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INSTRUMENTS晶研儀器

SG04 应变应力分析仪使用手册
Strain and Stress Gauge Analyzer

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11121535 1.6A

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一 产品概述

SG04应变应力分析仪是我公司研发的一款集应变测试、应力测试、称重测试于一体的多功能仪器。它基于惠斯通电桥原理和应变片应用而设计的专业仪器，采用4.3寸触摸彩屏，精度高达±0.5%red±3με。支持四通道独立测试，功能丰富，支持个性化设置。可应用于PCB线路板应变测试、机械工程设备检测、材料力学性能、航空航天项目、教学科研实验等场合。可与各种应变片、传感器连接使用，搭配灵活，精度高。本操作手册为SG04应变应力分析仪专用手册，请使用者在操作仪器前，先仔细阅读本手册。

二 产品特点

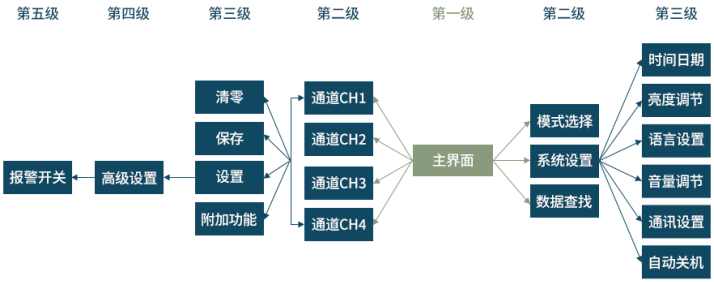
- 继电器采集，各通道独立测试。
- 多模式应用，同时具备应力、应变和称重测试功能。
- 采用4.3寸彩色触摸屏，界面直观清晰，操作便捷流畅。
- 4个通道实时信号同步测试，实时显示各通道的波峰、波谷。
- 直观分析任意通道的拉伸和弯曲变化。
- 可以自设定时基以改变采样频率。
- 可以自设定触发点位以稳定测试波形。
- 可以自设定滤波级别以过滤掉输入信号的噪音和杂波。
- 可对指定测试数据设置蜂鸣报警。
- 仪器配备专用接地端口，提高使用安全性及测量稳定性。
- 使用SD卡保存数据，可即时查看，同时支持电脑读取与查看数据。
- 数据传输与充电功能集成于同一Type-C接口。
- 支持仪器自保存数据及联机进行数据传输。
- 两用支架，可平放于水平面，亦可安装于垂直面。

三 规格参数

显示屏	4.3寸触摸彩屏
模式	3种模式（应变、应力、称重）
通道数	4个通道
精度	±（0.5%red±3με）

应力分辨率	0.01kPa
应变分辨率	0.1με
称重分辨率	0.01g
量程	±13000με
桥臂电阻	120Ω
支持应变片类型	120Ω、350Ω、1kΩ
桥接方式	1/4、1/2、全桥
采样频率	50Hz
接口类型	Type-C接口
供电电源	3.7V充电锂电池
工作电流	670mA
电池容量	5000mA・h
待机状态电池续航时间	4000H
工作状态电池续航时间	6H
工作温度	0℃—45℃
储存温度	-10℃—60℃
外形尺寸	13.5*11*4.5cm
重量	720g

四 界面级别



五 功能介绍

5.1 主界面介绍

仪器按下开机键进入主界面，界面由三部分组成：

通道窗口、菜单栏、状态栏。

主界面

5.1.1 通道窗口

主界面中4个窗口分别表示4个测试通道CH1、CH2、CH3、CH4，对应仪器后上方从左到右四个绿色接线端口。当对应的接线端口接入应变片或传感器时，主界面对应的通道中实时显示对应的测试数据。

5.1.2 菜单栏

主界面右侧三个图标分别为模式选择、系统设置、数据查找三个功能，点击对应图标将进行相应的操作。详细操作请查看“5.2、5.3、5.4”

5.1.3 状态栏

主界面上方为状态栏，依次显示实时时间、环境温度以及电池电量。

5.2 模式选择

在模式选择界面中，从左往右依次对应通道CH1、CH2、CH3和CH4的模式切换，可根据通道测试需求，通过点击上下箭头循环切换“称重模式、应力模式、应变模式、关闭”。

主界面 > 模式选择

5.3 系统设置

在系统设置菜单中，共有6项参数：

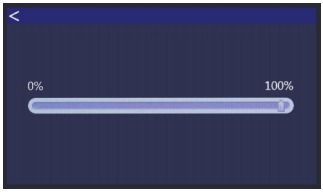
时间日期、亮度调节、语言设置、音量调节、通讯设置和自动关机。

主界面 > 系统设置

5.3.1 时间日期：在时间日期设置界面，长按线条框中的时间日期3秒，即可进入设置。

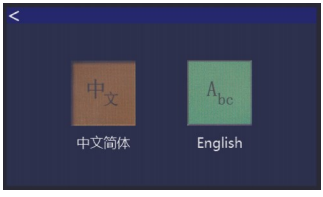
主界面 > 系统设置 > 时间日期

5.3.2 亮度调节：在背景亮度调节界面，可通过滑动滑块调节背景亮度从0%到100%。



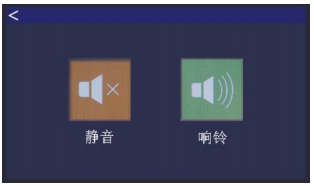
主界面 > 系统设置> 亮度调节

5.3.3 语言设置：在语言设置界面，用户根据需求将显示语言设置为中文或英文。



主界面 > 系统设置> 语言设置

5.3.4 音量调节：在音量调节设置界面，用户可根据环境将本仪器设置响铃或静音，响铃表示在操作触摸屏时，伴有蜂鸣声；静音则表示操作触摸屏时不伴有蜂鸣声。

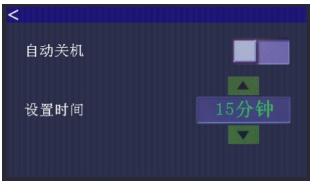


主界面 > 系统设置 > 音量调节

5.3.5 通讯设置：在通讯设置界面，根据通讯需求可选择打开或关闭USB，以及调节波特率为115200或256000bps。

主界面 > 系统设置 > 通讯设置

5.3.6 自动关机：在自动关机设置界面，打开自动关机开关，可以设置自动关机时间为15分钟、30分钟、45分钟、1小时或2小时。



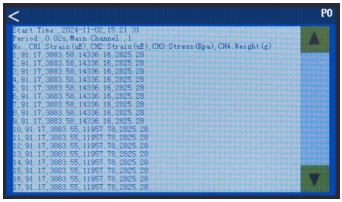
主界面 > 系统设置 > 自动关机

5.4 数据查找 在数据查找界面，点击选择要查看的文件，再点击“打开”图标，即可打开查看，点击“删除”图标，即可删除文件。

主界面 > 数据查找

文件前三行:

Start Time:,2024-11-02,15:21:31	//数据开始保存时间
Period:,0.02s, Main Channel:,1	//采样间隔：0.02s，在通道一保存数据
No.,CH1:Strain(uE),CH2:Strain (uE),CH3:Stress(Kpa),CH4:Weight(g)	//序号,CH1/2/3/4：应变/应力/称重(单位) 用“，”作为分隔符



主界面 > 数据查找 > 打开文件

5.5 通道图像界面

在任意通道图像界面中，主要窗口是坐标图像区，界面上方是通道状态栏，右侧是通道菜单栏。

（*以CH1窗口为例）

主界面 > CH1/2/3/4

5.5.1 坐标图像区

①坐标上：同步显示四条不同颜色的曲线，分别对应四个通道测量的数据波形。绿色对应CH1、蓝色对应CH2、红色对应CH3、黄色对应CH4。

②坐标上方：显示当前通道的滤波级别和实时测试数据。

③坐标左下方：显示当前各通道测试的最大值和最小值。

④坐标右下方**“触发”**：设置单次触发数值，使得波形在该起始点开始触发，并形成触发点在坐标中间位置的稳定波形。数值可以通过左右箭头切换或点击线条框输入。(*将正应变作为触发条件则数值设置为正值，将负应变作为触发条件则数值设置为负值。)

⑤坐标右下方**“值域”**：即当前通道纵坐标（Y轴）显示的量程。可以通过左右箭头切换或点击线条框输入。

5.5.2 通道状态栏

各通道的上方分别显示时基S/DIV、暂停/播放和系统状态栏。

①时基S/DIV：以时间作为横坐标 (X轴) 的基本单位，S/DIV为秒/刻度，最小可设置为0.2 S/DIV。

②暂停/播放：显示“ ❚❚ ”表示实时显示波形，显示“ ▶ ”表示暂停波形。此功能一般与触发功能一起使用，当触发稳定波形后，将出现“ ▶ ”图标，点击该图标，当出现“❚❚”即可继续实时播放波形。

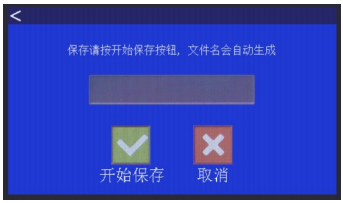
5.5.3 通道菜单栏

任意通道界面右侧的菜单栏有清零、保存、设置和附加功能。

①清零：

在对应通道窗口下，点击清零图标，即可将当前通道测量数据归零。

②保存：



主界面 > 通道 > 保存

主界面 > 通道 > 保存 > < > 保存

- 开始保存：在任意通道下进入数据保存界面，点击“开始保存”图标，即开始对当前测量结果进行保存。3秒后会自动返回通道界面，此时界面中保存图标持续闪烁。
- 结束保存：再次点击“保存”图标进入数据保存界面，出现“结束保存”图标，点击即完成单次保存数据操作。
- 取消图标说明：开始保存界面，点击“取消”图标表示取消开始保存，不进行保存操作。结束保存界面，点击“取消”图标表示取消结束保存，继续进行当前的保存操作。

*提示：保存功能必须在插入SD卡的前提下使用。

③设置：在任意通道的设置界面可设置对应的灵敏度参数、高级设置。

- 灵敏度系数设置：灵敏度系数设置根据该通道选择的测量模式决定。

  应变模式：在对应界面设置测量所用应变片的灵敏度系数，点击线条框即可修改。

应力模式：在对应界面根据试件材料设置弹性模量，根据测量所用应变片的规格设置灵敏度系数，点击线条框即可修改。

称重模式：在对应界面根据传感器参数设置其量程，可通过上下箭头调节为g或kg。根据测量所用传感器的规格设置传感器灵敏度，点击线条框即可修改。

主界面 > 通道 > 设置
*应变模式

主界面 > 通道 > 设置
*应力模式

主界面 > 通道 > 设置
*称重模式

- 高级设置: 在高级设置界面中可设置组桥方式、滤波级别和报警开关。

主界面 > 通道 > 设置 > 高级设置

组桥方式：根据当前通道实际的桥接方式，通过左右箭头切换为1/4、1/2或全桥。

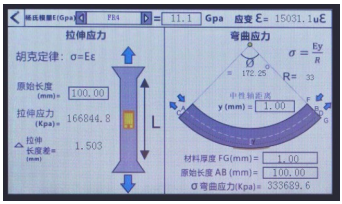
滤波级别：设置过滤掉输入信号的噪音和杂波等级，可设置的最小级别为3。

报警开关：在报警开关设置界面通过设置报警阀值、报警范围和范围内外，达到触发蜂鸣报警的值域。

如图，设置报警阀值为“1000”，报警范围为“100”，范围设置为“In”，当仪器测量数据处于（900~1100）范围内将发出蜂鸣报警。(*设置正应变数值报警则将报警阀值设置为正值，负应变报警则将报警阀值设置为负值。)

主界面 > 通道 > 设置 > 高级设置 > 报警开关

④附加功能：在附加功能界面能实时显示试件的拉伸应力和弯曲应力。



主界面 > 通道 > 附加功能

- 拉伸应力（界面左侧）

  1)在当前界面上方设置试件的弹性模量E (单位: Gpa)。

  2)设置试件的原始长度L(单位: mm)，点击线条框即可修改。

  3)即得到当试件被拉伸或压缩时产生的拉伸应力σ (单位: Kpa) 及拉伸长度差ΔL (单位: mm)。

- 弯曲应力（界面右侧）

  1)在当前界面上方设置试件的弹性模量E (单位: Gpa)。

  2)设置试件弯曲处CD离中性轴AB之间的距离y (单位: mm)，点击线条框即可修改。

  3)设置试件的材料厚度FG (单位: mm)，点击线条框即可修改。

  4)设置试件的原始长度AB (单位: mm)，点击线条框即可修改。

5)即得到当试件被弯曲时，以中性轴AB形成的圆弧，其对应的弧的角度θ (单位: °)和弯曲应力σ (单位: Kpa)。

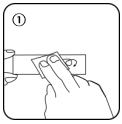
*仪器提供的选定材料的近似弹性模量如下表

材质	杨氏模量	材质	杨氏模量
自定义	自定义输入	纵纹木	9.8 GPa
FR4	11.1GPa	横纹木	0.5 GPa
黄铜	90.0 GPa	赛钢	2.6 GPa
铝合金6061	68.9 GPa	聚丙烯	1.3 GPa
碳钢	200.0 GPa	亚克力	3.0 GPa
铸铁	152.0 GPa	玻璃	55.0 GPa
花岗石	48.0 GPa	混凝土C30	30.0 GPa

