

# Reference 3020

Potentiostat/Galvanostat/ZRA



**GAMRY**  
INSTRUMENTS

# Reference 3020

## Potentiostat/Galvanostat/ZRA

### BEST IN CLASS PERFORMANCE

The Gamry Instruments **Reference 3020™** is a high-performance high-current Potentiostat/Galvanostat/ZRA meant for the most demanding of applications. An optional booster is available for even higher current applications.

The Reference 3020 is a potentiostat sensitive enough for research and capable enough for development of your battery, fuel cell, or electrolyzer. It is smaller and lighter than most comparable potentiostats. Don't let its size fool you – it offers research grade performance. While the Reference 3020 can apply and measure ampere level currents, it is also an excellent low noise, small signal potentiostat that can work with picoamp currents.

The Reference 3020 can be used with Gamry Instruments' software for all traditional applications of electrochemistry. These include:

- Fuel cell and electrolyzer research
- Battery development
- Electroplating
- Kinetic and Thermodynamic Measurements
- Corrosion Measurement
- Sensor Development
- Electrocatalysis
- Analytical Electrochemistry
- Electrochemical Impedance Spectroscopy

While the Reference 3020 is a very good general-purpose potentiostat, it was developed to be especially useful for energy applications. This field includes development of new chemistries, devices and systems for batteries, fuel cells, and electrolyzers. The Reference 3020 can operate stacks with voltages as high as 36 volts.

The Reference 3020 has features useful in ESC testing that are not found in other potentiostats and electrochemical systems. These include:

- A special stack mode that allows measurement and Potentiostatic control of stack voltages up to  $\pm 36$  volts.
- Two switchable compliance voltage and compliance current settings. The two settings are  $\pm 36$  Volts at  $\pm 1.5$  Amps and  $\pm 17.5$  volts ( $\pm 11$  Volts applied) at  $\pm 3.0$  Amps.
- EIS measurements in potentiostatic or one of two galvanostatic modes – normal and hybrid. In hybrid mode the AC current at each frequency is dynamically adjusted to give a fixed AC voltage.
- An Auxiliary Electrometer option with an array of eight high-voltage differential voltage inputs. These inputs can be used to measure voltages of cells in an ESC stack or measure reference electrodes within one electrochemical cell.
- Optional Low Impedance Cables that can measure cell impedances as low as  $100 \mu\Omega$ .

### Other Reference 3020 features include:

- 11 decade current auto-ranging
- Analog and digital filtering
- EIS up to 3 MHz (up to 500 kHz when using high compliance)
- Boostable to  $\pm 30$  A at  $+20/-2.5$  V.
- Electrical isolation from earth ground
- Current interrupt and PF iR compensation
- Data acquisition as fast as 300,000 pts/sec

A unique Digital Signal Processing (DSP) data acquisition mode allows the Reference 3020 to reject noise from the instrument, the electrochemical cell, and the lab environment. The Reference 3020 can often be used with its cell exposed on a lab bench when other instruments require a cell in a Faraday shield.



### Auxiliary Electrometer Option

The Reference 3020 Potentiostat can be equipped with a unique Auxiliary Electrometer option. This factory installed option is especially useful when you need to measure the performance of several individual cells in a multi-cell stack. Each of the eight channels on this option can measure a complete a 5V signal anywhere in the compliance range.

### Reference 30K Booster Option

The Reference 3020 can interface to a Reference 30K Booster to increase the current to  $\pm 30$  A at  $+20/-2.5$  V. This allows complete charge and discharge of a supercapacitor as well as cross-over studies on fuel cells and electrolyzers. When the Reference 30K Booster is attached, the Reference 3000 can measure impedances less than  $100 \mu\Omega$ .



The **Reference 3020** includes software for all electrochemical applications. Contact your local Gamry sales representative for more information. Below are selected specifications. See our website for complete specifications.

## SELECTED SPECIFICATIONS

### SYSTEM

|  |  |
|--|--|
| Potentiostat                             | Yes  |
| Galvanostat                              | Yes  |
| Zero Resistance Ammeter                  | Yes  |
| Floating (Isolated from Earth Ground)    | Yes  |
| Cell Connections                         | 2, 3, or 4   |
| Maximum Current                          | Normal Compliance: $\pm 3$ A<br>High Compliance: $\pm 1.5$ A |
| Current Ranges                           | 11   |
| Current Ranges (including internal gain) | 13   |
| Maximum Applied Potential                | $\pm 11$ V Normal Compliance: $\pm 36$ V High Compliance     |
| Rise Time                                | <250 ns  |
| Noise and Ripple                         | <2 $\mu$ V rms   |
| Minimum Time Base                        | 3.333 $\mu$ s  |
| Analog/Digital Converter                 | 20 bit   |

### EIS MEASUREMENT

|              |  |
|--------------|--|
| EIS          | 10 $\mu$ Hz - 3 MHz (500 kHz maximum on high compliance) |
| EIS Accuracy | See Accuracy Contour Plot                                |

### CONTROL AMPLIFIER

|                    |  |
|--------------------|--|
| Compliance Voltage | Normal Compliance: $\pm 17.5$ V<br>High Compliance: $\pm 36$ V |
| Output Current     | > $\pm 3$ A  |

### MEASURED POTENTIAL

|                     |   |
|---------------------|---|
| Measured Accuracy   | $\pm 1$ mV $\pm 0.3\%$ of reading         |
| Measured Resolution | 12.5 $\mu$ V, 50 $\mu$ V, 200 $\mu$ V/bit |

### MEASURED CURRENT

|                     |                                  |
|---------------------|----------------------------------|
| Measured Accuracy   | $\pm 10$ pA $\pm 0.3\%$ of range |
| Measured Resolution | 0.0033% full-scale/bit           |

### IR COMPENSATION

|      |   |
|------|---|
| Mode | Current Interrupt and Positive Feedback |
|------|---|

### AUXILIARY ELECTROMETER

#### Input Voltage

|                   |                          |
|-------------------|--------------------------|
| Common Mode Range | $\pm$ Compliance Voltage |
| Input Resistance  | >10 G $\Omega$           |
| Input Current     | <10 pA                   |

#### Difference Amp

|                    |           |
|--------------------|-----------|
| Difference Voltage | $\pm 5$ V |
|--------------------|-----------|

