

# INTERFACE 5000

Interface 5000 Potentiostat/Galvanostat/Zero-Resistance Ammeter



**GAMRY**  
INSTRUMENTS



The Interface 5000 is designed for testing of batteries, supercapacitors, and fuel cells. There are two versions available, the 5000P which provides capabilities for typical testing of single cells using techniques such as charge, discharge, cyclic charge/discharge, potentiostatic, galvanostatic, and galvanostatic EIS to 20 kHz. The 5000E includes Gamry's full suite of electrochemical techniques and extends the impedance frequency range to 1 MHz.

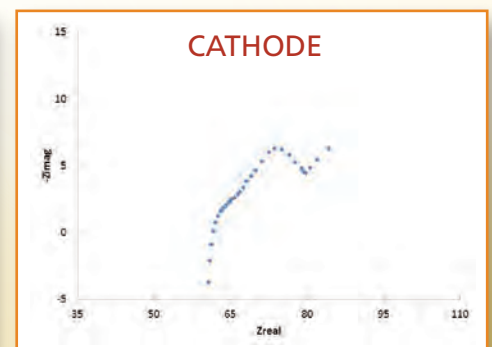
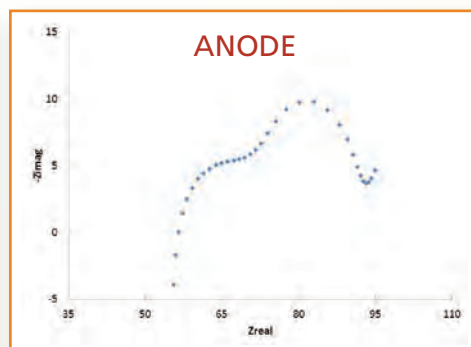
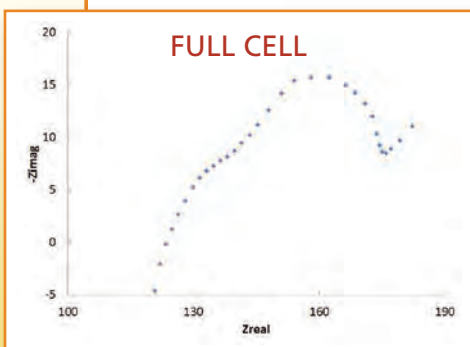
- $\pm 5$  A
- $\pm 6$  V
- EIS to 1 MHz
- Monitor Both Half Cells Simultaneously

### Flexible

With six current ranges from 50  $\mu$ A to 5 A you can characterize new materials or fully-assembled cells.

### Complete Cell Characterization

Gamry gives you the ability to monitor both half-cell voltages in addition to the full cell voltage when an embedded reference electrode is used. You can get both half cells and the whole cell characterized all in one experiment. This saves you time and lets you run more experiments.



## Floating

The Interface 5000 is electrically isolated from ground, allowing you to make measurements on earth-grounded electrodes or multiple working electrodes in a shared cell. You can also run the Interface 5000 in parallel with a power supply or electronic load when studying larger devices or a stack. The power supply or external load can supply or sink large DC currents while the Interface 5000 provides capabilities for EIS measurements.



## Throughput and Flexibility

The Interface 5000 can be configured in a multichannel configuration for increased throughput. Our Interface Power Hub can accommodate up to eight potentiostats in a single chassis. Our multichannel potentiostat even allows you to undock an instrument and move it directly next to your cell or to another lab. This is especially important for impedance measurements where longer cables limit measurement bandwidth.

Our multichannel system does not sacrifice on performance. Each individual channel has the full capabilities of an individual Interface 5000.

The rear of the Interface 5000 contains a User I/O connector that contains digital inputs and digital outputs and an auxiliary voltage out. A Sync port allows multiple potentiostats to be synced together for bipotentiostat and n-stat experiments. The front of the Interface 5000 contains a Monitor connector that can be used for monitoring temperature when coupled with an RTD probe. The monitor port also can be used to output voltage and current to be read by an external device. A monitor expansion board is available as an accessory.

## Low Noise

Gamry is the world leader in designing low noise potentiostats. Like the Interface 1000, the Interface 5000 has noise levels of  $< 20 \mu\text{V rms}$ . Lower noise = better measurements.

