

Potentiostat / Galvanostat / Electrochemical Workstation

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About us

Corrtest Instruments Co. (China) manufactured her first full-digital potentiostat/galvanostat for corrosion electrochemistry in 1995. After 29 years of research and development, Corrtest has developed a series of electrochemical workstations dedicated to electroanalysis, corrosion, electrocatalysis, energy material research, sensors, electrodeposition etc. We have acquired many patents, software copyrights and registered CorrTest® trademark. Corrtest has also developed different kinds of corrosion sensors and meters, corrosion management networks for on-site corrosion monitoring and risk evaluation of oilfields, petrochemicals, construction and offshore wind farms.

"Quality from Technology", "Progress from Profession" is our motto for research and development. We will continue to provide customers with high-quality products and professional services.



- 1995:** 1st electrochemical potentiostat was made based on AD&DA multifunction board
- 2007:** CorrTest was officially established with the first generation CS350 potentiostat designed
- 2015:** 2nd generation CS350G potentiostat with the achievement of 1MHz impedance
- 2016:** Listed on the Chinese New OTC market and embarked on the first generation corrosion meters
- 2017:** 3rd generation CS350H potentiostat, specialized in EIS for high-impedance coating
- 2021:** 4th generation, CS350M and CS310X multichannel products
- 2023:** 5th generation, CS2020B high-power booster to enhance CS350M output current

Overview

CS potentiostats/galvanostats/electrochemical workstations consist of a DDS arbitrary waveform generator, a high power potentiostat/galvanostat and a Frequency Response Analyser(FRA). Thanks to the dual-channel Sigma-delta 24bit AD converter and extension interfaces, they can conduct many high precision measurements in corrosion, energy, materials, electroanalysis and other electrochemical fields.

CS potentiostats/galvanostats can enhance their output current to $\pm 20A/40A/100A$ by CS2020B/CS2040B/CS2100B power booster, ideal for high-power batteries, electrolysis and electrodeposition applications; CS potentiostats/galvanostats can also extend their compliance voltage to $\pm 30V$. In addition, they also integrate a versatile I/O interface, which facilitates cooperation with third-party devices, such as fluorescence, pH, and temperature meters.

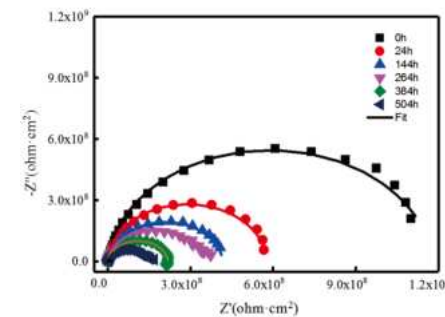
Corrosion Electrochemistry

CS potentiostats/galvanostats support a variety of electrochemical techniques for corrosion, such as OCP recorder, potentiodynamic, EIS, cyclic polarisation (CPP), LPR, hydrogen diffusion test, zero resistance ammeter (ZRA), electrochemical noise (ECN), etc.

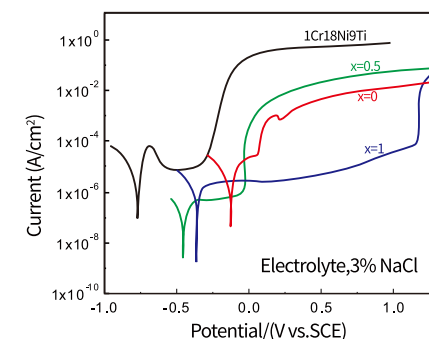
Due to their high input impedance($10^{13} \Omega$), they are especially suitable for EIS measurement of high-impedance systems like coating, concrete, and pure water.

Energy & Battery Testing

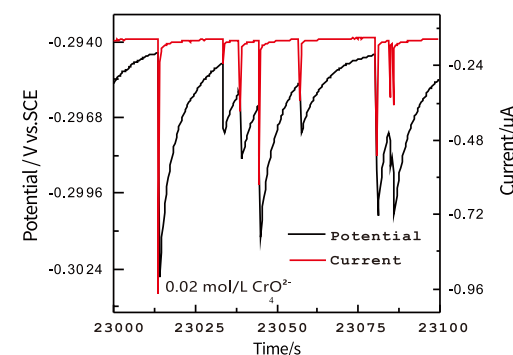
With versatile functions like linear sweep voltammetry (LSV), cyclic voltammetry (CV), galvanostatic charge/discharge (GCD), EIS(including potentiostatic and galvanostatic modes) with precise IR compensation, CS potentiostats are widely used in supercapacitor, Li-ion batteries, Li-S batteries, fuel cell, solar cell, solid-state batteries, flow batteries, and metal-air batteries, etc.



