

epsilon™ Electrochemistry



epsilon is a family of potentiostats/galvanostats designed to allow the user great flexibility in choosing their particular instrument. The most basic epsilon instrument can be used for standard techniques making it ideal for the teaching lab or for materials characterization (e.g., characterization of transition metal complexes by cyclic voltammetry and controlled potential electrolysis, or of biosensors by cyclic voltammetry and constant potential amperometry). Pulse, square wave, and stripping techniques can be added by a software upgrade, and a second channel can be added by a hardware upgrade. The Methods Option allows multiple techniques to be grouped together and repeated. This adds a great amount of flexibility to the instrument.

Features

- Potentiostat, galvanostat and potentiometer
- PC-controlled
- Windows® multiple document interface
- Optically isolated circuitry for noise reduction
- USB computer connection
- Control of BASi accessories such as cell stands (C3, CGME, RDE-2, and PWR-3)
- Bipotentiostat option
- Wide current range
- Peak finding routine (auto and manual)
- File subtraction
- File overlay
- Positive feedback iR compensation
- Initiate experiments at open circuit potential
- Internal dummy cells for hardware self-test and troubleshooting
- Analog filters - automatic and manual control
- 50/60 Hz selection for noise minimization
- Digital smoothing
- Data file conversion to various text formats, including DigiSim® compatible format
- IUPAC/Polarographic conventions

Techniques

Basic

Cyclic Voltammetry and Linear Sweep Voltammetry

Scan rate: 1 mV/s - 25 V/s
Step height: 100 μ V
Peak analysis - tailing (peak potential and current reported)
Optional software: DigiSim digital simulation

Chronoamperometry/Chronocoulometry

Single or double potential step
Step time: 1 ms – 65 s
Cottrell plot analysis (slope, intercept, and correlation coefficient reported)
Digital integration of current for charge vs time
Anson plot analysis (slope, intercept, and correlation coefficient reported)
Resolution: \approx 20 μ s

Controlled Potential Electrolysis

Electrolysis termination by time, minimum current, final/initial current ratio or total charge
High resolution 20-bit data
Data acquisition rate up to 20 Hz

DC Potential Amperometry

High resolution 20-bit data
Data acquisition rate up to 20 Hz

Chronopotentiometry

Potential resolution 20 μ V
High resolution 20-bit data
Data acquisition rate up to 20 Hz
Optional auto termination by potential

Open Circuit Potential vs. Time

Potential resolution 20 μ V
High resolution 20-bit data
Data acquisition rate up to 20 Hz

Basic Plus Option

Sampled Current Polarography

Staircase waveform

Normal Pulse Voltammetry/Polarography

Easy to change pulse width, period (drop time) and current sampling parameters

Differential Pulse Voltammetry/Polarography

Easy-to-change pulse width, period (drop time) and current sampling parameters
Measurement of peak potential, current, and area

Square Wave Voltammetry

Fastest of the common quantitative analysis techniques
Excellent detection limits
User-selectable frequency, amplitude, and current sampling
Square wave frequency: 1 Hz - 2000 Hz
Measurement of peak potential, current, and area

Stripping Voltammetric Techniques

Combination of deposition (preconcentration) step followed by voltammetric (stripping) step
Linear sweep, differential pulse, and square wave voltammetries available for stripping step
Capable of anodic, cathodic, and adsorptive stripping determinations
Measurement of peak potential, current, and area with auto or manual definition of baselines

Double Potential Step Chronopotentiometry

Minimum step time: 1 ms
Current range: \pm 32 mA
Resolution: \approx 20 μ s
Potential resolution: 20 μ V

Bipotentiostat Option

Multichannel Amperometry

Constant potential amperometry on two channels
Data acquisition up to 20 Hz
High resolution 20-bit data

Multichannel Cyclic Voltammetry

Both electrodes scanned identically
Scan Electrode 1 and Constant Potential Electrode 2

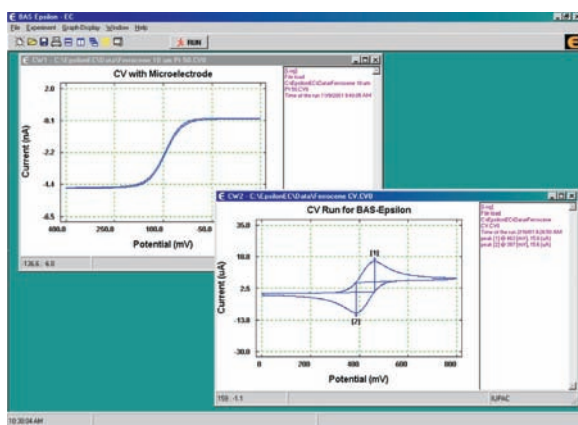
Multichannel Chronoamperometry

Both electrodes stepped identically
Step Electrode 1 and Constant Potential Electrode 2

