M6013

电容测试表使用说明

Capacitance Meter User Manual

09091354 1.0A

目录

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一、产品概述

M6013 **电容测试表**是一款功能强大且适用性广泛的电容测量仪器。该电容表具备**自动量程切换功能**，能够根据被测电容的容值自动选择合适的量程，极大地提升了操作便捷性与测量效率。采用 **128X64 点阵 LCD 屏幕，可清晰显示 5 位数字**。常规电容测试范围涵盖了从 **0.01 pF 至 47mF**（即 47000uF），同时对于法拉级别的超级电容，其测量范围可从 **47mF 延伸至470F**，能应对多种不同规格电容的测量工作，且**测量精度能够达到1%**。测量 2200uF 的电容仅需花费约 0.2s 即可完成测量，凭借这样的高精度与快速测量能力，无论是 DIY 用户还是专业工程师都能通过它满足电容测量需求。

二、产品特点

- **全谱系电容兼容测量：覆盖 0.01pF 至 470F 超宽量程**，既能精准捕捉皮法级微小电容的细微差异，又可稳定测量法拉级超级电容的超大容量，实现从微小元器件到大型储能电容的全类型、全规格覆盖，满足多样化场景下的一站式测量需求。
- **智能量程切换：**具备**自动量程**功能，可根据被测电容容量自动匹配最佳测量量程，提升操作效率；同时支持**手动量程**切换，满足专业场景下的精准测量需求，兼顾便捷性与灵活性。
- **ESR 内阻估计：可在47nF至47uF，47uF 至 47mF 以及 47mF 至 470F** 范围内对 ESR 内阻进行估计，借助该功能，用户能够粗略判断电解电容器的好坏状况，为电容器的性能评估提供有力参考。

- **标称电容精度偏差参考：**在 47nF 至47uF，47uF 至 47mF 量程内，可同步显示**实测电容值、标称值及两者偏差百分比**，为评估电容精度提供直观量化参考，助力快速判断元件性能符合性。
- **D 值和 Q 值估计：**可在 47nF 至 47uF、47uF 至 47mF 以及 47mF 至 470F 三个范围，对电容器的 D 值和 Q 值进行估计，便于用户从更多维度了解电容器特性参数，辅助其在相关应用场景中对电容器进行综合评估。
- **电容放电辅助：**在电容测试时，对于**部分小容量电容可提供一定的放电辅助功能**。但对于大容量电容，其电容电压较高，储存能量较大（$W=½×C×U^2$），仪表内部放电功能有限，无法确保安全应对，故强烈建议用户在测试前务必使用合适的功率电阻器对所有待测试电容进行放电，以防因电容能量过高损坏仪表。

三、技术参数

精度	高达 1% (参考量程表)	**电池**	2×AA 1.5V 碱性电池
量程范围	0.01pF ~470.00F	**外部电源**	DC 5V Micro USB
分辨率	5 位数	**工作电流**	0.02 A （一般小电容测试）
测量电压	< 0.8V	**电池续航时间**	>80 小时（参考量程范围1）
钳位电压	~1.25V（开路电压）	**重量**	140g

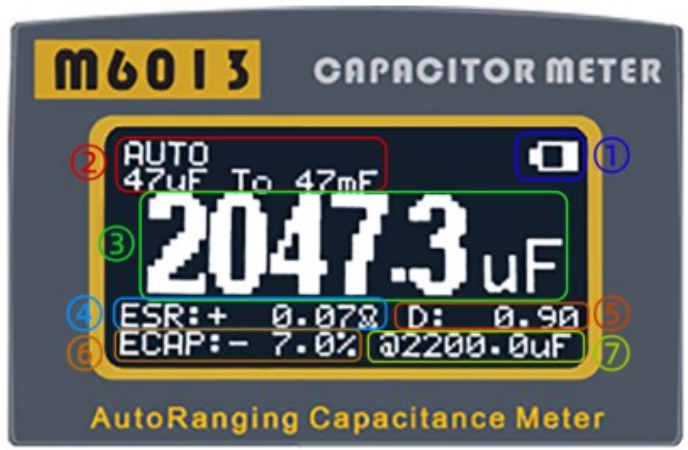
<table>
<tr><th rowspan="2">量程范围</th><th rowspan="2">精度
(清零, 分别测试 1nF, 1uF, 1000uF)</th><th colspan="2">刷新时间</th></tr>
<tr><th>手动控制模式</th><th>自动模式</th></tr>
<tr><td>0.01pF 至 47.000nF</td><td>1%+2 位数
（参考 1KHz标准电容器）</td><td>~0.2s 至 1s</td><td rowspan="4">根据电容值的不同，测量时间为0至2秒 或更长。电容值越大，测量时间越长。</td></tr>
<tr><td>47.00nF 至 47.000uF</td><td>1%+1 位数
（参考 1KHz 标准电容器）</td><td>~0.2s 至 4s</td></tr>
<tr><td>47.00uF 至 47.000mF</td><td>1 到 3%+1 位数
（参考100Hz 标准电容器）</td><td>~0.2s 至 30s</td></tr>
<tr><td>47.00mF 至 470.00F</td><td>3 到 12%+1 位数
(大容量电容会有较大的误差)</td><td>~15s 至 135s</td></tr>
<tr><td colspan="4">（电介质材料需要足够的稳定时间，因此法拉级别的测试时间更长）</td></tr>
</table>

