

## COMPANY PROFILE

**Wuhan Corrttest Instruments Corp., Ltd.**(Wuhan, China) started the design and research of electrochemical instruments from 1995, and was officially founded in 2007. We specialize in R&D, manufacturing, and sales of potentiostat /galvanostat/electrochemical workstation. We have acquired many patents and ISO9001, CECertificates. etc. In 2016, Corrttest grew to be a joint-stock corporation (stock code: 838319).

Corrttest brand potentiostat/galvanostat are applied in corrosion, batteries, supercapacitor, advanced materials, electrocatalysis, sensor, electrosynthesis, electrodeposition, etc.

Now we are the main supplier of electrochemical instruments for almost all Chinese universities and institutes, and also for some industrial users such as medical equipment company (surgicalimplants pitting potential measurement) and energy companies, etc.

Our products have also been exported to about 40 countries, such as S. Korea, India, Indonesia, Pakistan, Japan, Egypt, Saudi Arabia, Australia, USA, Mexico, Canada, Germany, UK, etc.

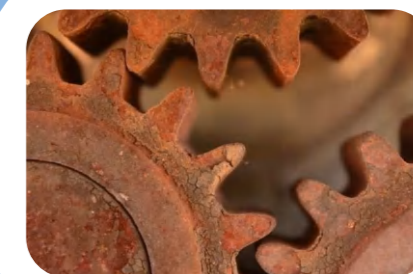
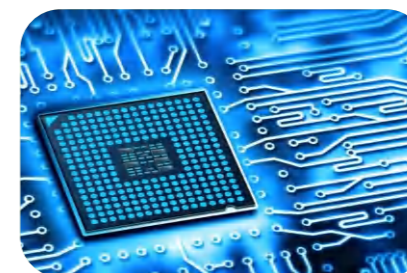
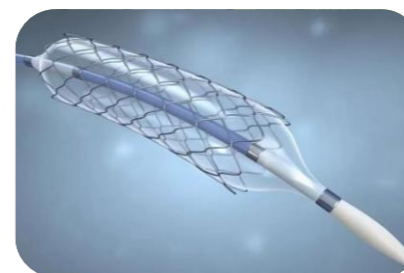
### Wuhan Corrttest Instrument Corp., Ltd

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# Potentiostat / Galvanostat / Electrochemical workstation

Stock code Brand

838319 Corrttest



visit our website

## Overview

Corrtest potentiostat/galvanostat/electrochemical workstation consists of DDS arbitrary waveform generator, high power potentiostat/galvanostat, dual-channel correlation analyzer, dual-channel high-speed 16bit/high-precision 24bit AD converter and extension interfaces. It can be used for various electrochemical fields such as corrosion, energy, material and electroanalysis. The current can be boosted upto 20A, and compliance voltage can be expanded upto 30V, which can meet the needs of power batteries, electrolysis and electrodeposition field.

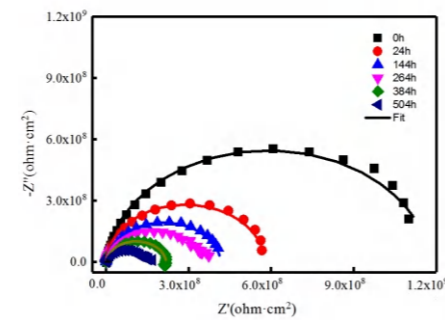
## Corrosion

Corrtest potentiostat includes all the electrochemical techniques for corrosion measurement such as OCP, polarization curve (potentiodynamic), EIS, Cyclic polarization CPP (passivation curve), Electrochemical Potentiokinetic Reactivation (EPR), Hydrogen diffusion test, ZRA, Electrochemical noise, etc. It can be used to study metal corrosion mechanism and corrosion resistance, and evaluate the coating durability and sacrificial anode current efficiency. It can also be used for rapid screening of corrosion inhibitors, fungicides, etc. It uses correlation integral algorithm and dual-channel over-sampling technique, and has strong anti-interference ability. The internal resistance of the instrument is upto  $10^{13}$ . It's suitable for EIS measurements of high-impedance system (such as coating, concrete etc.)