Methods Option

Sequential Techniques

Sequence up to 6 techniques
Insert delays and trigger in sequence
Auto-repeat sequence up to 9999 times



Specifications

Potentiostat

Compliance voltage: ± 12 V (Channel 1)
Applied potential: Dynamic DAC:
16 bit, ± 3.275 V @ 0.1 mV resolution
Offset DAC: 8 bit, ± 2.55 V @ 10 mV resolution
Maximum current: 100 mA
Bandwidth: > 100 kHz
Bias current: < 1 pA
Electrometer input impedance: > 10^{12} W

Galvanostat

Applied current: 50 pA - 50 mA
Range: ± 10 V, ± 1 V
Measured potential resolution: 0.02 mV
Maximum leakage current: 30 pA

Current-to-voltage Converter

Full scale sensitivity:
1 nA*, 10 nA*, 100 nA, 1 μ A, 10 μ A, 100 μ A,
1 mA, 10 mA, 100 mA (*secondary gain used)
Filter (2 pole Bessel): 0.1, 1.0, 10, 100, 1.0 k, and 10 kHz
Secondary gain: x1, x10, and x100
Bandwidth: >100 kHz
ADC resolution: 16 bit
Sampling rate: 50 kHz (20 μ s/conversion)
Data length: 32k points – fast

I/O

Analog: E_{out} , I_{out} , and E_{in}
Cell Stand port (control of C3 Cell Stand and CGME)
Accessories port (RDE-2 and PWR-3 control)
USB port
Trigger out: start and end of run
Trigger in: start run

Minimum PC Requirements

Windows 2000, XP, or Vista
Pentium III or higher
512 MB RAM
20 MB hard drive space available
USB port
CD-ROM drive

Power Requirements

100/120/220/240 V
50/60 Hz
120 W

Dimensions and Weight

16.75" (43 cm) X 5.25" (13 cm) X 12.75" (32.5 cm)
1 channel - 20.2 lb. (9.2 kg)



C3 Cell Stand

The C3 Cell Stand is a general-purpose accessory for electroanalytical experiments. It provides a base to support the cell vial and a mounted cell top to hold the electrodes. The base also contains a magnetic stirrer, and there are lines for inert gas purging. Stirring and gas purging are available by remote control by BASi EC epsilon. The standard package contains all accessories needed to run basic electrochemistry experiments.



CGME

The CGME is a mercury drop electrode that can be used as a Dropping Mercury Electrode (DME), a Static Mercury Drop Electrode (SMDE) (e.g., for polarography), and a Hanging Mercury Drop Electrode (HMDE) (e.g., for anodic stripping voltammetry). The mercury drop is grown by opening a fast-response valve, and drop size is determined by the length of time the valve is open, which allows a wide range of drop sizes.



RDE-2

The BASi RDE-2 is a rotator system for both fixed rotation rate and hydrodynamic modulation rotating disk electrochemical experiments. Rotation rates from 50 to 10,000 RPM are available with better than 1% accuracy. The rotator unit is manually raised and lowered, and can be inverted for spin-coating. Rotation functions can be controlled remotely using a BASi EC epsilon, or manually.



PWR-3 Power Module

The PWR-3 Power Module supplies up to 1 A with a compliance voltage of 85 V, and can be used as a current and compliance voltage booster for the EC epsilon.

Note: This is a booster for potentiostatic experiments only. (No galvanostat capabilities.)

epsilon Pricing: www.BASInc.com

BASIC INSTRUMENT

e2 Electrochemical Analyzer
e2P Electrochemical Analyzer with PC

CHANNEL OPTION

0 Single Channel
2 Bi-Potentiostat

SOFTWARE PACKAGE OPTION

0 Basic Software Package
1 Basic Plus Package
2 Methods Option
3 Both Basic Plus and Methods Option

CELL STAND OPTION

1 C3 Cell Stand
2 CGME
3 Both C3 and CGME
0 No Cell Stand

RDE (ROTATING DISK ELECTRODE) OPTION

1 RDE-2
0 No RDE-2

DIGITAL SIMULATION SOFTWARE OPTION

1 DigiSim
0 No DigiSim

POWER MODULE

1 PWR-3 Power Module
0 No Power Module

For Example: e2-011100 is an epsilon Electrochemical Analyzer with a Single Channel, and includes the Basic Plus Package, C3 Cell Stand, and RDE-2.

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