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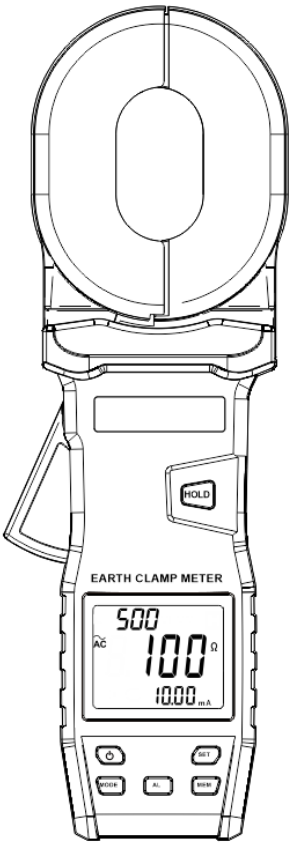


钳形接地电阻测试仪

Clamp Earth Resistance Tester

UT273系列

使用手册

Operating Manual

目　　录

安全规则及注意事项

感谢您购买了本公司钳形接地电阻测试仪，在你初次使用该仪器前，为避免发生可能的触电或人身伤害，请一定：详细阅读并严格遵守本手册所列出的安全规则及注意事项。任何情况下，使用本仪表应特别注意安全。

- ✧ 本仪表根据 IEC61010 安全规格进行设计、生产、检验。
- ✧ 任何情况下，使用本仪表应特别注意安全。
- ✧ 测量时，移动电话等高频信号发生器请勿在仪表旁使用，以免引起误差。
- ✧ 注意本仪表机身的标贴文字及符号。
- ✧ 使用前应确认仪表及附件完好，才能使用。
- ✧ 开机前，扣压扳机一两次，确保钳口闭合良好。
- ✧ 请勿在易燃性场所测量，火花可能引起爆炸。
- ✧ 开机时，不要扣压扳机，不能钳任何导线。
- ✧ 正常开机，显示“OL Ω”符号后，才能钳测被测对象。
- ✧ 请勿于高温潮湿，结露的场所及日光直射下长时间放置和存放仪表。
- ✧ 给仪表更换电池时，请确认仪表处于关机状态。
- ✧ 仪表显示电池电压低符号“  ”，应及时更换电池,否则会引起误差。
- ✧ 钳口接触平面必须保持清洁，不能用腐蚀剂和粗糙物擦拭。
- ✧ 打开扳机时，避免本钳表受冲击，尤其是钳口接合面。
- ✧ 本钳表在测量电阻时钳头会发出轻微响声，这是正常的，注意区别报警的“嘟--嘟--嘟--”声。
- ✧ 注意本仪表所规定的测量范围及使用环境。
- ✧ 测量导线电流不要超过本钳表的上量限。
- ✧ 使用、拆卸、校准、维修本仪表，必须由有授权资格的人员操作。
- ✧ 由于本仪表原因，继续使用会带来危险时，应立即停止使用，并马上封存，由有授权资格的机构处理。
- ✧ 仪表及手册中的“”安全警告标志，使用者必须严格依照本手册内容进行安全操作。

一、简介

钳形接地电阻测试仪又名回路电阻测试仪，用于接地电阻的测试。本仪表使用全新豪华屏设计、电阻电流同屏显示、同时还具有实时时钟、数据存储、数据查阅、报警、自动关机等功能。整机美观高档，量程宽广，分辨率高，操作便捷，携带方便，准确、可靠、性能稳定，抗干扰能力强。而且具有防震、防尘、防潮结构，是电信、电力、气象、机房、油田、机电安装和维修以及利用电力作为工业动力或能源的工业企业部门常用而必不可少的仪表。它适用于测量各种电信、电力、气象、机房、油田、电力配电线路、铁塔输电线路、加油站、工厂接地网、避雷针等接地电阻。

钳形接地电阻测试仪由微处理器控制，可准确检测接地电阻。其使用了快速滤波技术可将干扰减至最小。同时具有数据存储和数据上传等功能。

二、型号区别

型号	电阻量程	电流量程	蓝牙 APP
UT273A	0.010-300Ω	--	--
UT273B	0.010-600Ω	0.00mA-20.0A	--
UT273C	0.010-1200Ω	0.00mA-20.0A	蓝牙

三、量程及精度

测量模式	测量范围	分辨力	准确度
电　阻	0.010Ω-0.099Ω	0.001Ω	± (1%rdg + 0.01Ω)
	0.10Ω-0.99Ω	0.01Ω	± (1%rdg + 0.01Ω)
	1.0Ω-49.9Ω	0.1Ω	± (1%rdg + 0.1Ω)
	50.0Ω-99.5Ω	0.5Ω	± (1.5%rdg + 0.5Ω)
	100Ω-199Ω	1Ω	± (2%rdg + 1Ω)
	200Ω-395Ω	5Ω	± (5%rdg + 5Ω)
	400Ω-590Ω	10Ω	± (10%rdg + 10Ω)
	600Ω-980Ω	20Ω	± (20%rdg + 20Ω)
	1000Ω-1200Ω	30Ω	± (25%rdg + 30Ω)

*电　流①	0.00mA -9.99mA	0.01mA	± (2.5%rdg + 1mA)
	10.0mA -99.9mA	0.1mA	± (2.5%rdg + 5mA)
	100mA -299mA	1mA	± (2.5%rdg + 10mA)
	0.30A-2.99A	0.01A	± (2.5%rdg + 0.1A)
	3.0A-9.9A	0.1A	± (2.5%rdg + 0.3A)
	10.0A-20.0A	0.1 A	± (2.5%rdg + 0.5A)

注①： 电流功能仅 UT273B、UT273C 带有。

四、技术规格

功　　能	接地电阻测试、回路电阻测试、漏电流测试
电　　源	DC 6V，5 号碱性干电池（LR6 1.5V AA×4）
测量方式	互感方式
电阻分辨力	0.001Ω
电流分辨力①	0.01mA
钳口尺寸	55mm×32mm
时钟功能	有
Ω + A 同步显示	Ω + A 同屏显示
显示模式	4 位 LCD 显示
LCD 尺寸	46mm×36mm
仪表尺寸	288mm×95mm×55mm
测量时间	1 次/秒
USB 接口	具有 USB 接口，存储数据可以上传电脑，保存打印
蓝牙②	有
通 讯 线	USB 通讯线 1 条
数据存储	500 组，“MEM”存储指示，闪烁显示“MEM”符号表示存储已满。
数据查阅	查阅数据时“MR”符号指示
溢出显示	超量程溢出时“OL”符号指示

