, and the primary side current numerical will be displayed on the screen, when a side to current set by the current value, will keep the current value and start the countdown, ended when the countdown reaches 0 test.

3.7 U 盘存储 U disk storage

3.7.1 U 盘存储的软件界面 U disk storage software interface

进入主菜单，旋转一键飞梭将光标移动到 U 盘存储 选项上，按下一键飞梭即可进入 U 盘存储试验界面（如图 3-20）。

Into the main menu, rotate a key shuttle will cursor movement to U disk storage option, press a button to enter shuttle U dish storage test interface (as shown in figure 3-20).

图 3-20

U 盘存储功能可以将测试仪内存储的试验数据，
存入到 U 盘上，供上位机软件分析使用。
存储后文件的格式为.doc 格式，可用 Word 或写字板打开。

U disk storage function can be stored in tester test data,
Deposit to U disk, PC software used for analysis.
After the format for storing files. Doc format, can use Word or tablet open.

3.7.2 存储机内数据Storage data

首先要把 U 盘插入面板上的 USB 口，再将一键飞梭转到 存储上,按下一键飞梭，此时 U 盘上的指示灯会闪烁,表示试验数据正在存到 U 盘上,等试验数据存储完毕后，光标会自动停留在 返回 选项上,这时可以将 U 盘拔出。

注意：建议使用 FAT 格式的 U 盘(FAT32 也可以)。

First of all to put U disk into the USB port on the panel, again a key shuttle turned to storage, press the next key shuttle, this time on the U dish blink, said the test data is save to the U plate, and other test data storage, the cursor will automatically stay in return options, then can U dish will pull out.

Note: it is recommended that use FAT format U plate (FAT32 can also).

3.7.3 删除机内数据 Delete data

如果测试仪内存储的数据不需要了,可以将一键飞梭转到 删除 上按下一键飞梭,就可以删除全部试验数据了。

If the data stored in the tester don't need, can will turn to delete a key shuttle press a button on the shuttle, you can delete all the test data.

3.8 PC 通讯 PC communications

3.8.1 PC 通讯的软件界面

旋转一键飞梭`到入主界面中的 PC 通讯上，按下即进入 PC 通讯界面,这时测试仪就会响应 pc 的操作命令。

PC communications software interface

A key ` shuttle to rotate in the PC communication interface, press down namely into the PC communication interface, then tester will response PC operation command.

注意：必须将电脑和伏安特性测试仪通过串口连接起来

USB 口是读写 U 盘的,不能用来和电脑连接

伏安特性试验和变比试验接线和前面相同,可以参见前面相应的说明

Note: must be the computer and current-voltage characters tester connected through a serial port
USB port is reading and writing U disk, cannot be used to and computer connection
Current-voltage characters test and become test connection and front than the same, can see front the corresponding explanation

3．9 极性试验 Polarity test

极性试验中，伏安特性测试区域和变比区域内的端子均不需接线，也不需连接交流功率电源输入。仅需将电流互感器一次侧两根线接至测极性的一次侧两端子，电流互感器的二次侧两根线接至测极性二次侧两端子，打开装置电源，如果测极性区域内上端标有“正”的发光二极管闪动，则为同相，下端标有“反”的发光二极管闪动，则为反相。接线方法如图 3-21。

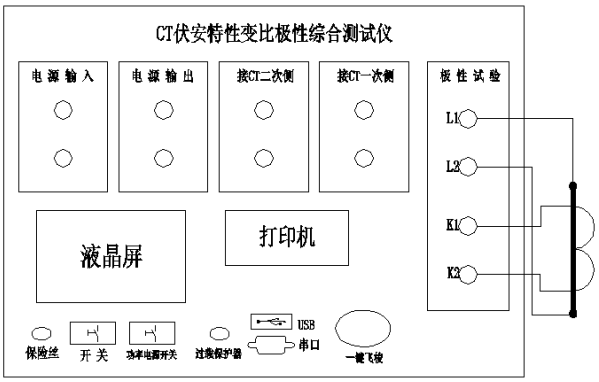


图 3-21

Polarity test, the test area and become current-voltage characters than the terminals of the region are free wiring, also do not need to connect ac power input. It will require the current transformer a side two root connected to the polarity of the primary side two terminals, current transformer secondary side of the two root connected to the polarity secondary side two terminals, open device power, if the polarity area marked with "is" at the top of the light emitting diode flashing, is the same phase, with lower "against" light-emitting diodes (leds) flashing, is reverse phase. As shown in figure 3-21 wiring method.