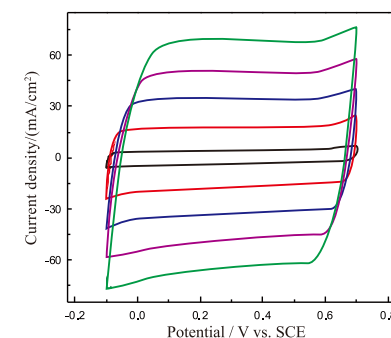
High-impedance coating ageing test in salt spray tests



Polarization curves of Ti-alloy & stainless steel in 3% NaCl solution



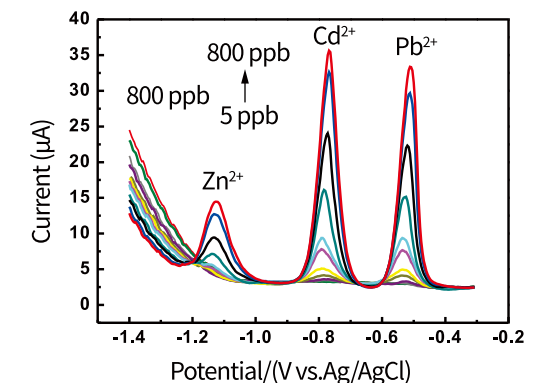
ECN of low-carbon steel in 0.05mol/L Cl⁻ + 0.1mol/L NaHCO₃



CV of PPY supercapacitor in 0.5 mol/L H₂SO₄ solution

Analytical Electrochemistry

CS potentiostats include comprehensive voltammetric methods such as NPV, DPV, DNPV, SWV, and ACV, which make them ideal for quantitative analysis of trace elements via the intrinsic Voltammetry stripping techniques.

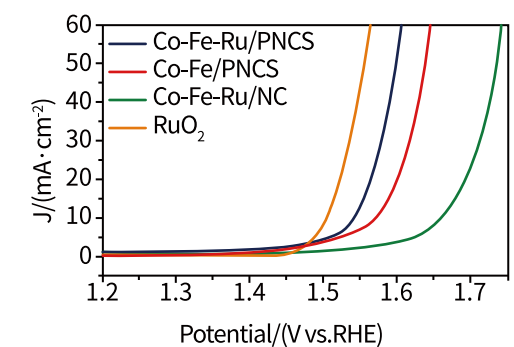


Stripping voltammetric curves in the solution dissolved with Pb²⁺, Cd²⁺, and Zn²⁺ ions

Electrocatalysis

Based on CV and LSV techniques, CS potentiostats can carry out long-term tests for ORR, OER, HER, and CO₂ reduction, which is crucial for evaluating catalyst stability. In addition, the CS2350M bi-potentiostat specialises in Faradaic efficiency synchronous measurement.

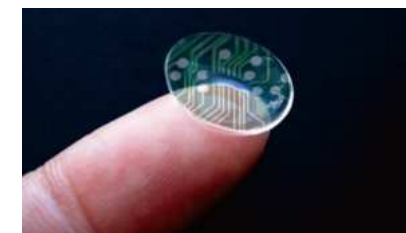
CS potentiostats can measure the half-wave potential (ORR) and overpotential (HER, OER) of catalysts and calculate the power density and energy density of Redox peaks.



LSV curves of various catalysts in alkaline solution

Electrochemical Sensor

Thanks to the high current sensitivity(100 fA) and voltage resolution(1 μV), the CS potentiostats can be used for the R&D of biosensors and electrochemical sensors.