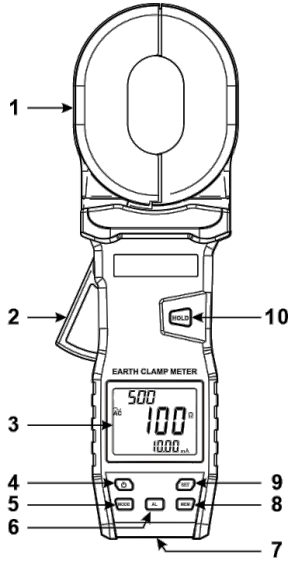
干扰测试	自动识别干扰信号，干扰电流大时“NOISE”符号指示
报警功能	测量值超过报警设定值时发出报警提示
电池电压	电池电压低符号提醒
自动关机	可设置为 5、10、15、20 分钟、OFF 几种方式，OFF 表示取消自动关机，默认为 5 分钟。
功　　耗	Max 约 80mA
质　　量	仪表：895g (含电池)
工作温湿度	-10℃～40℃；70%RH 以下
存放温湿度	-20℃～60℃；80%RH 以下
绝缘电阻	20MΩ以上(电路与外壳之间 500V)
耐　　压	AC 3700V/rms(电路与外壳之间)
外部磁场	＜40A/m
外部电场	＜1V/m
适合安规	IEC61010-1(CAT Ⅲ 300V、CAT IV 150V、污染度 2)；IEC61010-031；IEC61557-1(接地电阻)；JJG 1054-2009 钳形接地电阻仪检定规程

注①：电流功能仅 UT273B、UT273C 带有。

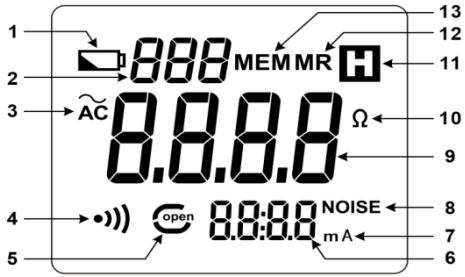
注②：蓝牙功能仅 UT273C 带有。

五、仪表结构

序号	说明
1	钳头
2	扳机
3	液晶显示屏
4	电源键
5	MODE 模式键
6	AL 报警键
7	USB 接口
8	MEM 存储键
9	SEL 设置键
10	HOLD 保持键



六、液晶显示



序号	说明	序号	说明
1	电池电压低符号	8	干扰符号
2	存储数据组编号数字	9	四位电阻数据
3	交流 AC 符号	10	电阻单位符号
4	报警符号	11	数据锁定符号
5	钳头张开符号	12	数据查阅符号
6	四位数字指示电流、时钟	13	数据存储符号
7	电流单位符号		

特殊符号说明:

⑴. open钳口张开符号，钳口张开时，该符号显示。此时，可能人为扣压扳机；或钳口已严重污染，不能再继续测量。

⑵. 电池电压低符号，当电池电量过低时，此符号显示，此时不能保证测量的准确度，应更换电池。

⑶. “OL Ω”符号，表示被测电阻超出了钳表的上量限。

⑷. “L0.01Ω”符号，表示被测电阻超出了钳表的下量限

⑸.。“OL A”符号，表示被测电流超出了钳表的上量限。

⑹. 报警符号，当被测量值大于设定报警临界值时该符号闪烁显示，同时仪表发出间歇“嘟--嘟--嘟--”声。

⑺. MEM 数据存储符号，保存数据时闪烁显示。

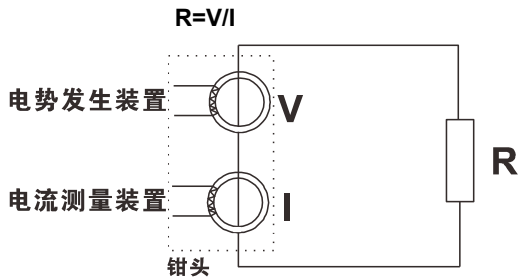
⑻. MR 查阅数据符号，在查阅数据时显示，同时显示所存数据的编号。

⑼. NOISE 符号，当被测试接地回路有较大干扰电流时此符号闪烁显示，同时仪表发出“嘟--嘟--嘟--”提示声。此时不能保证测试的准确性。

⑽. “Er”开机出错符号，可能开机时扣压扳机、钳住东西或钳口已张开。

七、测量原理

钳形接地电阻仪测量接地电阻的基本原理是测量回路电阻。见下图。钳表的钳口部分由电压线圈及电流线圈组成。电压线圈提供激励信号，并在被测回路上感应一个电势 V。在电势 V 的作用下将在被测回路产生电流 I。钳表对 V 及 I 进行测量，并通过下面的公式即可得到被测电阻 R。



$$R = V / I$$

八、操作方法

8.1、开关机

	开机时，不能扣压扳机，不能张开钳口，不能钳任何导线
	开机完成，显示“OLΩ”后，才能扣压扳机，打开钳口，钳被测导线
	开机前，扣压扳机一两次，确保钳口闭合良好
	开机时，要保持钳表的自然静止状态，不能翻转钳表，不能对钳口施加外力，否则不能保证测量的准确度

按电源键实现开关机。开机时仪表自动校准，开机完成后显示“OLΩ”，自动进入电阻测量模式，若没有正常开机自校准，仪表会显示“Er”符号，表示开机出错，常见开机出错原因有钳口没闭合良好、开机时钳入导线等。