注意：

- 由于测试线相关因素将会影响测量精度，测试线越长、线间距离越大，精度越易受干扰，尤其在测量 pF 级别电容时，建议采用尽可能短的测试线。
- 同时，需留意周围电磁干扰（EMI）及无线电频率（RF）噪声，因其会对 pF 级别电容测试产生影响。此外，人体作为导体也会干扰 pF级的读数。
- 若使用外接电源，务必确保接地良好，以保障测量精度。

四、整机介绍

（一）面板



① 电量　　② AUTO 自动/MANUAL 手动量程

③ 电容读数　　④ 预估的电容ESR值

⑤ D 值 /Q 值　　⑥ 实测值与标称值的偏差百分比

⑦ 标称电容值

（二）按钮

（1） 开/关机【 】

长按电源按钮开机。

开机状态下，短按电源按钮即可关机。

（2）清零【 ZERO 】

- 电容清零方式：（开路清零）

测试线对应插入正负极插孔中后，测试线两端不接任何东西，保持开路状态。

按下“ZERO”按键，屏幕会显示“ZEROING”等待清零，恢复读数界面即可开始测试。

*如使用的是阵列式插座，也需要处于开路状态才清零。

- ESR、D 值和 Q 值清零方式：（短路清零）

测试线对应插入正负极插孔中后，将测试线两端夹在一起，保持短路状态。

按下“ZERO”键，屏幕会显示 “ESR ZEROING ”等待清零，恢复读数界面即可开始测试。

（3） 自动模式 / 手动模式【 MODE RANGE 】

- 自动模式：(AUTO)

短按“MODE RANGE”按键，当LCD 屏幕左上方显示“AUTO”，即当前测量量程为自动切换模式。在自动模式下电容表会自动选择最适宜的量程进行测试。

- 手动模式：(MANUAL)

在“AUTO”模式下，再次短按“MODE RANGE”按键，屏幕左上方显示“MANUAL”，即为手动切换量程模式。

在此模式下，多次短按“MODE RANGE” 按键，电容表会循环切换 0~47nF, 47nF~47uF 和 47uF~47mF，47mF~470F 这四个量程。

（三）插座

（1）测试夹插孔

- 仪表上的两个插孔，使用标配的鳄鱼夹可直接对应插入插孔，红色为正极，黑色为负极，用于常规电容测量。
- 针对 pF 级别贴片电容的测试，建议选用专用 SMD 贴片夹子（需另行选购），以确保测量连接的稳定性与准确性。

（2）直插孔

左侧四孔为负极（靠近黑插孔），右侧四孔为正极（靠近红插孔），插件电容可依据电容引脚极性对应插入相应的插孔内即可开始测试。

（四）供电方式

（1）USB供电

支持DC 5V Micro USB接口供电。使用 USB 作为电源时，需关注接地情况，确保接地良好，以保障仪表的正常稳定运行。

注意：若公共接地状况欠佳，噪声将会对 pF 级别电容的读数产生影响，致使读数出现跳跃现象。因此，在进行 pF 级别电容测量时，建议优先选用电池作为电源；若采用USB供电，可在测试端子的负极上接地。