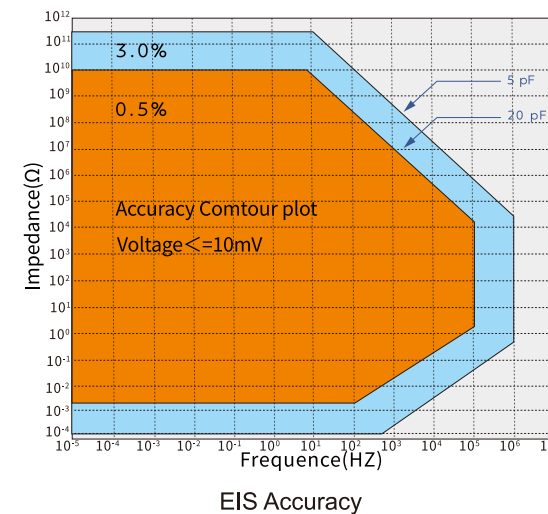


1. Switchable floating and earthing mode

- All CS potentiostats/galvanostats can switch between the floating and earthing modes, and this strategy is beneficial for studying electrochemical systems in which the working electrodes are intrinsically ground, such as autoclaves, in-situ concrete structures and multi-working electrodes requiring isolation, etc.

2. High-bandwidth EIS

- With the help of built-in digital FRA and arbitrary signal generator, as well as the high input impedance ($10^{13} \Omega$), the CS potentiostats are particularly suitable for EIS measurements of high-impedance systems (such as coating, membrane, concrete, etc.)
- Based on the DC bias compensation technique, CS potentiostats can conduct EIS tests under different charge/discharge states of batteries, making them suitable for ultra-low resistance systems, such as power batteries, fuel cells, water-splitting equipment, etc.



3. Multiple electrode configurations

- CS potentiostats support 2-, 3-, or 4-electrode configurations and can measure the galvanic current via built-in zero resistance ammeter circuits.

4. Independent multiple channels

- For CS310X multi-channel potentiostat, each channel is completely independent. It can be used for the electrochemistry measurements of multiple cells or multiple working electrodes in a cell.
- CS2350M Bipotentiostat/multi-channel potentiostat can be used for the RRDE test, dual-cell hydrogen diffusion test.

5. User-defined sequence test

- CS Studio 6.0 for Windows software supports user-defined sequence tests ("combination test"), which can facilitate automatic testing according to user-defined experiment sequences.

| No. | Name | Description |
|-----|------------------------------|---|
| 1 | Start time | The following test starts at [2022/03/23 11:34:35] |
| 2 | Start the cycle | Cycles:3 |
| 3 | Open Circuit Potential | Freq(Hz):10, Hold Time(s):1800 |
| 4 | Potentiostatic EIS (IMP) | DC Potential(V):0, Amplitude(mV):10, Initial Frequency:100000, Final |
| 5 | Potentiodynamic (Tafel, LPR) | Init E(V):-0.1 vsOCP, Final E(V):0.1 vsOCP, Scan Rate(mV/s):0.5, Freq |
| 6 | Wait | After 180 seconds, testing will be continued |
| 7 | End the cycle | End |

Sequence Test: corrosion tests

| No. | Name | Description |
|-----|--------------------|--|
| 1 | Cyclic Voltammetry | Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):5, Freq(Hz):10, Cyl |
| 2 | Cyclic Voltammetry | Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):10, Freq(Hz):20, Cyl |
| 3 | Cyclic Voltammetry | Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):20, Freq(Hz):40, Cyl |
| 4 | Cyclic Voltammetry | Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):50, Freq(Hz):100, Cyl |
| 5 | Cyclic Voltammetry | Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):100, Freq(Hz):200, Cyl |
| 6 | Cyclic Voltammetry | Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):200, Freq(Hz):400, Cyl |
| 7 | Cyclic Voltammetry | Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):500, Freq(Hz):1000, Cyl |

