Princeton Applied Research

Product Catalog

Potentiostats ● Galvanostats ● Power Boosters ● Scanning Systems ● Software

AMETEK®

Contents

The contents of this catalog contain a brief summary of the products offered by Princeton Applied Research. For further detailed specifications, please view our complete listing of product brochures online at www.princetonappliedresearch.com, or contact your local sales representative.

How To Choose A Potentiostat

Princeton Applied Research offers a broad range of potentiostats providing the optimum selection for every price range and application. There are many ways to go about purchasing a potentiostat. Most of the time certain specifications are the overriding factor in the selection process. These include:

- Price/Performance
- Maximum and Minimum Current
- Booster Capability
- Compliance Voltage
- Impedance Capability
- Highest Measurable Frequency
- Communication Protocol
- Floating Ground
- Programmability

Price/Performance

Value may be a consideration in purchasing an instrument. This usually means the customer is looking for good performance at an economical price. Sometimes it may mean that a unit which can be purchased at a good entry price can be expanded over time with additional features and upgrades. The VersaSTAT series is a perfect choice in these situations. With very good specifications, at an economical price, it can be optioned to perform an impressive list of electrochemical experiments.

Current

For many applications, the maximum current is the most important factor. For battery and fuel cell testing, and sometimes plating, higher currents are required. The 263A and the VersaSTAT 3/4/MC with their 2 amp option and the PARSTAT®2273 have the highest deliverable currents at 2 amps. These instruments can all be integrated with a current booster system to provide up to 20 amps, if desired.

The lowest measurable current or sensitivity is important in electrochemical trace analysis, and in high impedance applications. For low current measurements, the PARSTAT® 2273 is particularly suited and can go down to low pA levels in some applications. The high input impedance of this unit and the low input capacitance make it an excellent choice for the study of high impedance coatings and micro-electrode research.

Voltage

Maximum voltage can be important. In low conductivity solutions, or in concrete applications, for example, high compliance voltage of the potentiostat may be needed to drive the current through the solution from the counter to the working electrode. The PARSTAT® 2273 with its 100V compliance unit is well suited for these applications.

Impedance

Impedance capability can be a determining factor in the choice made. Almost all of our potentiostats can be interfaced into an impedance system. The PARSTAT® series has the impedance circuitry built into the potentiostat which comes standard. The VersaSTAT® series also has impedance circuitry built in which can be added as an option.

The salient specs here would be the highest measurable frequency and the input impedance and capacitance. The input impedance (along with lowest current measurement accuracy) dictates the highest impedance that can be measured, and the input capacitance determines the highest frequency a particular resistance can be measured to.

Communication

For ease of use and installation, the PARSTAT® and VersaSTAT® series of potentiostats utilize USB communication protocol. We continue to offer GPIB systems as well with the 263A and 273A systems.

Floating Ground

In some applications, it is necessary to have the electrodes of the potentiostat isolated (floating) from ground due to other components of the cell being grounded, such as an autoclave or corrosion studies within pipelines. In these cases, a potentiostat whose ground is not tied to the earth ground is required to make proper measurements. Only a select few systems are designed to operate in this manner such as the VersaSTAT 3F.

Versatility

There are occasions where the user wishes to design their own experimental techniques, and use the potentiostat in unconventional ways. Every Princeton Applied Research system was designed for versatility, so consult with one of our many sales and/or support specialists to determine which system best fits your needs, both now and in the future.

Global Leader

For over forty years, Princeton Applied Research has been recognized as THE Global Leader in the design and manufacture of electrochemical instruments. Our instruments are performance driven, designed to address the needs of today's varied electrochemical applications. Our valued customers have made us the benchmark against which all other electrochemical instruments are measured.

Wide Range of Potentiostats

We offer the widest range of potentiostats, with specifications and prices to meet most research applications and budgets. From high current and high voltage to extremely sensitive current measurements, front panel to computer control, single channel to multi-channel, Princeton Applied Research has the answer for your instrument needs.

Complimentary Products

To complete your electrochemical measurement system, we offer a wide range of cells, electrodes, and accessories. We also provide **Impedance Analyzers, Quartz Crystal Microbalances, Rotating Electrode Assemblies, and Mercury Electrodes**. All of your testing needs can be addressed with one purchase.

Corporate Overview

Princeton Applied Research is an operating unit within Advanced Measurement Technology, Inc. located in Oak Ridge, TN, USA. It is a division of Ametek, Inc. a leading manufacturer of electronic instruments with over $2.5 Billion in annual sales.

Applications

Corrosion Research

The worldwide cost of corrosion is estimated at billions of dollars per year and represents several percent of GDP for most industrial countries. Corrosion affects our lives in many ways, causing safety and maintenance problems in bridges, buildings, pipelines, aircraft, automobiles and household goods. Investigation into improved coatings, inhibitors and alloys continues to combat the devastating cost of corrosion but more research is needed.

Salt spray / coupon tests continue to be widely used in the investigation of corrosion phenomena. However, these tests typically take months to obtain information and are useless for investigating time-varying effects. By comparison, electrochemical test instrumentation (using potentiodynamic and galvanodynamic techniques) is able to obtain accurate results in a very short time period, allowing, for example, real-time monitoring of the performance of coatings and corrosion inhibitors.

Electrochemical techniques provided by our instruments that are widely used in corrosion applications include:

- Linear polarization resistance (LPR) and Tafel analysis – providing measurement of corrosion current (Icorr), polarization resistance (Rp) and corrosion rate
- Cyclic Polarization - providing a way to study localized, pitting corrosion
- Electrochemical impedance spectroscopy (EIS) - providing fast, non-destructive characterization of corrosion phenomena and verification of Rp and corrosion rate data obtained by LPR
- EIS at various polarization levels - providing impedance information relating to different corrosion regimes such as passivation and pitting

Battery, Fuel Cell and Supercapacitor Research

Fuel cells offer the prospect of cleaner, more environmentally friendly energy sources for the future and research continues to be a priority for these devices. The development of micro fuel cells for mobile communications and PC applications is an exciting new application of this technology. Supercapacitors continue to be developed for instantaneous high power applications. New technology ultra-thin / ultra-flexible batteries are being developed for smart-card and intelligent paper applications.

Measurement facilities provided by our instruments required for the analysis of small batteries, supercapacitors and fuel cells include:

- Charge / discharge cycling techniques for investigating cell performance and lifetime
- High-speed data acquisition for mobile phone GSM and CDMA pulse discharge applications
- Electrochemical impedance spectroscopy (EIS) - widely used for the characterization of batteries, supercapacitors and fuel cells
- High current capability with booster options for testing small cells and external power booster options for larger cells

Research electrochemistry

Research electrochemistry is a broad subject that covers many areas of investigation and therefore requires flexible test equipment that can be easily adapted to the requirements.

High current options may be added as the requirement grows, so whether the application involves electrodeposition or pulse-plating our instruments remain the ideal choice. With our wide selection of measurement techniques, our instruments provide the range of capabilities that are needed to cover the diverse requirements of a modern research laboratory.

Sensors

Sensors are an integral part of our daily lives, and Princeton Applied Research systems have been utilized in research that brought many of these sensors to market. Sensors for glucose measurement to assist diabetics in controlling their blood glucose levels are just one of the many sensor applications that have been advanced by research utilizing our potentiostats/galvanostats. Be it potentiometric voltametric, gas, or biological sensors, the development and utilization of these as transducers continue to expand, and you can count on our systems to provide the capabilities and performance that researchers need to refine these life-enhancing devices.

Biomedical applications

DC corrosion analysis techniques are used to investigate the corrosion susceptibility of metallic biomedical implant devices such as artificial hips, orthopedic screws / rods and prosthetics. New alloys and implant techniques are continually being developed but corrosion still causes cracks and fractures in load bearing implants and inflammation due to corrosion products being deposited in the surrounding tissue.

Our instruments are ideal for running test standards such as the ASTM F2129 “Standard Test Method for Conducting Cyclic Potentiodynamic Polarization Measurements to Determine the Corrosion Susceptibility of Small Implant Devices” that are widely used in this application.

