Potentiostat / Galvanostat

EC301 — ±30 V compliance voltage, ±1 A maximum current

EC301 Potentiostat / Galvanostat

- ***±30 V compliance voltage***
- ***±1 A current***
- ***Up to ±20 A power booster (opt.)***
- ***±15 V polarization range***
- ***Built-in EIS***
- ***Full-featured software included***
- ***Ethernet and GPIB interfaces***

- ***EC301 ... $7990*** *(U.S. list)*

The EC301 gives electrochemists the opportunity to equip their labs with high compliance, research-grade instrumentation at a very attractive price. Stand-alone front-panel operation allows easy use in the field or in handling routine electrode preparation. The free Windows software (SRSLab) has routines for all major electrochemical experiments and can be downloaded from the SRS 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 intuitive front panel of the EC301 allows you to quickly and easily set up several scan types (CV, LSV, steps and holds). Unlike many competitive models, the EC301 is a stand-alone instrument – you don't need to use a computer. The array of indicator LEDs make it easy to know the state of the instrument at a glance.

Software Included

The SRSLab software supports all the major electrochemical techniques including voltammetry, pulsed waveforms, step techniques, and Electrochemical Impedance Spectroscopy (EIS). You can even design your own custom measurements. 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 spreadsheets and graphing packages.

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 via a remote preamplifier. 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. The EC301 performs stand-alone EIS measurements up to 100 kHz. An external frequency response analyzer (FRA) can be used to measure EIS at frequencies up to 1 MHz using analog connections.

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.

Optional Power Boosters

SRS offers a ±5 A (O100BST), ±10 A (O200BST) or ±20 A power booster for applications requiring higher current. All three are affordably priced.

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

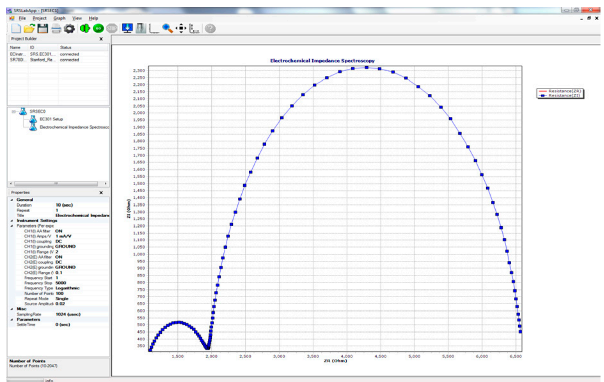
The EC301 supports scan rates up to 10 kV/s. Potential, current and an auxiliary signal are all acquired simultaneously at 250,000 samples per second. Furthermore, an AC line detection circuit allows synchronization of repetitive scans with the power line cycle.

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 Ω platinum RTD, the EC301 makes it easy to acquire and plot temperature right along with the rest of your data.

Open Command Set

While our software supports all 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 any other language.



EIS of two time constant load

Ordering Information

EC301	30 V / 1 A potentiostat / galvanostat	$7,990
O100BST	±5 A power booster	$3,500
O200BST	±10 A power booster	$4,000
O400BST	±20 A power booster	$5,000
QCM200	Quartz Crystal Microbalance	$2,995
O100CAB	Replacement terminal cables	$150
O100RTD	RTD for EC301	$250

EC301 front panel

EC301 rear panel

Power Amplifier (CE)

Compliance voltage	±30 V
Maximum current	±1 A
Bandwidth	>1 MHz (10 kΩ load, <100 µA)
Slew rate	≥10 V/µs
CE limit	Limits counter electrode voltage when enabled
Set range	±500 mV to ±30 V
Bandwidth	1 MHz
Bandwidth limit	10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz cutoff frequencies

Differential Electrometer (EC19 Module)

Input range	±15 V
Input impedance	>1 TΩ in parallel with 20 pF
Input bias current	<20 pA
Bandwidth	>10 MHz
CMRR	>80 dB (<10 kHz)

Potentiostat Mode

Applied voltage range	±15 V
Resolution	500 µV (200 µV performing an automatic scan)
Accuracy	±0.2 % of setting ±5 mV
Automatic scan rate	0.1 mV/s to 10 kV/s
Noise and ripple	<20 µVrms (1 Hz to 10 kHz)

Galvanostat Mode

Applied current ranges	±1 nA to ±1 A in decades
Setpoint resolution	0.001 x full scale current
Accuracy	
1 A range	±0.5 % of reading ±0.2 % of range
All other I-ranges	±0.2 % of reading ±0.2 % of range
Automatic scan rate	1 pA/s to 2 A/s

Power Booster (opt.)