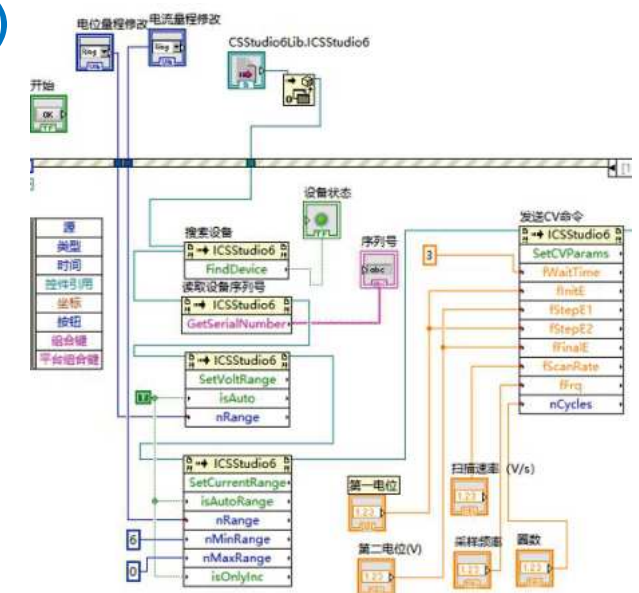
Sequence Test: Pseudocapacitor tests

6. Power booster

- Through CS2020B/CS2040B/CS2100B booster, the CS potentiostats can extend their output current up to $\pm 20A/40A/100A$, meeting the growing requirements in fuel cells, power batteries, electroplating, etc.
- CS potentiostats support compliance voltage customization ($\pm 30V$) for carbon/nitrogen electrochemical reduction.
- With our multiplexer, the CS potentiostats can be extended to 16~32 channels for high throughput testing.
- CS potentiostats can work with CST520 arrayed electrode mapper to study the non-uniform corrosion of metal samples under deposits, coatings and anti-rust oils.

7. Software development kit (SDK)

- All CS potentiostats run under the control of CS Studio 6.0 for Windows (CSS 6.0). The CSS 6.0 supports third-party languages, such as LabVIEW, C, C++, C#, VC, Python and others. Some API general interfaces and development examples can be supplied with the CS potentiostats. Through the SDK, customers can implement user-defined test methods.



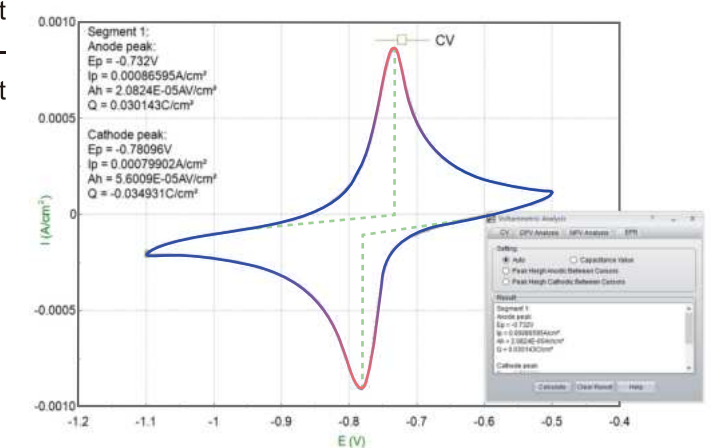
8. Real-time data saving

- CSS 6.0 saves experimental data timely, even if the experiment is accidentally interrupted by a power failure or computer shutdown. CSS 6.0 supports several data formats compatible with Originpro and Microsoft Excel.

9. Versatile data analysis functions

- CSS 6.0 provides robust functions, including various electrochemical measurements and data analysis. It can complete Tafel plot fitting, CV derivation, integration and peak height analysis, EIS equivalent circuit fitting, etc.

- 3, 4 parameter polarisation curve fitting
- EIS fitting
- Electrochemical noise spectrum analysis
- Pseudo-capacitance calculation
- GCD-specific capacitance, efficiency calculation
- Mott-Schottky analysis
- CV curve analysis
- Activation/re-passivation curve analysis



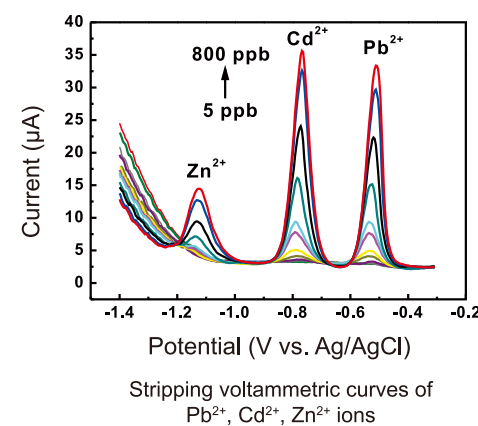
Pocket Potentiostat

CS100E is a pocketable, USB and battery-powered potentiostat /galvanostat(net weight <450g) with built-in frequency response analyzer (FRA) and zero resistance ammeter (ZRA). Its handheld and rugged design makes it ideal for field applications. Bluetooth and isolated USB communication can guarantee a perfectly floating measurement. Portable potentiostat APP supports Android phones.