第四章 PC机操作软件使用说明

CaptionⅣ PC Operating Software Instructions

4. 1 伏安特性试验:软件打开后显示伏安特性试验的画面如图4-1所示

4. 1 Volt-ampere characteristic test: It shows the picture of the Volt-ampere characteristic test as picture 4-1 below when you open the software.

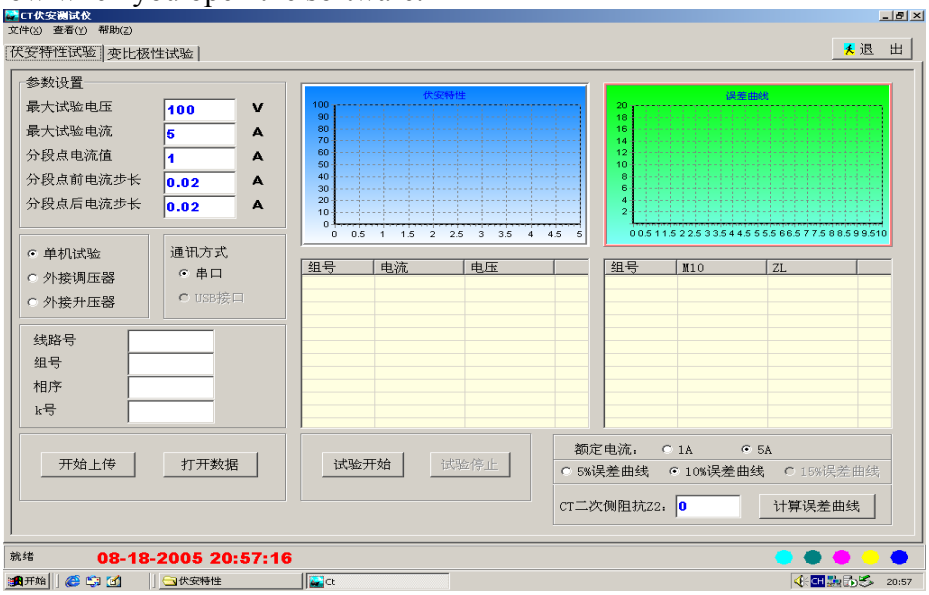


图4-1 伏安特性试验初始画面

4.1.1 界面参数说明Interface parameter specifies

最大输出电压：电流互感器二次侧的所能承受的最大电压，范围（0～1200）V。

最大输出电流：电流互感器二次侧的所能承受的最大电流，范围（0～20）A。

分段点电流值： 设置一个分段点，此点前后分别以两种不同电流步长进行试验，范围（0 ～ 20）A。

分段点前步长：分段点前的步进电流步长，范围（0.001～2.00）A。

分段点后步长：分段点后的步进电流步长，范围（0.001～2.00）A。

试用方式有单机试验，外接升压器，外接调压器。单机试验和外接调压器试验时，最大输出电压范围（0～1200）V，**最大输出电流范围**（0.02～20）A。**外接升压器时，最大输出电压范围**（0～2200）V，**最大输出电流范围**（0.02～1.5）A。

Maximum output voltage: current transformer secondary side can take maximum voltage, range (0-1200) V.

Maximum output current: current transformer secondary side can take the maximum current, range (0 ~ 20) A.

Segmentation point current value: set A segmentation point, before and after this point respectively in two different current step length to test, range (0 ~ 20) A.

Step length before Segmentation point: current step length before Segmentation point, range (0.001 ~ 2.00) A.

Step length after Segmentation point: current step length after Segmentation point, range (0.001 ~ 2.00) A.

It has a single test, external booster device, external pressure regulator to test. Single test and external pressure regulator test, maximum output voltage range (0-1200) V, maximum output current range (0.02 ~ 20) A. The external boost test, maximum output voltage range (0-2200) V, maximum output current range (0.02 ~ 1.5) A.

