

MULTICHANNEL ELECTROCHEMICAL WORKSTATION

A multichannel potentiostat / galvanostat is required that can individually allow EIS, multiplexing and bi-potentiostat options on separate channels. The total number of channels available should be 12 or more.

The specifications should be as follow:

Technical Specifications

- Number of Channels: 1 (Expandable upto 10 more channels at minimum)
- Compliance voltage: Standard ± 20 V or better at ± 400 mA current
Note: Adjustable compliance voltage configurations should be mentioned separately
- Maximum Output Current: ± 400 mA or better at ± 20 V.
- Current boosting : Expandable anytime to ± 10 A measured current or better with Current Booster at unchanging compliance voltage of ± 20 V and 0.0003% measured current resolution
- Output Voltage Range: ± 10 V or better
- Maximum scan rate: **1000V/s with 15 mV steps – Required**
- Current Ranges: ± 10 nA to current range 100 mA in eight or more ranges
- Measured current accuracy: 0.0003% of current range (30fA at 10 nA range): Must be a default hardware configuration without any additional external accessories or current boosters – **Required**
- Built-in Current Integrator: We require to separate faradaic current from capacitive current and also directly measure integrated charge in real-time rather than current
- Built-in Electromagnetic Noise filter: The system hardware must have internal third order Sallen-key filters for removing background noise that cannot be removed by simple measures such as faraday cage
- Measured Potential Resolution: $3\mu\text{V}$ or better
- Potentiostat Rise/fall Time: < 300 ns or lower
- Interface: USB interface for connection with PC.
- Input bias current: < 1 pA
- Bandwidth of electrometer: > 4 MHz
- Input impedance of electrometer: > 100 GOhm // 8 pF

Electrochemical Impedance Spectroscopy: Qt. 1

- Applied Frequency Resolution: 0.003%
- At 1 Hz frequency, impedance of 0.01Ω must be determined with 0.3° Phase accuracy & 0.3 % measured impedance accuracy. i.e – Measured impedance = $0.01 \pm 0.00003 \Omega$ - **Required**
- Frequency Range with External Waveform generator: $10 \mu\text{Hz}$ to 32 MHz
- Frequency Range with PSTAT/GSTAT: $10 \mu\text{Hz}$ to 1 MHz at a maximum current of ± 400 mA currents
- Required – Real time fit-simulation, live lissejous plots, live 3D plotting.
- Preferred Option in near future – An Advanced EIS software that selects equivalent circuit by itself and allows touch free fitting and simulation of upto 50+ EIS data files in single run

The system must have capability for hybrid measurements such as E-SPR, S-ECM, Spectro-electrochemistry, IMPS-IMVS, EQCM, etc. It should have TTL triggering, ADC, DAC based communication ports.

Electrochemical Cell Accessory: Qt. 1

A 50 mL total volume three electrode set-up is required with following features:

- Gas tight construction with flangeless fittings (PEEK)
 - A combination of chemically inert and organic solvent resistive materials including (i) PEEK: lid, electrode plugs and gas fittings, (ii) glass: chamber and RE body, (iii) FFKM O-Rings (iv) FEP tubing and (v) Epoxy resin: WE electrode body.
 - 2 mm GC RDE electrode, Pt and Au electrodes, Ag/AgCl aqueous electrode, platinum wire counter Electrode;
- Gas purging faculty, polishing set.
option

Software

The system software must have capability for hybrid measurements such as Spectro-electrochemistry, E-SPR, SECM, IMPS-IMVS, EQCM, etc. It should have TTL triggering, ADC, DAC based communication ports. The Software must be able to be downloaded to unlimited computers, free updates & fully windows based. Software should be capable of supporting a wide variety of electrochemical techniques as mentioned below:

Corrosion: Linear polarization with Tafel Slope Analysis, Polarization resistance evaluation, Electrochemical Noise analysis, critical pitting technique, **electrochemical frequency modulation**, hydrogen permeation analysis etc.

Battery & Supercapacitor Analysis: Rectangular CV analysis at varying scan rates for pseudo capacitor analysis, complete charge and discharge with built in integration and 'linkable' cut-offs, Galvanostatic charge discharge with cycle number vs specific capacitance plot, Voltage measurement on counter electrode, GITT, PITT, etc.

Solar Cell / Fuel Cell Studies: Linear polarization, I-V plotting with automatic determination for max power point & fill factor, IMPS-IMVS evaluation, EQE / IPCE Analysis, Charge extraction, Photo-current response, Mott-Schottky plots for single frequency scan, automated band-gap analysis, etc.

Electro-catalysis / Electro-deposition: ORR analysis using RDE/RRDE at varying rotation speeds and built-in Kotecky-levich plot generation, HER and OER Tafel based analysis for water splitting, Carbon dioxide reduction analysis, default plug-n-play protocol for spectro-electrochemistry based LSV, CV and Chrono evaluation, Galvanostatic CV and Chrono, ASV, DPSV, etc.

Trace Metal Analysis / Polarography: DPSV, ASV, Chrono Coulometry, etc.

Sensors: Automated one-click protocol for CV and LSV analysis at varying scan rates, fully automated single click amperometric detection protocol, EIS measurement with real-time equivalent circuit fit option, etc.

3D Based Live Plotting: Powerful graphic engine with useful features such as vector graphics, individual axis scaling, overlays, multiple Y-axes, plot addition, real-time 3D with zooming and rotation. Minimum 10+ plot could be plotted simultaneously.

Computer Station:

A suitable branded Computer like Dell or Compaq or equivalent for system control & data acquisition should be offered with the system. It should have following minimum specs: CPU Intel Core i5, RAM 8 GB RAM, HDD 500 GB, GPU DirectX 9.0c compliant display adapter with 1GB RAM, TFT Monitor 21 inch, 101 Keys Keyboard, Optical Mouse, 3 USB Ports. Software should be freely upgradable in future. The model and the software capability offered should be well documented in the brochure/catalogue and should be available at Principal website. And HP DESK TOP PRINTER.

Any-time Switchable Option 1 Vs EIS: A Multiplexer Module to allow Sequential Electrochemical Measurement from 4 to 64 independent Cells: Future Expandability

Any-time Switchable Option 2 Vs EIS: A dual-mode bipotentiostat module for electro catalysis measurements using RRDE set-ups or sensor research

Warranty: 1 year + 2 years AMC free or 3 Years Manufacturer's Warranty Certificate

Back-up: 1KVA UPS

Note: Vendor should be an authorized provider of sophisticated high-precision potentiostat/galvanostat systems for past 15 Years or more with a

- A proven track record in multiple countries and national institutes
- Standard quality certifications such (ISO 9001)
- 10+ past installations of similar systems in India in past two years.