



राष्ट्रीय प्रौद्योगिकी संस्थान, मणिपुर

**NATIONAL INSTITUTE OF TECHNOLOGY, MANIPUR**

Langol Campus, Ph. (0385) 2445812 / email:- [nitmn@nitmanipur.ac.in](mailto:nitmn@nitmanipur.ac.in)

An Autonomous Institute under MHRD, Govt. of India

## Appendix-I

### 1. Cyclic Voltammetry/Electrochemical System

#### Technical Specification

##### A. Potentiostat/Galvanostat technical specifications:

1. Potentiostat/Galvanostat designed for electrochemical research over a broad spectrum of applications
2. Cell Connections: 2, 3 or 4 terminals plus ground
3. Standard Voltage Compliance:  $\pm 12V$  or better
4. Standard Current Compliance:  $\pm 350$  mA or better
5. Potentiostat Bandwidth: 1MHz or more
6. Potentiostat Rise Time:  $< 350$  ns with no load
7. Applied Voltage Range:  $\pm 10V$  with resolution  $300 \mu V$  in maximum voltage range &  $300nV$  in minimum voltage range
8. Applied Voltage Accuracy:  $\pm 0.2\%$
9. Maximum Scan Rate:  $1000$  V/s with  $10$  mV step or better
10. Applied Current Range: smallest current range:  $\pm 10$  nA to current range  $100$  mA in multiple ranges
11. Applied Current Accuracy:  $\pm 0.2\%$
12. Input Impedance of electrometer:  $> 90G\Omega$
13. Electrometer Leakage Current:  $\leq 5$  pA
14. Voltage Measurement Range:  $\pm 10V$  with  $6 \mu V$  minimum resolution
15. IR Compensation: Positive Feedback & Dynamic IR
16. EIS module:  
It should be possible to apply a frequency from EIS option in the range of  $10 \mu Hz$  -  $10$  MHz. The measurable frequency range in combination with potentiostat / galvanostat should be  $10 \mu Hz$  -  $1$  MHz upto  $\pm 350$  mA currents. Hardware and software for EIS measurements should be available in potentiostatic and galvanostatic control, over entire measurable frequency range. The applied frequency resolution should be  $0.003\%$  or better. Also real-time measurement plots needed for – Lissajous curve, Nyquist, Bode, Admittance, Dielectric & Mott-Schottky.
17. Digital Inputs / Outputs, Auxiliary Voltage Input, DAC voltage Output
18. USB interface to communicate with PC
19. The Software to be provided with the Potentiostat / Galvanostat should be comprehensive, fully windows based with three-dimensional view of graphics and analysis software. Software should record current, voltage and time for cyclic and



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linear sweep voltammetric measurement. It should be possible to record current, voltage and time data in tabular format for each measuring point in voltammogram. Software should be capable of supporting a wide variety of electrochemical techniques as mentioned below:

Cyclic & Linear Sweep Voltammetry

Linear Polarization

Differential Pulse, Sampled DC & Square Wave Voltammetry

Chrono-amperometry, chrono-coulometry and chrono-potentiometry ( $\Delta t > 1$  ms)

Tutorials to help the user to familiarize with software

Programming of different electrochemical methods and optional accessories

Software Development Kit to control the PGStat using Labview Software.

Comprehensive database structure & powerful data analysis tool.

Inbuilt electrochemical spread sheet

User programmable formulae to new plots.

Powerful graphic engine with useful features such as individual Axis scaling, overlays, multiple Y axes, plot addition, zooming and rotation.

Each plot should be saved as a vector image file to use directly in paper or presentation.

Built-in Calibration with Internal Dummy Cell for calibration check

20. Warranty: 3 years from the date of installation

21. Certification: CE approved

22. The hardware must be capable for the following future up gradation possibilities.

a. Current booster's 10 A or more

b. Ultra-low current measurement capability with at least 125 nA current resolution

#### **B. Required Accessories:**

1. Small volume (15ml) cell with gas purging provision, Ag/AgCl Reference Electrode, Pt Wire Counter Electrode, GC Working Electrode
2. Computer with at least i5 processor, 8GB RAM, 1TB HDD, Windows10 etc.