REDEFINING HIGH VALUE ELECTROCHEMISTRY




# INTERFACE1030

## Potentiostat/Galvanostat/Zero Resistance Ammeter

GAMRY INSTRUMENTS

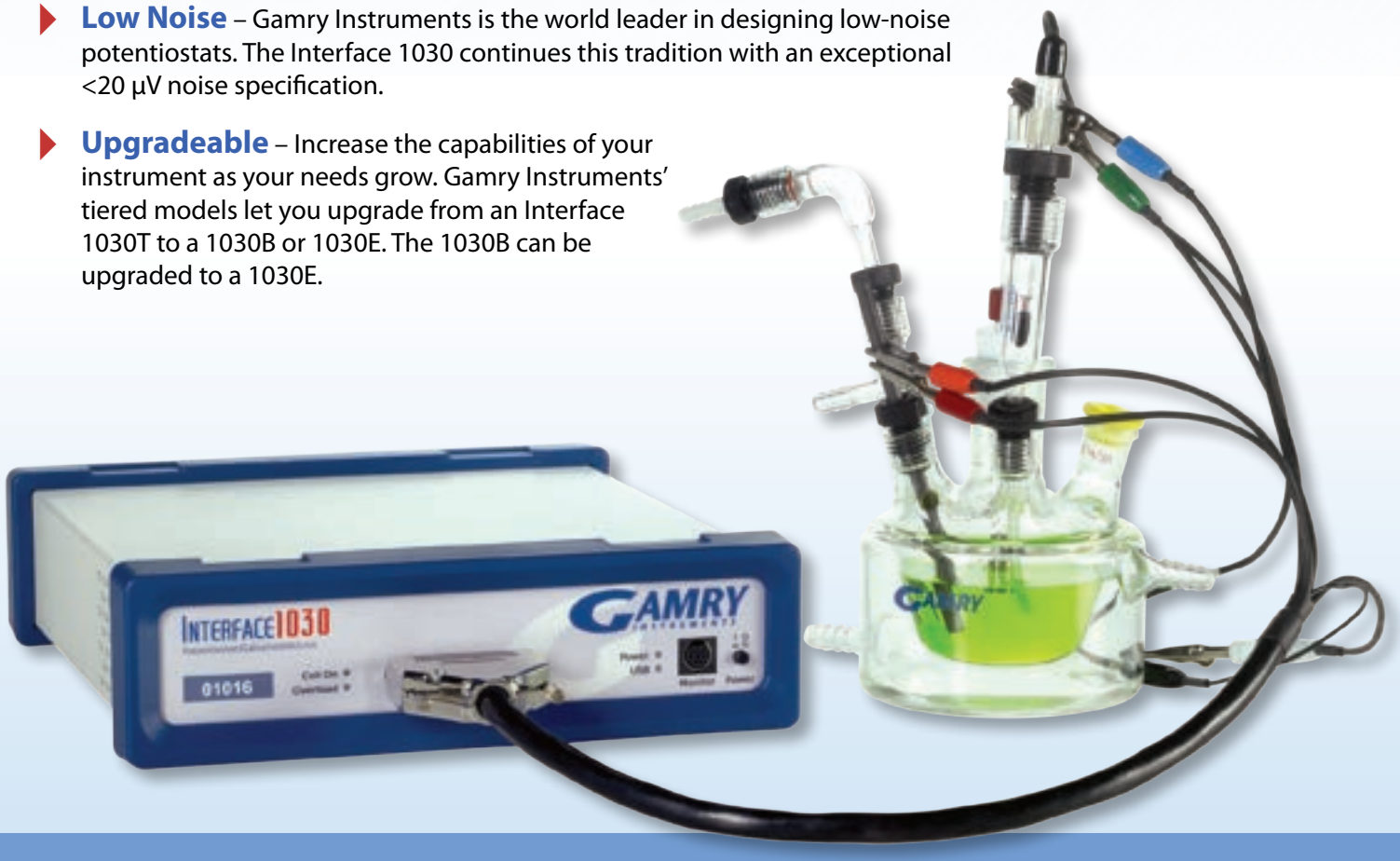
# HIGHLIGHTS

The Interface 1030™ potentiostat/galvanostat/ZRA is extremely popular, with an EIS range that extends to 2 MHz and integrated temperature monitoring. It is ideal for corrosion measurements, battery testing, sensor development, and physical electrochemistry. The Interface 1030™ is the perfect blend of performance and value.