（2）电池充电

电池盖下为电池仓，此处可以安装两节5号电池对仪表进行供电。

（五）支撑架

仪表背部配备有可调式支撑架，通过调节可使仪表保持稳定的站立状态，便于用户快速读数。无需使用支撑架时，可以按压支架上方的两个卡扣锁定。

五、主要功能

M6013 作为一款专业的电容测试表，核心功能在于对电容器的容值进行精准测量，其具备超宽的测量范围，可覆盖从 0.01pF 的微小电容至 470F 的大容量法拉级电容，满足不同规格电容器的测试需求。

（1）操作步骤

- 开机：安装好电池或连接好外部电源，长按电源开关按钮开机
- 连接：将测试夹正确插入测试插孔中（红对红，黑对黑）
- 模式：按量程模式按钮切换为AUTO自动模式。也可切换MANUAL手动模式的合适档位。
- 清零：保持两个测试夹是开路状态，按ZERO按钮清零
- 测试：等待清零结束，将测试夹与电容器的两个引脚相连接（提前将电容器放过电的）（红色测试夹接正极，黑色测试夹接负极）
- 结果：连接好后，仪表将自动检测并显示测量结果
- 完成：测试完成断开测试夹与电容器的连接，再次按下电源开关按钮关闭仪表（如果长时间不使用，建议取出电池）

（2）电容放电

在测试电容器前，请务必对电容器进行放电操作。

按照大约 5 个时间常数（时间 = 5×R×C，其中 R 为电阻阻值，C 为电容容量）来进行放电，以此确保电容充分放电，避免残留电量带来潜在风险。

注意：本电容表内部虽设有保护防电设计，旨在对高电压进行一定程度的防范，但需要明确的是，该保护并非是100%有效的。倘若不对电容进行预先放电，在测量时，可能会产生强浪涌电流和电压，这极有可能会对电容表造成不可逆的损坏，进而影响仪表的正常使用以及测量工作的顺利开展。

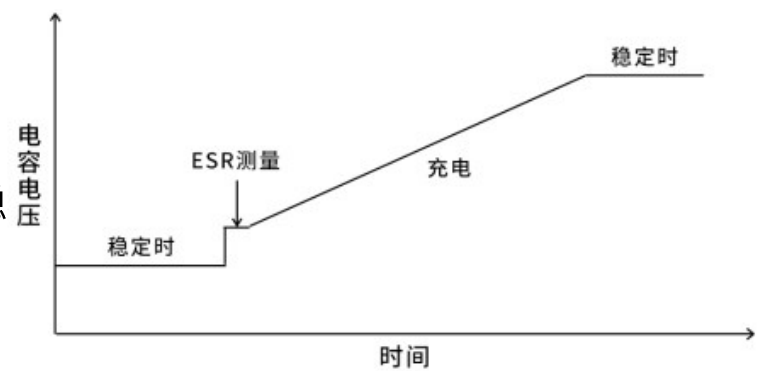
（3）pf级别电容测量

由于pf级别电容的数值相对较小，其测量结果较易受到测试环境因素的干扰。因此，在使用本仪表对pf级别电容进行测试时，建议您采取有效的防干扰措施，例如确保测试环境远离强电磁干扰源、尽量缩短测试线长度等，以此保障测量结果的准确性。

（4）法拉电容器测量

测量过程：

等待电介质稳定(确保离子远离端子，大约需要5 s)→测量电容器的ESR值→充电5 - 120 s（用固定电压和精密电阻为电容器充电）→再次等待电介质材料稳定（等待离子远离端子，大约需要5 s)→测量电容器增加的电压→计算法拉电容器的电容值



显示反馈：在整个测量过程中，仪表显示屏会依次呈现“discharging...”（放电中）-> “charging...”（充电中）-> “calculating...”（计算中）的提示信息，待完整测量循环结束后，容值将会显示在仪表屏幕上。

注意：在实际测量法拉电容器时，部分制造商建议预留30 分钟的稳定时间，或者采用恒流以及在充电或放电步骤中测量容值等不同方式，但这些方式往往会使得整个测试时长过长。考虑到用户的实际使用体验，本仪表提供了一种相对更快的法拉电容测量方法，不过需要注意的是，通过该快速测量方法所获取的读数仅供用户参考使用。这是因为一些制造商在实际应用中发现，法拉电容器的测量容值可能会出现与第一次测量相比高达30% 的变化漂移情况，所以在参考测量结果时，请您结合实际情况综合考量。