4.1.2 试验方法Test method

试验原理以及接线方式与单机相同。接线完毕后，请点击**“试验开始”**，即开始伏安特性试验。此时装置自动根据电压、电流和步长值逐步增加电压和电流进行测试，每测出一个点将自动在曲线图上标示出来，并在数据显示框中显示电压电流数值。试验过程中可以随时点击**“试验停止”**来终止试验。试验完毕后系统提示是否保存本次试验结果，可以根据需要选择保存或不保存。在点击**“试验开始”**开始试验前，请在线路号、组号、相序、K号内输入相应的值。

The principle and the wiring way are same as single. After the connection, please click "test begins", it will begin current-voltage characters test. At this time, device automatically according to the voltage, current and step length value gradually increases the voltage and current to test, each measure will indicate in the graph automatically and display voltage， current value in the data display box. You can click the "test stops" to end the test at any time in the test process. After the test completion, the system will advise whether the test results saved, you can choose according to your need. Clicking "test begins" before the test begins, please input the corresponding value of line number, group number, phase sequence and K number.

4.1.3 数据上传Upload data

点击**“开始上传”**，可以将在下位机保存的测试数据上传到PC 机上保存。上传完毕后系统将提示数据保存信息，请输入要保存的文件名，系统自动根据上传数据的组数生成相应个数的文本文件。如果没有联接下位机或者下位机没有数据则自动结束无任何显示。

Click "start Upload", it can upload the test data saved in lower computer to the PC storage. After the uploading, the system will prompt to save the information; please input the file name, the system will create corresponding number of the text files automatically according to the uploading data number. If there is no connection with the lower computer or no data in the lower computer, then it will be automatically over without any display.

4.1.4 打开数据Open data

点击**“打开数据”**，可以打开已经保存在PC 机内的数据以及图形。点击**“打开数据”**，画面显示如图4-2所示

Click on the "open data", it can open the data and graphs saved in the PC. Click on the "open

data", the picture shows as 4-2 below.

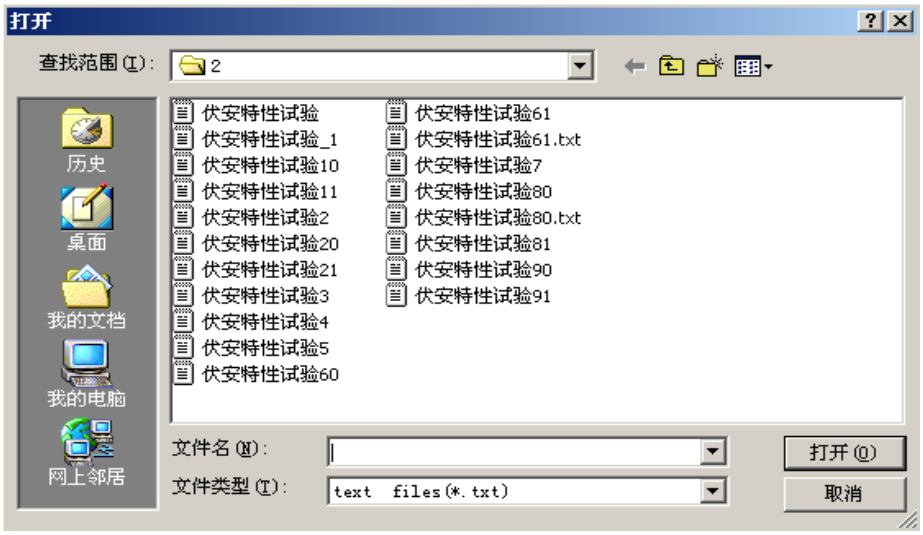
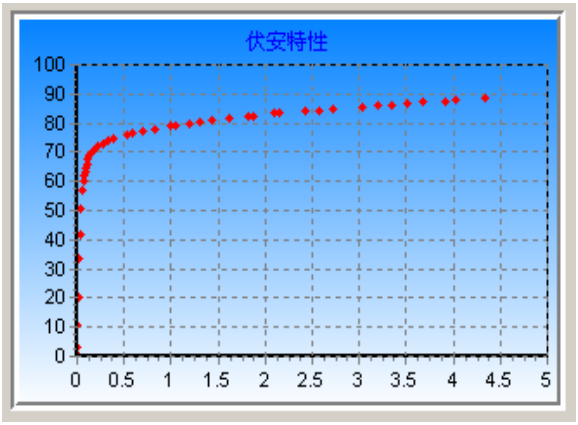