## *Three models to suit your needs:*

- **Interface 1030T** – A specially designed model for teaching labs that can do basic Physical and Analytical Electrochemistry, DC Corrosion, and Potentiostatic EIS to 20 kHz.
- **Interface 1030B** – The basic model is equipped with our Physical Electrochemistry, Pulse Voltammetry, DC Corrosion, and EIS to 20 kHz.
- **Interface 1030E** – This model includes everything available for running any type of electrochemical experiment.

- **Flexible and Powerful** – 9 current ranges from 1 A down to 10 nA. Also includes positive feedback and current interrupt iR compensation.
- **Floating** – Designed from the ground up to provide true floating capability. Easily measure grounded electrodes, grounded cells, or multiple working electrodes in a shared electrolyte.
- **Easily Transported** – Weighing a mere 2 kg and carried as easily as a book, the Interface 1030 continues Gamry Instruments' tradition of pairing capability with portability.
- **Low Noise** – Gamry Instruments is the world leader in designing low-noise potentiostats. The Interface 1030 continues this tradition with an exceptional <20 µV noise specification.
- **Upgradeable** – Increase the capabilities of your instrument as your needs grow. Gamry Instruments' tiered models let you upgrade from an Interface 1030T to a 1030B or 1030E. The 1030B can be upgraded to a 1030E.








# MULTICHANNEL WITHOUT LIMITS




- **Dedicated Performance** – Gamry Instruments' multichannel setup is designed to get you full capabilities out of each channel. No multiplexing of measurements unlike other manufacturers.
- **Isolation** – Each channel is isolated, letting you run on grounded cells or multiple working electrodes.
- **High Bandwidth** – Gamry Instruments' multichannel setup lets you place each channel closer to your cell, letting you use shorter cables. Shorter cables mean more bandwidth for your measurements.
- **Modular** – Gamry Instruments' multichannel setup allows you to remove channels for placement closer to your cell. You can even remove a channel to take into the field or when traveling to another lab.

# ELECTROCHEMICAL APPLICATIONS

## ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY—EIS



EIS is a powerful tool for a variety of applications. Gamry Instruments civilized EIS by combining sophisticated data acquisition with state-of-the-art hardware design. The Interface 1030 maintains these innovations by making EIS easy to use, compact, accurate, and affordable. Gamry Instruments' wide range of EIS techniques include potentiostatic, galvanostatic, hybrid, and Mott-Schottky. Our software also includes optimized, power-leveling multisine techniques for both potentiostatic and galvanostiatic EIS. We even include Total Harmonic Distortion to give you non-linear behavior of your sample!

## CORROSION



Electrochemical corrosion testing is a mainstay of Gamry Instruments' potentiostats and the Interface 1030 is no exception. Gamry Instruments' impressive collection of corrosion-related experiments are all available to run on the Interface 1030. Along with EIS, we offer for corrosion researchers:

**DC Corrosion Techniques** – 14 experiments from basic to advanced cover most corrosion testing.

**Electrochemical Noise** – Different setups for different levels of sophistication, including the most powerful noise software available.

**Electrochemical Frequency Modulation** – A non-destructive multisine technique that returns beta constants and a corrosion rate. Causality factors are automatically calculated to confirm the validity of your data.

**Critical Pitting Temperature** – As per ASTM G150. Special hardware is required, but this provides information not available through other techniques.

## PHYSICAL ELECTROCHEMISTRY



Gamry Instruments offers a complete library of physical and electroanalytical techniques for the Interface 1030. These include linear sweep and cyclic voltammetry, chronamperometry, chronocoulometry, chronopotentiometry, differential pulse, and square-wave voltammetry. Multiple-step or repeating techniques are available for chronoamperometry and chronopotentiometry.

## BATTERIES, FUEL CELLS, SUPERCAPACITORS



Research on various electrochemical energy systems combines some tried-and-true electrochemical techniques like EIS and CV, but also brings unique challenges to the table. Gamry Instruments has several specially designed experimental techniques for the Interface 1030 that allow high-performance testing of electrochemical energy devices.

## FILMS AND COATINGS



Materials and corrosion scientists frequently deal with thin films and coatings. EIS is a major part of the electrochemical testing of films and coatings. For some researchers DC corrosion tests may also be applicable while for others physical electrochemistry or energy device-type experiments are more appropriate. The Interface 1030 is compatible with all of these options, and the 4-probe setup allows for impedance testing of a membrane without compounding it with electron-transfer impedances.