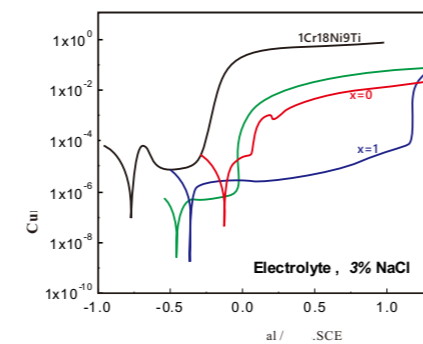
## Energy

With techniques LSV, CV, galvanostatic charge and discharge (GCD), Constant potential/ current EIS, and precise IR compensation circuit, Corrtest potentiostats are widely used

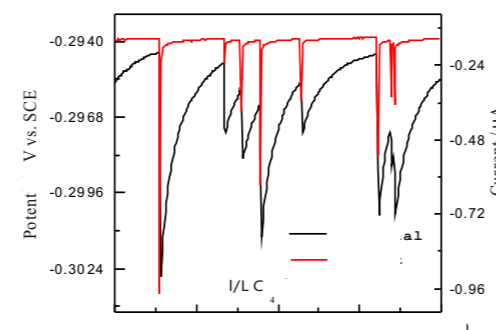
in supercapacitor, Li-ion batteries, sodium-ion batteries, fuel cell, Li-S batteries, solar cell, solid-state batteries, flow batteries, metal-air batteries etc. It is an excellent scientific tool for researchers in the fields of energy and materials.



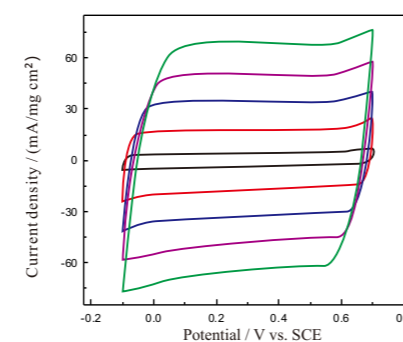
Salt spray aging test of high impedance coating



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



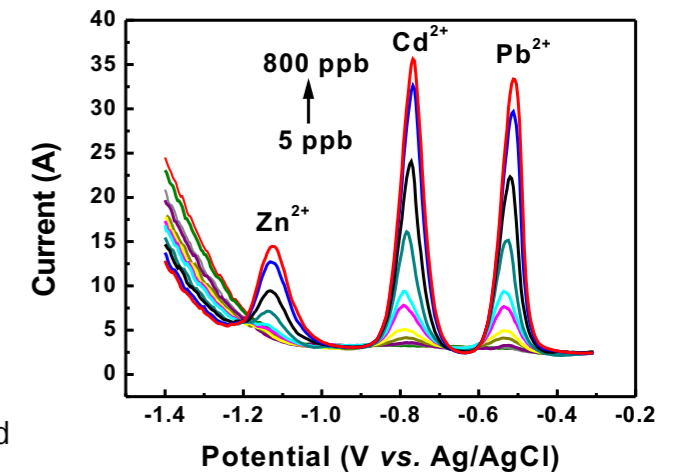
EN of low-carbon steel in 0.05mol/L Cl<sup>-</sup>+0.1mol/L NaHCO<sub>3</sub>



CV curve of PPy supercapacitor in 0.5 mol/L H<sub>2</sub>SO<sub>4</sub> solution

## Electroanalysis

Corrtest potentiostat includes all the voltammetric methods such as NPV, DNPV, SWV, ACV, and can be used for fast analysis of the trace elements in the solution. Voltammetry stripping methods can do the Quantitative analysis according to the stripping peak current.

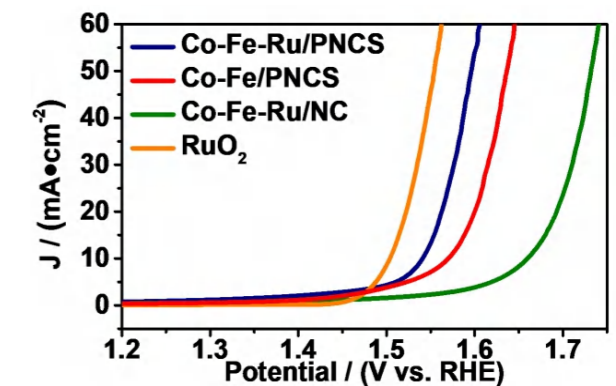


Stripping voltammetric curves in solution of different Pb<sup>2+</sup>, Cd<sup>2+</sup>, Zn<sup>2+</sup> concentration

## Electrocatalysis

Corrtest potentiostat can measure the half-wave potential (ORR), overpotential (HER, OER) of the catalyst, and has the function of peak power density and energy density calculation.