图4-2 打开数据画面 figure 4-2 Open data interface

选择需要打开的数据文件，这里可以选择打开文本文件和WORD文件，打开后的曲线和数据如图4-3和图4-4所示

Choose data files you need to open, there are text files and WORD document to choose, the open curves and data as shown in figure 4-3 and figure 4-4 below.



组号	电流	电压
1	0.008	0.50
2	0.013	2.70
3	0.021	10.20
4	0.031	19.90
5	0.041	32.60
6	0.051	41.10
7	0.061	49.80
8	0.075	56.60
9	0.085	59.20
10	0.091	61.10
11	0.102	62.90
12	0.111	64.20

图4-3 伏安特性曲线

图4-4 伏安特性数据

Figure 4-3 Volt-Ampere Characteristics curve

Figure 4-4 Volt-Ampere Characteristics data

对于曲线的密集区，可以放大后进行显示，其方法是点住鼠标左键从左上角到右下角选择需要放大的区域，放大后的曲线显示如图4-5所示

You can magnify the picture to the curve concentration areas. The method is pressing on the left mouse button to choose magnified area you need, magnified curve is shown as 4-5 below.

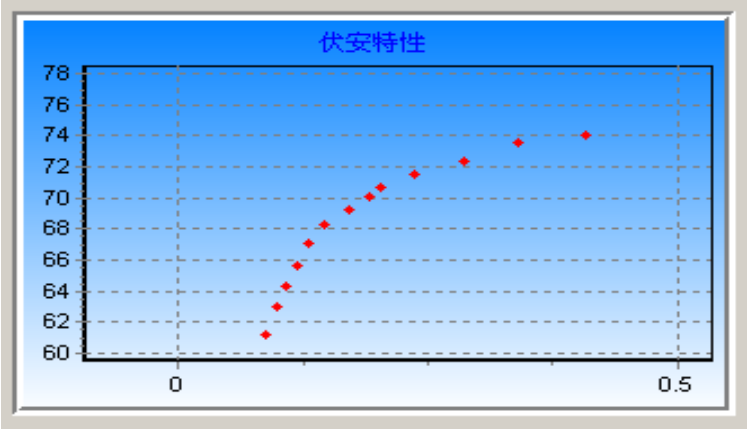


图4-5 局部放大后的伏安特性曲线

这时还可以通过点住鼠标右键对曲线上、下、左、右进行平移，以进一步观察曲线。

Then you can also press on the right mouse button make the curve up, down, left, right move, in order to further observation of the curve.

4.1.5 误差曲线error curve

由已经打开的数据可得出误差曲线。CT 的额定电流可以为1A 和5A，CT 二次侧阻抗Z2 的设置范围为0 到20 欧Ω，可选择5%或10%误差曲线。参数设置好后点击**“计算误差曲线”**，即显示出误差曲线以及计算得出的数据，并对计算出的误差数据和误差曲线进行保存。下图为CT的额定电流为1A、CT 二次侧阻抗Z2 的设置为0欧、10%的误差曲线和数据，如图4-6和图4-7所示

The open data can work out error curve. CT rated current can be 1 A and 5 A, the set range of CT secondary side of impedance Z2 is 0 to 20Ω, you can choose the 5% or 10% error curve. Click "calculation error curve" after set parameters then it will show the error curve and calculate the data and save them. This illustration shows the CT rated current is 1 A, CT secondary side of impedance Z2 is 0Ω, 10% of the error curve and the data, as shown in figure 4-6 and figure 4-7 below.