选定材料的近似弹性模量

六 应变片粘贴

使用仪器进行测试前，需将应变片粘贴至试件的待测位置。粘贴的方法根据所用的应变片及粘合剂不同而异。一般粘贴方法可参考以下操作步骤。

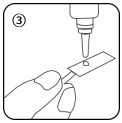


①打磨

贴片前先将试件用细砂纸呈圆弧状进行打磨，打磨区域要略大于粘贴面积。

②清洁

使用纱布蘸取酒精或丙酮等可高挥发性溶解油脂的溶剂，向同一方向擦拭粘贴位置，将应变片粘贴面擦干净。

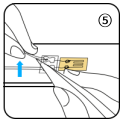


③应变片背面涂胶

仔细确认应变片的表面（金属箔部分）及反面，在应变片反面滴适量粘合剂，并快速将应变片粘贴到测量位置。

④按压固化

将应变片定位到测量位置后，用聚乙烯薄膜快速固定应变片并用手指按压均匀，将多余的粘合剂和气泡挤出。

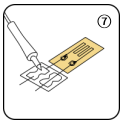


⑤抬高引线

固化完成后，取下薄膜，将应变片导线末端拉高，注意不要将引线拉断，可用镊子固定住接近焊点处的引线。

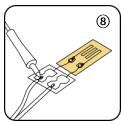
⑥粘贴接线过渡片

在接线过渡片背面滴上适量胶水，尽量靠近应变片基底附近粘贴，避免引线接触试件引起短路。



⑦焊接引线

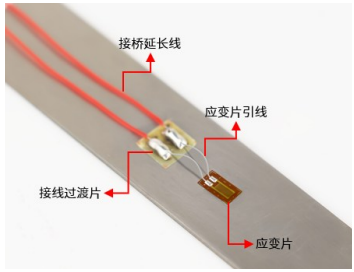
将引线置于接线过渡片上方，用电烙铁加焊锡将过渡片与引线牢固焊接在一起，注意保持引线的少量松弛度，可适当折断多余的引线。



⑧焊接延长线

取适量长度的延长线，先用焊料镀覆导线的裸漏芯线（避免误触导致短路或电阻异常），再将导线末端焊接到接线过渡片上。

粘贴示例：采用电阻为120Ω的应变片粘贴在不锈钢片上



七 组桥方式

(1) 通道说明：仪器共有四个通道，每个通道都是独立的。

仪器后上方的接线端子从左往右依次对应通道CH1、CH2、CH3和CH4。

(2) 针脚说明：每个接线端子四个针脚从左往右依次定义为

A—供电电源+；B—信号2；C—信号1； D—供电电源-。

(3) 桥接方式：按照应变片的粘贴方式选择桥接方式。

有三种桥接方式分别为1/4桥、1/2桥和全桥。（接线方式及应变片粘贴位置如图所示）

(1) 1/4桥接法：①使用一个应变片1，粘贴在试件待测位置。

②应变片的两根引线分别接至接线端子的C口和D口。

(2) 1/2桥接法：

①使用两个应变片1和2，分别粘贴在试件正反两面的待测位置。

②将应变片1和2各一根引线串联接至接线端子的C口。

③应变片1和2剩余两根引线分别接至A口和D口。

(3) 全桥接法：①使用四个应变片在试件正反两面的待测位置各粘贴两个应变片，正面作为应变片1和3，反面作为应变片2和4。

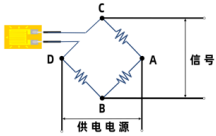
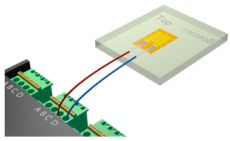
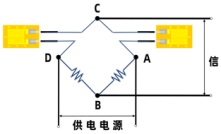
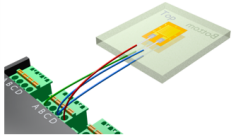
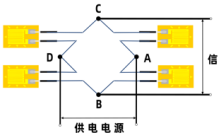
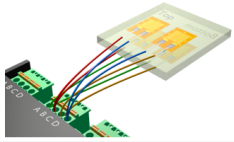
②将应变片1和3各一根引线串联接至接线端子的A口。

③将应变片2和4的各一根引线串联接至D口。

④将应变片1和2的各一根引线串联接至C口。

⑤将应变片3和4的各一根引线串联接至B口。

*说明：在桥接应变片前按照“六、应变片粘贴”相关步骤贴好应变片。

	电桥电路	粘贴接线	接口	应用推荐
1/4桥			C、D	简单测量
1/2桥			A、C、D	一般动态测量
全桥			A、B、C、D	高精度测量/称重传感器

应变片接线方式

八 操作指南

以测量印制电路板应变为例，其操作步骤如下:

使用120Ω应变片，采用1/4桥连接仪器CH1

(1) 应变片粘贴：使用一个应变片粘贴至试件待测位置。

(详细操作参考“六、应变片粘贴”)

(2) 桥接应变片：使用螺丝刀等工具将引线接至通道CH1的C口和D口。

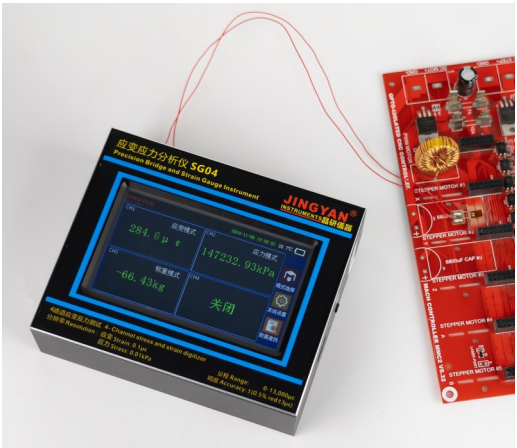
(详细操作参考“七、组桥方式”)