## MORE...



Gamry Instruments' software capabilities go beyond the set experiments above. Toolkitpy (python-based), eChemToolkits, and a Virtual Front Panel allow users with some specialty ideas to run different tests, design their own software to control the Interface 1030, or integrate their Gamry Instruments system into a setup with other devices.

Gamry Instruments can also provide custom solutions for non-standard experimental techniques that you may need. Call us to discuss your application.



# PERFORMANCE

**The Interface 1030™ is Gamry Instruments' high-performing value Potentiostat/ Galvanostat/ZRA. It is ideal for labs on a budget doing fundamental electrochemical studies. The performance/cost ratio makes it the best choice for multichannel setups where performance cannot be sacrificed for higher throughput.**

## Low Noise

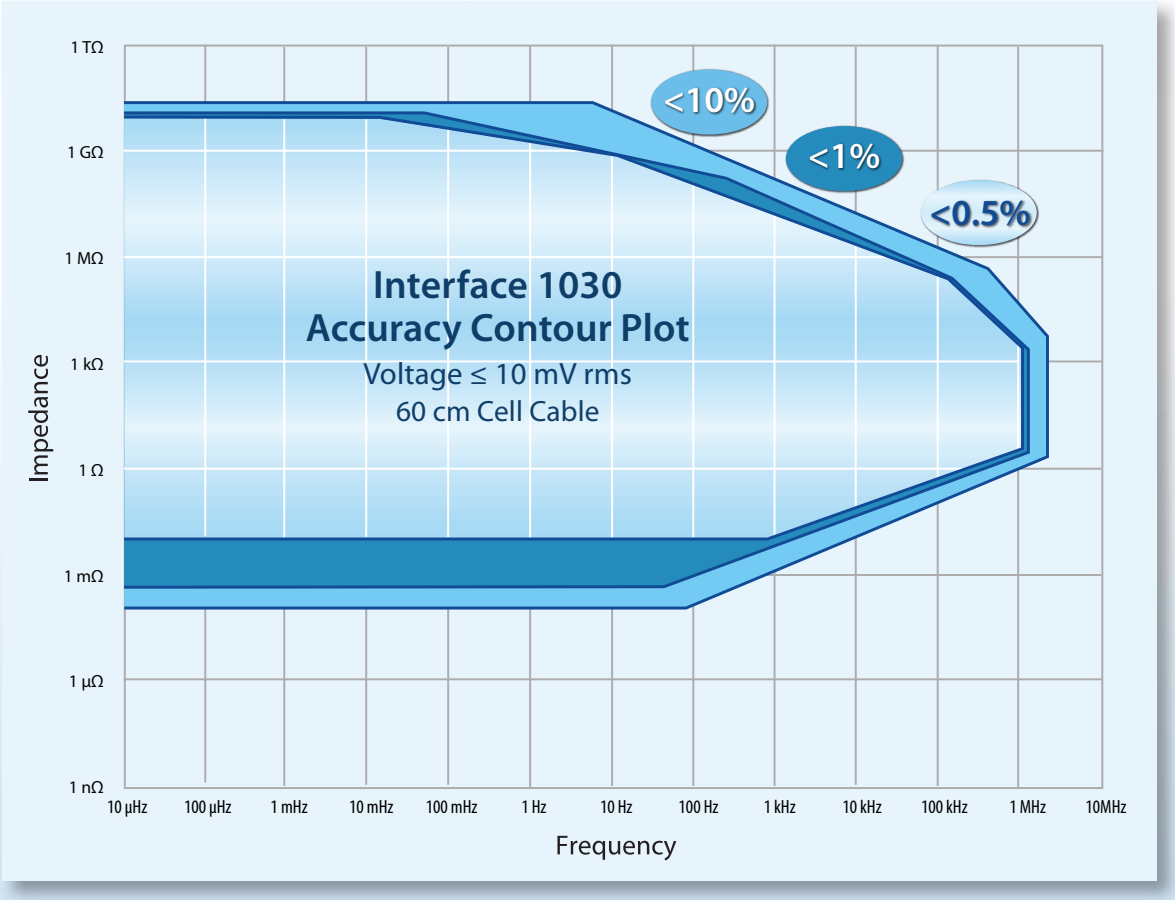
While every potentiostat has some intrinsic noise level caused by electronic components and the laws of physics, board layout and well-designed filtering can reduce its effect on your measurements. Gamry Instruments' engineers have designed the Interface 1030 with one of the lowest noise specifications available.

## DSP Mode

By acquiring data at 60 kHz, the Interface 1030 is able to massively oversample for the best signal-to-noise ratio in the industry. Combine DSP acquisition with the low intrinsic noise in the instrument, and you will see how Gamry Instruments brings new meaning to the term *low noise*.