开机后到达设定关机时间后自动关机，在自动关机前仪表会闪烁显示 30 秒，再按下电源键会延开关机时间。

8.2、电池电压检查

开机后，如果 LCD 显示电池电压低符号“  ”，表示电池电量不足，请及更换电池，若符号“  ”闪烁显示表示即将关机。电池电力充足才能保证测量的精度。

8.3、电阻、电流测试

	当用户认为被接地值不符合常规时，可以用随机配的校验环检验一下钳表是否正常。

开机自检完成后，中间大数字显示“OLΩ”，即可进行电阻测量。此时，扣压扳机，打开钳口，钳住待测回路，读取电阻值。

电阻和接地漏电可以同时测量，开机后按“MODE”键切换“电阻+电流”、“电阻+时钟”模式。

中间大数字显示“OLΩ”，表示被测电阻超出了钳表的上量限。

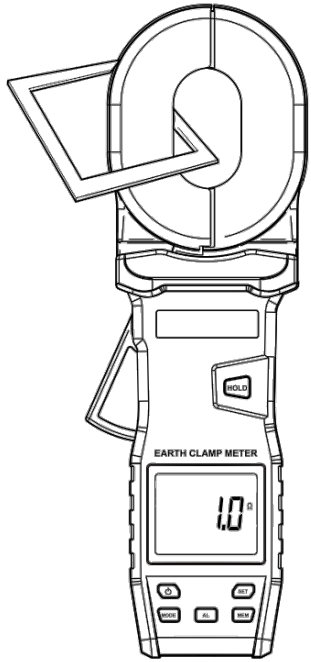
中间大数字显示“L0.01Ω”，表示被测电阻超出了钳表的下量限。

在“电阻+电流”模式时，显示屏右下方显示电流值，如“0.00mA”，如需测

量电流时则切换到此模式直接读取电流值即可。

在“电阻+时钟”模式时，显示屏右下方显示接地电压值，如“12：00”，如需读取当前时间则切换到此模式直接读取时间即可，更换电池需重新设定时间。

电阻+电流模式：



测量电阻值为 0.51Ω，

保存组数为 1 组，被测回路电流为 0.00mA

电阻+时钟模式：

被测电阻回路超出下量限，

保存组数为 8 组，当前时间为 12:08

8.4、时钟与关机时间设置

开机后，长按“SET”键进入设定模式后，屏幕左下角的数字为关机时间设置短按“HOLD”键可以修改关机时间，分别有 5 分钟、10 分钟、15 分钟、20 分钟及 OFF 不关机选项。

屏幕右下角闪烁的数字为时钟的时间设置，短按“SET”键可以分别切换到年、月与日、时与分的设置界面。再短按“MODE”键切换选择要修改的数字位，数字位闪烁显示，再通过短按“MEM”键或者“AL”键增减对应数据，再长按“SET”键保存退出。

图 1 2020 年　　图 2 12 月 18 日　　图 3 12 时 08 分

8.5、报警设置

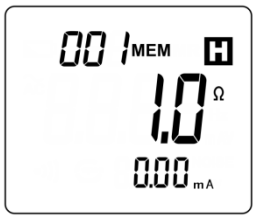
开机后，短按“AL”键开启或者关闭报警功能。

长按“AL”键可以设置电阻，电流报警值，短按“HOLD”键切换选择要修改的数字位，数字位闪烁显示，再通过短按“SET”键和“MEM”键增减对应数据，短按“MODE”键切换报警模式，再长按“AL”键保存退出。

当测量阻值大于报警临界设定值并开启报警功能时，仪表闪烁“　　”符号，并发出“嘟--嘟--嘟--”报警声。如下图：

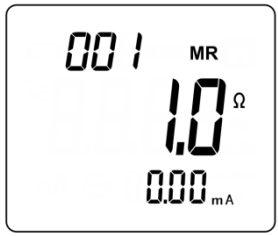
8.6、数据锁定/存储

开机后测量稳定后，短按“HOLD”键锁定当前显示数据，并自动保存数据，“MEM”符号闪烁一下并自动编号，若存储已满，仪表闪烁显示“MEM”符号，再短按“HOLD”键退出锁定模式。如下图，“MEM”符号为数据存储时闪烁显示符号，“HOLD”符号表示当前数据锁定：



8.7、数据查阅/删除

开机后测量并保存数据后，短按“MEM”键进入数据查阅，存储数据读取界面“MR”符号显示。短按“SET”或“AL”键以步进值为 1 增减选择查阅数组号对应数据，或长按“SET”或“AL”键以步进值为 10 增减选择查阅数组号对应数据。再短按“MEM”键退出查阅。下图为数据查阅模式，当前查阅组数为 1。



在数据查阅状态下，长按“MEM”键，进入数据删除状态，短按“AL”键删除所存数据键，短按“SET”键取消删除。

九、电池说明

当电池电压过低时，电量符号“”显示,请及更换电池。电量符号“”闪烁显示表示即将关机，电池电压低电时影响测量准确度。

十、手机 APP 使用说明

1) 仪器开机后，开启蓝牙功能。

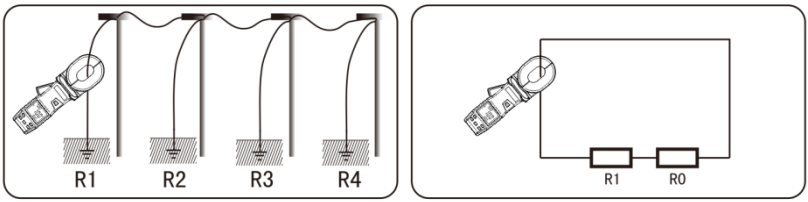
2) 手机安装 “UT273C.apk” APP 后,打开 APP 搜索名称为“UT273C”的蓝牙设备（此功能只有带有蓝牙的仪器才能使用），点击它等待连接成功即可使用。

3) 连接成功后，可在线操作测试与显示，可浏览历史存储数据。

十一、 现场应用

11.1、多点接地系统

对多点接地系统(例如输电系统杆塔接地、通信电缆接地系统、某些建筑物等)，它们通过架空地线（通信电缆的屏蔽层）连接，组成了接地系统。见下图。当用钳表测量时，其等效电路如下：



其中：R1 为预测的接地电阻。

R0 为所有其它杆塔的接地电阻并联后的等效电阻。

虽然，从严格的接地理论来说，由于有所谓的“互电阻”的存在，R0 并不是通常的电工学意义上的并联值（它会比电工学意义上的并联值稍大），但是，由于每一个杆塔的接地半球比起杆塔之间的距离要小得多，而且毕竟接地点数量很大，R0 要比 R1 小得多。因此，可以从工程角度有理由地假设 R0=0。这样，我们所测的电阻就应该是 R1 了。