六、其他功能

（1）超量程提示

在测量电容器容值时，若超出仪器手动所选量程范围或仪表整体测量范围（0.01pF-470F），显示屏将显示 “OL” 以作超量程提示。

（2）预估电容ESR值

本仪表显示电容器的ESR（等效串联电阻）预估值：

格式：屏幕显示格式为 XXX.XX Ω，其分辨率为 0.01 Ω，

例如，当仪表测量出某电容器的 ESR 值为 3.1 Ω时，屏幕将显示 “ESR: + 3.10Ω”

范围：在 47mF 测量范围内，仪表所能显示的最大 ESR 值为 25 Ω；

而在 470F 测量范围时，最大可显示的 ESR 值为 100 Ω。

注意：*所显示的数值包括长电缆电阻以及接触电阻等相关因素

*准确性依托于产品设计本身来保障，其公差可能会超过 10%。若实际测量中遇 ESR 值相对

较大，需要进行更为精确的 ESR 值测量以再次验证时，建议您选用本公司出品的 MESR -100 电容内阻表来完成相应操作。

*需要强调的是，本仪表所提供的 ESR 测量值仅供用户参考使用，在实际应用中，您可结合具体情况及相关专业需求，综合判断电容器的实际状况。

（3）预估D 值和 Q 值

本仪表提供D 值（损耗因数）和 Q 值（品质因数）参考值，供用户初步判断电容器的质量并帮助选择元件。D /Q值两者采用循环切换方式显示，测量基于 1kHz 频率信号。

格式：D 值：最小显示值为 0.00，分辨率 0.01

Q 值：最大显示值为 655.34，分辨率 0.01

注意：测量精度基于设计标准保障，其公差可能超过10%。

*若 D 值显示 0.00，Q 值显示 655.34，表明所测 D、Q 值趋于极限状态，这两个显示数值无实际常规意义，仅供参考了解趋向情况，不可用于电容性能分析判断。

（4）偏差估算功能

本仪表具备电容偏差估算功能，针对多数电解电容器 ±20% 的常规公差特性，依据E6 系列通用标称值标准（1.0、1.5、2.2、3.3、4.7、6.8 ）进行偏差计算。

估算逻辑：仪表会将实测电容值匹配至最接近的标准标称值，再计算两者偏差百分比。例如：当实测电容为 1800uF 时，仪表将其匹配至标准标称值 2200uF，偏差计算公式为：100%×(实测值 - 标称值)/ 标称值，即 100%×(1800uF-2200uF)/2200uF=-18.1%。

显示方式：屏幕下方将同步显示计算结果

格式为 "ECAP: -18.1% @2200.0uF"（负号表示实测值低于标称值）

（5）滑动平均:

当测量值趋于稳定时，仪表将自动启动滑动平均功能，以优化数据稳定性，提升读数准确性。功能状态通过屏幕左下方标识直观显示：

运行滑动平均时显示 "AVG"；未运行时显示原始数据标识 "RAW"。

当原始数据出现明显噪声干扰时，该功能将自动激活。为获得更高精度的测量结果，建议在屏幕显示 "AVG" 状态时读取数值。

（6）屏幕背光

仪表开机后，屏幕背光将保持常亮状态，确保在各种光线环境下均能清晰读取测量数据。

（7）自动关机

为优化电量管理，若连续一小时没有操作或跳动数值小于500，仪表将自动关机，以减少不必要的电量消耗，延长供电续航时间。

七、安全注意事项

- 本电容表仅用于测量电容，禁止用于测量其他非电容类的电气参数，以免造成仪器损坏甚至引发安全事故。
- 在测量带电电容器时，务必先进行放电处理，防止触电危险。
- 如果电容表使用外部电源供电，要确保电源电压符合仪器要求，避免因电压过高或过低损坏仪器。

Ⅰ. Product Overview

The M6013 Capacitance Tester is a powerful and versatile instrument for capacitance measurement. It has an **automatic range-switching function** and a **128×64 dot-matrix LCD screen** for clear **5-digit display.** With a regular measurement range **from 0.01 pF to 47 mF** (47000 μF) and an extended range **up to 470 F** for supercapacitors, it can measure various capacitors. Boasting high speed and **1% measurement accuracy**. Measuring a 2200 μF capacitor takes only about 0.2 seconds to complete. It meets the capacitance measurement needs of both DIY enthusiasts and professional engineers.