Maximum current	±5 A, ±10 A or ±20 A
Compliance voltage	±20 V

ZRA Mode

Voltage offset	CE_{Sense} and WE electrodes held within ±5 mV of each other

Voltage Measurement

Range	±15 V
Resolution	
±15 V range	0.4 mV
±5 V range	0.1 mV
±2 V range	0.06 mV
Accuracy	±0.2 % of reading ±5 mV
Acquisition rate	4 µs (250 kS/s)

Current Measurement

Range	±1 nA to ±1 A in decades
Resolution	0.01 % of full scale current
Accuracy	
1 A range	±0.5 % of reading ±0.2 % of range
All other current	±0.2 % of reading ±0.2 % of range
Acquisition rate	4 µs (250 kS/s)

Voltage and Current Analog Outputs

Voltage output	±15 V output
Accuracy	±0.2 % of $V_{RE} - V_{WE}$ Sense ±5 mV
Output impedance	50 Ω
Max. output current	10 mA
Filters	No filtering or 10 Hz low-pass
Bias rejection	±15 V (full range)
Current output	±2 V
Accuracy (1A range)	I_{WE} within ±0.5 % of ($V_{BNC} \times I_{Range}$) ±0.2 % × I_{Range}
Accuracy (all other ranges)	I_{WE} within ±0.2 % of ($V_{BNC} \times I_{Range}$) ±0.2 % × I_{Range}
Max. output current	10 mA
Filters	No filtering or 10 Hz low-pass
Bias rejection	±2 V (full range)

IR Compensation

Positive feedback	
Range	3 Ω to 3 GΩ (depends on current range)
Resolution	1 mΩ (1 A range) to 100 kΩ (1 nA range)
Current interrupt	
Switching time	<5 µs (1 kΩ resistive load)
Interrupt duration	100 µs to 1 s
Interrupt frequency	0.1 Hz to 300 Hz

EIS

Mode	Potentiostatic / Galvanostatic

Sine Wave Generator (open control loop)

Frequency range	10 µHz to 100 kHz
Frequency setability	1 µHz
Sweep	Linear or logarithmic
Amplitude, p'stat	10 mVpp to 15 Vpp
Amplitude, g'stat (1A range)	1% of full scale current to 2x full scale current
Amplitude resolution	1 mV (potentiostatic) or 0.1% of full scale current (galvanostatic)
Potentiostatic DC offset	±14.9 V (| offset + amplitude | <15V)

Impedance Analyzer

Frequency	10 µHz to 100 kHz

Phase Accuracy	2 degrees (typical, load and frequency dependent)
Amplitude Accuracy	1% (typical, load and frequency dependent)

Temperature Measurement

Sensor	100 Ω Pt RTD
Accuracy	±1 °C (–100 °C to +200 °C)

Rotating Electrode Output (front-panel BNC)

Range	0 to 10 V settable analog output
Accuracy	±1 % of setting ±5 mV

External Input (front-panel BNC)

Input range	±15 V (potentiostat mode), ±2 V (galvanostat mode)
Potentiostat mode	1 V input corresponds to an applied voltage of 1 V
Galvanostat mode	1 V input corresponds to an applied voltage of 1 A
Impedance	10 kΩ in parallel with 50 pF
Bandwidth	>1 MHz
ADD TO SCAN button	Adds the external input voltage to internally-generated scans
DIRECT CONTROL button	Takes the control voltage or current solely from the external input

Rear-Panel Inputs and Outputs

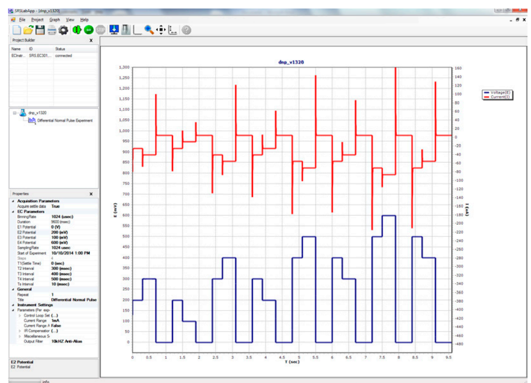
Timebase	10 MHz, 1 Vpp
Raw E	±15 V output
Raw I	±2 V output (1 V full scale)
CE / 3	±10 V, V_{CE}/3 voltage output, 1 MHz bandwidth
Sync ADC	±10 V analog input
CI sync	TTL output for IR compensation
Scan trigger	Digital input. Falling edge begins automatic scan
Program E/I	±15 V input (sum of internal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

General

Dimensions	17" × 5.25" × 19.5" (WHL)
Weight	26 lbs.
Warranty	One year parts and labor on defects in materials & workmanship

SRSLab Software

Communication	IEEE-488.2 & TCP/IP interfaces
Operating system	Windows
Measurements	Cyclic Voltammetry (CV)
	Linear Sweep Voltammetry
	Cyclic Staircase Voltammetry (Tast)
	Square Wave Voltammetry
	Differential Pulse Voltammetry (DPV)
	Differential Normal Pulse Voltammetry (DNPV)
	Timed Hold
	Quartz Crystal Microbalance (QCM)
	Electrochemical Impedance Spectroscopy (EIS)



Differential normal pulse