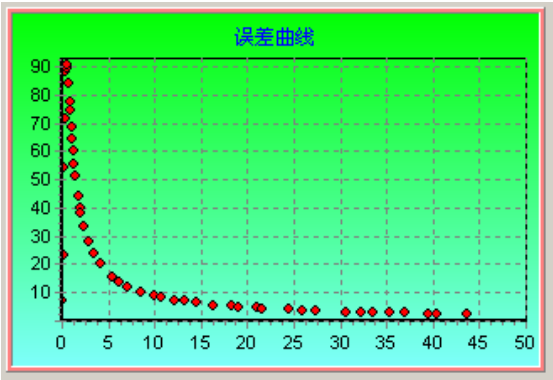


图4-6 误差曲线

组号	M10	ZL
1	6.9	0.08
2	23.1	0.13
3	54.0	0.21
4	71.3	0.31
5	88.3	0.41
6	89.5	0.51
7	90.7	0.61
8	83.9	0.75
9	77.4	0.85
10	74.6	0.91
11	68.5	1.02
12	64.3	1.11

图4-7误差曲线数据

4. 2 变比极性试验ratio polarity test

变比极性试验的画面如图4-8所示ratio polarity test interface will shown as fellow:

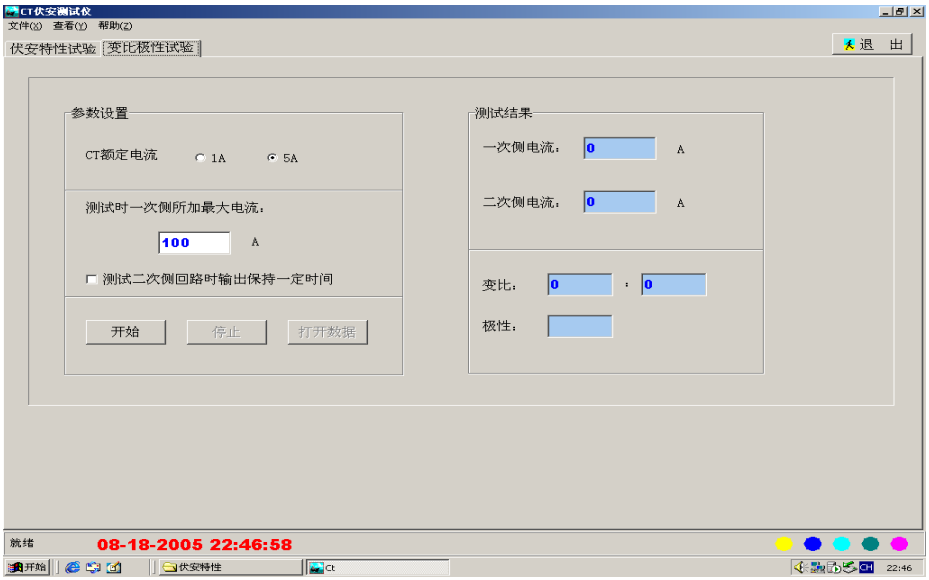


图4-8 变比极性试验画面

4.2.1 参数说明Parameter specifies

一次侧测试电流：在变比极性测试时，电流互感器一次侧需施加的电流，范围为0～900A。

二次侧额定电流：电流互感器二次侧的额定电流，1A 或5A。

一次侧电流：变比极性试验过程中一次侧所施加的实际电流显示值。

二次侧电流：变比极性试验过程中二次侧所测得的实际电流显示值。

变比：变比极性试验根据一次侧和二次侧所测的实际电流计算出的实际变比。

极性：变比极性试验所测的实际极性。

“测试二次侧回路时输出保持一定时间”用于将一次侧输出电流保持一段时间。该时间的长度与电流值有关，电流越大，时间越短。

Primary side measuring current: ratio polarity test, the current transformer primary side needs to input the current; the range is 0 to 900 A.

Secondary side rated current: rated current of current transformer secondary side is 1 A or 5 A.

Primary side current: actual input current displayed value during the turns ratio polarity test of primary side

Secondary side current: actual input current displayed value during the turns ratio polarity test of secondary side

Turns ratio: Turns ratio polarity test, according to primary side and secondary side actual current calculated actual turns ratio.

Polarity: the actual polarity in turns ratio polarity test.

"Test secondary side loop keep some output time" for a side output current keep period of time. This time the length and the current value of the relevant, the greater the current, time is shorter.