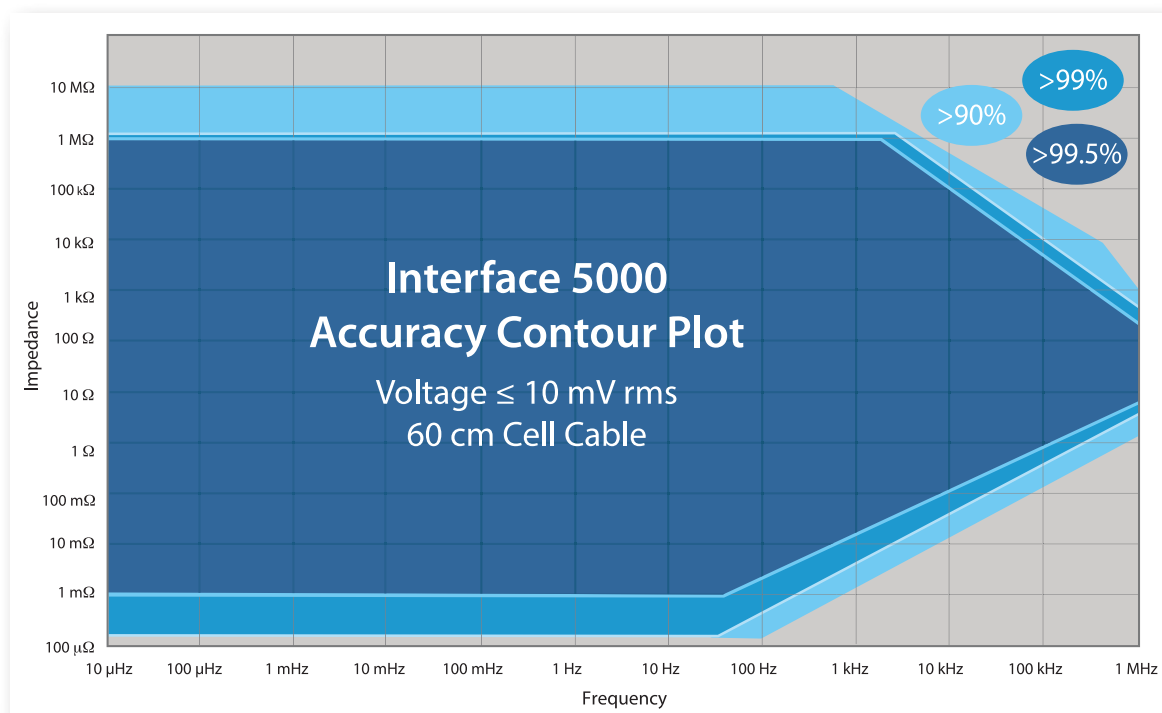
## DSP mode

By acquiring data at 60 kHz (that's 16.6 micro seconds per point), the Interface 5000 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'll see how Gamry brings new meaning to the term low noise.

## Impedance Done Right

Every Interface 5000 is equipped to perform EIS without requiring an expensive FRA or additional option boards. The build-in Direct Digital Synthesis circuitry generates a pure sine wave that is ideal for electrochemical applications. The Interface 5000 can accurately measure impedances down to  $150 \mu\Omega$ . The Interface 5000P can perform galvanostatic EIS up to 20 kHz while the Interface 5000E can perform potentiostatic, galvanostatic, and hybrid EIS up to 1 MHz.

## Accuracy Contour Plot



## Filter

The Interface 5000 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 measurements. The Interface 5000 automatically selects the best filter for the acquisition mode, while still offering expert users the choice for manual adjustments.