Surface Imaging and Scanning

Scanning systems combine the functionality of electrochemical measurements with an advanced positioning system in order to map local activity. A modular base provides flexibility to gain information on local events for various applications, ranging from pitting corrosion to sensor development to electrode kinetics. The spatial resolution of these scanning techniques provides complementary information to the traditional integrated response of bulk electrochemical methods.

Education

Princeton Applied Research offers a wide range of price-performance systems, including a lower cost, easy to use, yet powerful electrochemical system within range of most educational/teaching budgets. For the undergraduate or graduate level instruction, we can provide a system that is feature-rich and fully capable of performing those experiments most relevant to the theory and application of electrochemistry. Include with this our easily accessible and capable technical support team eager to assist the next generation of electrochemical researchers, and you have the ideal product for educational applications.

PARSTAT 2273
potentiostat/galvanostat

The PARSTAT 2273 is the ultimate potentiostat/galvanostat/FRA, boasting superior quality and high reliability. The 2273's exceptional impedance capability, resolution, speed, high current, and high compliance voltage continues to be the standard against which all other systems are measured.

The 2273 is designed to be the most comprehensive potentiostat/galvanostat/FRA in your laboratory. We have incorporated customer feedback to provide not only more internal maximum current but the ability to boost up to 20A and the ability to interface all the ancillary equipment customers need today for their unique research.

The PARSTAT 2273 provides most all the capabilities you need in your laboratory:

- 2 A current max. (20 A boosted)
- 100 V compliance
- 1.2 fA current resolution
- $>10^{13}$ Ω input impedance
- <5 pF of capacitance
- 10 µHz to 1 MHz built in analyzer for impedance

The PARSTAT 2273 is designed to support the following applications:

- Research Electrochemistry
- Corrosion
- Sensors
- Batteries/Fuel Cells
- Electrodeposition/Plating
- Biomedical Applications

OPTIONS:

- 8A booster option
- 10A booster option
- 20A booster option

Power Amplifier	
Compliance Voltage	±100 V
Maximum Current	±2 A
Rise Time	<250 ns (No Load)
Slew Rate	>15 V/µs (No Load)
System Performance	
Minimum Time Base	20 µs
Minimum Potential Step	2.5 µV
Noise and Ripple	<50 µV/rms (typical)
Minimum Current Range	2 nA (hardware)
Minimum Current Range	40 pA (after 50X gain)
Minimum Current Resolution	1.2 fA
iR Compensation	
Positive Feedback Range	2000 MΩ to 2 Ω (depending on current range)
Current interrupt	16 bit DAC Potential Error correction
Current Measurement	
Ranges	12 decades, 2A to 40 pA (with internal gain applied)
Accuracy (dc)	20 µA to 2A: <0.4% Full Scale 20 nA and 1 µA Ranges: <0.5% 2 nA < 0.75%
Differential Electrometer	
Input Bias Current	< 5pA at 25°C
Max. Voltage Range	± 10 V
Max. Input Voltage Differential	± 10 V
Bandwidth	3 dB @ >15 MHz
Common Mode Rejection	>80 dB at 100 Hz
	>60 dB at 100 kHz
Input Impedance	$>10^{13}$ Ω in parallel with <5 pf
Impedance (EIS)	
Mode	Potentiostatic / Galvanostatic
Frequency Range	10 µHz to 1 MHz
Minimum AC Voltage Amplitude	0.1mV RMS
Sweep	Linear or Logarithmic
Interface	
Digital inputs / Outputs	5 TTL logic outputs, 2 TTL logic inputs
Interface	
Ext In	±10 V analog input. Input impedance is 4.0 k Ω
E Monitor	Front panel analog output of current readings.Range ±10V, 50Ω output impedance
I Monitor	Front panel analog output of current readings.Range ±10V, 50Ω output impedance, 0 to ±2 V corresponds to ±full scale current range
Interface	
DAC Voltage Output	±10 range
	BNC Connector (for stirrers, rotating disk electrodes, etc.)
PC / Software	
Communications Interface	Universal Serial Bus (USB)
Software	PowerSuite

VersaSTAT 4
potentiostat/galvanostat

The VersaSTAT 4 builds upon the already impressive new design of the VersaSTAT 3 giving you even more improved speed, versatility, and precision required for a range of electrochemical applications.

The increased maximum current of 1A standard, as well as optional current boosters up to 20A, positions the VersaSTAT 4 to take you from the early stages of battery and fuel cell development to the charge/discharge experiments on the final product and the challenges that lie ahead for the next generation of batteries.

The improved low current performance with fA resolution and pA accuracy addresses current sensitive applications such as sensors, corrosion inhibitors, and combined with the optional FRA, coating technologies. The additional analog filtering makes the VersaSTAT 4 an even better choice for corrosion applications while the additional bandwidth filtering adds extra stability for capacitive cells. The VersaSTAT 4, with its added capabilities, makes an exciting addition to our VersaSTAT family making them even more of an exceptional value for all of your application needs.

- Improved low current performance with fA resolution and pA accuracy
- Maximum current up to 1A with additional booster options ranging from 2A-20 A
- 2 µs time base for faster data acquisition and faster scan rates
- Additional analog filter selections on current and voltage channels for superior signal/noise measurements
- Additional bandwidth filtering options for greater stability on capacitive cells
- An internal frequency response analyzer option that provides impedance analysis over the frequency range 10 µHz to 1 MHz
- Easy-to-use VersaStudio software included

OPTIONS:

- 2A high current option
- FRA Option
- Advanced Auxiliary Interface

Data Acquisition	
Data Acquisition	3 x 16 bit 500 k samples per secondADCs synchronized-voltage/current/auxillary
Time Base Resolution (minimum)	2 µs (500k samples/second)
Automatic Noise Filters	enabled/disabled
Power Amplifier	
Voltage Compliance	± 12 V
Current Compliance	± 1A (standard) ±2A (with 2A option)
Potentiostat Bandwidth	1 MHz
Stability Settings	high speed, high-stability
Slew Rate	> 8 V per µs typical (no load)
Rise Time (-1.0V to +1.0V)	<350 ns (no load)
Voltage Control (potentiostat mode)	
Applied Voltage Range	± 10 V
Applied Voltage Resolution	for ±10 mV signal = 300 nV for ±100 mV signal = 3 µV for ±1 V signal = 30 µV for ±10 V signal = 300 µV
Applied Voltage Accuracy	±0.2% of value ±2 mV
Maximum Scan Rate	5000 Vs^{-1} (10mV step)
Maximum Scan Range	±10 V / 300µV
Current Control (galvanostat mode)	
Applied Current Range	±full scale(depends on range selected) ±1A (standard), ±2A (with option)
Applied Current Resolution	±1/32,000 x full scale
Applied Current Accuracy	±0.2% of reading, ±0.2% of range ±200 pA
Max. Current Range/Resolution	±1A / 60 µA
Min. Current Range/Resolution	±4nA / 120 fA
Electrometer	
Max. Input Range	±10 V
Bandwidth	≥ 10 MHz (-3dB)
Input impedance	≥ 10^{12} Ω in parallel with ≤ 5 pF (typical)
Leakage current	≤ 5 pA at less than 25°C
CMRR	60 dB at 100 kHz (typical)
Voltage Measurement	
Voltage range	± 10 V
Minimum resolution	6 µV
Voltage accuracy	±0.2% of reading, ±2 mV
Current Measurement	
Current ranges	Auto-ranging (10 ranges) 1A to 4nA (8 ranges) 2A to 4nA (with option)
Current resolution	120 fA (4nA range)
Current accuracy (DC)	20 nA to 2A ±0.2% of reading, ±0.2% of range 4 nA <0.5% ± 20 pA
Bandwidth	1 MHz (signal ≥2mA range typical)
Bandwidth limit filter	Yes, five total
Impedance (EIS) Option	
Mode	Potentiostatic / Gavanostatic
Frequency range	10 µHz to 1 MHz
Minimum AC voltage amplitude	0.1mV RMS
Sweep	Linear or Logarithmic
PC / Software	
Communication Interface	Universal Serial Bus (USB)
Software	VersaStudio

VersaSTAT 3
potentiostat/galvanostat

The VersaSTAT 3 potentiostat/galvanostat design incorporates over forty years of Princeton Applied Research knowledge and expertise in the development of world leading electrochemical test products with advanced performance from the very latest measurement technology. This, together with easy to use, yet powerful PC software, makes the VersaSTAT 3 the best value electrochemical test system on the market.