Long-term cyclic measurement for ORR, OER, HER, CO<sub>2</sub>RR by techniques such as cyclic voltammetry, potentiostatic, galvanostatic. Faraday efficiency can be measured with a bipotentiostat.

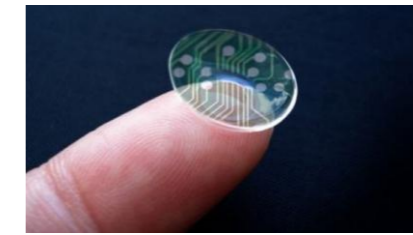


LSV curve of catalysts in alkaline solution

Maximum current can be 20A and compliance voltage can be 30V, and with IR compensation technique, Corrtest potentiostat can precisely measure the overpotential of the electrode, which is a big advantage in electrocatalysis field.

## Sensors

CS100 handheld potentiostat can be used in the field of biosensors and chemical sensors, and many others. With the size of a mobile phone, it can be carried easily for lab and on-site use. Potential resolution is 3µV, and current resolution can be 1pA.



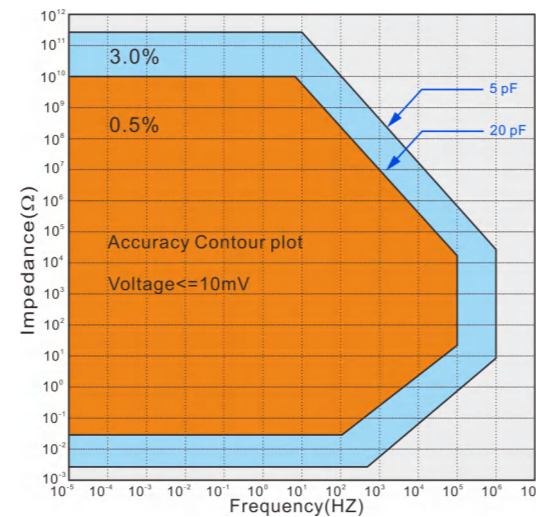
## Full floating

\* All Corrttest potentiostats/galvanostats are designed as full-floating, and can be used for electrochemical study of working electrode connecting to earth, such as autoclave, metal part in bridge, concrete

## EIS

\* Corrttest potentiostat uses correlation integral algorithm and dual-channel over-sampling technique, and has strong anti-interference ability. The internal resistance of the instrument is upto  $10^{13}\Omega$ . It's suitable for EIS measurements of high-impedance system (such as coating, concrete etc.)

\* With constant current carrier and DC bias technology, Corrttest potentiostat can be used for battery impedance measurement under charge and discharge state, suitable for ultra-low resistance system (such as 18650 battery, soft pack battery, battery core...)



EIS Accuracy

## Multi electrode system

- \* Support 2-, 3-, 4-electrode system, can be used to test battery internal resistance or 4-electrode thin film impedance measurement
- \* With Zero resistance ammeter for galvanic current measurement

## Independent multichannel potentiostat

- \* Multichannel potentiostat(independent channels) can achieve simultaneous measurement in multi cell system, or can be used for multi working electrodes measurement within one cell.
- \* Bipotentiostat can be used for RRDE test, and can be used with Devanathan-Stachurski cell for hydrogen diffusion curve and material hydrogen embrittlement susceptibility study

## Combination test

\* CS studio software supports the combination test for various experiments to achieve flexible and unattended test. You can set the parameters for each experiment in advance, and set the intervals, wait time etc between each experiment.