Ⅱ. Product Features

- **All-range Capacitance Compatibility: Spans 0.01 pF to 470 F**, precisely detecting differences in tiny picofarad capacitors and stably measuring farad-level supercapacitors.
- **Intelligent Range Switching**: Features an **automatic range** function for optimal range matching based on capacitor capacitance, enhancing efficiency. Also supports **manual switching** to meet precise measurement needs in professional settings, combining convenience and flexibility.
- **ESR Estimation and Display**: Estimates and shows **ESR within specific ranges (47 nF - 47 μF, 47 μF - 47 mF, 47 mF - 470 F)**, enabling users to roughly assess electrolytic capacitor quality and providing a strong reference for performance evaluation.
- **Nominal Capacitance Deviation Percentage**: In **the ranges of 47 nF to 47 μF and 47 μF to 47 mF**, it displays measured capacitance, nominal value, and their **deviation percentage** simultaneously, offering an intuitive and quantitative reference for assessing capacitance accuracy and facilitating quick determination of component performance compliance.

- **D-value and Q-value Estimation:** Estimates and displays the D-value (Dissipation Factor) and Q-value (Quality Factor) of capacitors within specific ranges **(47 nF - 47 μF, 47 μF - 47 mF, 47 mF - 470 F)**, helping users understand capacitor characteristics from multiple aspects.
- **Capacitance Discharge Assistance:** The instrument provides **discharge assistance for small-capacity capacitors**. For high-capacity ones with high capacitance voltages and large stored energy ($W = 1/2 \times C \times U^2$). The internal discharge function of the instrument is limited. So, it's strongly advised to use proper power resistors to pre-discharge all test capacitors to prevent instrument damage from excessive capacitor energy.

III. Technical Parameters

Accuracy	Up to 1% (Refer to the range table)	**Battery**	2 × AA 1.5V alkaline batteries
Range	0.01pF ~470.00F	**External Power Supply**	DC 5V Micro USB
Resolution	5 digits	**Operating Current**	0.02A (Refer small capacitor test)
Measurement Voltage	<0.8V	**Battery Life**	>80 hours (Refer to range 1)
Clamping Voltage	~1.25V (Open-circuit voltage)	**Weight**	140g

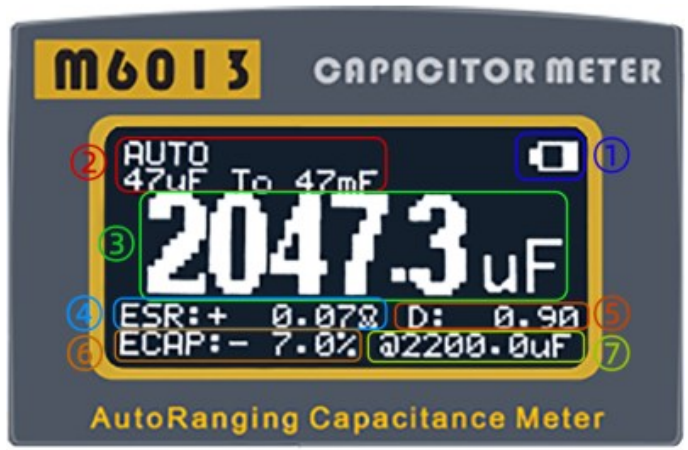
<table>
<tr><th rowspan="2">Range</th><th rowspan="2">Accuracy
(Zeroing, testing 1 nF, 1 μF, 1000 μF respectively)</th><th colspan="2">Refresh Time</th></tr>
<tr><th>Manual Mode</th><th>Auto Mode</th></tr>
<tr><td>0.01pF to 47.000nF</td><td>1%+2 digits
(Refer to 1 kHz standard capacitor)</td><td>~0.2s to 1s</td><td rowspan="4">According to the different capacitance values, the measurement time is from 0 to 2 seconds or longer. The larger the capacitance value, the longer the measurement time.</td></tr>
<tr><td>47.00nF to 47.000uF</td><td>1%+1 digit
(Refer to 1 kHz standard capacitor)</td><td>~0.2s to 4s</td></tr>
<tr><td>47.00uF to 47.000mF</td><td>1 to 3%+1 digit
(Refer to 100 Hz standard capacitor)</td><td>~0.2s to 30s</td></tr>
<tr><td>47.00mF to 470.00F</td><td>3 to 12%+1 digit
(Large-capacity capacitors will have larger errors)</td><td>~15s to 135s</td></tr>
<tr><td colspan="4">*The dielectric material needs sufficient stabilization time, so the test time for farad-level capacitors is longer.</td></tr>
</table>