High accuracy (0.1%), high current sensitivity (up to 100fA), and high potential resolution(1 μ V) make portable potentiostat an excellent device for low current detection in biosensor applications. Voltammetric techniques such as DPV, SWV, DNPV etc. are powerful for heavy metal ions detection.

There are two models for pocket potentiostat: CS100E with EIS and CS100 without EIS.



Key specifications

| | |
|---------------------------|--|
| Maximum potential control | ±10V |
| Potential resolution | 1 μ V |
| Maximum output current | ±45mA |
| Current sensitivity | 100fA |
| Compliance voltage | ±12V |
| EIS frequency range | 10 μ Hz~1MHz |
| Power supply | Built-in Li-ion battery 6000mAH@3.7V, or USB-powered |
| Com. port | USB / Bluetooth |

CS350M Potentiostat/Galvanostat

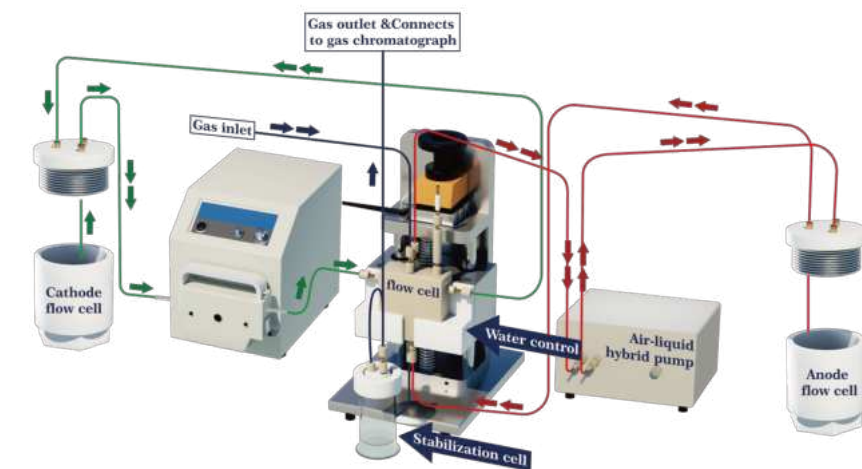
CS350M is a single-channel potentiostat consisting of a DDS arbitrary function generator, a potentiostat/galvanostat and an FRA. With the help of built-in dual 24-bit Delta-sigma AD converters, it achieves excellent stability and high potential (1 μ V) and current(1pA) resolutions. CS350M has been widely applied in corrosion, energy, material and analysis electrochemistry. In addition, via CS2020B/CS2040B/CS2100B current booster. CS350M can increase its output current up to 20A/40A/100A.



CS350M Potentiostat/Galvanostat

Applications

- Energy materials (Li-ion battery, solar cell, fuel cell, supercapacitors);
- Reactive mechanisms of electrosynthesis, electrodeposition (electroplating), anodic oxidation, electrolysis;
- Metallic corrosion; corrosion inhibitor, coating and cathodic protection efficiency;
- Electrocatalysis (HER, OER, ORR, CO₂RR, NRR).



CO₂ reduction test

Key specifications

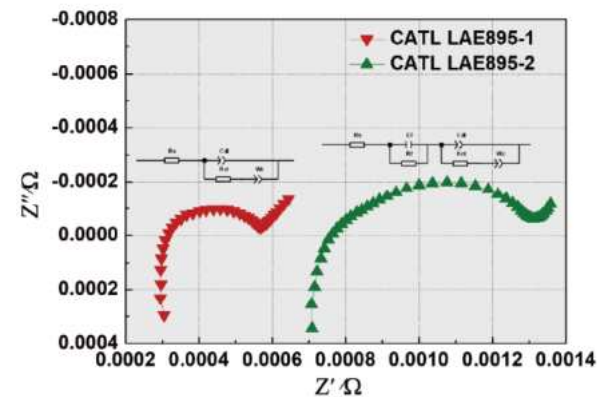
| | |
|----------------------------|---------------------|
| Maximum potential control | ±10V |
| Potential control accuracy | 0.1% |
| Potential resolution | 1 μ V |
| Maximum output current | ±2A |
| Current control accuracy | 0.1% |
| Current sensitivity | 1pA(100fA optional) |
| Compliance voltage | ±21V(30V optional) |
| EIS frequency range | 10 μ Hz~1MHz |

CS2020B/CS2040B/CS2100B Power Booster

CS2020B/CS2040B/CS2100B power boosters are designed to boost the output current($\pm 20\text{A}/40\text{A}/100\text{A}$) of CS potentiostats, which are particularly useful for the electrochemical tests of power batteries, fuel cells and PEM water splitting, etc.