多次不同环境、不同场合下与传统方法进行对比试验，证明上述假设是完全合理的。

11.2、有限点接地系统

这种情况也较普遍。例如有些杆塔是 5 个杆塔通过架空地线彼此相连；再如某些建筑物的接地也不是一个独立的接地网，而是几个接地体通过导线彼此连接。

在这种情况下，如果将上图中的 R0 视为 0 则会对测量结果带来较大误差。

出于与上述同样的理由，我们忽略互电阻的影响，将接地电阻的并联后的等效电阻按通常意义上的计算方法计算。这样，对于 N 个（N 较小，但大于 2）接地体的接地系统，就可以列出 N 个方程：

$$R_1 + \frac{1}{\frac{1}{R_2} + \frac{1}{R_3} + \cdots + \frac{1}{R_N}} = R_{1T}$$

$$R_2 + \frac{1}{\frac{1}{R_1} + \frac{1}{R_3} + \cdots + \frac{1}{R_N}} = R_{2T}$$

.

.

.

$$R_N + \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_{(N-1)}}} = R_{NT}$$

其中：R1、R2、.....RN 是我们要求得的 N 个接地体的接地电阻。

R1T、R2T、.....RNT 分别是用钳表在各接地支路所测得的电阻。

这是一个有 N 个未知数，N 个方程的非线性方程组。它是有确定解的，但是人工解它是十分困难的，当 N 较大时甚至是不可能的。

为此，请选购我公司的有限点接地系统解算程序软件，用户即可使用办公电脑或手提电脑进行机解。

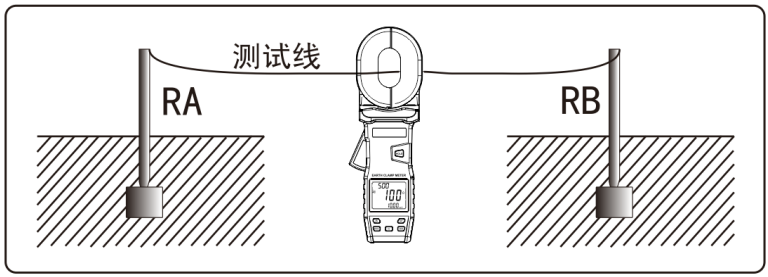
从原理上来说，除了忽略互电阻以外，这种方法不存在忽略 R0 所带来的测量误差。 但是，用户需要注意的是：您的接地系统中，有几个彼此相连接的接地体，就必须测量出同样个数的测试值供程序解算，不能或多或少。而程序也是输出同样个数的接地电阻值。

11.3、单点接地系统

从测试原理来说，钳表只能测量回路电阻，对单点接地是测不出来的。但是，用户完全可以利用一根测试线及接地系统附近的接地极，人为地制造一个回路进行测试。下面介绍二种用钳表测量单点接地的方法，此方法可应用于传统的电压-电流法无法测试的场合。

⑴．二点法

见下图，在被测接地体 RA 附近找一个独立的接地较好的接地体 RB（例如临近的自来水管、建筑物等）。将 RA 和 RB 用一根测试线连接起来。



由于钳表所测的阻值是两个接地电阻和测试线阻值的串联值。

RT=RA+RB+RL

其中：RT 为钳表所测的阻值。

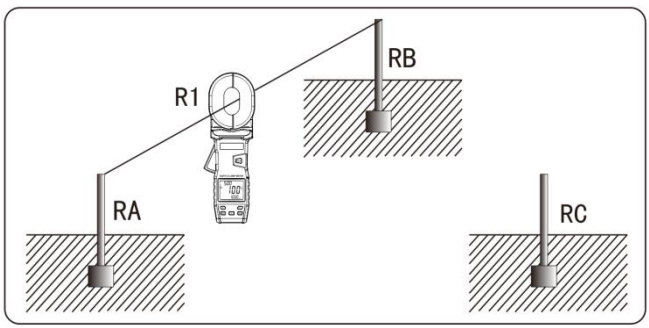
RL 为测试线的阻值。

将测试线头尾相连即可用钳表测出其阻值 RL。

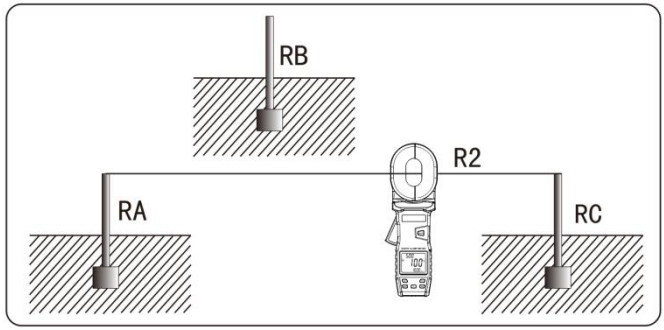
所以，如果钳表的测量值小于接地电阻的允许值，那么这两个接地体的接地电阻都是合格的。

⑵．三点法

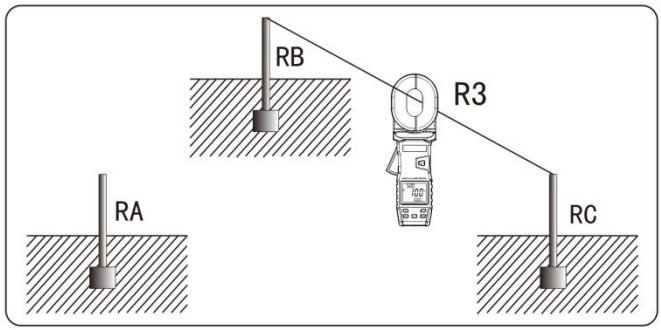
如下图，在被测接地体 RA 附近找二个独立的接地体 RB 和 RC。第一步，将 RA 和 RB 用一根测试线连接起来，见下图。用钳表读得第一个数据 R1。