The VersaSTAT 3 provides most of the capabilities you need in your laboratory:

- ±650mA / ±10 V polarization range as standard - ideal for many electrochemical applications including corrosion, sensors and biomedical
- ±2A high current option and boosters up to 20A for battery, fuel cell or electroplating applications
- Excellent current measurement resolution for corrosion, coatings and micro-electrode analysis
- An optional internal frequency response analyzer that provides impedance analysis over the frequency range 10 µHz to 1 MHz

The VersaStudio software is included with all VersaSTAT 3 systems. Systems are provided for a range of voltammetry and corrosion applications. The following groups of techniques are available:

- **Corrosion** providing multiple corrosion analysis techniques such as LPR, Tafel etc
- **Voltammetry** providing basic and advanced scan, step and pulse electrochemical techniques
- **Impedance** may be added to any system to provide electrochemical impedance spectroscopy techniques

The impressive combination of performance and versatility makes the VersaSTAT 3 tremendous value for researchers and scientists.

OPTIONS:

- 2A high current option
- FRA Option
- Advanced Auxiliary Interface

Data Acquisition	
Data Acquisition	3 x 16 bit 500 k samples per secondADCs synchronized-voltage/current/auxiliary
Time Base Resolution (minimum)	10 µs (100k samples/second)
Automatic Noise Filters	enabled/disabled
Power Amplifier	
Voltage Compliance	± 12 V
Current Compliance	± 650 mA (standard) ±2A (with 2A option)
Potentiostat Bandwidth	1 MHz
Stability Settings	high speed, high-stability
Slew Rate	> 8 V per µs typical (no load)
Rise Time (-1.0V to +1.0V)	<350 ns (no load)
Voltage Control (potentiostat mode)	
Applied Voltage Range	± 10 V
Applied Voltage Resolution	for ±10 mV signal = 300 nV for ±100 mV signal = 3 µV for ±1 V signal = 30 µV for ±10 V signal = 300 µV
Applied Voltage Accuracy	±0.2% of value ±2 mV
Maximum Scan Rate	5000 Vs^{-1} (50 mV step)
Maximum Scan Range	±10 V / 300µV
Current Control (galvanostat mode)	
Applied Current Range	±full scale(depends on range selected) ±650mA (standard),±2A (with option)
Applied Current Resolution	±1/32,000 x full scale
Applied Current Accuracy	±0.2% of reading, ±0.2% of range
Max. Current Range/Resolution	±650 mA / 60 µA
Min. Current Range/Resolution	±200 nA / 60 pA
Electrometer	
Max. Input Range	±10 V
Bandwidth	≥ 10 MHz (-3dB)
Input impedance	≥ $10^{12}\Omega$ in parallel with ≤ 5 pF (typical)
Leakage current	≤ 5 pA at less than 25°C
CMRR	60 dB at 100 kHz (typical)
Voltage Measurement	
Voltage range	± 10 V
Minimum resolution	6 µV
Voltage accuracy	±0.2% of reading, ±2 mV
Current Measurement	
Current ranges	Auto-ranging (8 ranges) 650 mA to 200 nA (8 ranges) 2A to 200 nA (with option)
Current resolution	6pA (200nA range)
Current accuracy (DC)	±0.2% of reading, ±0.2% of range
Bandwidth	1 MHz (signal ≥2 mA range typical)
Bandwidth limit filter	Yes
Impedance (EIS) Option	
Mode	Potentiostatic / Gavanostatic
Frequency range	10 µHz to 1 MHz
Minimum AC voltage amplitude	0.1 mV RMS
Sweep	Linear or Logarithmic
PC / Software	
Communication Interface	Universal Serial Bus (USB)
Software	VersaStudio

VersaSTAT 3F
floating option potentiostat/galvanostat

The VersaSTAT 3F is the latest addition to the VersaSTAT family. Although sharing similar specifications to the VersaSTAT 3 (10 µs data acquisition, +/-650 mA current range) and the VersaSTAT 4 (4 nA lower current range, enhanced filtering options), the VersaSTAT 3F was designed specifically to operate with earth-grounded cells.

The "F" in the VersaSTAT 3F name is for "floating," a term used to describe the electrical isolation of the systems electrode leads and rear panel connectors from earth ground. In floating mode, the internal ground of the VersaSTAT 3F (as well as the cell leads and external connections at the rear panel) is allowed to float with respect to earth ground which allows it to operate with these grounded cells. Examples of earth grounded cells include autoclaves, strain apparatus, storage tanks and pipelines, and additional electrodes connected to a separate potentiostat that is not floating

The VersaSTAT 3F was designed to operate in either a "normal" mode (same mode as V3 and V4 models) or a "floating" mode, selectable in the operating software. In addition to the mode selections, the VersaSTAT 3F also provides additional filters that could be required with some cells in order to enhance the signal to noise. A special "Notch Filter" for those frequencies associated with line power (50/60Hz), and "EIS Filters" (for those systems equipped with the FRA option) are available as needed.

- Capable of "floating" for operation with grounded cells and electrodes
- Specialized filters for float mode operation for enhanced signal/noise ratio
- ±650 mA / ±10 V polarization range as standard - ideal for many electrochemical applications including corrosion, sensors and biomedical
- An internal frequency response analyzer option that provides impedance analysis over the frequency range 10 µHz to 1 MHz
- Additional bandwidth filtering options for greater stability on capacitve cells
- Easy-to-use VersaStudio software included

Data Acquisition	
Data Acquisition	3 x 16 bit 500 k samples per secondADCs synchronized-voltage/current/auxillary
Time Base Resolution (minimum)	10 µs (500 k samples/second)
Automatic Noise Filters	enabled/disabled
Power Amplifier	
Voltage Compliance	± 12 V
Current Compliance	± 650 mA (standard) ±2A (with 2A option)
Potentiostat Bandwidth	1 MHz
Stability Settings	six settings; high stability
Slew Rate	> 8 V per µs typical (no load)
Rise Time (-1.0V to +1.0V)	<350 ns (no load)
Voltage Control (potentiostat mode)	
Applied Voltage Range	± 10 V
Applied Voltage Resolution	for ±10 mV signal = 300 nV for ±100 mV signal = 3 µV for ±1 V signal = 30 µV for ±10 V signal = 300 µV
Applied Voltage Accuracy	±0.2% of value ±2 mV
Maximum Scan Rate	5000 Vs^{-1} (10mV step)
Maximum Scan Range	±10 V / 300µV
Current Control (galvanostat mode)	
Applied Current Range	±full scale(depends on range selected) ±650mA (standard),±2A (with option)
Applied Current Resolution	±1/32,000 x full scale
Applied Current Accuracy	±0.2% of reading, ±0.2% of range ±200 pA
Max. Current Range/Resolution	±650 mA / 60 µA
Min. Current Range/Resolution	±4 nA / 120 fA
Electrometer	
Max. Input Range	±10 V
Bandwidth	≥ 10 MHz (-3dB)
Input impedance	≥ 10^{12} Ω in parallel with ≤ 5 pF (typical)
Leakage current	≤ 5 pA at less than 25°C
CMRR	60 dB at 100 kHz (typical)
Voltage Measurement	
Voltage range	± 10 V
Minimum resolution	6µ V
Voltage accuracy	±0.2% of reading, ±2 mV
Current Measurement	
Current ranges	Auto-ranging (10 ranges) 1A to 4 nA (8 ranges) 2A to 4 nA (with option)
Current resolution	120 fA (4 nA range)
Current accuracy (DC)	20 nA to 2A ±0.2% of reading, ±0.2% of range 4 nA <0.5% ± 20 pA
Bandwidth	1 MHz (signal ≥2 mA range typical)
Bandwidth limit filter	Yes, five total
Impedance (EIS) Option	
Mode	Potentiostatic / Gavanostatic
Frequency range	10 µHz to 1 MHz
Minimum AC voltage amplitude	0.1 mV RMS
Sweep	Linear or Logarithmic
PC / Software	
Communication Interface	Universal Serial Bus (USB)
Software	VersaStudio

VersaSTAT MC

mulit-channel potentiostat/galvanostat

Princeton Applied Research recognizes that traditional single channel systems do not always satisfy the demands for economy and throughput, yet many multi-channel systems are designed to satisfy only specific markets and/or applications. The VersaSTAT MC was designed to have the broad capabilities of a research-grade single-channel electrochemical system along with the value and increased throughput provided by multi-channel systems.