Single-channel potentiostat+CS2020B



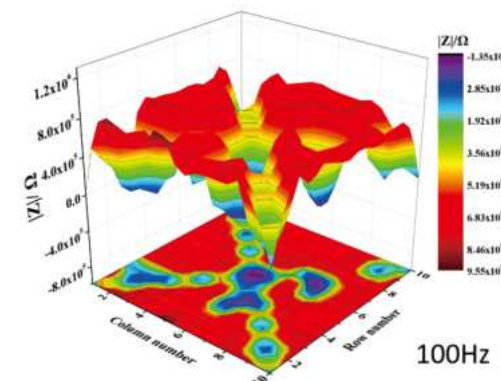
EIS results of CATL-LAE895 battery core

CST520 Multi-electrode Array Electrochemical Mapper

Based on high-resolution AD converters and zero resistance ammeter techniques, **CST520** can quickly map the galvanic current and OCP distribution on an arrayed multi-electrode and facilitate the study of non-uniform corrosion of metal samples under deposits, coatings and anti-rust oils. Further, it can work with CS potentiostat to map impedance distribution on a multiple-electrode sensor.



Photo of CST520 and impedance modulus distribution on a 10x10 wire beam electrodes



Bi-potentiostat/Bi-galvanostat (model CS2350M)

CS2350M bi-potentiostat has two sets of independent potentiostat /galvanostat. The two channels can work together to conduct RRDE and hydrogen diffusion tests. In addition, each channel can also work independently in a complete electrical isolation mode. CS2350M bi-potentiostat is composed physically of two CS350M potentiostats.



CS2350M Bi-potentiostat

Typical Applications

- RRDE:** CS2350M can work cooperatively with the RRDE setup for the electrocatalysis study, such as LSV on the disk via channel #1 and LSV on the ring electrode via channel #2, to detect the intermediate products on the disk electrode.
- HDT:** CS2350M can work with type H cells for hydrogen diffusion / permeating test. The H atoms diffusion coefficient in metal and hydrogen flux can be calculated by measuring the hydrogen charging current in the cathodic chamber and oxidation current in the anodic chamber.



RRDE Test



Hydrogen diffusion test

Key specifications

| | |
|----------------------------|---------------------------------|
| The number of channels | 2 |
| Maximum potential control | $\pm 10\text{V}$ (each channel) |
| Potential control accuracy | 0.1% |
| Potential resolution | 1 μV |
| Maximum output current | $\pm 1\text{A}$ (each channel) |
| Current control accuracy | 0.1% |
| Current sensitivity | 1pA |
| Compliance voltage | $\pm 21\text{V}$ |
| EIS frequency range | 10 μHz ~1MHz |

CS310X Multi-channel Potentiostat/Galvanostat

CS310X multi-channel Potentiostat/Galvanostat is a precise and cost-effective electrochemical instrument offering 4~8 channels. Each channel can work independently in a complete electrical isolation mode. All working electrodes are designed in switchable earthing/floating mode. CS310X can significantly boost experiment efficiency. It would be an ideal potentiostat for batch battery testing, corrosion, electrocatalysis, etc.

Customers can order the number of channels according to their budget. There are 4 basic options for CS310X:

Option A

4-channel with EIS in one channel

Option B

4-channel with EIS in all 4 channels

Option C

8-channel with EIS in one channel

Option D

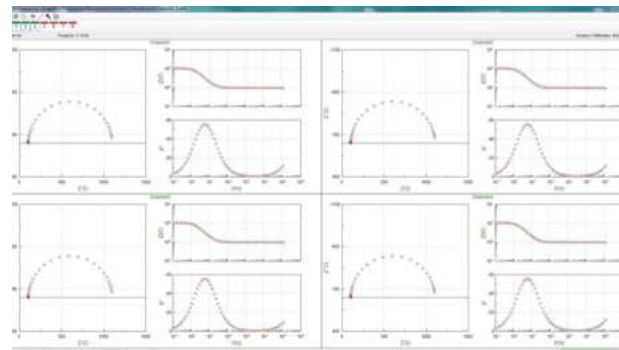
8-channel with EIS in all 8 channels

The lower option can be upgraded online into a higher one after the purchase.