第二步，将 RA 和 RC 连接起来，见下图。用钳表读得第二个数据 R2。



第三步，将 RB 和 RC 连接起来，见下图。用钳表读得第三个数据 R3。



上面三步中，每一步所测得的读数都是两个接地电阻的串联值。这样，就可以很容易地计算出每一个接地电阻值：

由于： R1=RA+RB R2=RB+RC R3=RC+RB

所以： RA=（R1+R3-R2）÷2

这就是接地体 RA 的接地电阻值。为了便于记忆上述公式，可将三个接地体看作一个三角形，则被测电阻等于邻边电阻相加减对边电阻除 2。

其它两个作为参照物的接地体的接地电阻值为：

RB=R1-RA RC=R2-RA

十二、 装箱单

仪表	1 台
1.5V 电池 AA（碱性）	4 节
校验环 1Ω 10Ω	各 1 个
USB 通讯线	1 条
用户手册	1 份
保修证/合格证	1 份
布包	1 个

本用户手册的内容不能作为将产品用做特殊用途的理由。

本公司不负责由于使用时引起的其他损失。

本公司保留对用户手册内容修改的权利。若有修改，将不再另行通知。

CONTENT

Precaution For Use

Thank you for purchasing this Clamp earth resistance tester from our company. In order to better use for the product, please be certain:

----Read this user manual carefully.

----Comply with the operating cautions presented in this manual.

- The tester design, production and test according to IEC61010 safety requirements.
- Under any circumstances, user should pay special attention to safety.
- When measuring, do not use high-frequency signal generators such as mobile phones near the instrument to avoid errors.
- Pay attention to the text labeled on the panel and backplane of the meter.
- Before use, confirm that the meter and accessories are in good condition.
- Before boot up, withhold the trigger once or twice to ensure the jaws are closed well.
- Do not measure in flammable places, as sparks may cause explosion.
- In booting up, do not withhold the trigger, nor clamp any wires.
- In normal boot up and display "**OL Ω**" symbol, and then clamp and test the measured object.
- Do not place and store the meter in high temperature&humidity or dewy places and under direct sunlight for a long time.
- Make sure the meter is at the shutdown state when replace the battery.
- When the meter displays battery low voltage symbol "  ",please replace the battery in time, otherwise it will cause errors.
- The clamp contact surfaces must be kept clean, cannot rubbed with caustics and coarse material.
- Avoid any impact onto this meter, especially the Jaw contact surface.
- It is normal that the meter clamp will have some buzzing sound in measuring resistance, pay attention to the difference from alarm "beep, beep, beep -" sound.
- Pay attention to measuring range and usage environment stipulated for the tester.
- Measuring wire current should not exceed the meter range upper limit.
- Disassembly, calibration, and repair of this tester must be performed by authorized personnel.
- Due to the reason of this instrument, if it is dangerous to continue using, should stopped and sealed immediately ,and handled by an authorized institution.

◆ The meter manual with the danger mark "  ", users must follow instructions to operate safely.

1. Introduction

The clamp ground resistance tester, also known as the loop resistance tester, which is used to measure the ground resistance. The tester equip with new luxury screen design, which can display resistance and current value on the same screen, and it also has real-time clock, data storage, data review, alarm, automatic shutdown and other functions. The whole tester is beautiful and high-end, with a wide range, high resolution, convenient operation, easy to carry, accurate, reliable, stable performance, and strong anti-interference ability. The tester with structure of shockproof, dustproof, and moisture-proof, which is commonly used and indispensable instrument for telecommunications, electricity, meteorology, computer rooms, oil fields, electromechanical installation and maintenance, and the industrial enterprises that use electricity as industrial power or energy. Suitable for measuring the ground resistance of various telecommunications, electricity, meteorology, computer rooms, oil fields, power distribution lines, iron tower transmission lines, gas stations, factory grounding grids, lightning rods, etc.

The clamp ground resistance tester is controlled by the microprocessor that can accurately detect the ground resistance. It uses fast filtering technology to minimize interference. At the same time, it has functions such as data storage and data upload.

2. Model Series

Model	Resistance Range	Current Range	Bluetooth APP
UT273A	0.010~300Ω	---	---
UT273B	0.010~600Ω	0.00mA~20.0A	---
UT273C	0.010~1200Ω	0.00mA~20.0A	Bluetooth

3. Ranges & Accuracy

Mode	Range	Resolution	Accuracy
Resistance	0.010Ω~0.099Ω	0.001Ω	± (1%rdg＋0.01Ω)
	0.10Ω~0.99Ω	0.01Ω	± (1%rdg＋0.01Ω)
	1.0Ω~49.9Ω	0.1Ω	± (1%rdg＋0.1Ω)
	50.0Ω~99.5Ω	0.5Ω	± (1.5%rdg＋0.5Ω)
	100Ω~199Ω	1Ω	± (2%rdg＋1Ω)
	200Ω~395Ω	5Ω	± (5%rdg＋5Ω)
	400~590Ω	10Ω	± (10%rdg＋10Ω)
	600Ω~980Ω	20Ω	± (20%rdg＋20Ω)
	1000Ω~1200Ω	30Ω	± (25%rdg＋30Ω)

*Current①	0.00mA~9.99mA	0.01mA	± (2.5%rdg＋1mA)
	10.0mA~99.9mA	0.1mA	± (2.5%rdg＋5mA)
	100mA~299mA	1mA	± (2.5%rdg＋10mA)
	0.30A~2.99A	0.01A	± (2.5%rdg＋0.1A)
	3.0A~9.9A	0.1A	± (2.5%rdg＋0.3A)
	10.0A~20.0A	0.1 A	± (2.5%rdg＋0.5A)

Note①:Current function is only available on UT273B and UT273C.