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

Combination 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, Cycles:3
2	Cyclic Voltammetry	Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):10, Freq(Hz):20, Cycles:3
3	Cyclic Voltammetry	Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):20, Freq(Hz):40, Cycles:3
4	Cyclic Voltammetry	Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):50, Freq(Hz):100, Cycles:3
5	Cyclic Voltammetry	Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):100, Freq(Hz):200, Cycles:3
6	Cyclic Voltammetry	Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):200, Freq(Hz):400, Cycles:3
7	Cyclic Voltammetry	Step1 E(V):-1 vsRef, Step2 E(V):1 vsRef, Scan Rate(mV/s):500, Freq(Hz):1000, Cycles:3

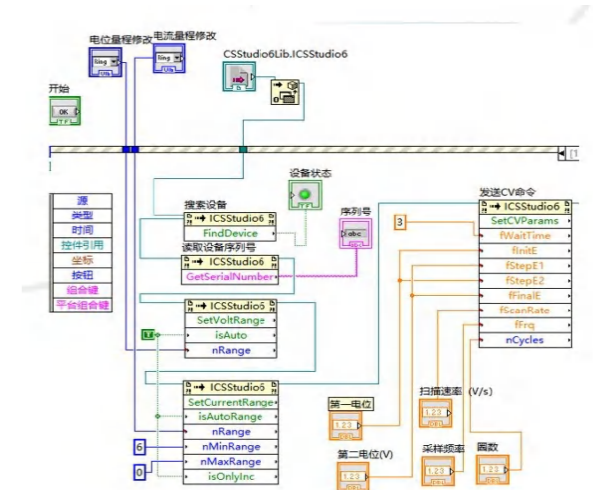
Combination Test: Pseudocapacitor tests

## High current option

- \* With the booster, the current can be boosted to 20A, which meets the requirement in fuel cell, power battery, electroplating, etc
- \* Can customize the instrument to be 30V high compliance voltage, which meets the test requirement in low-conductivity solutions(organic system, concrete system etc), especially suitable for carbon and nitrogen reduction study.

## Software development kit (SDK)

\* We can provide secondary development interfaces, API general interfaces and development examples, and can realize data call for Labview, C, C++, C#, VC and other program, which is convenient for secondary development and test methods customization.



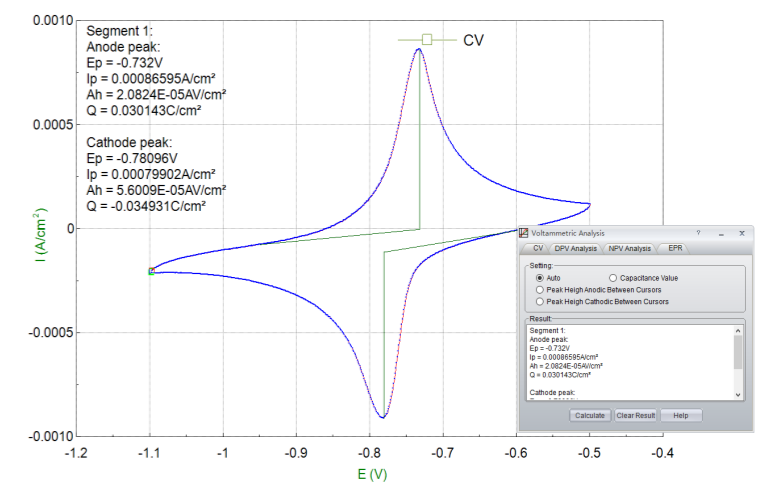
## Real-time data storage

\* Experiment data can be stored in real time. Even if the test is interrupted by a power failure, the data will be automatically saved. The data is compatible with Excel, Origin, and can be directly opened in third-party software for data processing and curve drawing.

## Versatile data analysis

\* CS Studio is the software for Corrttest potentiostat for experiment control and data analysis. It can do: multi-parameter Tafel curve fitting, derivation, integration and peak height analysis of voltammetric curve, EIS equivalent circuit customization and impedance spectrum fitting, etc.