(3) 选择模式：在仪器主界面点击模式选择，对应将CH1的测试模式选择为应变模式，设置完成返回主界面。

(4) 设置参数：主界面 > CH1 > 设置 > 灵敏度系数：2.000> 高级设置 > 组桥方式：1/4

(5) 读数归零：返回CH1测试通道界面，将试件静置（不施加任何外力），使其处于正常状态，点击右侧清零，使其形变数据归零。

(6) 开始测试：此时施加外力可在该界面观察到其形变曲线，坐标右上角实时显示形变数据。



印制电路板应变测量实例

九 数据传输

本应变仪配套自主研发的上位机软件，连接后可以：

- 远程配置仪器参数
- 实时监测数据峰值及变化趋势
- 支持导出数据及曲线

操作步骤：

(1)准备：参考操作指南并根据实际应用场景，将仪器处于测试环境。

(2)连接通讯线：使用配套的数据线将仪器与电脑连接。

(3)进入系统：打开电脑中提前安装好的系统和插件。

(4)插件：在软件界面中，点击“连接插件”。

(5)端口：从端口选项中，选择对应连接的端口号。

(6)波特率：选择与仪器中预先设置相一致的波特率。

(7)连接仪器：点击“设备连接”。连接成功后可进行参数设置。

(8)参数设置：通过上位机设置各通道的模式及其他参数，仪器会及时响应设置的参数。

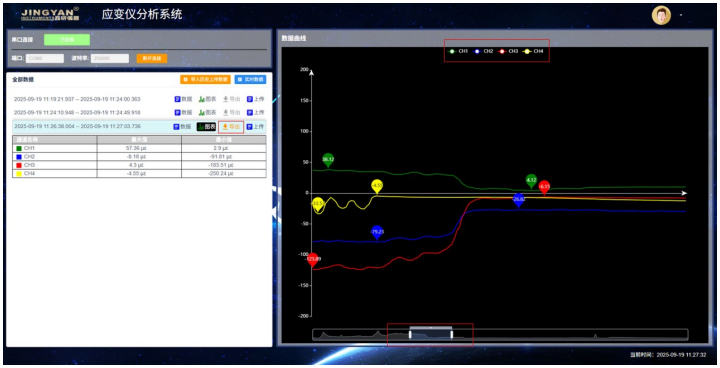
(9)清零：开始测试前，点击对应测试通道的“清零”，将通道数据归零。

(10)开始：点击“开始获取”，软件将实时采集仪器上的测试数据。

(11)负载：按照测试工况，开始对测试材料施加负载，软件将实时显示和记录。

(12)结束：完成测试后，点击进入“数据保存”界面。

(13)保存：在数据保存界面，可以通过调节进度条来选择需要导出数据的区间。（进度条对应的区间为导出的节点），也能选择导出的通道。



*本仪器配套的上位机软件提供网页版与离线版，若有下载需求，可通过网站或咨询客服获取。

十 数据保存

本应变仪提供两种将测试数据导出的方式，具体如下：

(1) 仪器自保存（仅导出测试数据）

若选择通过仪器自身来保存测试数据，需要借助 SD 卡来完成操作。

操作时，先把SD卡插入仪器左侧卡槽，测试前在通道界面点击“保存”按钮，测试数据就会存储至SD卡中。(详细操作请参见“5.5.3 ② 保存”）

查看保存数据时，可在仪器主界面的数据查找界面查看，也可将SD卡插入电脑卡槽（若电脑无卡槽，可使用读卡器）后打开卡盘文件查看。(详细操作请参见“5.4 数据查找”）

(2) 联机测试（可导出数据及曲线）

使用配套的上位机软件，将仪器连接电脑后，通过软件可同步将仪器测试的数据传输至电脑，还可在软件中设置仪器的各项参数。测试结束，可以按需选择导出测试数据及曲线，以便后续做进一步的深入分析。（(详细操作请参见“九、数据传输”）

十一 外部接口

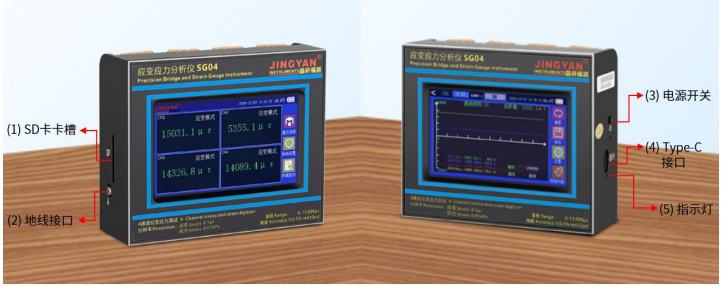
(1) SD卡卡槽：用于插入SD卡，保存测试数据。

(2) 地线接口：用于接入地线，提高测量精度、稳定性和抗干扰性能力。

(3) 电源开关：按下开机；长按3秒关机。

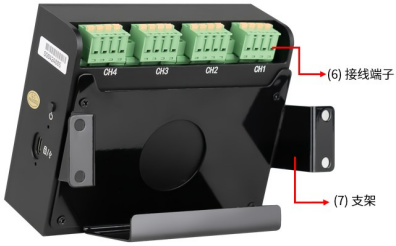
(4) Type-C接口：连接Type-C数据线，用于给设备充电或数据传输。

(5) 指示灯：充电中红色指示灯亮，充满电绿色指示灯亮。



(6) 接线端子：用于连接应变片，仪器正面从左往右依次为CH1、CH2、CH3、CH4。

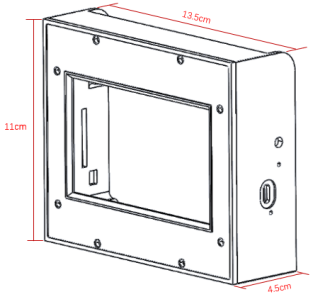
(7) 支架：用螺丝安装在设备背部，可固定于墙面或平放在桌面上。

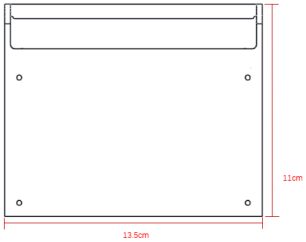


十二 电池充电

- 仪器采用3.7V 5000mAh的聚合物锂电池。当仪器电量耗尽时，建议选择安全性能较高的充电器，连接设备进行充电。
- 仪器第一级、第二级界面右上方均显示电池电量图标，共有4档：三格电量、两格电量、一格电量和电量槽空。电池满电时为三格。当电量槽为空时，最后一格持续闪烁，此时请尽快接入充电器，当电量耗尽，本仪器会自动关机。

十三 结构尺寸





十四 安全须知

- 避免在极端温度（过高或过低）和高湿度环境下使用仪器，过高或过低的环境温度及高湿环境均可能造成仪器损坏。
- 如仪器需要长期存储，应将其放置在干燥、通风良好且温度适宜的环境中，并定期对仪器进行通电检查和维护，防止电子元件老化和电池性能下降。
- 非专业人员请勿尝试拆卸、组装或改装仪器，不当的操作可能导致仪器无法正常工作或引发安全事故。
- 如使用仪器与笔记本进行数据传输时，建议将仪器进行接地操作。在连接地线时请先切断电源。

1 Product Overview

The SG04 Strain and Stress Gauge Analyzer is a multi-functional instrument developed by our company, integrating strain testing, stress testing and weighing testing. It's a professional instrument designed on the basis of the Wheatstone bridge principle and the application of strain gauges. Equipped with a 4.3-inch touch color screen, it boasts an accuracy as high as ±0.5%red±3με.

It supports 4-channel independent testing with rich functions and personalized settings. Suitable for printed circuit board strain testing, mechanical engineering equipment inspection, material mechanical properties testing, aerospace projects, teaching and scientific research experiments, etc.

Compatible with various strain gauges and sensors, it offers flexible configuration and high precision. This operation manual is specially for the SG04 Strain and Stress Gauge Analyzer. Users are advised to read this manual carefully before operating the instrument.