2000V CT 伏安特性变比极性综合测试仪

2000V CT Turns Ratio & Volt-Ampere Characteristics Tester

技术参数及说明

Technical parameters and description

1、 装置技术参数 Technical parameters

	输入电压 Input voltage	输出范围 Output range	测量范围 Measurement range	测量精度 Measurement accuracy
装置主机 Device host	220V	0～2000V, 0～20A	0～2200V, 0～20A	<0.5%
装置主机升流器 Device host High current generator	220V	0～800A	0～900A	变比测量精度 ＜0.5% Turns ratio measurement accuracy < 0.5%

装置工作电源 power supply	AC 220V±10%，50／60Hz	工作环境温度 Ambient temperature	-25℃ – +65℃
测量用功率电源 Power frequency power supply for measurement	AC 220V	体积、重量 Volume, weight	420×300×270mm³，36Kg

表一 table 1

2、 装置使用说明 device operation instruction

本装置实验方法、参数设置及接线方法与 1200V 测试仪相同；本装置只允许单机使用，不可以外接调压器或升压器。

This device experiment method, parameter setting and wiring method and 1200 V tester is the same; This device is only allowed to use single, can not external voltage regulator or set up transformer.

伏安特性试验输出电压为 0～2000V，电流为 0～20A，可用于做 500KV 等级 1A 电流互感器的伏安特性试验；变比测试最大电流高达 800A。如果电流互感器一次侧可以穿多匝，本装置最多可以穿 9 匝，输出便可达到 7000 安匝。

- Volt-Ampere characters test output voltage is 0 ~ 2000 V, current 0 ~ 20 A, can be used to do 500 KV level 1 A current transformer's Volt-Ampere characters test; Change is the maximum current than test up to 800 A. If current transformer primary side can wear many turns, this device most can wear 9 circle, the output will reach 7000 ampere-turn

注意： Note:

装置面板上交流功率电源输入固定为 AC220V，不可输入 AC380V。

Device panel ac power input fixed for AC220V, not AC380V input.

附录 1 安全注意事项 软件升级 故障维护

Appendix 1 safety caution software upgrade fault maintenance

1 安全注意事项safety caution

⑴ 请勿将本仪器置于不平稳的平台上以防仪器跌落受损。

(1) Do not lay the instrument at unsteady platform, in case to fall and instrument damaged.

⑵ 仪器右侧面的风扇为通风散热而设，为保证仪器工作的可靠性，请勿堵塞。

(2) the fan at right instrument for ventilation cooling, do not plug to guarantee the reliability of the instrument.

⑶ 装置用的电源为 220V 交流电源。而面板上的交流功率电源可为 AC220V 或 AC380V，请勿将二者混淆。

(3) Device is 220 V AC power supply. And the power supply of panel power is AC 220V or AC380V, please do not confuse them.

⑷ 不要让任何异物掉入机箱内，以免发生短路。

(4)Don't let any foreign bodies fall into the case, avoid to short circuit.

⑸ 作为安全措施，该仪器配有单相三线插头，试验之前请将电源线中的接地线可靠接地。如现场电源无接地线，应将装置面板上接地端子可靠接地。

(5)For security , the instrument equipped with single phase three line plug, please earth well before test. If can not earth on site, ground terminal on the panel should grounding reliably.

2 主机软件更换 Host software replacement

软件升级时无需拆开主机，通过 USB 进行在线升级即可。

Software upgrade without apart the host, online upgrade through the USB.

3 精度调整 Precision adjustment

本装置采用高精度精密元件，元器件采用工业级标准，采样传感器精度 0.1%，电阻精度及传感线性度 0.1%，电阻温度系数 10PPM。所有待调参数出厂时已校准，无须再次调整。

The device adopts a high precision components, components using industrial standards, sampling the sensor precision 0.1%, resistance precision and sensor linearity 0.1%, resistance temperature coefficient 10 PPM. The parameters that needs to be check out have already calibration in factory, you does not need to adjust again.

4 亮度调整 Brightness adjusting

本品出厂时已调至最佳亮度，用户无需再次调整。

This product has transferred to the best brightness, users don't need to adjust.