- Multi-parameters Polarization curve
- EIS fitting
- Electrochemical noise analysis
- Pseudocapacitance calculation
- GCD specific capacitance, efficiency
- Mott-Schottky plot analysis
- CV analysis



CV Data Analysis

## CS100 Portable potentiostat

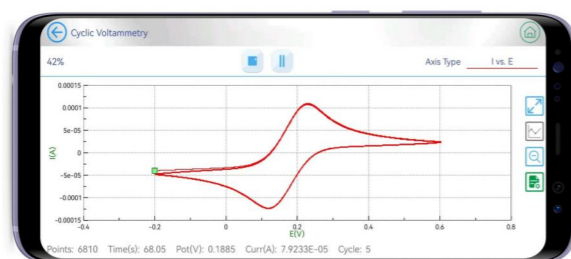
- Total weight: 500g
- Wireless Bluetooth or USB connection
- Battery and USB powered
- Maximum current:  $\pm 45\text{mA}$
- Potential control range:  $\pm 10\text{V}$
- EIS frequency range:  $10\mu\text{Hz} \sim 1\text{MHz}$
- Different configurations for different budgets

Two Models: CS100 without EIS & CS100E with EIS

### Applications

- Testing of battery materials in the glove box;
- Ultra-low detection limit of heavy metal ions, suitable for water quality testing in environmental protection;
- High current accuracy, suitable for small current detection in biosensor;
- Comprehensive functions, can be used for the active ingredients detection in food and drug field;
- Easy to carry, suitable for bridge corrosion and soil corrosion measurements

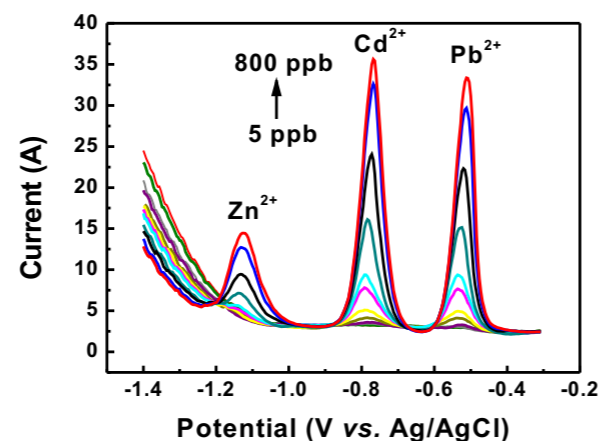
CS100 portable potentiostat can be controlled by desktop CS Studio software as well as App on phone.



App - Example: CV test



CS100 Handheld potentiostat



Voltammetry stripping curves

## Single-channel potentiostat

Corrtest electrochemical workstation (potentiostat / galvanostat) contains a fast digital function generator, high-speed data acquisition circuitry, a potentiostat and a galvanostat. With high performance in stability and accuracy with advanced hardware and well-functioned software, it is a comprehensive research platform for corrosion, batteries, electrochemical analysis, sensor, life science and environmental chemistry etc.



CS350M EIS potentiostat

### Applications

- (1) Energy materials(Li-ion cell, solar cell, fuel cell, supercapacitor etc), advanced functional material, and sensor
- (2) Electro-analysis study
- (3) Reaction mechanism study on electrosynthesis, electrodeposition(electroplating), anode oxidation, electrolysis etc
- (4) Corrosion study and anti-corrosion abilities evaluation for metallic materials
- (5) Evaluation of corrosion inhibitors, water stabilizers, coating and cathodic protection

Key specs	
Potential control range	$\pm 10\text{V}$
Potential accuracy	$0.1\% \times \text{full range} \pm 1\text{mV}$
Potential resolution	$10\mu\text{V} (> 100\text{Hz}), 3\mu\text{V} (< 10\text{Hz})$
Current range	$\pm 2\text{A}$
Current accuracy	$0.1\% \times \text{full range}$
Current sensitivity	$1\text{pA}$
Compliance voltage	$\pm 21\text{V}$
EIS Frequency	$10\mu\text{Hz} \sim 1\text{MHz}$