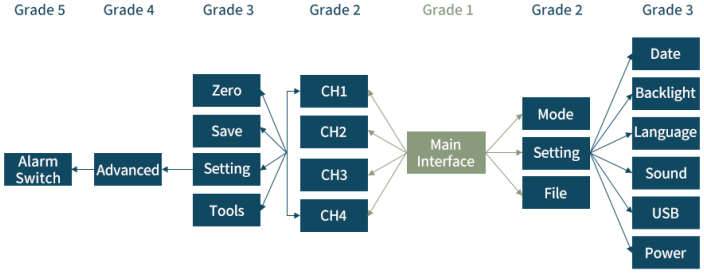
2 Product Features

- Relay acquisition with independent testing of each channel.
- Multi-mode application: stress, strain and weight testing.
- 4.3-inch touch color screen, with simple and intuitive operation.
- 4 channels real-time signal synchronization test,
  real-time display of the peaks and valleys of each channel.
- Intuitively analyzes stretching and bending variations of any channel.
- Self-setting time base to change sampling frequency.
- Trigger point can be set to stabilize the test waveform.
- Filtering level can be set to filter out noise and clutter from the input signal.
- Buzzer alarm can be set for specified test data.
- Equipped with a dedicated grounding port to improve safety and measurement stability.
- Save data on SD card for instant viewing and support PC reading and viewing.
- Data transfer and charging functions are integrated into the same Type-C port.
- Supports instrument self-storage of data and online data transmission.
- Versatile stand: usable on horizontal surfaces or vertical mounting.

3 Specification

Display Screen	4.3-inch touch color screen
Modes	3 modes (strain, stress, weight)
Number of Channels	4 channels
Accuracy	±(0.5%red±3με)
Stress Resolution	0.01kPa
Strain Resolution	0.1με
Weight Resolution	0.01g
Range	±13000με
Bridge Arm Resistance	120Ω
Supported Strain Gauge Types	120Ω、350Ω、1kΩ
Bridge Connection Method	1/4、1/2、Full bridge
Sampling Frequency	50Hz
Interface Type	Type-C interface
Power Supply	3.7V rechargeable lithium battery
Working Current	670mA
Battery Capacity	5000mA・h
Battery Life in Standby State	4000H
Battery Life in Working State	6H
Operating Temperature	0°C—45°C
Storage Temperature	-10°C—60°C
External Dimensions	13.5*11*4.5cm
Weight	720g

4 Interface Level



5 Function Introduction

5.1 Main interface introduction

Press the power button to enter the main interface. The interface consists of three parts: the channel window, the menu bar, and the status bar.

Main Interface

5.1.1 Channel Window

The four windows on the main interface represent test channels CH1, CH2, CH3, and CH4 respectively, corresponding to the four green connection ports from left to right on the upper rear of the instrument. When a strain gauge or sensor is connected to the corresponding port, the corresponding test data will be displayed in real-time in the corresponding channel on the main interface.

5.1.2 Menu Bar

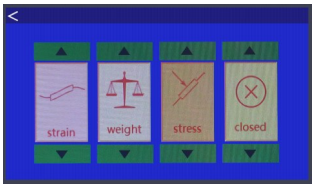
The three icons on the right side of the main interface are the three functions of mode, setting, and file. Click the corresponding icon to perform the corresponding operation. For detailed operations, please refer to "5.2, 5. 3, 5.4"

5.1.3 Status Bar

The status bar is located at the top of the main interface, displaying the real-time time, ambient temperature, and battery power in sequence.

5.2 Mode

In the mode selection interface, the mode switching of channels CH1, CH2, CH3, and CH4 is corresponding from left to right. According to the channel test requirements, you can cycle through "weight, stress, strain, closed" by clicking the up and down arrows.



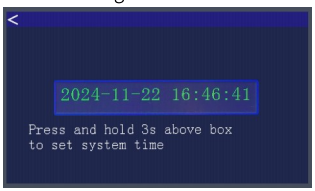
Main Interface > Mode

5.3 Setting

In the system settings menu, there are a total of 6 parameters: Date, Backlight, Language, Sound, USB, and Power.

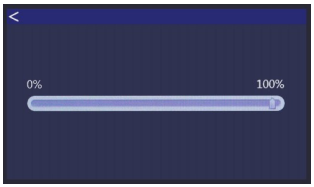
Main Interface > Setting

5.3.1 Date In the date setting interface, long press the time and date in the line box for 3 seconds to enter the setting.



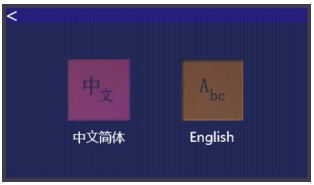
Main Interface > Setting > Date

5.3.2 Backlight In the backlight interface, you can adjust the background brightness from 0% to 100% by sliding the slider.



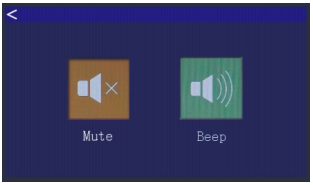
Main Interface > Setting > Backlight

5.3.3 Language In the language settings interface, the user can set the display language to Chinese or English according to their needs.



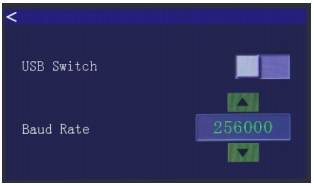
Main Interface > Setting > Language

5.3.4 Sound In the volume adjustment setting interface, users can set the instrument to beep or mute based on the environment. Ringing has a beep when operating the touch screen, while muting has no beep.



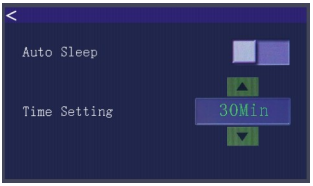
Main Interface > Setting > Sound

5.3.5 USB In the communication settings interface, you can choose to turn on or off the USB and adjust the baud rate to 115200 or 256000bps according to the communication requirements.



Main Interface > Setting > USB

5.3.6 Power In the automatic shutdown setting interface, turn on the automatic shutdown switch and you can set the automatic shutdown time to 15 minutes, 30 minutes, 45 minutes, 1 hour, or 2 hours.



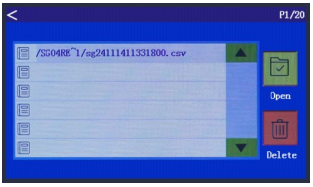
Main Interface > Setting > Power

5.4 File

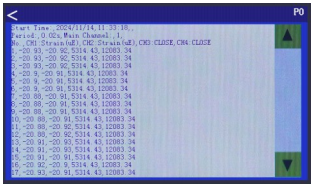
In the file interface, click to select the file you want to view, and then click the "open" icon to open and view it. Click the "delete" icon to delete the file.

The first three lines of the document:

Start Time:,2024-11-02,15:21:31
Period:,0.02s, Main Channel:,1
No.,CH1:Strain(uE),CH2:Strain(uE),CH3:Stress(Kpa),CH4:Weight(g)



Main Interface > File



Main Interface > File > Open

5.5 Channel Interface

In any channel interface, the main window is the coordinate image area, the upper part of the interface is the channel status bar, and the right side is the channel menu bar.

(*Example of CH1 window)

Main Interface > CH1/2/3/4

5.5.1 Coordinate Area

① On the coordinate: Four curves of different colors are synchronously displayed, corresponding to the data waveforms measured by the four channels respectively. Green corresponds to CH1, blue corresponds to CH2, red corresponds to CH3, and yellow corresponds to CH4.