## Smart Cell Cables

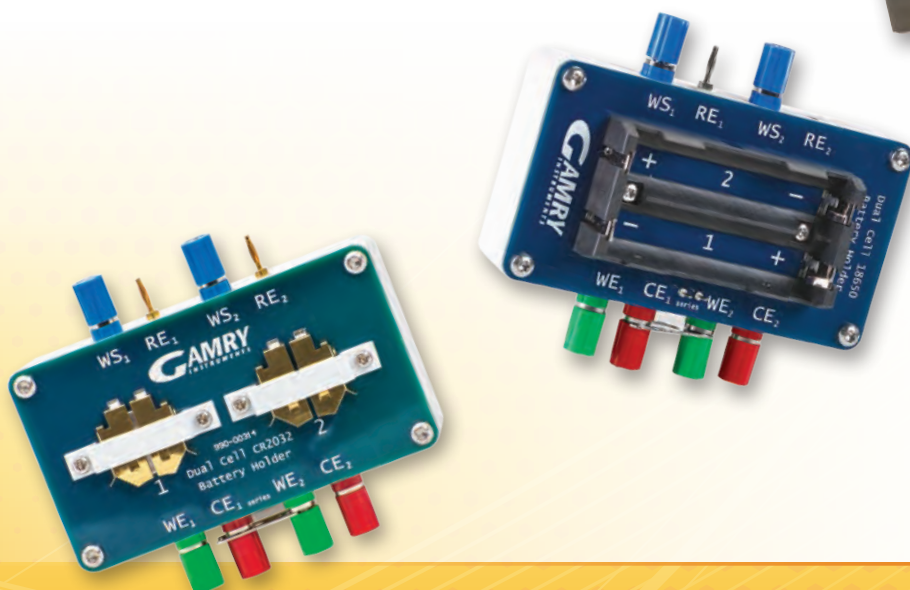
The cell cables for the Interface 5000 have been optimally designed for impedance testing of low-impedance devices such as battery and fuel cells. Low stray capacitance, high resistance isolation, and separate sense and current leads ensures an accurate EIS measurement down to  $150 \mu\Omega$ .

## Multi-stage Cell Switch

A sophisticated two-stage cell Switch is utilized in the Interface 5000 design. The first stage is a relay which insures pure electrical isolation while the second stage is an ultra-fast MOSFET switch with zero contact bounce. The second stage allows for better signal application with minimal spikes, as well as the ability to perform current interrupt iR compensation.

## Accessories

Gamry has several accessories to help you with your research. Our battery holders are designed for four-point direct-contact measurements, reducing contact resistance, giving you more accurate results. Additionally, we have cell kits designed for testing of Lithium battery materials or electrolytes. See our website for additional information on these accessories.



# POTENTIOSTAT / GALVANOSTAT / ZRA SPECIFICATIONS\*

	Interface 5000P	Interface 5000E
<b>SYSTEM</b>		
Cell Connections	2, 3, 4 or 5	2, 3, 4 or 5
Maximum Current	± 5 A	± 5 A
Current Ranges	6 (50 µA - 5 A)	6 (50 µA - 5 A)
Current Ranges (including internal gain)	8	8
Minimum Current Resolution	150 pA	150 pA
Maximum Applied Potential	± 6 V	± 6 V
Rise Time	< 1 µs	< 1 µs
Minimum Timebase	10 µs	10 µs
Noise and Ripple (typical)	< 20 µV rms	< 20 µV rms
<b>CONTROL AMPLIFIER</b>		
Compliance	±8.5 / ±2.5	±8.5 / ±2.5
Output Current	> ± 5 A	> ± 5 A
Speed Settings	5	5
Unity Gain Bandwidth	1050, 250, 434, 4.4, 0.5 kHz	1050, 250, 434, 4.4, 0.5 kHz
<b>EIS MEASUREMENT</b>		
EIS	10 µHz - 20 kHz <sup>†</sup>	10 µHz - 1 MHz
Current AC Amplitude	± 5 A max	± 5 A max
<b>ELECTROMETER</b>		
Input Impedance	> 10 <sup>12</sup> Ω    < 2 pF	> 10 <sup>12</sup> Ω    < 2 pF
Input Current (typical)	< 25 pA	< 25 pA
Bandwidth	> 10 MHz	> 10 MHz
CMR	> 98 db (10 kHz), > 88 db (10 kHz)	> 98 db (10 kHz), > 88 db (10 kHz)
<b>POTENTIAL</b>		
Applied Accuracy	± 1 mV ± 0.2% of setting	± 1 mV ± 0.2% of setting
Applied Resolution	200 µV, 50 µV, 12.5 µV/bit	200 µV, 50 µV, 12.5 µV/bit
Measured Accuracy	± 1 mV ± 0.3% of reading	± 1 mV ± 0.3% of reading
Measured Resolution	200 µV, 20 µV, 2 µV/bit	200 µV, 20 µV, 2 µV/bit
<b>CURRENT</b>		
Applied/Measured Accuracy	± 25 pA ± 0.05% of range ± 0.2% of value	± 25 pA ± 0.05% of range ± 0.2% of value
Applied/Measured Resolution	0.003% full-scale/bit	0.003% full-scale/bit
Bandwidth	> 5 MHz (5 mA)	> 5 MHz (5 mA)

Selected Specifications\* Specifications subject to change. <sup>†</sup>Galvanostatic only