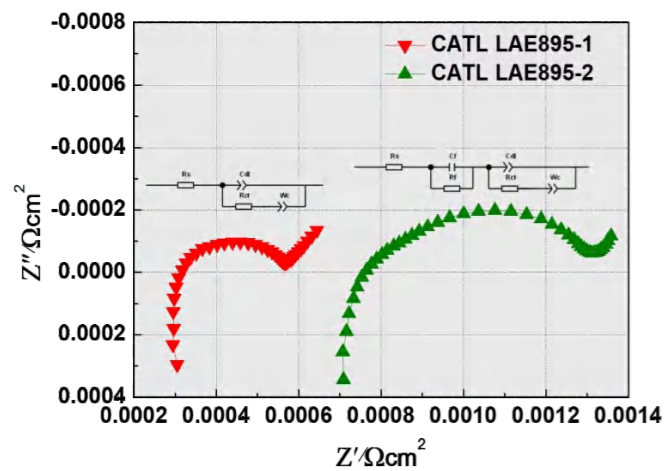
Single channel models: CS350M, CS310M, CS300M, CS150M, CS120M for various budgets

## CS2020B Current booster (20A)

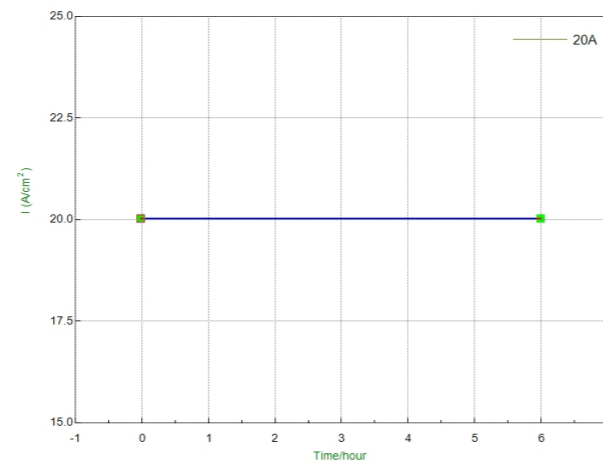
With a current booster model CS2020B, the maximum current can be boosted to 20A. Any single channel model can be connected with the CS2020B.



Single channel Potentiostat+CS2020 Current booster



EIS results of CATL-LAE895 battery core



20A output in galvanostatic mode by the potentiostat+booster

## Bipotentiostat(with built-in EIS) Model CS2350M

CS2350M bipotentiostat has two sets of built-in independent potentiostat /galvanostat. Experiments can be conducted simultaneously in each channel. Besides this, the two channels can jointly complete experiment of two-working electrode system such as RRDE and Hydrogen diffusion. CS2350M bipotentiostat is the real double-channel potentiostat.



CS2350M Bipotentiostat

### Typical Applications

**RRDE /ORR :** CS2350M can be used with the RRDE setup for the electrocatalysis study. Doing LSV on disk in the 1st channel and doing LSV or potentiostatic polarization on ring in the 2nd channel, it aims to detect the intermediate products on the disk electrode

**Hydrogen diffusion:** CS2350M can be used with H cells for hydrogen diffusion test in the metal. By measuring the hydrogen charging current in cathodic cell, and the H atoms anodic oxidation current, it can further calculate the H atoms diffusion coefficient in metal and hydrogen flux.



RRDE Test



Hydrogen diffusion test

Two models for bipotentiostat: entry model CS2150M(without EIS) and CS2350M (with EIS)

Key specs	
Current range	± 20A
Current accuracy	0.1%×full range
Current sensitivity	1pA
Potential range	±10V
Potential accuracy	0.1%×full range±1mV
Potential resolution	10μV(>100Hz), 3μV(<10Hz)
Compliance voltage	±13V
EIS Frequency	10μHz ~ 1MHz

Key specs	
Number of channel	2
Potential range	±10V
Potential accuracy	0.1%×full range±1mV
Potential resolution	10μV
Current range	±1A
Current accuracy	0.1%×full range
Current sensitivity	1pA
Compliance voltage	±21V
EIS Frequency	10μHz ~ 1MHz

## Multichannel Potentiostat CS310X

Multichannel potentiostat/galvanostat is a versatile instrument offering 8 slots. It supports floating mode, and uses Ethernet connection.

Each channel is completely independent. Multichannel potentiostat brings convenience to those who have many samples, and is an ideal device for studies of energy materials, battery study, metal corrosion etc.