② Above the coordinate: The filter level and real-time test data of the current channel are displayed.

③ Bottom left of the coordinate: The maximum and minimum values of each channel test are displayed.

④ "Trigger" at the bottom right of the coordinate: Set a single trigger value so that the waveform starts to trigger at this starting point, and forms a stable waveform in the middle of the coordinate. The values can be switched by left and right arrows or input by clicking the line box. (Set the value as positive if the positive strain is used as the trigger condition, and set it as negative if the negative strain is used as the trigger condition.)

⑤ "Value Range" at the bottom right of the coordinate: It refers to the range of the ordinate (Y-axis) display of the current channel. You can switch by left and right arrows or click the line box to input.

5.5.2 Channel Status Bar

The upper part of each channel respectively shows the time base S/DIV, pause/play, and system status bar.

① Time Base S/DIV: Take time as the basic unit of the abscissa (X-axis). The unit of S/DIV is seconds per division, and the minimum can be set to 0.2 S/DIV.

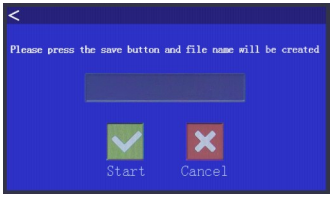
② Pause/Play: "❚❚" indicates real-time waveform display, and "▶" indicates waveform pause.

This function is generally used together with the trigger function. After a stable waveform is triggered, the "▶" icon will appear. Click this icon, and when "❚❚" appears, the waveform can continue to be played in real-time.

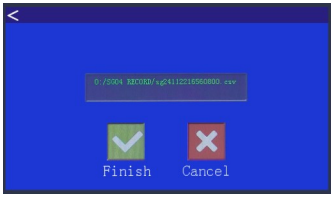
5.5.3 Channel Menu Bar: The menu bar on the right side of any channel interface has zero, save, setting, and tools.

① **Zero:** In the corresponding channel window, click the "zero" icon to zero the measurement data of the current channel.

② **Save**



Main Interface > Channel > Save



Main Interface > Channel > Save > < > Save

- Start: Enter the data saving interface under any channel. Click on the "Start" icon to start saving the current measurement. After three seconds, it automatically returns to the channel interface, at which time the save icon continues to blink.
- Finish: Click the "Save" icon again to enter the data saving interface, the "Finish" icon appears, click it to complete the single save data operation.
- Cancel Icon Description: In start saving interface, clicking "Cancel" icon means canceling the start saving, and no saving operation will be carried out. Clicking "Cancel" icon in finish saving screen means canceling the end save and continuing the current save operation.

  *Note: The save function can only be used when an SD card is inserted.

③ **Setting:** In the setting interface of any channel, you can set the corresponding sensitivity parameters and advanced settings.

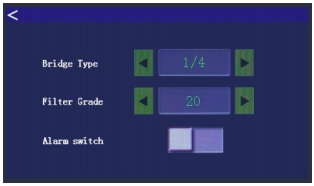
- Sensitivity factor setting: The sensitivity factor is determined by the specifications of the strain gauges used and the parameters to be set depend on the measurement mode selected for that channel.
  For strain mode: Set the sensitivity factor of the strain gauge used for measurement in the corresponding interface, and click the line box to modify.
  For stress mode: Set the elastic modulus based on the specimen material and the sensitivity factor according to the specification of the strain gauge in the corresponding interface, and click the line box to modify.
  For weighing mode: Set the measurement range as per sensor parameters in the corresponding interface, adjustable to " g " or " kg " via arrows. Set the sensor sensitivity according to the specification of the sensor used for measurement, and click the line box to modify.

Main Interface > Channel > Setting
* Strain Mode

Main Interface > Channel > Setting
* Stress Mode

Main Interface > Channel > Setting
* Weight Mode

- Advanced Settings: In the advanced settings interface, you can set the bridge type, filter grade and alarm switch.



Main Interface > Channel > Setting > Advanced Settings

Bridge Type: According to the actual bridge connection method of the current channel, switch to 1/4, 1/2, or full bridge by left and right arrows.

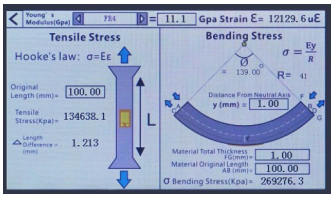
Filter Grade: Setting the filter level, and the minimum level that can be set is 3.

Alarm Switch: Set the alarm value, alarm range, and inside/outside the range in the alarm switch setting interface to reach the value range that triggers the buzzer alarm.

As shown in the figure, set the alarm value to "1000", the alarm range to "100", and the range to "In". When the instrument measurement data is within the range of (900 - 1100), a buzzer alarm will be issued. (Set the alarm threshold as positive for positive strain value alarm and negative for negative strain alarm.)

Main Interface > Channel > Setting > Advanced Settings > Alarm Switch

④Tools: In the additional function interface, the tensile stress and bending stress of the specimen can be displayed in real-time.



Main Interface > Channel > Tools

- Tensile stress (left side of interface)

  Set the elastic modulus E (unit: Gpa) of the specimen in the current interface.

  Set the original length L (unit: mm) of the specimen, and click the line box to modify.

  The tensile stress σ (unit: Kpa) and the difference in tensile length ΔL (unit: mm) are obtained when the specimen is stretched or compressed.

- Bending stress (right side of interface)

  Set the elastic modulus E (unit: Gpa) of the specimen in the current interface.

  Set the distance y (unit: mm) between the bending point CD of the specimen and the neutral axis AB, and click the line box to modify.

Set the material thickness FG (unit: mm) of the specimen, and click the line box to modify.

Set the original length AB (unit: mm) of the specimen, and click the line box to modify.

Obtain the arc formed with the neutral axis AB when the specimen is bent, its corresponding arc angle θ (unit: °) and bending stress σ (unit: Kpa).

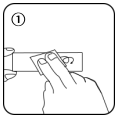
*The approximate elastic modulus of the selected materials provided by the instrument is shown in the following table:

Material	Young's Modulus	Material	Young's Modulus
Custom	Custom Input	Longitudinal Grain Wood	9.8 GPa
FR4	11.1 GPa	Transverse Grain Wood	0.5 GPa
Brass	90.0 GPa	Polyoxymethylene	2.6 GPa
Aluminum Alloy 6061	68.9 GPa	Polypropylene	1.3 GPa
Carbon Steel	200.0 GPa	Acrylic	3.0 GPa
Iron	152.0 GPa	Glass	55.0 GPa
Granite	48.0 GPa	Concrete C30	30.0 GPa

Approximate modulus of elasticity of selected materials

6 Strain Gauge Bonding

Before using the instrument for testing, the strain gauge needs to be bonded to the position to be tested on the specimen. The bonding method varies depending on the strain gauge and adhesive used. The general bonding method can refer to the following operation steps.