5 故障维护 Fault maintenance

装置使用过程中如出现某些异常情况，请按下述步骤进行处理：

In the course of using the device such as a certain abnormal condition, please deal with as the following steps:

⑴ 如果电压输出不正常，如幅值太低，或甚至输出接近为零，请检查面板开关是否闭合或交流功率电源是否接好。

(1) if the voltage output is not normal, such as amplitude is too low, or even output close to zero, please check whether the switch panel closed or ac power whether connected.

(2) 如果开机无任何反应，风扇不转，电源指示灯和显示屏均不亮，请检查面板左下角电源保险丝是否断开。

(2) if the boot without any response, fan not turn, the power indicator and the screen are not bright, please check whether the power supply fuse panel disconnect.

(3) 如果确属装置内部故障，请速于我公司联系，我公司将尽快予以解决。

(3) if it is internal fault device, please contact my company quickly, our company will be solved as soon as possible.

附录 2　打印机色带和纸卷安装

Appendix 2 printers ribbon and paper roll installation

更换色带：

色带盒在打印机出厂时已经装好，使用中需更换时按下列步骤进行：

- 翻开打印机的前面盖板，如图 1。
- 拉出机头：如图 2 所示，捏紧机头左右两侧的弹性捏手，将机头拉板向外拉

出，直到色带全部露出打印机机壳外面。

- 取下色带盒：参考图 3，从打印机机头上轻轻取下色带。操作时，先抬起色

带的右侧，然后再抬起左端，取下色带盒。

- 安装新色带盒：首先将色带盒的右端轻轻放在机头右端的齿轮轴上，左端稍

抬起，不要放下。这时如发现色带盒右端未落到底，请用手指按住色带盒上的旋钮，按逆时针方向稍微转动一下，直到色带盒的右端落到底后再放下色带盒的左端。请检查色带是否拉直，如未拉直，或色带还露在色带盒的外面，可再旋动色带盒上的旋钮，直到把色带拉入色带盒内并拉到为止。当没有纸在机头里时，更换色带更加容易。

- 将机头拉板推回原位，盖上打印机前面盖板。

Replace the ribbon:

The ribbon box in a printer factory has already pack good, use the need to change the time according to the following steps:

• Open the front cover plate printer l, as shown in figure 1.

• Pull out head: as shown in figure 2 shows, holding the elasticity of the nose on a left hand hold, will head to pull to pull at the plate

Out, until the ribbon all show printers outside shell.

• Take the ribbon box: see figure 3, from printer head gently took down the ribbon. When operating, carried first improvement

Take the right, then raise left end, take down the ribbon box.

• Installation new ribbon box: first the ribbon of the right end of nose gently the right gear shaft, slightly at left

Lift, don't put down. Then if found the ribbon box of the right end did not lie the end, please use your fingers on the ribbon on the box knob, according to a little circle your counterclockwise until the ribbon box right side fell down again after what left end of ribbon box. Please check whether the ribbon pull straight, if not straight, or the ribbon also Lou in the outside of the box of ribbon, to turn the ribbon on the box knob until the ribbon pulled into a ribbon box and pull to date. When there is no paper in the nose, replace the ribbon easier.

• Pull back on board with in situ, close the front cover plate printer.

更换纸卷：Replace paper roll

打印机更换纸卷操作非常简单，它不需要取出整个打印机，只需打开打印机前面盖板，拉出机头拉板更换纸卷，便完成了换纸操作。其具体步骤如下：

Printer replace paper roll operation is very simple, it does not need to take out the whole printer, juest open the front cover plate printer, pull out and replaced with board paper roll, then complete replace paper operation. The specific procedure is as follows:

- 翻开打印机前面盖板，如图 1。
- Open the front cover plate printer, as shown in figure 1.
- 拉出机头拉板：如图 2 所示，用手捏紧，将机头拉板向外拉出，直到纸轴在打印机机壳外面。
- Pull out head pull board: as shown in figure 2, pinch tightly, pull out the board , until the paper in the shaft printers outside shell.
- 取下纸轴：如图 4 所示，捏紧伸缩纸轴的两端，将纸轴从打印机中取下。
- 安装新纸卷：将纸卷套在纸轴上，如图 4 捏紧纸轴两端，将纸轴放回原处。