Each VersaSTAT MC can be equipped with up to four (4) channels. The system can be ordered fully loaded, or for those with limited budgets, the VersaSTAT MC can be purchased initially with only a single channel then upgraded later to add additional channels or options as needed or budget permits. If more than four channels are needed, multiple units can interface to the same computer and all channels controlled independently with the VersaStudio software.

- Versatile performance in choice of 1-4 channels at an affordable price – the ideal choice for performance, productivity, and value
- ±650mA / ±10V polarization range as standard – ideal for most electrochemical applications including corrosion, sensors, and biomedical
- Impedance measurement capability standard on all channels simultaneously and/or independently from 10uHz to 1MHz with no separate analyzer required
- Options for each channel include ± 2A high current option and boosters up to 20A for battery, fuel cell, or electroplating applications
- High speed DC measurement and experiment sequencing (e.g. for step / pulse analysis)
- VersaStudio software designed for versatility and ease of use

OPTIONS:

- 2A high current option
- Advanced Auxiliary Interface

Data Acquisition	
Data Acquisition	3 x 16 bit 500 k samples per secondADCs synchronized-voltage/current/auxillary
Time Base Resolution (minimum)	10 µs (100 k samples/second)
Automatic Noise Filters	enabled/disabled
Power Amplifier	
Voltage Compliance	± 12 V
Current Compliance	± 650 mA (standard) ±2A (with 2A option)
Potentiostat Bandwidth	1 MHz
Stability Settings	high speed, high-stability
Slew Rate	> 8 V per µs typical (no load)
Rise Time (-1.0V to +1.0V)	<350 ns (no load)
Voltage Control (potentiostat mode)	
Applied Voltage Range	± 10 V
Applied Voltage Resolution	for ±10 mV signal = 300 nV for ±100 mV signal = 3 µV for ±1 V signal = 30 µV for ±10 V signal = 300 µV
Applied Voltage Accuracy	±0.2% of value ±2 mV
Maximum Scan Rate	5000 Vs^{-1} (50 mV step)
Maximum Scan Range / Resolution	±10 V / 300 µV
Current Control (galvanostat mode)	
Applied Current Range	±full scale(depends on range selected) ±650mA (standard),±2A (with option)
Applied Current Resolution	±1/32,000 x full scale
Applied Current Accuracy	±0.2% of reading, ±0.2% of range
Max. Current Range/Resolution	±650 mA / 60 µA
Min. Current Range/Resolution	±200 nA / 60 pA
Electrometer	
Max. Input Range	±10 V
Bandwidth	≥ 10 MHz (-3 dB)
Input impedance	≥ 10^{12} Ω in parallel with ≤ 5 pF (typical)
Leakage current	≤ 5 pA at less than 25°C
CMRR	60 dB at 100 kHz (typical)
Voltage Measurement	
Voltage range	± 10 V
Minimum resolution	6 µV
Voltage accuracy	±0.2% of reading, ±2 mV
Current Measurement	
Current ranges	Auto-ranging (8 ranges) 650 mA to 200 nA (8 ranges) 2A to 200 nA (with option)
Current resolution	6 pA (200 nA range)
Current accuracy (DC)	±0.2% of reading, ±0.2% of range
Bandwidth	1 MHz (signal ≥ 2mA range typical)
Bandwidth limit filter	Yes
Impedance (EIS) Option	
Mode	Potentiostatic / Gavanostatic
Frequency range	10 µHz to 1 MHz
Minimum AC voltage amplitude	0.1 mV RMS
Sweep	Linear or Logarithmic
PC / Software	
Communication Interface	Universal Serial Bus (USB)
Software	VersaStudio

Model 263A and Model 273A

potentiostat/galvanostat

The Models 263A and 273A are legendary in their combined capability, reliability, and performance. With more than 30 years of market presence between the two models and thousands of references in scientific journals to endorse their value, these systems continue to be the preferred choice of many top researchers in electrochemistry. For those that appreciate and desire a more traditional system, we are proud to continue offering both the 263A and 273A systems.

Use the 263A to service most all your laboratory needs:

- 20V compliance 200mA current output
- High current options from 2A up to 20A
- EIS capable up to 100kHz with optional LIA/FRD

Take advantage of the 273A's superior quality in your laboratory:

- 100 V compliance 1 A current output
- Excellent general purpose instrument
- In use in thousands of laboratories around the world

Model 263A Key System Specifications	
Compliance Voltage	±20 V
Max. Voltage Range	±10 V
Maximum Current	±200 mA
Minimum Current Range	100 nA (hardware)
Minimum Current Range	1 nA (after 50x gain)
Minimum Current Resolution	2 pA
Ranges	7 decades, 100 mA to 100 nA
Accuracy (dc)	10 µA to 100 µA: 0.4% Full Scale 100 nA and 1 µA Ranges: <0.5% ±5 nA Full Scale
Minimum Time Base	30 µs
Input Impedance	$>10^{12}$ Ω in parallel with 20 pF
Dimensions	17.5" W x 18.5" D x 5.5" H
Weight	16 kg (35 lbs)

Model 273A Key System Specifications	
Compliance Voltage	>±100 V
Max. Voltage Range	±10 V
Maximum Current	>±1.0A
Minimum Current Range	±200 mA
Minimum Current Range	100 nA (hardware)
Minimum Current Resolution	1 nA (after 50x gain)
Ranges	8 decades, 1A to 100 nA
Accuracy (dc)	10 µA to 1A: >0.2% of range 100 nA and 1 µA Ranges: <0.5% of range ±5 nA max (±1 nA typical)
Minimum Time Base	50 µs
Input Impedance	$>10^{12}$ Ω in parallel with <50 pF
Dimensions	19" W x 12" D x 20" H
Weight	31 kg (68 lbs)

Specification Summary

	VersaSTAT 3	VersaSTAT 4	VersaSTAT 3F	VersaSTAT MC	PARSTAT 2273	Model 263A	Model 273A
Specification							
Compliance Voltage	±12V	±12V	±12V	±12V	±100V	±20V	±100V
Max Current Output	±650mA	±1A	±650mA	±650mA	±2A	±200mA	±1A
Rise Time (No Load)	<350ns	<350ns	<350ns	<350ns	<250ns	<1µs	<750ns
Slew Rate (No Load)	>8V/µs	>8V/µs	>8V/µs	>8V/µs	>15V/µs	>1V/µs	>10V/µs
Current Measurement							
Max Current Range	±650mA	±1A	±650mA	±650mA	±2A	±100mA	±1A
Min Current Range	±200nA	±4nA	±4nA	±200nA	±2nA	±100nA	±100nA
Accuracy / Range	±0.2%	±0.2%	±0.2%	±0.2%	±0.4%	±0.4%	<0.5%
Min Resolution	6pA	120fA	120fA	6pA	1.2fA	2pA	2pA
Differential Electrometer							
Max Voltage Range	±10V	±10V	±10V	±10V	±10V	±10V	±10V
Input Impedance	$>10^{12}$	$>10^{12}$	$>10^{12}$	$>10^{12}$	$>10^{13}$	$>10^{11}$	$>10^{12}$
Input Capacitance	<5pF	<5pF	<5pF	<5pF	<10pF	<50pF	<50pF
Input Bias Current	<5pA	<5pA	<5pA	<5pA	<5pA	<20pA	<20pA
System Performance							
Max Scan Range	20V	20V	20V	20V	20V	16V	4V
ADC	16 bit	16 bit	16 bit	16 bit	16 bit	12 bit	12 bit
EIS Capable	Option	Option	Option	Yes	Yes	Option	Option
Floating Capabilities	No	No	Yes	No	No	Option	No
Current Booster Option	2A - 20A	2A - 20A	2A - 20A	2A - 20A	8A - 20A	2A - 20A	10A - 20A
Computer Control							
Software	VersaStudio	VersaStudio	VersaStudio	VersaStudio	PowerSuite	PowerSuite	PowerSuite
Communications Interface	USB	USB	USB	USB	USB	GPIB	GPIB

Please refer to individual product brochures for more detailed specifications

VersaSTAT LC
Low Current Interface

The VersaSTAT LC Low Current Interface is a plug-in, research grade option for the VersaSTAT Series of potentiostats/galvanostat, designed for the measurement of ultra-low currents with greater accuracy and resolution than the base system. With the addition of a VersaSTAT LC option, any VersaSTAT Series system will acquire a lowest current range of 4pA and current resolution as small as 122 aA.