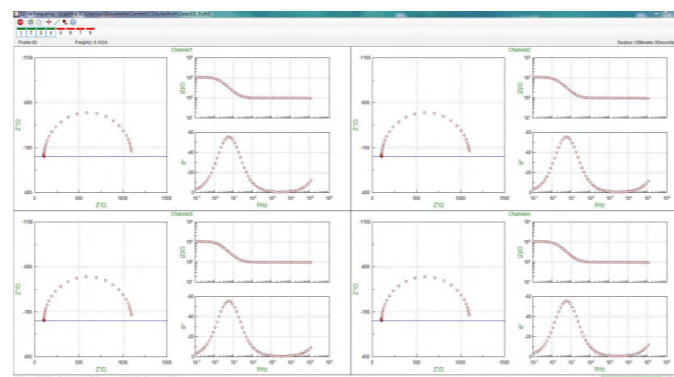
- Option A: 4-channel, EIS\*1
- Option B: 4-Channel, EIS\*4
- Option C: 8-channel, EIS\*1
- Option D: 8-channel, EIS\*8

### Simultaneous experiment

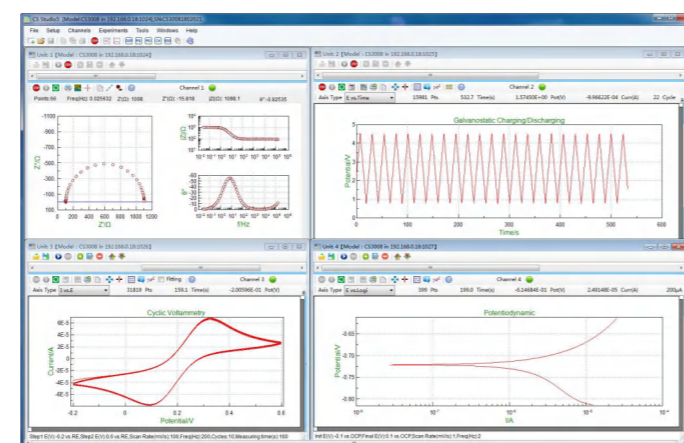
You can run a same experiment for each channel at the same time. Set the same parameters for each experiment once and run all independently. It's especially useful when you have many samples for one single test.



Multichannel potentiostat



Run EIS in each channel



Run different experiment in each channel

You can also choose different techniques in each channel. Set the parameters for each experiment one by one, and run each experiment independently. As is shown in right picture, EIS, Galvanostatic charge & discharge, Cyclic Voltammetry, and polarization curve test are tested.

### Technical advantages

The number of channel is expandable by adding and installing more boards, thanks to the intelligent chassis and plug-in design

Each channel potential control range is 10V, current control range  $\pm 1A$ , can meet experiment requirement for most people.

Full floating module and electrical isolation design guarantee each channel is totally independent, which ensures accurate data and efficient simultaneous measurements.

Number of channels can be customized. Different configuration ensures you get desired product suiting to various budgets



Key specs	
Number of channel	4/8
Potential range	$\pm 10V$
Potential accuracy	$0.1\% \times \text{full range} \pm 1mV$
Potential resolution	$10\mu V$
Current range	$\pm 1A$
Current accuracy	$0.1\% \times \text{full range}$
Current sensitivity	$1pA$
Compliance	$\pm 21V$
EIS frequency	$10\mu Hz \sim 1MHz$

