

# **PARSTAT® 3000A-DX**

bipotentiostat | galvanostat



# Introducing the Next Level in Bipotentiostat Design...

The PARSTAT 3000A-DX builds on the high performance of the PARSTAT Multichannel platform and the popular small footprint of the PARSTAT 3000A. The PARSTAT 3000A-DX is all of the following:

- A bipotentiostat/galvanostat capable of independently controlling two working electrodes in a single electrochemical cell using a synchronized hardware start with separate or shared counter and reference electrodes
- A dual channel multichannel potentiostat/galvanostat, each with EIS functionality, for space-conscious laboratories
- A high-specification potentiostat/galvanostat with both a **High Voltage** and a **High Current** channel included
- A versatile electrochemistry research tool with access to a wide range of electrochemical techniques through the easy-to-use VersaStudio software platform

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## Introduction

Princeton Applied Research is excited to be offering a solution to researchers requiring a true bipotentiostat – an instrument that can independently control two different working electrodes in the same cell with separate or shared reference and counter electrodes. Hardware synchronization is a must for accurate data interpretation, while a floating ground is required for electrical isolation between each working electrode. The PARSTAT 3000A-DX offers both, while its dual-channel design also make it perfectly suited for running two asynchronous experiments on separate electrochemical cells.

A bipotentiostat, such as the PARSTAT 3000A-DX, is imperative for studies involving rotating ring disk electrodes (RRDE). This hydrodynamic technique quickly reaches steady state conditions, thereby eliminating the contribution from double-layer charging, and the associated theory is well defined. Typical RRDE experiments are often referred to as generator/collector experiments where the Disk reaction generates a product that can be collected at the Ring. This collection efficiency can be used to gain insight into the reaction pathway(s) and related rate constants. The research areas that employ RRDE are expansive, with the most prominent being the evaluation of oxygen reduction reaction (ORR) electrocatalysts for developing new and improving existing fuel cell designs. Additional bipotentiostat applications include:

- Electrochemical sensor development
  - Dual channel sensors for selective and simultaneous detection of two analytes
  - Generator-collector or redox cycling based sensors for signal amplification
- Determination of reaction mechanisms
  - Electrodeposition / electroplating processes like Cu Damascene
  - Detection of short lived species and elucidation of the primary reaction pathway
- Electrocatalyst evaluation
  - Hydrogen evolution reaction (HER), methanol/ethanol oxidation reaction electrocatalysts for fuel cells



## Highlights

Combining a high current channel and a high voltage channel into a single, compact system, each with on-board EIS capability, then adding extreme low current resolution to one channel and 6-WIRE auxiliary voltage measurement to another, along with data acquisition rates up to 1000 kS/sec, make the PARSTAT 3000A-DX the highest performing bipotentiostat/galvanostat on the market. These features are available whether utilizing the PARSTAT 3000A-DX as a traditional bipotentiostat or a dual-channel instrument running two asynchronous experiments on two individual electrochemical cells.

feature	allows for
<b>+/- 30 V Compliance</b>	corrosion analysis of large surface area samples in low conductivity electrolyte and non-aqueous electrochemistry
<b>+/- 30 V Polarization</b>	study of high voltage batteries and battery stacks and nanostructure formation via anodization
<b>4 nA to 2 A Current 10 current ranges 120 fA resolution</b>	microelectrode to macroelectrode studies, detection of low and high concentrations of electroactive species, coatings analysis and industrial electrolysis and electroplating
<b>Optional VersaSTAT LC 4 pA minimum range 122 nA resolution</b>	high accuracy and resolution measurements of extreme low currents generated by ultramicroelectrodes and high impedance coatings and nanosensors
<b>EIS standard on both channels</b>	determination of uncompensated resistance for iR compensation, ESR for energy device characterization and charge-transfer resistance for evaluation of corrosion resistant coatings
<b>6-WIRE</b>	simultaneous DC and EIS measurements of anode/cathode or single cell during stack testing and additional measurement of compliance voltage or external probe voltage
<b>1000 kS/sec</b>	fast scan cyclic voltammetry for electroanalytical detection and fast-transient measurements for analysis of fast electron transfer reactions

