Potentiostat / Galvanostat

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

- ±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 Potentiostat / Galvanostat**

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.
**EC301 Potentiostat / Galvanostat**

**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 kHz. 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.

**Ordering Information**

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<th>Item</th>
<th>Description</th>
<th>Price</th>
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<td>EC301</td>
<td>30 V/1 A potentiostat/galvanostat</td>
<td>$8,990</td>
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<tr>
<td>O100BST</td>
<td>±5 A power booster</td>
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<td>O200BST</td>
<td>±10 A power booster</td>
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<td>O400BST</td>
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<td>QCM200</td>
<td>Quartz Crystal Microbalance</td>
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<td>O100CAB</td>
<td>Replacement terminal cables</td>
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<td>O100RTD</td>
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**Images**

- **EC301 front panel**
- **EC301 rear panel**

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**SRS**

Stanford Research Systems

phone: (408)744-9040

www.thinkSRS.com
### EC301 Specifications

#### 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**: ±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**: $I_{WE}$ within ±0.5% of (V BNC × $I_{Range}$) ±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**: 1% of full scale current to 2x full scale current (1A range)
  - **Amplitude resolution**: 1 mV (potentiostatic) or 0.1% of full scale current (galvanostatic)
  - **Potentiostatic DC offset**: ±14.9 V
    - ($|\text{offset} + \text{amplitude}| < 15V$)
  - **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 100Ω 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 Adds the external input voltage to internally-generated scans
DIRECT CONTROL 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

**SRS Lab 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)