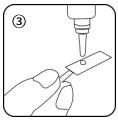


①Grinding

Before bonding the patch, grind the specimen with fine sandpaper in an arc shape, and the grinding area should be larger than the bonding area.

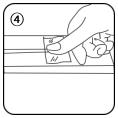
②Cleaning

Use gauze dipped in alcohol or acetone and other highly volatile solvents that can dissolve grease to wipe the bonding position in the same direction, and clean the bonding surface of the strain gauge.



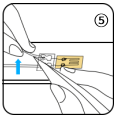
③Apply Adhesive on the Back of the Strain Gauge

Identify the surface (metal foil part) and the back of the strain gauge, drop proper adhesive on the back of the strain gauge, and quickly bond the strain gauge to the measurement position.



④Press and Cure

After positioning the strain gauge, quickly fix the strain gauge with a polyethylene film and press it evenly with fingers to squeeze out the excess adhesive and air bubbles.

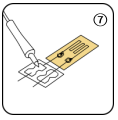


⑤Raise the Leads

After curing is completed, remove the film and raise the end of the strain gauge wire. Be careful not to break the lead and use tweezers to fix the lead near the solder joint.

⑥Bond the Connection Transition Piece

Drop appropriate glue on the back of the connection transition piece, and bond it as close as possible to the base of the strain gauge to avoid short circuit from the lead contacting the specimen.



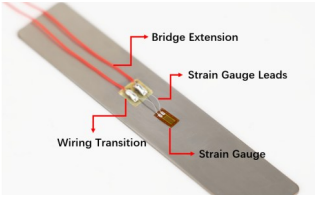
⑦Solder the Leads

Place the leads on top of the connection transition piece, and use an electric soldering iron with solder to firmly solder them together. Keep leads slack and break off excess leads as needed.

⑧Solder the Extension Wire

Take a wire of appropriate length, coat its exposed core with solder (to prevent short circuits or resistance abnormalities), then weld the end to the connection transition piece.

Paste example: using a strain gauge with a resistance of 120Ω to paste on a stainless steel sheet.



7 Bridge Connection Modes

(I) Channel Description: The instrument has four channels, and each channel is independent. The connection terminals on the upper rear of the instrument correspond to channels CH1, CH2, CH3, and CH4 from left to right.

(II) Pin Description: The four pins of each connection terminal are defined as A - power supply +; B - signal 2; C - signal 1; D - power supply - from left to right.

(III) Bridge Connection Method: Select the bridge connection method according to the bonding method of the strain gauge. There are three bridge connection methods: 1/4 bridge, 1/2 bridge, and full bridge. (The wiring method and the bonding position of the strain gauge are shown in the figure.)

(1) 1/4 bridge connection method:

①Use a strain gauge and bond it at the position to be tested on the specimen.

②Connect the two leads of the strain gauge to the C and D ports of the connection terminal respectively.

(2) 1/2 bridge connection method:

① Use two strain gauges 1 and 2, respectively, pasted on the front and back of the specimen to be measured.

② Connect one lead of strain gauges 1 and 2 in series to port C.

③ Connect the remaining two leads of strain gauges 1 and 2 to ports A and D respectively.

(3) Full bridge connection method:

① Use four strain gauges to paste two strain gauges on each of the two sides of the specimen to be measured, the front side as strain gauges 1 and 3, and the reverse side as strain gauges 2 and 4.

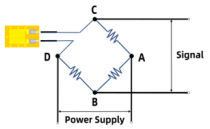
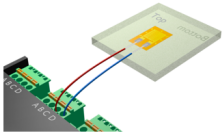
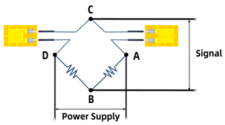
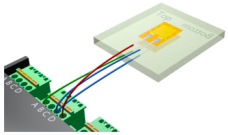
② Connect one lead of each strain gauge 1 and 3 in series to port A.

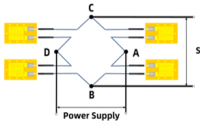
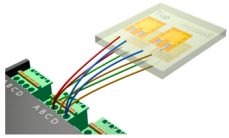
③ Connect one lead of each of strain gauges 2 and 4 in series to port D of the terminal block.

④ Connect each lead of strain gauges 1 and 2 to port C in series.

⑤ Connect each lead of strain gauges 3 and 4 to port B in series.

*Note: Before bridging the strain gages, please refer to the steps in "6. Strain Gage Pasting" to paste the strain gages before bridging.

	Bridge Circuit	Wiring	Interface	Application
1/4 Bridge			C、D	Simple measurement
1/2 Bridge			A、C、D	General dynamic measurement

	Bridge Circuit	Wiring	Interface	Application
Full Bridge			A、B、C、D	High-Precision Measurement/ Weight Sensor

Strain gauge wiring method

8 Operation Guide

Take the strain measurement of printed circuit board as an example, the operation steps are as follows. Use 120Ω strain gauges, using 1/4 bridge to connect the instrument CH1.

(1) Strain gauge paste: Use a strain gauge paste to the specimen to be measured position. (Refer to "6. Strain Gauge Bonding" for detailed operation.)

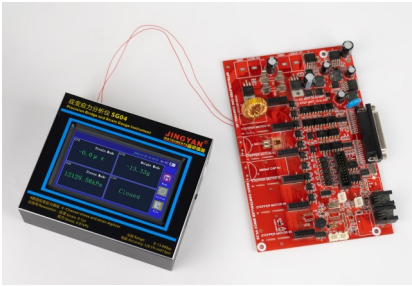
(2) Strain gauge bridge connection: Use a tool to press down on the orange portion of the terminal, then connect the leads to ports C and D of channel CH1. (For detailed operation, refer to "7. Bridge Connection Modes".)

(3) Select mode: Click mode selection in the main interface of the instrument . Select strain mode for CH1, and return to the main interface after setting.

(4) Setting parameters: Main interface > CH1 > Setting > Sensitivity Factor: 2.000 > Advanced > Bridge Type: 1/4

(5) Zeroing reading: return to CH1 test channel interface, leave the specimen static (without applying any external force) to make it in normal state, and click zero on the right side to zero the deformation data .

(6) Start test: At this time, the deformation curve can be seen in the interface when external force is applied, and the deformation data is displayed in real time at the upper right corner of the coordinates.



Example of printed circuit board strain measurement

9 Data Transmission

This strain gauge is equipped with independently developed upper computer software. After connection, the following functions are available:

- Remotely configure the instrument parameters.
- Monitor the peak values of data and their changing trends in real time.
- Support the export of data and curves.

Operation steps:

(1) Preparation: Refer to the operation guide and place the instrument in the testing environment according to the actual application scenarios.