Notes:

- Test lead factors affect measurement accuracy; longer leads and greater distances between them make accuracy more vulnerable. For picofarad-level capacitor measurement, use the shortest test leads possible.
- Also, note the surrounding electromagnetic interference (EMI) and radio frequency (RF) noise as they impact picofarad-level measurements. Moreover, the human body, being a conductor, can interfere with picofarad-level readings.
- When using an external power supply, ensure proper grounding for accurate measurements.

IV. Overall Introduction

1. Panel



① Battery level ② AUTO / MANUAL range

③ Capacitance reading ④ Estimated capacitor ESR value

⑤ D-value / Q-value ⑥ Tolerance

⑦ Standard Value

2. Buttons

(1) POWER [⏻]

Press and hold the power button to turn on the meter.

In the powered-on state, press the power button to turn it off.

(2) ZERO [ZERO]

- **Capacitance zeroing method**: (open-circuit zeroing)

Insert the test leads into the positive and negative jacks respectively. Then, keep the two ends of the test leads unconnected to anything and in an open-circuit state. Press the "ZERO" button, and the screen will display "ZEROING". Wait for the zeroing to finish before starting the test.

*If an array socket is used, it also needs to be in an open-circuit state for zeroing.

- **ESR, D-value and Q-value zeroing method**: (short-circuit zeroing)

Insert the test leads into the positive and negative jacks respectively. Then, clamp the two ends of the test leads together to keep them in a short-circuit state. Press the "ZERO" button, and the screen will display "ESR ZEROING". Wait until the zeroing process is completed and then start the test.

(3) MODE RANGE [MODE RANGE]

- **AUTO Mode:**

Briefly press the "MODE RANGE" button. When "AUTO" is displayed in the upper left corner of the LCD screen, it indicates that the current measurement range is in the automatic switching mode. In the automatic mode, the capacitance meter will automatically select the most suitable range for testing.

- **MANUAL Mode:**

In the "AUTO" mode, press the "MODE RANGE" button again. When "MANUAL" is displayed in the upper left corner of the screen, it indicates that the range is switched to the manual switching mode. In this mode, repeatedly press the "MODE RANGE" button, and the capacitance meter will cyclically switch among the four ranges:

0 - 47 nF, 47 nF - 47 µF, 47 µF - 47 mF, and 47 mF - 470 F.

3. Sockets

(1) Test Clip Jacks

- The meter has two jacks where standard crocodile clips can be directly inserted. The red jack is for the positive pole and the black one for the negative pole, used for regular capacitance measurement.
- For picofarad-level SMD capacitors, it's recommended to use dedicated SMD clip-on probes (purchased separately) for stable and accurate measurement connections.

(2) Straight Jacks

The four holes on the left side are the negative poles (close to the black jack), and the four holes on the right side are the positive poles (close to the red jack). Plug-in capacitors can be inserted into the corresponding jacks according to the polarity of their pins to start the test.

4. Power Supply Mode

(1) USB Power Supply

It supports power supply via the DC 5V Micro USB interface. When using a USB as the power source, ensure good grounding to guarantee the normal and stable operation of the meter.

Notes: If the grounding is poor, noise will affect the readings of picofarad-level capacitors and cause fluctuations. So, when measuring such capacitors, it's recommended to use batteries as the power source first. If USB power supply is chosen, the negative terminal of the test terminal can be grounded.

(2) Battery

The battery compartment is located beneath the battery cover, where two AA batteries can be installed to power the instrument.

5. Support Frame

The back of the meter is equipped with an adjustable support frame. Adjust it to keep the instrument in a stable standing state for users to quickly read the values. When the support frame is not needed, you can

press the two buckles on the upper part of the support frame to lock it.