## VersaStudio software

The PARSTAT 3000A-DX bipotentiostat/galvanostat is controlled using Princeton Applied Research's popular VersaStudio software. VersaStudio software combines **functionality** – it is used to control various Princeton Applied Research potentiostats/galvanostats (VersaSTAT series, PARSTAT 4000A, PARSTAT 3000A and PARSTAT MC) – **ease-of use** – it offers flexible experimental setup, simple data comparison and convenient data analysis and fitting routines – and **accessibility** – it is free to download from our website without the need for registration.

Each PARSTAT 3000A-DX channel has full access to VersaStudio's expansive selection of electrochemical techniques. These include Voltammetry, Corrosion, Energy, Impedance and Advanced Actions. The latest addition is the RRDE Action specifically designed to support researchers using PARSTAT 3000A-DX bipotentiostat/galvanostat in combination with a RRDE setup. Various techniques (chronoamperometry, chronopotentiometry, ramp or staircase cyclic voltammetry and linear scan voltammetry) can be selected independently for each channel, while also controlling the rotation rate. Users can now plot the Disk and Ring Current versus the Disk Potential in a single graph for simple data interpretation. Whether using the dual-channel PARSTAT 3000A-DX as independent potentiostats or as a hardware synchronized bipotentiostat, VersaStudio is the ideal software platform.

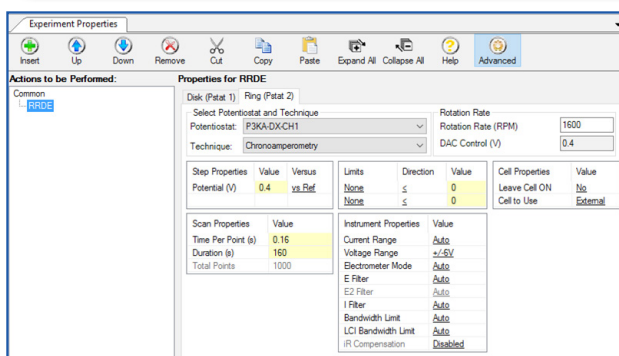
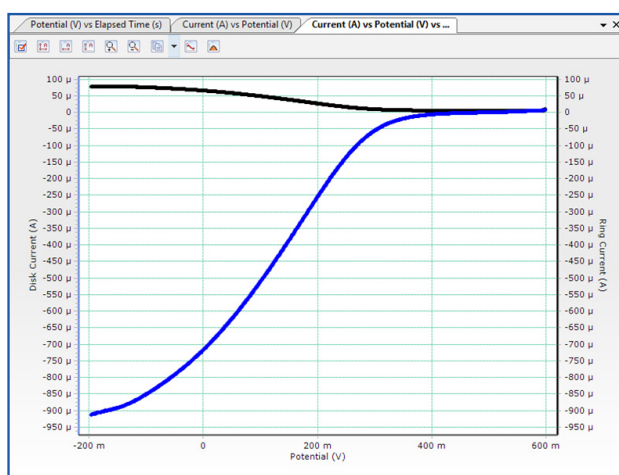
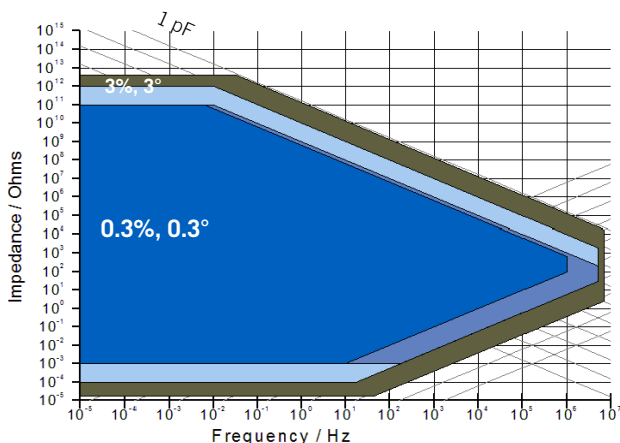


Fig. 1: Measurement of the collection efficiency of a Au/Au RRDE using 10 mM ferricyanide in 0.1 M KCl at 1600 RPM.