## Impedance Done Right

Every Interface 1030 is equipped to perform EIS without requiring an expensive FRA or expansion modules. The built-in Direct Digital Synthesis circuitry generates a pure sine wave that is ideal for electrochemical applications. Thanks to the wide range of currents this instrument can sense, the Interface 1030 can accurately measure impedances from $10^{10}$ ohms down to 0.001 ohms.

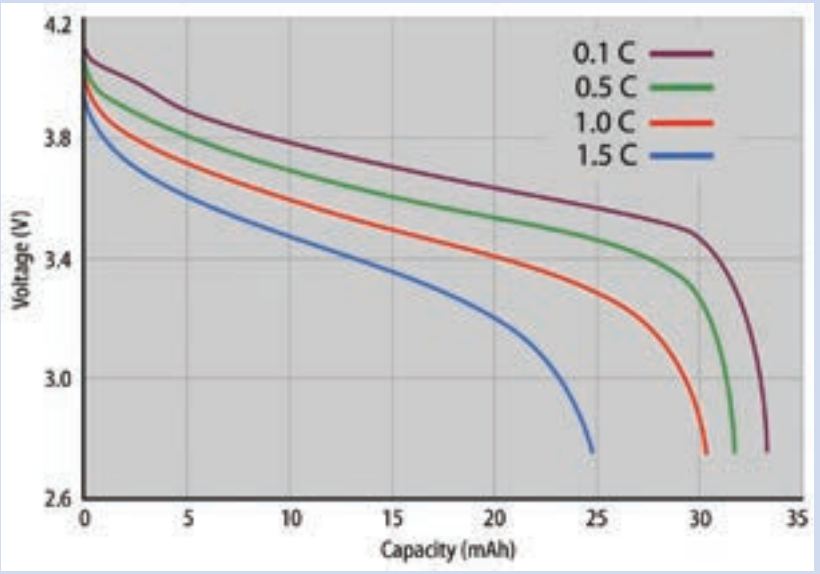


## Filters

The Interface 1030 employs a combined total of ten active filters for the Voltage and Current channels. These filters allow for optimal rejection of external signals and noise—which can adversely impact your sensitive measurements. The Interface 1030 automatically selects the best filter for the acquisition mode, while still offering expert users the choice for manual adjustments.

## Smart Cell Cables

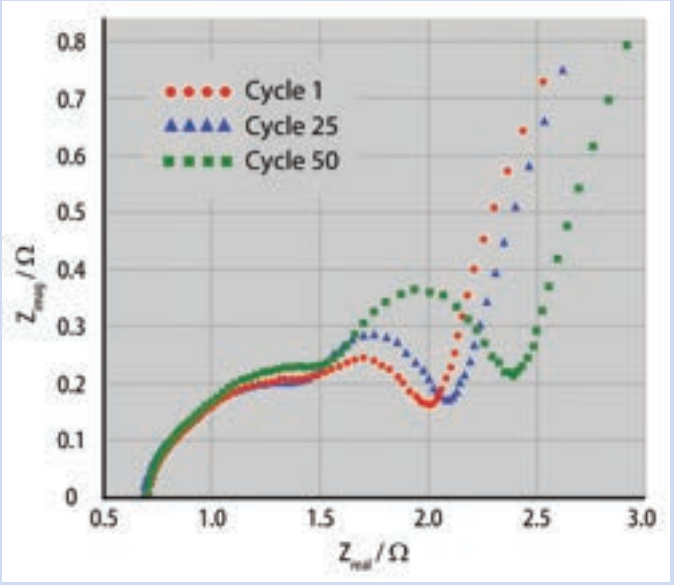
Even the cell cables for the Interface 1030 are impressively engineered for high performance. The standard cell cable is optimized for low stray capacitance and high-resistance isolation between the internal conductors and the shields. You get better EIS results for high-impedance samples and truer signals for high speed experiments. A special low-*Z* cable is available to extend the inductive limit when performing EIS on batteries and supercapacitors.




*Discharge curves for a lithium ion 2032 coin cell battery, 40 mAh-rated capacity.*

## Multi-Stage Cell Switch

We use a sophisticated two-stage cell switch in the Interface 1030 design. The first stage is a relay which insures pure electrical isolation. The second stage consists of an ultra-fast MOSFET switch with zero contact bounce. This second stage offers better signal application with minimal spikes, plus the ability to perform current-interrupt iR compensation.