4. Specifications

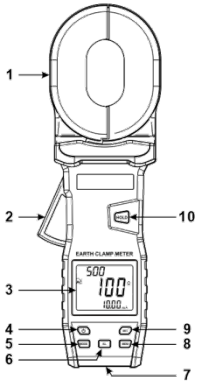
Function	Ground resistance test, loop resistance test, leakage current test
Working Temperature & Humidity	23℃±5℃, below 75%RH
Power	DC6V Alkaline dry battery (LR6 1.5VX 4PCS
Measure Method	Mutual induction
Resistance Resolution	0.001Ω
Current Resolution①	0.01mA
Jaw Size(mm)	55mmX32mm
Clock Function	Yes
Ω + A Synchronous display	Ω + A displayed on same screen
Display Mode	4-bit LCD digital display
LCD Size	46mmX36mm
Meter Size	288mm(L)X95mm(W)X55 mm(H)
Measurement Time	1 time/second
USB Interface	With USB interface, the stored data can be uploaded to the computer, saved and printed
Bluetooth②	Yes
Communication Line	1 USB communication cable
Data Storage	500 groups, The flashing "**MEM**" symbol indicates that the store is full.
Data Review	Viewing data function:The "**MR**" symbol display

Overflow Display	Exceed measurement range overflow function: "**OL**" symbol display
Interference Test	Automatically identify interference signals, and indicate with the "**NOISE**" symbol when the interference current is large
Alarm Function	When the measured value exceeds the alarm setting value, an alarm prompt will be issued
Battery Voltage	Low battery voltage symbol reminder
Automatic Shutdown	Can be set to 5, 10, 15, 20 minutes, and OFF. OFF means canceling automatic shutdown. The default is 5 minutes.
Power Consumption	Max about 80mA
Weight	About 895g (including battery)
Working Environment& Humidity	-10℃~40℃; below 80%RH
Storage Environment& Humidity	-20℃~60℃; below 70%RH
Insulation Resistance	Above 20MΩ (between circuit and outside shell is 500V)
Withstand Voltage	AC 3700V/rms. (Between circuit and outside shell)
Protection Level	Double insulation
Structure	Clamp CT
Shift	Automatic shift
External Magnetic Electric field	＜40A/m; ＜1V/m
Single Measurement Time	0.5 s
Protection Type	IEC61010-1 (CAT Ⅲ 300V, CAT IV 150V, Pollution 2); IEC61010-031; IEC61557-1 (Earth resistance);

Note①: Current function is limited to UT273B and UT273C

Note②: Bluetooth function is limited to UT273C

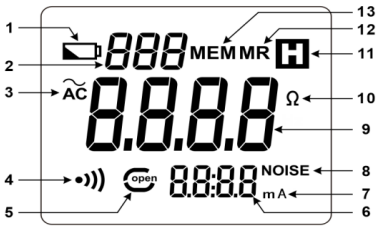
5. Meter Structure



5.1. Clamp Jaw
5.2. Trigger
5.3. LCD Display
5.4. POWER Key
5.5. MODE Key
5.6. AL Alarm Function Key
5.7. USB Interface
5.8. MEM Key
5.9. SEL Setting Key
5.10. HOLD Key

6. Liquid Crystal Display

6.1. LCD Screen



6.1.1. Low battery voltage symbol
6.1.2. No. of data storage unit
6.1.3. AC Symbol
6.1.4. Alarm symbol
6.1.5. Open jaw symbol
6.1.6. 4-digit digital indication of current, clock
6.1.7. Current unit symbol
6.1.8. Interference symbol
6.1.9. 4-digit resistance data
6.1.10. Resistance unit symbol
6.1.11. Data lock symbol
6.1.12. Data access symbol
6.1.13. Data storage symbol

6.2. Description of Special Symbols

6.2.1. open Jaw opening symbol: This symbol is displayed when the jaw is opening. At this point, trigger may be artificially withheld, or the jaw has been seriously polluted. It cannot continue to measure.

6.**2.2.** Low battery voltage symbol: when the battery voltage is low, the symbol will show. At this time, it cannot guarantee accuracy of the measurement. It should be replaced the battery.

6.2.3. "**OL Ω**" Symbol indicates that the measured resistance has exceeded upper limit range of the meter.

6.2.4."**L0.01Ω**" Symbol indicates that the measured resistance has exceeded lower limit range of the meter.

6.2.5."**OL A**" Symbol indicates that the measured current has exceeded upper limit range of the

meter.

6.2.6. Alarm symbol: When the measured value is bigger than the setting alarm critical value, the symbol will flash. The meter issue by intermittent "beep--beep –beep--" sound.

6.2.7. **MEM** Full data storage symbol: storage data is full of 99 units, it cannot continue to store data. **MEM** symbol will flash.

6.2.8. **MR** Data access symbol: display in accessing data, at the same time display the serial number of the stored data.

6.2.9. **NOISE** symbol: This symbol flashes when the grounded circuit with a large interference current in testing. The meter emits "beep--beep--beep--" prompt sound. The accuracy of the test cannot be guaranteed at this time.

6.2.10. "**Er**" Boot error symbol: May be withheld the trigger when boot up or the jaw have open.

7. Measurement Principle

The basic principle of UT278 in the measurement of resistance is to measure the loop resistance, as shown in the figure below. The jaw part of the Meter is comprised of voltage coil and current coil. The voltage coil provides excitation signal .It will induce a potential V on the measured loop.

Under the action of electric potential V will have a current in the circuit to be tested, The Meter will measure V & I.

The measured resistance R can be obtained by the following formula.

R=V/I

8. Operating Method

8.1. Start Up/Shutdown

	In booting, user cannot withhold the trigger ,cannot open jaw, and cannot clamp any wires
	After boot up and display "**OL Ω**", then withhold the trigger, open jaws and clamp the measured wire
	Before booting up, the trigger should withhold one or two times to ensure the jaws are well closed.
⚠	In booting, must be sure to keep the natural static state of the Meter; do not overturn the Meter, nor impose any external force on the clamp. Otherwise, the accuracy of measurement cannot be guaranteed.

Press **POWER** key to Starting up, the instrument auto-calibration, after starting up displayed "**OL Ω**", automatically enter the Resistance measurement mode. If abnormal boot and self-calibration, instrument will display "Er" symbol, indicate boot error. Common reasons for startup errors include the jaws not closing properly, the wire being clamped when the machine is turned on, etc.

After boot up, it will automatically shut down when the set shutdown time is reached. The meter will flash for 30 seconds before automatically shutting down. Press POWER key again will delay the power on and off time.

8.2.Battery Voltage Inspection

After start on, if LCD displays low battery voltage symbol "，which indicates that battery voltage is low, and please replace the battery in compliance with instructions. The flashing symbol " indicates that the power will be turned off soon.Adequate battery power can ensure the accuracy of measurement.