The VersaSTAT LC is ideal for applications requiring low current accuracy and resolution. Applications such as ultra micro electrodes, coatings research, corrosion testing of bio-implants, and sensor research are all areas where greater current sensitivity may be needed.

The VersaSTAT LC option can be purchased at any time as a plug-in option. It consists of an interface cable to connect to the VersaSTAT, a main body containing the high input impedance electrometer and additional current ranges, and the cell leads. Once attached to the VersaSTAT system and calibrated with the built-in DC Calibration routine, additional bandwidth stabilization filters are provided with the VersaSTAT LC option to provide maximum stability over a wide range of experimental conditions and applications.

- Femtoampere accuracy and attoampere resolution for both DC and AC (EIS) measurements
- Expands E and i filter selection for VersaSTAT 3 and VMC Systems
- Plug-in add-on for VersaSTAT Series potentiostats/ galvanostts
- Auto-current ranging capability from 200mA - 4pA

System Performance	
Minimum Current Range	4pA (4 x 10^{-12} A)
Minimum Current Resolution	122 aA (122 x 10^{-18} A)

Power Amplifier	
Maximum Current	± 200mA

Differential Electrometer	
Input Bias Current	<200 fA at 25°C
Maximum Voltage Range	± 10 V maximum
Input Voltage Differential	± 10 V
Bandwidth	700 kHz (-3dB)
Common Mode Rejection	>60dB @ 100Hz, >50dB @ 100kHz
Input Impedance	>10^{14} Ω in parallel with <200 fF, typical

Current Measurement	
Ranges	12 decades, 200mA to 4pA
Accuracy (dc)	2µ to 200mA < 0.2% full scale
	20nA and 200nA ranges < 0.5% full scale
	200pA - 4pA ranges < 1.0% full scale ± 500fA full scale

Current Control	
Applied Current Range	± full scale per range
Applied Current Resolution	± 1/32,000 x full scale
Applied Current Accuracy	± 0.5% of range, ±0.5% of reading
Max. Current Range/Resolution	± 200mA / 10µA
Min. Current Range/Resolution	± 4pA / 122aA

All other specifications not listed default to the connected potentiostat. Specifications subject to change.

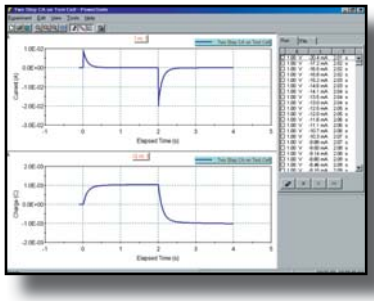
Power Boosters

The Princeton Applied Research Power Boosters are designed to boost the current measuring / applying capabilities of our potentiostats. Each power booster consists of an external power supply interfaced to additional internal circuitry on the rear panel of the potentiostat. A simple cable connection and switch setting converts the potentiostat from normal to boosted mode. The boosters are compatible with both our PowerSuite and VersaStudio software packages. These boosters can be supplied as a complete system at the time of original potentiostat purchase or can be added on (factory installation required) at a later time.

- 8, 10, and 20 Amp Options
- Operates in boosted or normal mode - Simple cable connection converts potentiostat from normal to boosted operation
- Compatible with PowerSuite or VersaStudio software
- Internal 2A booster options for VersaSTAT 3, VersaSTAT 4, VersaSTAT MC, and 263A

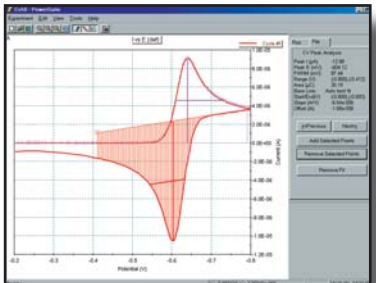
PowerSuite® software

Available for PARSTAT & GPIB/273A/263A Systems (purchase individually or as a package)



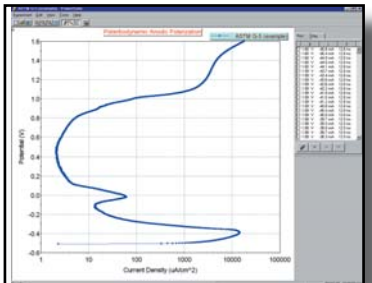
PowerSTEP®

- One Step Chronoamperometry
- Two Step Chronoamperometry
- Chronopotentiometry



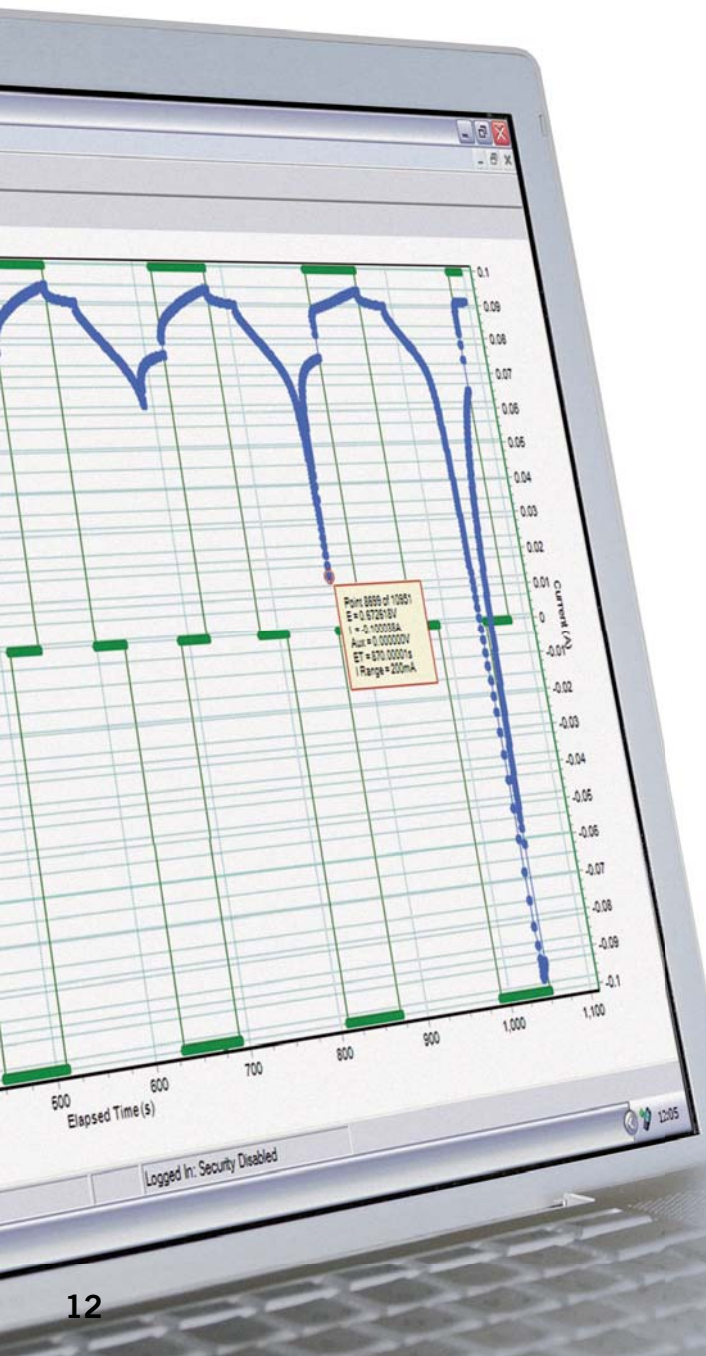
PowerCV®

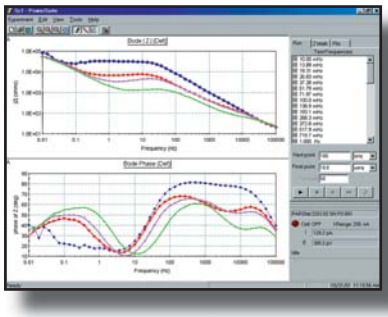
- Linear Scan Voltammetry
- Ramp Cyclic Voltammetry
  - One Vertex
  - Two Vertex
  - One Vertex/Multi Cycle
  - Two Vertex Multi Cycle
- Stair Case Cyclic Voltammetry
  - One Vertex
  - Two Vertex
  - One Vertex/Multi Cycle
  - Two Vertex Multi Cycle