*Selected EIS spectra after charging steps for lithium-ion 2032 coin cell battery, 40 mAh-rated capacity, 10 mA rms.*

## Differential Electrometer

High impedance and low input current are hallmarks of a Gamry Instruments Differential Electrometer. High impedance ensures no stray current leaks through the measurement circuit. Low input current means that it can detect small variations in voltage. The Interface 1030 employs not just one electrometer, but a second for the Zero Resistance Ammeter. Gamry Instruments potentiostats are simply the best choice for electrochemical noise and galvanic corrosion measurements.

## Dual DAC Signal Generation

Two 16-bit Digital-to-Analog converters (DACs) are used to provide the best signal generation possible. By using the Bias DAC to set a DC level and the Scan DAC to provide the scanning signals, we can optimize the resolution and accuracy of the output signal.

# THE GAMRY DIFFERENCE

Gamry Instruments provides you with the complete solution to get the answers you need. We carefully consider every detail of system design. Everything from board layout, component selection, signal processing, all the way down to the tip of our smart cell cables, is designed to deliver maximum performance. Our software is intuitive and easy to use yet powerful enough underneath to allow you to customize experiments and interfaces to suit your needs. This combination of features and capabilities give you the maximum amount of performance at incredible value.

# SPECIFICATIONS

| | Interface 1030T | Interface 1030B | Interface 1030E |
|---|---|---|---|
| Cell Connections | | 2, 3, 4 | |
| Floating | | Yes | |
| **System** | | | |
| Maximum Current | ±100 mA | | ±1 A |
| Current Ranges | 6 | | 9 |
| Current Ranges (with Gain) | 8 | | 11 |
| Minimum Current Resolution | 0.3 pA | | 3.3 fA |
| Minimum Voltage Resolution | | 1 µV | |
| Maximum Applied Potential | ±5 V | | ± 12 V |
| Rise Time | | 1 µs | |
| Noise and Ripple | | <20 µV rms | |
| Minimum Timebase | 1 ms | | 10 µs |
| Maximum Timebase | | 750 s | |
| Minimum Potential Step | | 12.5 µV | |
| **EIS Measurement** | | | |
| Frequency Range | 10 µHz–20 kHz | | 10 µHz–2 MHz |
| Impedance Accuracy | 99% | | See Accuracy Contour Plot |
| Maximum AC Amplitude | | 2.33 V rms | |
| **Control Amplifier** | | | |
| Compliance Voltage | | ±20 V | |
| Output Current | | > ±1 A | |
| Speed settings | | 3 | |
| Unity Gain Bandwidth (typical) | | 980, 260, 40, 4, 0.4 kHz | |
| **Electrometer** | | | |
| Input impedance | | $>10^{12}$ Ω | |
| Input current | | <20 pA | |
| Bandwidth (–3 dB) (typical) | | >15 MHz | |
| Common Mode Rejection Ratio | | >80 dB (10 kHz), >60 dB (1 MHz) | |
| **Applied Potential** | | | |
| Accuracy | | ±1 mV ± 0.2% of setting | |
| Resolution | | 12.5 µV, 50 µV, 200 µV/bit | |
| Potential Scan Range | | ±0.4 V, ±1.6 V , ±6.4 V | |
| **Measured Potential** | | | |
| Accuracy | | ±1 mV ± 0.3% of setting | |
| Resolution | | 400 µV, 100 µV, 10 µV, 1 µV/bit | |
| **Applied Current** | | | |
| Accuracy | | ±5 pA ± 0.3% of setting | |
| Resolution | | 0.0033% full-scale/bit | |
| **Measured Current** | | | |
| Accuracy | | ±5 pA ± 0.3% of setting | |
| Resolution | | 0.0033% full-scale/bit | |
| Bandwidth (current range-dependent) | | >10 MHz (100 mA–100 µA ranges)<br>>1.5 MHz (10 µA range)<br>>150 kHz (1 µA range) | |
| Stability Settings | | 3 | |
| **iR Compensation** | | | |
| Mode | | Positive Feedback and Current Interrupt | |
| Minimum Interrupt Time | | 33 µs | |
| Maximum Interrupt Time | | 715 s | |
| **Physical Dimensions** | | | |
| Weight | | 2 kg | |
| Size | | 24 × 6 × 27 cm (W × H × D) | |
| Cable | | 60 cm (std); 1.5 m, 3 m, 10 m | |

734 Louis Drive | Warminster, PA 18974 USA | +215-682-9330 | Fax: +215-682-9331 | sales@gamry.com | www.gamry.com

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