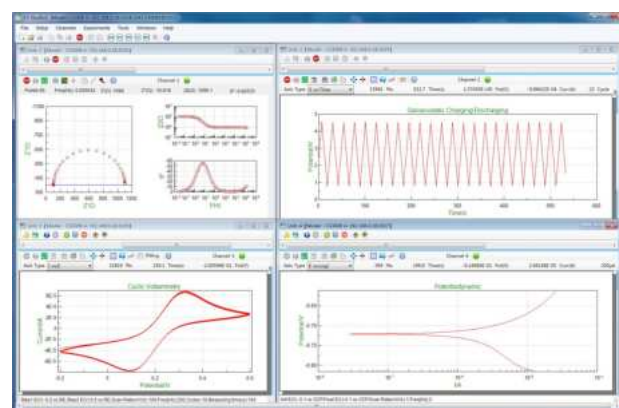
CS310X can run the same experiment on all channels or different experiments on each channel simultaneously. It is beneficial for batch electrochemical tests.



Multichannel potentiostat



Run EIS in each channel



Run different experiment in each channel

Technical advantages

Thanks to the expandable slot design, customers can open the chassis and install the potentiostat boards to increase the number of channels.



CS310X provides the maximum applied potential of $\pm 10V$, the maximum current of $\pm 1A$ and the maximum compliance voltage of $\pm 21V$ for each channel of potentiostats. Floating module and electrical isolation design guarantee complete independence of each channel.

Key specifications

| | |
|----------------------------|--------------------------|
| The number of channels | 4~8 |
| Maximum potential control | $\pm 10V$ (each channel) |
| Potential control accuracy | 0.1% |
| Potential resolution | 1 μV |
| Maximum output current | $\pm 1A$ (each channel) |
| Current control accuracy | 0.1% |
| Current sensitivity | 1pA |
| Compliance voltage | $\pm 21V$ |
| EIS frequency range | 10 μHz ~1MHz |

Specifications

| Models | Pocket | | Single-channel series | | | Bi-potentiostat | Multi-channel |
|-------------------------------------|--|--------|----------------------------------|--------|--------|--------------------------------|---------------|
| | CS100 | CS100E | CS300M | CS310M | CS350M | CS2350M | CS310X |
| Number of channels | 1 | | | | | 2 | 4~8 |
| Electrode configuration | 2-, 3-, 4-electrode | | | | | | |
| Maximum potential control | ±10V | | | | | | |
| Maximum current control | ±45mA | | ±2A（20A/40A/100A with a booster） | | | ±1A（20A/40A/100A with booster） | |
| Potential control accuracy | 0.1% | | | | | | |
| Current control accuracy | 0.1% | | | | | | |
| Potential resolution | 1μV | | | | | | |
| Current sensitivity | 1pA (100fA optional) | | | | | | |
| Potential rise time | 1μs | | | | | | |
| Reference electrode input impedance | 10 ¹³ Ω 8pF | | | | | | |
| Current range | 50mA~2nA, 9 ranges | | 2A~2nA, 10 ranges | | | 2A~2nA, 10 ranges | |
| Compliance voltage | ±12V | | ±21V（30V optional） | | | ±21V | |
| Maximum output current | ±45mA | | ±2A（20A/40A/100A with a booster） | | | ±1A（20A/40A/100A with booster） | |
| CV/LSV scan rate | 0.001mV~10000V/s | | | | | | |
| CA/CC pulse width | 0.0001~65000s | | | | | | |
| Current increment during scan | 1mA @1A/ms | | | | | | |
| Potential increment during scan | 0.076mV @1V/ms | | | | | | |
| SWV frequency | 0.001~100KHz | | | | | | |
| DPV/NPV pulse width | 0.0001~1000s | | | | | | |
| AD data acquisition | 16bit@1MHz, 20bit@1kHz | | | | | | |
| DA Resolution | 16bit, setup time:1μs | | | | | | |
| Minimum potential increment in CV | 0.075mV | | 0.020mV | | | | |
| IMP frequency | 10μHz~1MHz | | | | | | |
| Low-pass filters | covering 8-decade | | | | | | |
| Current/potential range setting | Auto | | | | | | |
| Communication | Bluetooth/USB | | USB/LAN | | | LAN | |
| Extension interface | Support trigger pulse output, 0~5V analog output, RS485 isolated communication | | | | | | |
| Weight(kg) | 0.45 | | 7.6 | | | 7.5 | 12.5 |
| Dimensions(mm) | 155*90*33 | | 365*338*140 | | | 365*338*140 | 530*483*190 |