8.3.Resistance /Current Measurement

⚠	User can use the calibration ring provided to check whether the clamp meter is normal if thinks that the grounding value is not normal

After the booting and auto-inspection, display "**OL Ω**" and will be able to proceed with resistance measurement. At this point, press the trigger and open the jaws, clamp the measured loop, reading and getting the resistance value.

Resistance and ground leakage can be measured at the same time. After booting, press "**MODE**" key to switch between "**Resistance + Current**" and "**Resistance + Clock**" modes.

Display "**OL Ω**", indicate that the measured resistance value exceeded the upper limit range of Meter,

Display "**L0.01Ω**", indicate that the measured resistance value exceeded the lower limit range of Meter.

Under "**Resistance + Current**" mode, the current value is displayed in the lower right corner of the LCD, such as "**0.00mA**". If user need to measure the current, switch to this mode to directly read the current value.

Under "**Resistance + Clock**" mode, the ground voltage value is displayed at the lower right corner of the LCD, such as "**12:00**". If user need to read the current time, switch to this mode then read the time directly. The time needs to be reset when the battery is replaced.

8.3.1. Resistance + Current mode:

--Measured resistance is 0.51Ω

--Auto storage as the 001 group of data,

--The measured loop current is 0.00mA

8.3.2.Resistance + Clock

--Measured loop resistance exceeds the lower limit

--Auto storage as the 008 group of data,

--Current time is 12:08

8.4.Clock and shutdown time settings

After starting up, long press the "**SET**" key to enter the setting mode. The digital in the lower left corner of the screen is the shutdown time setting, short press the "**HOLD**" key to modify the shutdown time. There are options of 5 minutes, 10 minutes, 15 minutes, 20 minutes and OFF(cancel automatic shutdown function).

The flashing digital in the lower right corner of the screen is the clock time setting. Short press the "**SET**" key to switch to the setting interface of year, month and day, hour and minute. Short press the "**MODE**" key again to switch to the digit to be modified. The digit flashes. Then short press the "**MEM**" key or the "**AL**" key to increase or decrease the corresponding digital, and then long press the "**SET**" key to save and exit.

Figure1 2020 Figure 2 18th Dec. Figure 3 12:08

8.5.Alarm Setting

After startup, press " **AL**" button to open or shut off alarm function.

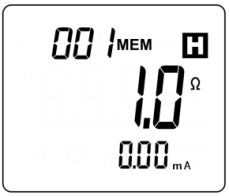
Long press" **AL**" button to enter alarm critical value settings, press " **HOLD** " to change current digital, digital flashing display. Press " **SET**" button and"**MEM**"button increase or decrease the corresponding data. Press "MODE" button to switch alarm mode, then long press the "**AL**" key to

save and exit.

When measurement value is larger than alarm critical settings value and the alarm function started up yet, "ster will flash indicating symbol and will make out "toot-toot-toot--"alarming sound.

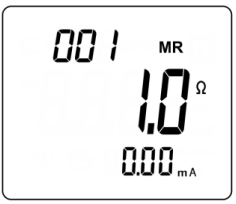
8.6. Data Lock/Storage

In test model, press **HOLD** key to lock the present display value and display HOLD symbol. This lock value is automatically numbered and stored as a set of data .The "MEM" symbol flashes and the numbering is automatic. If the memory is full, the MEM symbol will flash display. Then press **HOLD** key to release locking. As shown below, MEM symbol would flash when data is being stored. "**HOLD**" symbol indicate that the current data is locked.



8.7. Data Access/Clear

Press MEM key to enter into reading data storage mode, press" MR" symbol display on the stored data reading interface.Press "SET" or "AL" key to increase or decrease the number of data corresponding to the review group number with a step value of 1, Press "SET" or "AL" key to increase or decrease the number of data corresponding to the review group number with a step value of 10. Press "MEM" key again to exit review. The figure below shows the data review mode, and the current number of review groups is 1.



In data reading model, press MEM key automatically enter the data deletion state. Press AL key clear all the stored data.Press the "SET" key to cancel the deletion.

9. Battery Description

If LCD displays low battery voltage symbol "▭", which indicates that battery voltage is low, and please replace the battery in time. The flashing symbol '▭ indicates that the power will be turned off soon.Adequate battery power can ensure the accuracy of measurement.

10. Mobile APP Instructions

10.1. After startup, turn on the Bluetooth function.

10.2. After installing the "UT273C.apk" APP on the phone, open the APP and search for the Bluetooth device named "UT273C" (this function can only be used by instruments with Bluetooth), click it and wait for the connection to succeed.

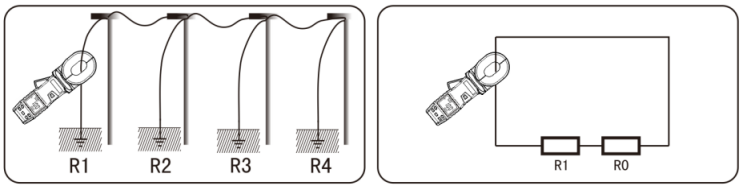
10.3. After connecting, user can operate the test and display online, and browse the historical storage data.

11. Earth Resistance Measurement Methods

11.1. Multi- point Grounding System

As for the multi-purpose grounding system (such as electricity transmission tower grounding system, grounding cable communications systems, certain buildings, etc.), they usually pass the overhead ground wire (cable shielding layer) connected to form a grounding system.

As the Meter is in the above measurement, its equivalent electric circuit is shown in the figure below:



Where: R_1 is the predicted grounding resistance.

R_0 for all other equivalent resistance after the tower grounding resistance in parallel.

Although strictly on the theoretical grounding, because of the existence of so-called "mutual resistance", $\mathbf{R_0}$ is not usually of electrotechnics in the sense of value in parallel (it will be slightly bigger than a parallel connection of electrotechnics sense value) But because a tower grounding hemisphere was much smaller than the distance between the towers, and with a great number of locations after all, $\mathbf{R_0}$ is much smaller than R_1. Therefore, it can be justified to assume $\mathbf{R_0}$=0 from an engineering perspective. In this way, the resistance we measured should be R1.

Times of comparing tests in different environments and different occasions with the traditional method proved that the above assumption is entirely reasonable.