Models		Single channel models (ordinary benchtop type) (±2A,±10V)					Single channel Portable potentiostat (±45mA,±10V)		Bipotentiostat (±2A, ±10V)		Multichannel potentiostat (±1A, ±10V) Model CS310X			
		CS120M	CS150M	CS300M	CS310M	CS350M	CS100	CS100E	CS2150M	CS2350M	4-channel	4-channel	8-channel	8-channel
Techniques		No EIS			With EIS		No EIS	With EIS	No EIS	EIS * 2	EIS * 1	EIS * 4	EIS * 1	EIS * 8
Stable polarization	Open Circuit Potential (OCP)	√	√	√	√	√	√	√	√	√	√	√	√	√
	Potentiostatic (i-t curve)	√	√	√	√	√	√	√	√	√	√	√	√	√
	Galvanostatic		√	√	√	√	√	√	√	√	√	√	√	√
	Potentiodynamic(Tafel plot)	√	√	√	√	√	√	√	√	√	√	√	√	√
	Galvanodynamic		√	√	√	√	√	√	√	√	√	√	√	√
Transient polarization	Multi-Potential Steps	√	√	√	√	√	√	√	√	√	√	√	√	√
	Multi-Current Steps		√	√	√	√	√	√	√	√	√	√	√	√
	Potential Stair-Step (VSTEP)	√	√	√	√	√	√	√	√	√	√	√	√	√
	Galvanic Stair-Step (ISTEP)		√	√	√	√	√	√	√	√	√	√	√	√
Chrono methods	Chronopotentiometry (CP)		√	√	√	√	√	√	√	√	√	√	√	√
	Chronoamperometry (CA)		√	√	√	√	√	√	√	√	√	√	√	√
	Chronocoulometry (CC)		√	√	√	√	√	√	√	√	√	√	√	√
Voltammetry	Cyclic Voltammetry (CV)	√	√	√	√	√	√	√	√	√	√	√	√	√
	Linear Sweep Voltammetry (LSV)(I-V)	√	√	√	√	√	√	√	√	√	√	√	√	√
	Staircase Voltammetry (SCV) #			√	√	√	√	√	√	√	√	√	√	√
	Square wave voltammetry (SWV) #			√	√	√	√	√	√	√	√	√	√	√
	Differential Pulse Voltammetry (DPV)#			√	√	√	√	√	√	√	√	√	√	√
	Normal Pulse Voltammetry (NPV)#			√	√	√	√	√	√	√	√	√	√	√
	Differential Normal Pulse Voltammetry (DNPV)#			√	√	√	√	√	√	√	√	√	√	√
	AC voltammetry (ACV) #			√	√	√	√	√	√	√	√	√	√	√
Amperometry	2nd Harmonic A.C.Voltammetry (SHACV)			√	√	√	√	√	√	√	√	√	√	√
	Differential Pulse Amperometry (DPA)			√	√	√	√	√	√	√	√	√	√	√
	Double Differential Pulse Amperometry (DDPA)			√	√	√	√	√	√	√	√	√	√	√
	Triple Pulse Amperometry (TPA)			√	√	√	√	√	√	√	√	√	√	√
EIS	Integrated Pulse Amperometric Detection (IPAD)			√	√	√	√	√	√	√	√	√	√	√
	EIS vs Frequency (IMP)				√	√	√	√	√	√	√	√	√	√
	Galvanostatic EIS				√	√	√	√	√	√	√	√	√	√
	EIS vs Potential (IMPE) (Mott-Schottky)				√	√	√	√	√	√	√	√	√	√
	EIS vs Time (IMPT)				√	√	√	√	√	√	√	√	√	√
Corrosion test	Galvanostatic EIS vs Time				√	√	√	√	√	√	√	√	√	√
	Cyclic polarization curve (CPP)		√	√	√	√	√	√	√	√	√	√	√	√
	Linear polarization curve (LPR)		√	√	√	√	√	√	√	√	√	√	√	√
	Electrochemical Potentiokinetic Reactivation (EPR)		√	√	√	√	√	√	√	√	√	√	√	√
	Electrochemical Noise (EN)		√	√	√	√	√	√	√	√	√	√	√	√
Battery test	Zero resistance Ammeter (ZRA)		√	√	√	√	√	√	√	√	√	√	√	√
	Battery charge and discharge		√	√	√	√	√	√	√	√	√	√	√	√
	Galvanostatic charge and discharge (GCD)		√	√	√	√	√	√	√	√	√	√	√	√
	Potentiostatic Charging and Discharging(PCD)		√	√	√	√	√	√	√	√	√	√	√	√
	Potentiostatic Intermittent Titration Technique(PITT)		√	√	√	√	√	√	√	√	√	√	√	√
	Galvanostatic Intermittent Titration Technique(GITT)		√	√	√	√	√	√	√	√	√	√	√	√

4-channel potentiostat, we mean there are 4 potentiostat boards installed in the chassis and other 4 slots are empty/upoccupied for future adding potentiostat boards.  
8-channel potentiostat, we mean all the 8 slots are equipped with potentiostat boards, no room for future channel extending for this set.