Potentiostat / Galvanostat

EC301 — 30 V / 1 A compliance potentiostat /galvanostat

EC301 Potentiostat / Galvanostat

- **30 V / 1 A compliance**

- **±15 V polarization range**

- **Front-panel setup and operation**

- **Free full-featured Windows software**

- **1 MHz control bandwidth for EIS**

- **Easy field calibration**

- **Compliance voltage limiting**

- **Handles grounded working electrodes**

- **Ramps from 0.1 mV/s to 10 kV/s**

- **Waveform generation includes Arbs**

- **Ethernet and GPIB interfaces**

The EC301 gives electrochemists the opportunity to equip their labs with high compliance, research-grade instrumentation at less than half the cost of competitive models. Stand-alone front-panel operation allows easy use in the field or in handling routine electrode preparation. The Windows software has routines for all major electrochemical experiments and can be downloaded (at no charge) from our web site. The EC301 has an open command set which allows scientists to write their own unique waveforms and even write custom software.

Front-Panel Operation

The front panel allows you to quickly and easily set up several scan types (CV, LSV, steps and holds). This is particularly useful when the potentiostat is playing a supporting role in an experiment and is not the focus. You can be performing your experiment before some computers finish booting up. The array of indicator LEDs make it easy to know the state of the instrument at a glance.

Software Included

Instead of charging for the software required for you to use your new instrument, we give it to you. Compared to some competing vendors, this can reduce your cost of ownership by thousands of dollars. The software supports all the major electrochemical techniques including voltammetry, pulsed waveforms, step techniques, and EIS. You can even design

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your own waveforms. Data is acquired over the TCP/IP interface or via IEEE-488 (GPIB). The software lets you easily configure sequences of experiments and shows you the data as they are generated. The data is easily exported to your favorite spreadsheet or graphing package.

Designed for EIS

The EC301 was designed with electrochemical impedance spectroscopy (EIS) in mind. Instead of employing driven shields, we bring the measurement close to the cell. This means higher accuracy and less susceptibility to parasitic effects. Shunt resistor current measurements in all ranges enhance control loop stability, enabling EIS at high frequencies.

Compliance Limiting

Quite often, electrochemists are working with sensitive cells which would be destroyed if the full compliance of a potentiostat were brought to bear. Bubbles in a flow cell system can easily cause potentiostats to lose voltage control by blocking feedback to the instrument from the reference electrode. Without compliance limiting, a carefully prepared electrode will be ruined. With this feature, the user can simply select the maximum potential the counter electrode will be allowed to apply. When the limit is reached, it is clamped to the preset level. Compliance limiting guarantees safe operation even if control is lost.

Floating Working Electrode

In normal operation, the working electrode current return path is tied to chassis ground. However, there are times in which electrochemists wish to experiment with working electrodes that are intrinsically grounded (e.g., water pipes, rebar in concrete, an autoclave). Once the shorting bar from the rear panel of the instrument is removed, the ground return path floats, allowing these experiments.

Fast Cyclic Voltammetry

The EC301 supports scan rates up to 10 kV/s. Potential, current and an auxiliary signal are all acquired simultaneously at 250,000 samples per second. Furthermore, an AC line detection circuit allows synchronization of repetitive scans with the power line cycle.

Built-in Temperature Measurement

Temperature is a critical parameter in many battery, fuel cell and corrosion experiments, but it is often not recorded. Not knowing the temperature at which the data were acquired can make it difficult to compare your results. With a built-in input for a 100 ohm platinum RTD, the EC301 makes it easy to acquire and plot temperature right along with the rest of your data.

Open Command Set

Some vendors do not publish their commands, locking customers in to buying their software. Our software is free and so is our command set. While our software covers the major electrochemical techniques, we realize that electrochemistry isn't static. When a new technique or procedure is developed, the open command set lets experimentalists write customized software to support it. You can write in LabVIEW, MATLAB, or whatever your favorite language is.

EC301 front panel

EC301 rear panel

Measurement Accuracy

Voltage	±0.2 % of reading ±5 mV
Current	
1A range	±0.5 % of reading ±0.2% of range
All other ranges	±0.2 % of reading ±0.2 % of range
Sample period	4 µs

Differential Electrometer

Input impedance	>1 TΩ ‖ 20 pF
Input bias current	<20 pA
Bandwidth	>10 MHz

Cell Current Input

Ranges	1 nA to 1 A in decade ranges

Power Amplifier

Compliance	±30 V at ±1 A
Slew rate	≥10 V/µs

Potentiostat Mode

Applied potential acc.	±1 % of setting ±5 mV
Automatic scan rate	0.1 mV/s to 10 kV/s
Applied potential range	±15 V versus reference
Noise and ripple	<20 µVrms (1 Hz to 10 kHz)

Galvanostat Mode

Current	
1A range	±0.5 % of reading ±0.2% of range
All other ranges	±0.2 % of reading ±0.2 % of range
Automatic scan rate	1 pA/s to 2 A/s

ZRA Mode

Voltage offset	±5 mV

Control Loop

Bandwidth limits	10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, >1 MHz
CE limit accuracy	±100 mV ± 1 mV/mA of cell current

Temperature Measurement

Sensor	Pt RTD
Accuracy	±1 °C, ±0.3 °C below 100 °C (typ.)

IR Compensation

Positive feedback range	3 Ω to 3 GΩ (depends on current range)
Interrupt switching time	<5 µs (1 kΩ resistive load)
Interrupt duration	100 µs to 1 s
Interrupt frequency	0.1 Hz to 300 Hz

Front-Panel Inputs & Outputs

Voltage (E)	±15 V output
Filters	None, 10 Hz low-pass
Bias rejection	±15 V (full range)
Current (I)	±2 V output (1 V full scale)
Filters	None, 10 Hz low-pass
Bias rejection	±2 V (full range)
Rotator	0 to 10 V output
External input	
Potentiostatic range	±15 V
Galvanostatic range	±2 V (±1 V on 1 A range)
Impedance	$Z_{in} = 10\,k\Omega\ \|\ 50\,pF$
Bandwidth	1 MHz

Rear-Panel Inputs & Outputs

Timebase	10 MHz, 1 Vpp
Raw E	±15 V output
Raw I	±2 V output, (1 V full scale)
CE / 3	±10 V V_{CE} / 3 voltage output, 1 MHz bandwidth
Sync ADC	±10 V analog input
CI Sync	TTL output for IR compensation
Scan trigger	Digital input. Falling edge begins automatic scan
Program E/I	±15 V input (sum of internal and external voltage programs)
ADC 1,2,3	±10 V analog inputs (general purpose)

General

Remote interfaces	IEEE-488.2 and TCP/IP
Weight	26 lbs.
Dimensions	17" × 5.25" × 19.5" (WHD)
Warranty	One year parts and labor on defects

GMP SA
Av. des Baumettes 17
CH-1020 Renens

Tél. 021 633 21 21
Fax 021 633 21 29
info@gmp.ch – www.gmp.ch

GMP
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MICROTECHNOLOGY
& PHOTONICS

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