PowerCORR™

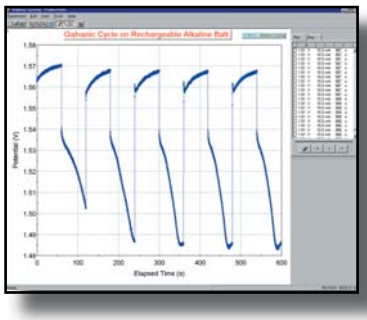
- Tafel Plot
- Anodic Polarization
- Linear Polarization
- Potentiostatic
- Galvanostatic
- Ecorr versus Time
- Galvanic Corrosion
- Cyclic Polarization
- Cyclic Polarization (no reverse)
- Zero Resistance Ammeter
- Galvanodynamic
- Galvanodynamic (no reverse)





PowerSINE®

- Potentiostatic EIS
- Multi-Sine EIS
- Galvanostatic EIS
- Potentiostatic Impedance versus Time
- Galvanostatic Impedance versus Time
- Mott-Shottky



PowerPULSE™

- Recurrent Potential Pulsing
- Recurrent Galvanic Pulsing
- Square Wave Voltammetry
- Cyclic Square Wave Voltammetry
- Differential Pulse Voltammetry
- Cyclic Differential Pulse Voltammetry
- Normal Pulse Voltammetry
- Reverse Normal Pulse Voltammetry

PC Requirements

Communication Interface	Universal Serial Bus (USB)
Operating System	Windows XP Professional (preferred)/95/98/NT Windows 2000/VISTA

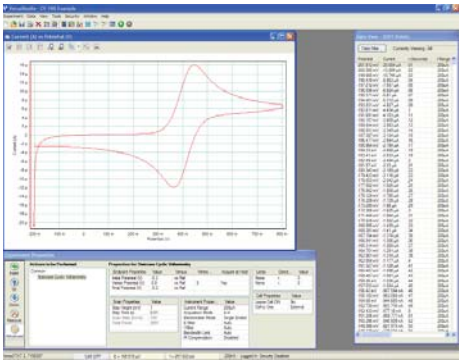
Software Summary - PowerSuite

	PARSTAT 2273	PARSTAT 2263	Model 273A	Model 263A
PowerCV				
Linear Sweep Voltammetry	●	●	●	●
Cyclic Voltammetry - Single Vertex	●	●	●	●
Cyclic Voltammetry - Double Vertex	●	●	●	●
Uncompensated Resistance Determination	●	●	●	●
PowerSTEP				
Chronoamperometry - One Step	●	●	●	●
Chronoamperometry - Double Step	●	●	●	●
Chronopotentiometry	●	●	●	●
Chronocoulometry - One Step	●			
Chronocoulometry - Double Step	●			
PowerPULSE				
Recurrent Potential Pulse - Two Step	●	●	●	●
Recurrent Potential Pulse - Three Step	●	●	●	●
Recurrent Potential Pulse - Four Step	●	●	●	●
Recurrent Galvanic Pulse - Two Step	●	●	●	●
Reccurent Galvanic Pulse - Three Step	●	●	●	●
Recurrent Galvanic Pulse - Four Step	●	●	●	●
SquareWave Voltammetry	●	●	●	●
Cyclic SquareWave Voltammetry	●	●	●	●
Differential Pulse Voltammetry	●	●	●	●
Cyclic Differential Pulse Voltammetry	●	●	●	●
Normal Pulse Voltammetry	●	●	●	●
Reverse Normal Pulse Voltammetry	●	●	●	●
PowerCORR				
Linear Polarization	●	●	●	●
Tafel	●	●	●	●
Potentiodynamic	●	●	●	●
Cyclic Polarization	●	●	●	●
Ecorr vs. Time	●	●	●	●
Galvanic Corrosion	●	●		●
ZRA Mode	●	●		●
Potential Step	●	●	●	●
Galvanic Step	●	●	●	●
Galvanic Sweep	●	●	●	●
PowerSINE				
Potential Single Sine	●	●	Y	Y
Potential Multi Sine	●	●	Y	Y
Mott-Schottky	●	●	Y	Y
Galvanostatic	●	●	Y	Y

Y - Models 273A and 263A require additional analyzer hardware

VersaStudio® software

Included with VersaSTAT Systems

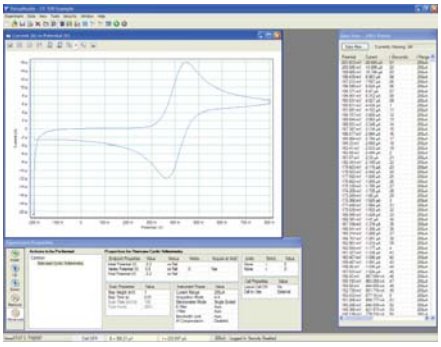


The complete VersaStudio software provides full access to the capabilities of the VersaSTAT series of instruments, including the high current option and power booster when present. Various systems combining hardware and the VersaStudio software are provided to focus on particular application areas or to minimize cost.

Systems may be upgraded at any time as budget becomes available or as requirements change. An impressive list of corrosion and electrochemical experiment types are provided that can be run individually or combined in powerful experiment sequences.

VersaStudio™

- Open Circuit
- Linear Scan Voltammetry
- Cyclic Voltammetry (single)
- Cyclic Voltammetry (multiple cycles)
- Staircase Linear Scan Voltammetry (single)
- Staircase Linear Scan Voltammetry (multiple cycles)
- Chronoamperometry
- Chronopotentiometry
- Chronocoulometry
- Fast Potential Pulses
- Fast Galvanic Pulses
- Recurrent Potential Pulses
- Recurrent Galvanic Pulses
- Square Wave Voltammetry
- Differential Pulse Voltammetry
- Normal Pulse Voltammetry
- Reverse Normal Pulse Voltammetry
- Zero Resitance Ammeter (ZRA)
- Galvanic Corrosion
- Cyclic Polarization
- Linear Polarization
- Tafel
- Potentiostatic
- Potentiodynamic
- Galvanostatic
- Galvanodynamic
- Dynamic IR
- Potentiostatic EIS
- Galvanostatic EIS
- Loop
- Time Delay
- Message Prompt
- Measure OC
- Auxillary Interface
- Run External Application
- DAC Output Control
- Condition
- Deposition
- Equilibration
- Purge
- iR Determination



Full access and capability of the entire VersaStudio suite of techniques depends on the VersaSTAT model to which it interfaces:

VersaSTAT 100 basic potentiostat DC voltammetry techniques
VersaSTAT 200 advanced DC voltammetry techniques
VersaSTAT 300 DC corrosion techniques
VersaSTAT 400 complete suite of DC techniques
VersaSTAT MC complete suite of DC and AC techniques

Some techniques, such as Electrochemical Impedance Spectroscopy (EIS), require additional hardware options, such as the FRA Option

PC Requirements

Communication Interface	Universal Serial Bus (USB)
Operating System	Windows XP Professional (preferred)/Windows 2000/VISTA