Ⅴ. Main Function

As a professional capacitance tester, the M6013 is designed for accurate capacitance measurement. It features an ultra-wide range spanning 0.01 pF to 470 F, catering to the measurement needs of capacitors across various specifications, from tiny components to large farad-level supercapacitors.

1. Operation Steps

- **Power On:** Install the batteries or connect the external power supply properly, and then press and hold the power button to turn on the instrument.
- **Connection:** Insert the test clips correctly into the test jacks.
- **Mode:** Press the range mode button to switch to the AUTO (automatic mode) or select an appropriate MANUAL (manual range) mode.
- **Zeroing:** Keep the two test clips in an open-circuit state and press the ZERO button to zero.
- **Testing:** Wait for the zeroing process to end, and then connect the test clips to the pre-discharged capacitor's pins (red to positive, black to negative).
- **Display:** The meter will automatically detect and display the measurement result after connection.
- **Completion:** Disconnect the test clips from the capacitor, press the power button to turn off the instrument. (For long-term non-use, remove the batteries.)

2. Capacitance Discharge

Before testing a capacitor, it must be discharged. Discharge it according to approximately 5 time constants (time = 5 × R × C, where R is the resistance value and C is the capacitance value) to ensure that

the capacitor is fully discharged and avoid potential risks caused by residual charge.

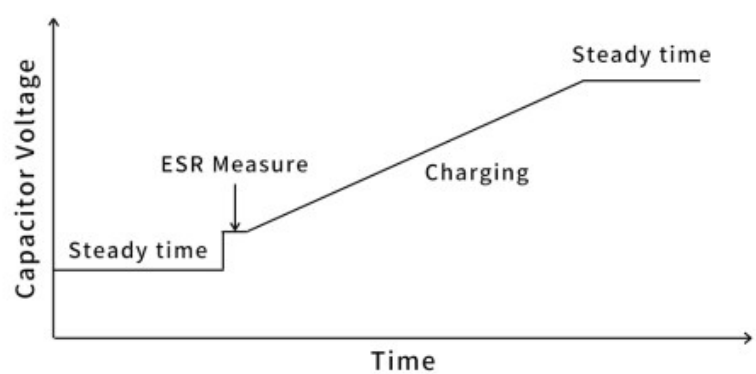
Notes: Although the internal protection against electricity design of this capacitance meter aims to prevent high voltage to a certain extent, it should be clearly noted that this protection is not 100% effective. If the capacitor is not discharged in advance, strong surge current and voltage may be generated during measurement, which will most likely cause irreversible damage to the capacitance meter, thereby affecting the normal use of the meter and the smooth progress of the measurement work.

3. Picofarad-level Capacitance Measurement

Since the capacitance values of picofarad-level capacitors are relatively small, their measurement results are more easily affected by test environment factors. Therefore, when using this meter to measure picofarad-level capacitors, it is recommended that you take effective anti-interference measures, such as ensuring that the test environment is far away from strong electromagnetic interference sources and trying to shorten the length of the test leads as much as possible, so as to ensure the accuracy of the measurement results.

4. Farad-level Capacitance Measurement

Measurement Process: Wait for the dielectric to stabilize (ensure that ions are away from the terminals, which takes about 5s) → Measure the ESR value of the capacitor → Charge the capacitor for 5 - 120s (using a fixed voltage and a precision resistor) → Wait for the dielectric material to stabilize again (wait for ions to be away from the terminals, which takes about 5s) → Measure the increased voltage of the capacitor → Calculate the capacitance value of the farad-level capacitor.



Display Feedback: During the entire measurement process, the meter display screen will successively show the prompt messages of "discharging..." (discharging), "charging..." (charging), and "calculating..." (calculating). After the complete measurement cycle is completed, the capacitance value will be displayed on the screen.

Precautions: In the actual measurement of farad-level capacitors, some manufacturers recommend reserving 30 minutes for stabilization time or adopting different methods such as constant current and measuring the capacitance value during the charging or discharging steps.

However, these methods usually result in a relatively long overall test time. Considering the actual user experience, this meter provides a relatively faster farad-level capacitance measurement method. It should be noted that the readings obtained by this fast measurement method are for reference only. This is because some manufacturers have found in practical applications that the measured capacitance values of farad-level capacitors may have a variation drift of up to 30% compared to the first measurement. Therefore, when referring to the measurement results, please consider the actual situation comprehensively.