松手后纸轴会卡在纸轴架上，确认纸轴已安装牢固。

- 将纸卷断头剪成如图 5 所示的形状。
- 接通打印机电源，打印机走纸三点行后，进入待命状态，此时指示灯亮。按

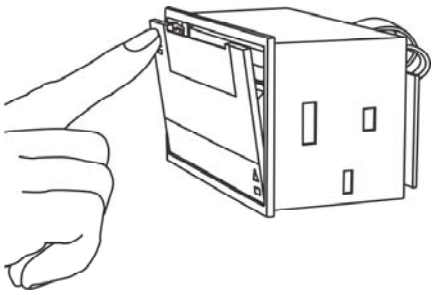
键（持续时间一秒以上），打印机开始走纸。这时将以剪好纸头的纸卷推入机头底部进纸口，纸便会被打印机卷进机头，直到从机头出纸孔方露出一段长度为止。再按一下 LF 键停止走纸；将拉板推回原位，并将打印纸的纸头从前盖板的出纸口中穿出，盖上打印机前面盖板。

● take paper shaft: as shown in figure 4 shows, holding adjustable paper at both ends of the shaft, will be taken from the printer paper axis.

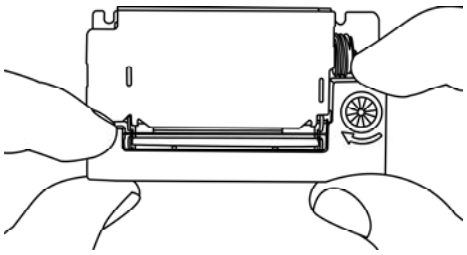
● Install the new paper roll: will paper roll set in the paper on the shaft, as shown in figure 4 holding paper ends shaft, will be to replace the paper axis.

After let go of paper shafts will stuck in paper shaft rack, paper shaft installed firmly has confirmed.

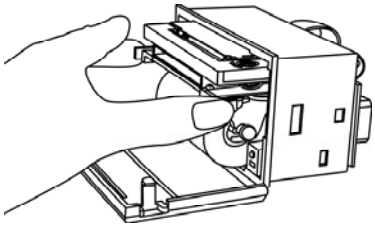
- will paper roll in and cut into as shown in figure 5 shows the shape.
- through to the printer power supply, printers go paper come at three, to the staging state, this time the indicator emit light. According toKey (for a second time above), printers began to walk paper. At this time will be cut out of the paper roll pushed into the bottom head into the mouth paper, paper will be printer into head, until the helicopter out from KongFang revealing a paper length so far. Click on the button LF stop go paper; Will pull back plate in situ, and will the paper was the cover plate printing out paper mouth wear a, close the front cover plate printer.



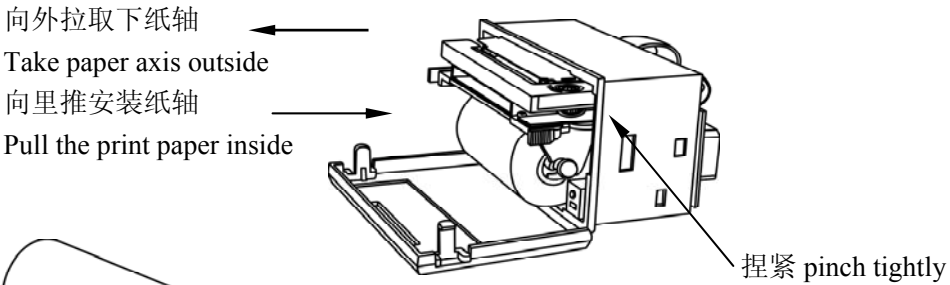
附图 1　系列开盖方法
Figure 1 the cover series method



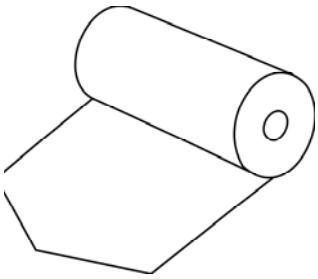
附图 2　取下色带盒
Figure 2 Take down the ribbon box



附图 3　拉出机头拉板 Figure 3 pull out head board



附图 4　取下纸轴安装打印纸
Figure 4 Take down paper axis installs printing paper



附图 5　纸卷端头式样
Figure 5 Paper roll end style