Software Summary - VersaStudio

	VersaSTAT -100	VersaSTAT -200	VersaSTAT -300	VersaSTAT -400
PowerCV				
Open Circuit	●	●	●	●
Linear Scan Voltammetry	●	●		●
Cyclic Voltammetry (single)	●	●		●
Cyclic Voltammetry (multi cycles)	●	●		●
Staircase Linear Scan Voltammetry		●		●
Staircase Cyclic Voltammetry (single)		●		●
Staircase Cyclic Voltammetry (multi cycles)		●		●
Chronoamperometry	●	●		●
Chronopotentiometry		●		●
Chronocoulometry		●		●
Recurrent Potential Pulses		●		●
Recurrent Galvanic Pulse - Two Step		●		●
SquareWave Voltammetry		●		●
Differentail Pulse Voltammetry		●		●
Normal Pulse Voltammetry		●		●
Reverse Normal Pulse Voltammetry		●		●
Zero Resistance Ammeter (ZRA)			●	●
Galvanic Corrosion			●	●
Cyclic Polarization			●	●
Linear Polarization			●	●
Tafel			●	●
Potentiostatic			●	●
Potentiodynamic			●	●
Galvanostatic			●	●
Galvanodynamic			●	●
Dynamic IR			●	●
Potentiostatic EIS*	●	●	●	●
Galvanostatic EIS*	●	●	●	●
Loop		●	●	●
Time Delay		●	●	●
Message Prompt		●	●	●
Measure OC		●	●	●
Auxiliary Interface		●	●	●
Run External Application		●	●	●
DAC Output Control		●	●	●
Condition		●	●	●
Deposition		●	●	●
Equilibration		●	●	●
Purge		●	●	●
iR Determination		●	●	●

* EIS capability (impedance) is optionally available with any of these systems

Model 370
Electrochemical Scanning Workstation

The Model 370 Scanning Electrochemical Workstation is a modular concept in Scanning Probe Electrochemistry designed for ultra-high resolution, spatially resolved electrochemical and non-contact surface topography measurements.

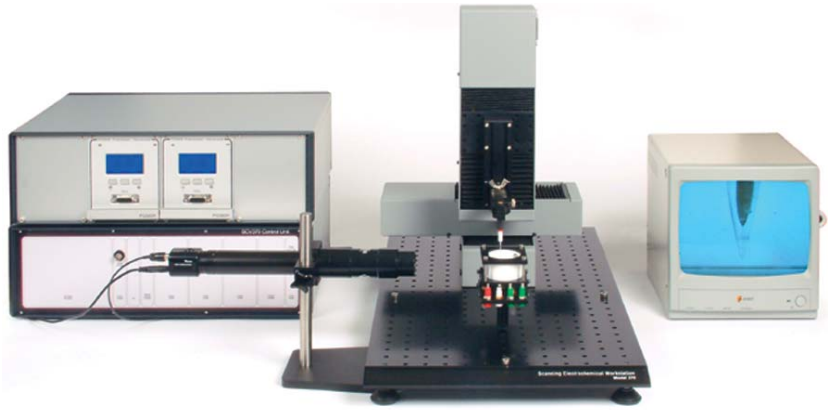
The Model 370 is a modular configurable system which will perform the key Scanning Probe Electrochemical techniques plus laser based non-contact surface profiling:

- **Scanning Electrochemical Microscopy (SECM)**
- **Scanning Kelvin Probe (SKP)**
- **Scanning Vibrating Electrode Technique (SVET)**
- **Localized Electrochemical Impedance Spectroscopy (LEIS)**
- **Scanning Droplet System (SDS)**
- **Non-contact Surface Profiling (OSP)**

The Model 370 utilizes a fast and precise closed loop x, y, z positioning system with nanometer resolution, along with a flexible data acquisition system enabling the user to select the configuration most suited to their experiments. The system is designed with flexibilty in mind and the design ergonomics insure convenient cell, sample and probe access.

The Model 370 is available in any one or all of the six configurations (SECM, SVET, SKP, LEIS, SDS, OSP) and may be upgraded at a later date by subsequent purchase of any combination of the available options.

A wide variety of optional accessories are available, including various probe options, cell options (Environmental TriCell® and µTriCell®), long working distance optical video microscope (VCAM2) and 3D shaded surface rendering software (IsoPlot™). The ability to configure to a specific application and upgrade at a later date makes the Model 370 uniquely flexible, while maintaining ultimate performance.



SECM370
Scanning Electrochemical Microscope System

The SECM370 is a precision scanning micro-electrode system which can be used to monitor (or impose) current flowing between a micro-electrode and a specimen surface in solution at extremely high spatial resolutions.

SVP370
Scanning Vibrating Electrode System

The Scanning Vibrating Electrode Technique (SVET) operates with a non-intrusive scanning, vibrating probe measuring and mapping the electric field generated in a plane above the surface or an electrochemically active sample.

SKP370
Scanning Kelvin Probe System

The Scanning Kelvin Probe (SKP) is a non-contact, non-destructive instrument designed to measure the surface work function difference between conducting, coated, or semi-conducting materials and a sample probe.

LEIS370
Localized Electrochemical Impedance System

The LEIS370 allows spatially resolved impedance measurements to be made, combining established principles of EIS measurements with scanning probe technology.

SDS370
Scanning Droplet System

The Scanning Droplet System is a technique which confines a liquid in contact with a sample surface in order to measure electrochemical and corrosion reactions over a limited region where the droplet is actually in contact with the sample.

OSP370
Non-contact Surface Profiling

Utilizing a non-contact laser displacement sensor, the OSP370 module allows fast and accurate non-contact surface measurement to a very high accuracy.

Options: Environmental TriCell™

The environmental TriCell™ mounts directly into the Model 370 Scanning Electrochemical Workstation optical table base, and provides for large samples and various electrode configurations. It comes with a flexible rubber cover through which a probe can be inserted in order to allow control over the environment. The cell has four external ports, tilt glass cell, and adjustable electrode holders.

- Easy sample access and connection
- External level adjustment
- Enables experiments under controlled atmosphere
- Enables experiments under liquid flow
- Accomodates a wide range of sample geometrys including sheet metal and 32mm diameter metallurgical mount

Options: µTriCell™

The environmental µTriCell™ mounts directly into the Model 370 Scanning Electrochemical Workstation optical table base, and provides for small samples with low electrolyte volumes and various electrode configurations. It has a PTFE body, and comes with a quartz window to allow optical and viewing access.

- Easy sample access and connection
- External level adjustment
- Accomodates a wide range of samples

Options: Long Working Distance Video Microscope, VCAM2

Optical microscope, camera, and monitor for probe imaging / positioning, parfocal through zoom range. Working distance 108mm. Field of view at 0.7x position 8.6mm. Field of view at 4.5x position 1.4mm. Recommended for use with all scanning probe techniques.

VCAM2 Specifications:
1/2" B&W CCD Image Sensor
Field of View: 0.75° (x4.5) tp 4.6° (x0.7)
Number of Pixels: 420K Pixels
Resolution: 570 TV Lines
Operation Temperature: -30° - +70°C
Camera Dimensions: 34mm x 34mm x 46mm

Features
- Very low light operation, min illumination: 0.0003 lux - f1.4
  Compact Size: 1.8" Long w/out lens
- CS- Mount lenses or C-Mount Lenses w/5mm Adapter
- Power: 12V DC +10%, 160mA

Ancillary Instrumentation

QCM922

- Sensitive enough to measure weight changes in a monolayer
- Quantify both elastic and viscous changes in your system
- Front panel display of resonant frequency and resistance
- Analog outputs for frequency and resistance changes
- Frequency range of 1 MHz to 10 MHz
- Designed for EQCM with a potentiostat or stand alone operation

Quartz Crystals

- 9 MHz AT-cut: Gold or Platinum sputtered on Ti (Standard or Mirror Finish)
- Electrode Area: 0.2cm^2
- Electrode Thickness: Au or Pt ~300 nm

FRD100
Frequency Response Detector

- Provides EIS capabilities to 263A, 273A, and 283 potentiostats up to 100 kHz
- Direct digital demodulation without down-conversion
- 10 µs to 100 ks output time constants
- Quartz Crystal stabilized internal oscillator
- Synchronous oscillator output for input offset reduction

Oscillator

- Frequency
  Range: 0.001 Hz to 120 kHz
  Setting Resolution: 1 mHz
  Absolute Accuracy: ±50 ppm
  Distortion (THD): -80 dB @ 1 kHz and 100 mV rms