## PARSTAT 3000A-DX contour map



## PARSTAT 3000A-DX system

Compliance Voltage	± 30 V
Polarization Voltage	± 30 V
Maximum Current	2 A
Lowest Current Range	4 nA (4 pA with VersaSTAT LC)
EIS Frequency Range	7 MHz to 10 μHz
Data Acquisition Rate	1000 kS/sec (1 μs)
Auxiliary Voltage (6-WIRE)	Standard
Synchronization	Hardware Start
Isolation	Floating or Grounded

## PARSTAT 3000A-DX channel 1

Compliance Voltage	± 12 V
Polarization Voltage	± 10 V
Maximum Current	2 A
Lowest Current Range	4 nA (4 pA with VersaSTAT LC)
EIS Frequency Range	1 MHz to 10 μHz
Data Acquisition Rate	500 kS/sec (2 μs)
Auxiliary Voltage (6-WIRE)	Not available
Synchronization	Not available
Isolation	Floating or Grounded

## PARSTAT 3000A-DX channel 2

Compliance Voltage	± 30 V
Polarization Voltage	± 30 V
Maximum Current	1 A
Lowest Current Range	4 nA
EIS Frequency Range	7 MHz to 10 μHz
Data Acquisition Rate	1000 kS/sec (1 μs)
Auxiliary Voltage (6-WIRE)	Standard
Synchronization	Not available
Isolation	Floating or Grounded

## Accessories

### Rotators

#### 636A

Compatible with Rotating Ring Disk Electrode (RRDE) and Rotating Disk/Cylinder Electrode (RDE/RCE)

#### RDE0070

Ring-Disk Arbor for 636A  
(compatible with all electrodes listed below)

### Electrochemical Cell

#### RDE0018

Analytical Cell Kit to Accommodate RRDE, RDE, and RCE

### Electrodes

#### Permanent RRDE

GC/Pt, Au/Pt, Pt/Pt, GC/Au, Au/Au, Pt/Au disk/ring

#### Change-disk RRDE

Pt, Au or GC ring with any disk material insert listed below

#### Change-disk Inserts

Pt, Au, GC, Ag, carbon steel, various stainless steel alloys, Al, Co, Cu, Fe, Nb, Ni, Pb, Sn, Ta, Ti, W, Zn

### Bipotentiostat Accessory Kit - 1108308

#### 1108305

Bipotentiostat Dummy Cell

#### PMC ALG01

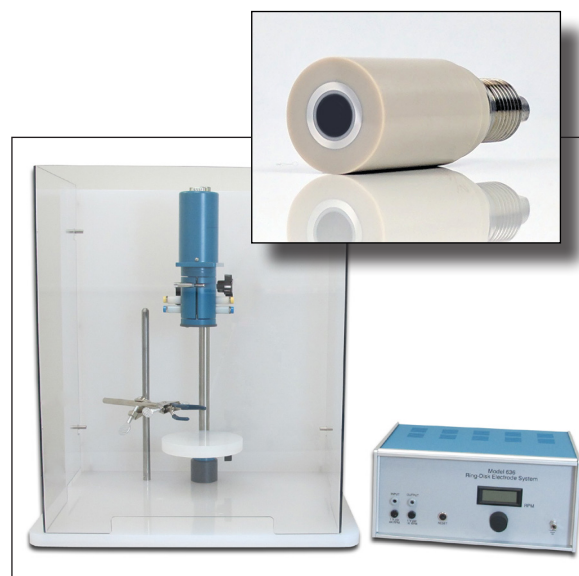
PARSTAT MC Analog Auxiliary Cable (1-m) 9-pin to BNCs

#### 234155

Adapter, BNC Female with 2 Banana Connector

#### SC0033

BNC/BNC Cable Assembly (4 ft) RG-58C/U



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