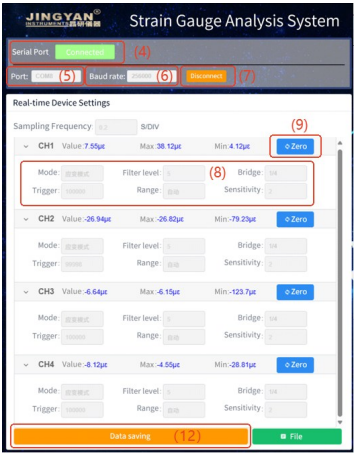
(2) Cable connect: Use the matching data cable to connect the instrument to the computer.

(3) Enter the system: Open the system and plugins that have been installed in advance on the computer.

(4) Plugins: Click on "Connect Plugins" in the software interface.

(5) Port: Select the port number corresponding to the connected port from the port options.

(6) Baud rate: Select the baud rate that is consistent with the preset value in the instrument.



(7) Connect the instrument: Click on "Connect". After successful connection, parameter settings can be carried out.

(8) Parameter settings: Set the mode and other parameters of each channel through the software, and the instrument will respond to the set parameters in a timely manner.

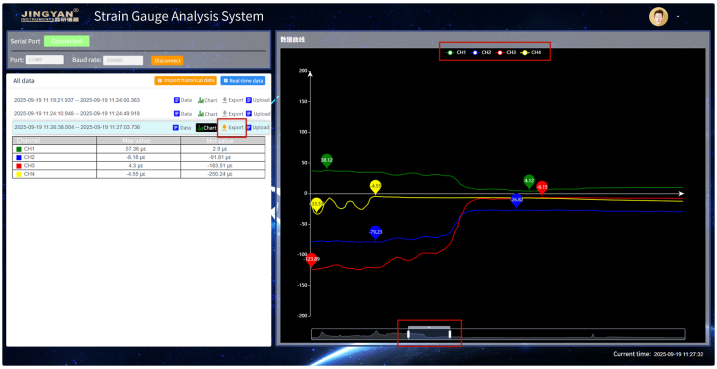
(9) Zero clearing: Before starting the test, click "Zero" of the corresponding test channel to reset the channel data to zero.

(10) Start: Click "Start Acquisition", and the software will collect the test data on the instrument in real time.

(11) Load: According to the test conditions, start applying load to the test materials, and the software will display and record in real time.

(12) End: After completing the test, click to enter the "Data Saving" interface.

(13) Saving: On the data saving interface, you can adjust the progress bar to select the interval of the data that needs to be exported. (The interval corresponding to the progress bar is the export node), and you can also choose the export channels.



*The upper computer software with this instrument provides a web version and an offline version. If there is a need for downloading, it can be obtained through the official website or via email.

10 Data Saving

This strain gauge provides two ways to export and save the test data, as follows:

(1) Instrument self-saving (only export test data)

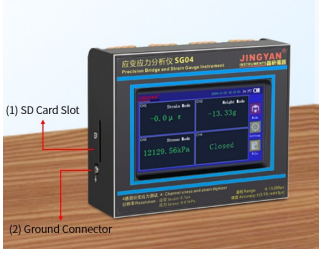
If you choose to save the test data through the instrument itself, you need to use an SD card to complete the operation.During the operation, first insert the SD card into the card slot on the left side of the instrument. Before the test, click the "Save" button on the channel interface, and the test data will be stored in the SD card. (For detailed operations, please refer to "5.5.3 ② Save") When viewing the saved data, you can view it in the data search interface on the main interface of the instrument, or insert the SD card into the card slot of the computer (if the computer has no card slot, you can use a card reader) and then open the disk file to view it. (For detailed operations, please refer to "5.4 File")

(2) Online testing (data and curves can be exported)

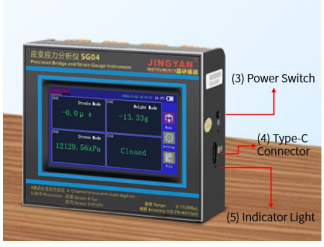
Use the matching upper computer software to connect the instrument to the computer. Through the software, the test data of the instrument can be synchro-

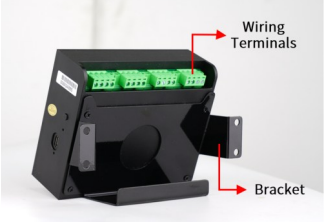
nously transmitted to the computer, and various parameters of the instrument can also be set in the software. After the test is completed, you can choose to export the test data and curves as needed for further in-depth analysis. (For detailed operations, please refer to "9. Data Transmission")

11 External Interfaces



(1) SD card slot:
for inserting SD card to save test data.
(2) Ground connector:
for accessing ground wire to improve measurement accuracy, stability and anti-interference.
(3) Power switch:
press to turn on; long press for 3 seconds to turn off.
(4) Type-C connector:
connect the Type-C data cable for charging the device or data transmission.
(5) Indicator light:
red indicator light is on during charging, green indicator light is on when it is fully charged.
(6) Wiring terminals:
used for connecting strain gauges, CH1, CH2, CH3, CH4 in order from left to right on the front of the instrument.
(7) Bracket:
mounted on the back of the device with screws, it can be fixed on the wall or flat on the desktop.



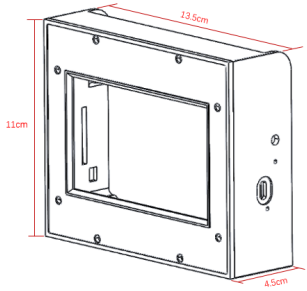


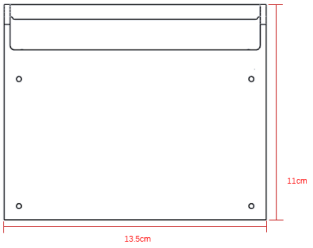
12 Battery Charging

- The instrument is powered by a 3.7V 5000mAh lithium polymer battery. When the instrument runs out of power, it is recommended to choose a charger with higher safety performance and connect the device for charging.
- The battery power icon is displayed on the top right of the first and second

level interface of the instrument, with four grades: three cells, two cells, one cell and empty power slot. When the battery is fully charged, it is three cells. When the power slot is empty, the last cell continues to flash, at this time, please access the charger as soon as possible. when the power is exhausted, the instrument will automatically shut down.

13 Structural Dimensions





14 Safety Precautions

- Avoid using the instrument under extreme temperature (too high or too low) and high humidity environment, too high or too low ambient temperature and high humidity environment may cause damage to the instrument.
- If the instrument is to be stored for a long period of time, it should be placed in a dry, well-ventilated environment at a suitable temperature, and the instrument should be periodically energized, inspected and maintained to prevent deterioration of the electronic components and degradation of the battery performance.
- Non-professionals should not attempt to disassemble, assemble or modify the instrument, improper operation may cause the instrument to fail to work properly or cause safety accidents.
- When using the instrument to transfer data with a laptop, it is recommended that the instrument be grounded. Please disconnect the power supply before connecting the grounding wire.

SERVICE

E-Mail: support@jingyan.tech

Website: www.jingyan-tech.com

阅读说明书
Read Instructions

安全警告
Warning or Caution

数据传输
Data Transmission

单点触摸
Single-Point Touch