11.2. Limited Point Grounding System

This is also quite common. For example, in some towers, five towers are linked with each other through overhead ground wire; besides, the grounding of some of the buildings is not an independent grounding grid. But several grounding bodies connected with each other through the wire.

Under such circumstances, the above R_0 regarded as 0, will yield more error on the results of the measurement.

Due to the same reasons mentioned above, we may ignore the impact of the mutual resistance; the equivalent resistance of the grounding resistance paralleled is calculated by the usual sense. Thus, for the grounding system of N (N is smaller, but larger than 2) grounding bodies, it can offer N equations:

$$R_1 + \frac{1}{\frac{1}{R_2} + \frac{1}{R_3} + \cdots + \frac{1}{R_N}} = R_{1T}$$

$$R_2 + \frac{1}{\frac{1}{R_1} + \frac{1}{R_3} + \cdots + \frac{1}{R_N}} = R_{2T}$$

.

.

.

$$R_N + \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_{(N-1)}}} = R_{NT}$$

Where: **R1、R2、……RN** are grounding resistances of N grounding bodies.

R1T、R2T、……RNT are the resistances measured with the Meter in the different grounding branches.

It is nonlinear equations with N unknown numbers and N equations.

In principle, in addition to ignore the mutual resistance, this method does not have the measurement error caused by neglecting R0.

However, users need to pay attention to that: In response to the number of the grounding bodies mutually linked in your grounding system, it is necessary to measure the same number of the testing values , not more or less.

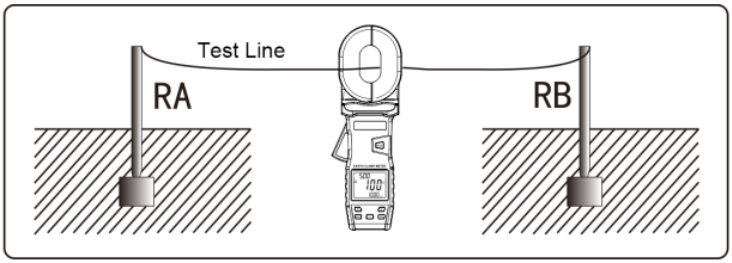
11.3. Single-Point Grounding System

From the measuring principle, Clamp Meter can only measure the loop resistance, the single-point grounding is not measured. However, users are able to use a testing line very near to the earth electrode of the grounding system to artificially create a loop for testing. The following presented is

two kinds of methods for the single-point grounding measurement by use of the Meter. These two methods can be applied to the occasions beyond the reach of the traditional voltage-current testing methods.

11.3.1. Two-Point Method

As shown in the figure below, in the vicinity of the measured grounding body RA, find an independent grounding body of better grounding state RB (for example, near a water pipe or a building). RA and RB line will connect to each other using a single testing line.



As the resistance value measured by the Meter is the value of the series resistance from the testing line and two grounding resistances.

$$RT=RA + RB + RL$$

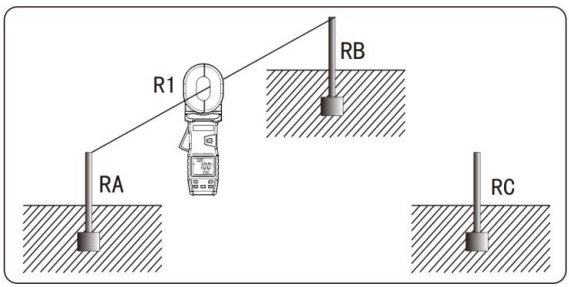
Where: RT is the resistance value measured with the Meter.

RL is the resistance value of the testing line. Meter can measure out the resistance value by connecting the test lines with both ends. So, if the measurement value of the Meter is smaller than the allowable value of the grounding resistance, then the two grounding bodies are qualified for grounding resistance.

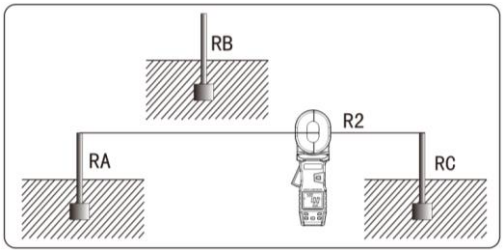
11.3.2. Three-Point Method

As shown in the figure below, in the vicinity of the measured grounding body RA, find two independent grounding bodies of RB and RC.

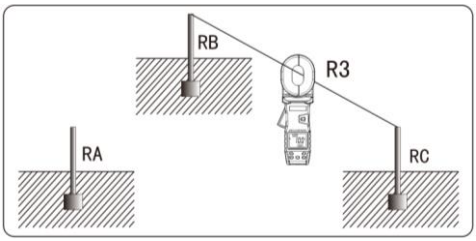
First, connect the RA and RB with a test line; use the Meter to get the first reading R1.



Second, connect with the RC and RA , as shown in the following figure. Use the Meter to get the second reading R2.



Third, connect with the RB and RC, as shown in the following. Use the Meter to get the third reading R3.



In the above three steps, the reading measured in each step is the value of the two series grounding resistance. In this way, we can easily calculate the value of each grounding resistance:

From: R1=RA+RB R2=RB+RC R3=RC+RB

We get: RA=（R1+R2-R3）÷2

This is the grounding resistance value of the grounding body RA. To facilitate the memory of the above formula, these three grounding bodies scan be viewed as a triangle; The measured resistance is equivalent to the value of the resistance values of the adjacent edges plus or minus resistance value of the opposite sides, and divided by 2.

As the reference points, the grounding resistance values of the other two grounding bodies are:

RB=R1-RA RC=R2-RA

12. Accessories

Earth Tester	1 PCS
Test Ring 1Ω and 10 Ω	1 PCS
Alkaline dry battery (LR6 1.5V)	4PCS
USB communication cable	1PCS
Meter Case	1 PCS
Cloth Bale	1 SET

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说明书菲林做货要求：

序号	项目	内容
1	尺寸	135x195mm±1mm
2	材质	封面、封底用128g铜板纸、内页用60g书纸做货
3	颜色	1：1印刷，印刷黑色
4	外观要求	印刷完整清晰、版面整洁，无分层、残损、毛边等缺陷。
5	装订方式	采用2枚大号书钉钉装，说明书沿装订线对折而成
6	排版	
7	表面处理	无
8	其它	REV.0

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