VI. Other Functions

1. Over-range Indication

When the capacitance value of the capacitor under test exceeds the range manually selected by the meter or the overall measurement range of the instrument (0.01 pF - 470 F), the display screen will show "OL" as an over-range indication.

2. Estimated Capacitor ESR Value

This meter displays the estimated ESR (Equivalent Series Resistance) values of capacitors.

Format: The screen display format is XXX.XX Ω, with a resolution of 0.01 Ω.

For example, when the meter measures an ESR value of a capacitor as 3.1 Ω,

the screen will display "ESR: + 3.10Ω".

Range: In the 47 mF measurement range, the maximum ESR value that the instrument can display is 25 Ω; in the 470 F measurement range, the maximum displayable ESR value is 100 Ω.

Notes: *The displayed values incorporate factors like long cable resistance and contact resistance.

*The accuracy is guaranteed by the product design itself, and its tolerance may exceed 10%. If a relatively large ESR value is encountered during actual measurement and a more precise ESR value measurement is required for verification, it is recommended to use the MESR-100 capacitor internal resistance meter produced by our company to complete the corresponding operation.

*It should be emphasized that the ESR measurement values provided by this meter are for reference only. In practical applications, you can comprehensively judge the actual condition of the capacitor in combination with specific circumstances and relevant professional requirements.

3. Estimated D-value and Q-value

This meter provides reference values for the D-value (Dissipation Factor) and Q-value (Quality Factor) to help users preliminarily judge the quality of capacitors and select components.The D-value and Q-value are displayed in a cyclic switching manner, and the measurement is based on a 1 kHz frequency signal

Format: D-value: The minimum display value is 0.00, with a resolution of 0.01.

Q-value: The maximum display value is 655.34, with a resolution of 0.01.

Notes: *The measurement accuracy is guaranteed by the design standard, and its tolerance may exceed 10%. It should be specially noted that the D-value and Q-value measurement results are for reference.

*If the D value shows 0.00 and the Q value shows 655.34, it indicates that the measured D and Q values tend to be in a limit state. These two displayed values have no practical conventional meaning and are only for reference to understand the tendency, and should not be used for analyzing and judging capacitor performance.

4. Deviation Estimation Function

This instrument has a capacitance deviation estimation function. For the conventional tolerance characteristics of ±20% of most electrolytic capacitors, it conducts tolerance calculations based on the E6 series universal nominal value standards (1.0, 1.5, 2.2, 3.3, 4.7, 6.8).

Estimation logic: The meter will match the measured capacitance value to the closest standard nominal value and then calculate the percentage tolerance between them.

For example, when the measured capacitance is 1800 μF, the meter will match it to the standard nominal value of 2200 μF. The deviation calculation formula is: 100%×(measured value - nominal value) / nominal value, that is, 100%×(1800 μF - 2200 μF) / 2200 μF = -18.1%.

Display method: The calculation result will be synchronously displayed at the bottom of the screen.

Format: "ECAP: -18.1% @2200.0 μF"

(the negative sign indicates that the measured value is lower than the nominal value).

5. Moving Average

When the measured values tend to be stable, the meter will automatically activate the moving average function to optimize data stability and improve the accuracy of readings.The function status is intuitively displayed by the indicator in the lower left corner of the screen.

"AVG" is displayed when the moving average is running; the original data indicator "RAW" is displayed when it is not running.

The function automatically activates when significant noise interference appears in raw data. For higher-precision results, it is recommended to read values when "AVG" is displayed.

6. Screen Backlight

After the meter is turned on, the screen backlight will remain on constantly to ensure that the measured data can be clearly read in various light environments.

7. Automatic Shutdown

To optimize power management, the instrument will automatically shut down if within one hour there is no operation or the fluctuating value is less than 500, so as to reduce unnecessary power consumption and extend the power supply duration.

VII. Safety Precautions

- This capacitance meter is designed specifically for capacitance measurement and must not be used to measure other non-capacitance electrical parameters, so as to prevent instrument damage and safety accidents.
- Before measuring charged capacitors, discharge them first to avoid the risk of electric shock.
- When using an external power supply for the capacitance meter, make sure the power supply voltage complies with the instrument's requirements to avoid damage caused by overvoltage or undervoltage.

SERVICE

E-Mail: support@jingyan.tech

Website: www.jingyan-tech.com

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