5210EC
Dual-Phase Lock-In Amplifier

- Provides EIS capabilities to 263A, 273A, and 283 potentiostats up to 100 kHz
- Continuous Full-Scale Sensitivity Control
- Sinewave or Squarewave Demodulation
- Powerful fourth-order signal channel bandpass, low pass or notch filter
- Two independent line frequency rejection filters
- Up to 130 dB Dynamic Reserve

303A
Static Mercury Drop Electrode

- Renewable mercury electrode surface provides higher sensitivity
- Greater operating convenience than the traditional dropping mercury electrode (DME)
- Reduces baseline distortions in DPP and enhances sensitivity
- Easily converts into an extremely stable HMDE for stripping or squarewave voltammetry
- Manual or automatic control of purge time, drop size, drop dispensing, and drop dislodgement
- Operates with PARSTAT and VersaSTAT systems via model 507 interface

Model is shipped with the following:

- Capillary
- Cell Bottoms
- Siliconizing Solution
- Vycor® Tips
- Reference Electrode Jacket
- Saturated KCl/AgCl Filling Solution

636
Rotating Ring-Disk Electrode

- Disk or Ring-Disk configuration
- Remote analog speed control (input is summed with front-panel settings)
- A variety of disk and ring-disk electrodes to choose from
- Interchangeable electrode assemblies in either disk or cylinder configurations for corrosion studies
- On/Off and Rotational Rate Control

Accessory Options

- Permanent Disk Electrode
- Permanent Ring-Disk Electrodes
- Quick-Change Disk and Cylinder Electrodes

Electrode Types

- Platinum Disk - Platinum Ring
- Glassy Carbon Disk - Gold Ring
- Glassy Carbon Disk - Platinum Ring

Arbor Options

- Disk Arbor
- Ring Disk Arbor

616
Rotating Disk Electrode

- Front-panel speed controls
- Remote analog speed control (input is summed with front-panel settings)
- Front-panel and remote (TTL) on/off switching (using PAR stir-control signals)
- Remote analog output for speed verification
- Integral ring-stand for convenient cell mounting
- A variety of electrode assemblies for a wide range of experiments, including: High-precision corrosion measurements, Ultra-trace analytical determinations, Automated Levich Plots, Hydrodynamically-modulated voltammetry, Cyclic stripping voltammetry

Accessory Options

- Quick-Change Disk Electrodes
- Quick-Change Cylinder Electrodes
- Permanent Disk Electrodes

Electrode Types

- Platinum
- Gold
- Glassy Carbon

Electrochemical Accessories

Corrosion Cell Kit

Model K0047

The K0047 is ideal for testing and evaluation of metal specimens in corrosive environments. It is fashioned after a well-known cell configuration and is a standard in some ASTM methods.

The cell permits a variety of metal specimens and liquid environments to be tested quickly and uniformly. Most of the common electrochemical techniques for corrosion testing can be employed under aggressive conditions (except for HF) and at ambient or elevated temperatures.

The K0047 Kit includes:

Model	Qty.	Description
G0091	2	Graphite Rod
G0094	1	Purge Tube
G0095	1	Reference Electrode Bridge Tube
G0096	1	Corrosion Flask (1 liter flat bottom flask with ground glass joints
G0097	1	Electrode Holder
G0098	2	Threaded Adapter for T24/40 Joint
G0099	1	Ball and Socket Clamp
G0100	1	Replacement Vycor Frits (pkg of 5)
K0077	1	Saturated Calomel Reference Electrode
MP0630	1	Replacement Teflon Gaskets for Mounting Sample (pkg of 5)
MP0631	1	Electrode Mounting Rod
MP0751	1	Cylinder Specimen, 430 Stainless Steel
2806-0043-0	1	Knurled Thumb Nut
2815-0043-0	1	Flat Washer
2815-0093-0	1	Flat Teflon Washer

Tait Cell

Model K0307

The Tait Cell was developed to address coatings/corrosion studies on flat specimens where the electrolyte under study cannot support a standard reference electrode. The diameter and exposed sample area are approximately 6.35cm and 32cm^2, respectively.

The Tait Cell is offered with counter and reference electrodes made from Hastelloy steel.

- Excellent for coatings studies in difficult media
- Designed for long term exposure times
- Quick, easy changing of electrodes
- Allows electrolyte volumes as small as 80mL

Micro-Cell Kit

Model K0264

For routine analytical voltammetry applications, we offer the K0264 Micro-Cell Kit. The kit includes:

Model	Qty.	Description
G0100	1	Vycor frits, 4mm (pkg of 5)
K0265	1	Silver/Silver chloride reference electrode (includes tube, wire, and frit)
K0266	1	Counter Electrode Assembly (includes counter electrode bridge tube, 2 ml. volume, Vycor frit and Platinum 0.3mm diameter counter electrode wire)
SL0070	1	3M NaCl/saturated AgCl filling solution for K0265
219581	1	Cell Top (ring stand mountable which accommadates a variety of microelectrodes)
219600	1	Glass Cell Bottom
220196	1	Threaded Blushing (three, used to secure the reference, counter, or optional thermometer)
220253	1	Threaded Bushing (used to secure the working electrode)
220262	1	Threaded Plug (to plug thermometer port)
220325	1	Threaded Plug (to plug sample port)
220553	1	Cell Support Cap
230125	1	Knob
230197	1	Bev A Line Tubing (2 ft)
230259	5	Ferrule Fitting
231572	1	Stopcock
231573	1	Lauer Lock Ring
231574	1	Fitting
231575	1	Fitting
231576	1	Fitting
231581	1	Fitting
2504-0102-0	1	Quad Ring, Viton

Microelectrodes (10 µm diameter)

G0224	Gold Microelectrode
G0225	Platinum Microelectrode
G0226	Glassy Carbon Microelectrode

Milli-electrodes (2 mm diameter)

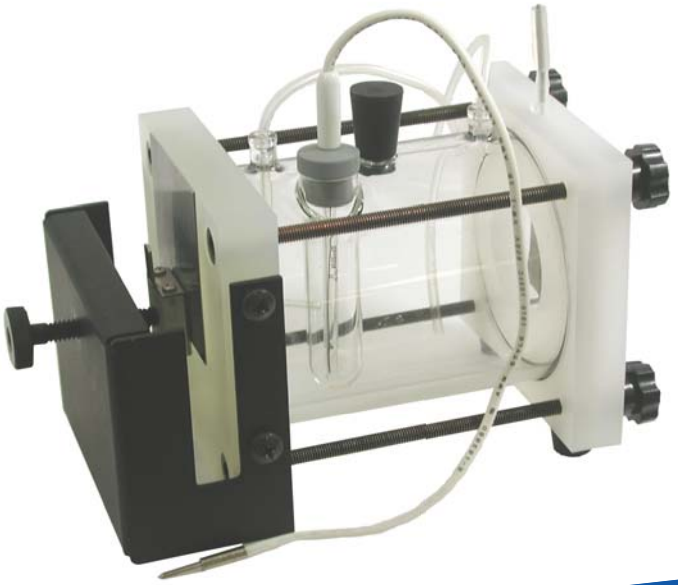
G0227	Gold Milli-electrode
G0228	Platinum Milli-electrode
G0229	Glassy Carbon Milli-electrode

Flat Cell Kit

Model K0235

The practical design of the Model K0235 Flat Cell makes it simple and easy to use for corrosion and/or coatings research. It can accommodate a wide range of electrode sizes, eliminating the need for machining or special mechanical procedures. It disassembles quickly and easily, operates with a 250mL sample volume and simplifies electrochemical corrosion measurements. The Kit includes:

2517-1343A	Clamping Screw
222594	Clamping Frame
2806-0086	Nut, Rivnut
2800-0042	Resting Foot
219806	Sample End Cap
219808	Glass Cylinder
2805-0043	Drain Plug
2805-0044	Rubber Well Plug
219810	Counter Electrode
2517-1345A	Shoe Assembly
2811-0280-0	Screw (#10-32) SS
MP1239	Gasket, TFE
800877	Screw (#4-40) SS x 3/8"
OR0142	Gasket, Viton
3100-0094-0	Tubing, Tygon
219995	Reference Electrode
232117	Tubing, TFE
230213	Cap and Silicon Tubing



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