Electrochemical Impedance Spectroscopy

| Signal generator | | | |
|-----------------------|---|------------------------------|--|
| Frequency range | 10μHz~1MHz | DC Bias | -10V~+10V |
| Frequency accuracy | 0.005% | DDS output impedance | 50Ω |
| AC amplitude | 0mV~2500mV | Waveform | sine wave, triangular wave and square wave |
| Signal resolution | 0.1mV RMS | Sine wave distortion | <1% |
| Scanning mode | logarithmic/linear, increase/decrease | | |
| Signal integrator | | DC offset compensation | |
| Integral time minimum | 10ms or the longest time of a cycle | Potential compensation range | -10V~+10V |
| Maximum | 10 ⁶ cycles or 10 ⁵ s | Current compensation range | -1A~+1A |
| Measurement delay | 0~10 ⁵ s | Bandwidth | 8-decade frequency range, automatic and manual setting |

After-sales Support

Warranty

3-year warranty; Lifelong software upgrading for the same model

Delivery

Deliver goods within 7 working days via express like DHL, FedEx

Repair

Free repair service within the warranty

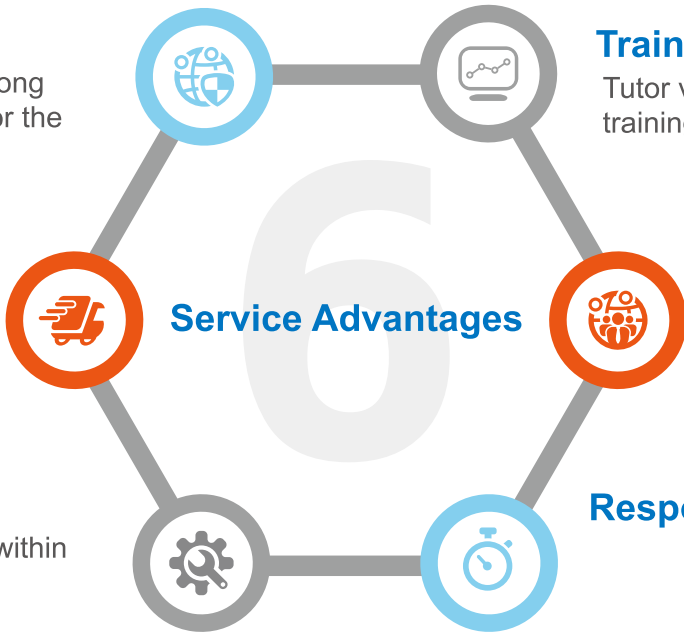
Training

Tutor videos for the beginners; Online training from our technicians

Online support

Emails, calls, videos, online meetings, remote operation& check

Respond within 24h



Reference electrodes

- Saturated calomel electrode
- Ag/AgCl reference electrode
- Hg/HgO reference electrode
- Mercury/Mercurous sulfate electrode
- Non-aqueous Ag/Ag⁺ electrode



Counter electrodes

- Platinum wire counter electrode
- Platinum plate electrode
- Platinum mesh electrode
- Platinum conductivity electrode
- Graphite rod



Working electrodes

- Glassy carbon working electrode
- Platinum working electrode
- Gold working electrode
- L-shape glassy carbon electrode
- Metal working electrode



Others

- Cell Stand
- Electrode polishing kit
- Specimen clamp
- Specimen holder
- Coin cell measuring cable



Electrochemical Cells

- Electrolytic cell(sealed)
- H-cells
- Jacketed glass cell
- Glass electrolytic Cell, 4 ports
- Flat corrosion cell
- Corrosion Cell, 5 ports
- Coating evaluation cell(Paint test cell)
- Photoelectrochemical cell
- Photoelectrochemical H-Cells
- Spectroelectrochemical cell

