

# HCP-1005



High current potentiostat...

... specially focused on battery testing!

- Li-ion
- Ni-Cd
- Ni-MH

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The investment in new energy sources is growing with the announced lack of oil and emerging nations using vehicles. Research on secondary batteries is now one of the most important fields of electrochemistry. Researchers need a dedicated instrument. The **HCP-1005** is a compact high current potentiostat / galvanostat / FRA specially designed to study strong secondary batteries with a high capacity. With a voltage range of 0 to 5 V and a current range of +/-100 A, this unit can be used to test industrial battery modules. The EIS capability integrated in the chassis is ideal for ageing tests.

This High Current Potentiostat is a 100 A / 0-5 V system. It is available in two different models: the controlled stand-alone one **HCP-1005** and an external booster **VMP3B-1005** that is included in an other chassis to be controlled by an existing potentiostat of our range. This booster is compatible with SP-150, VSP, VMP2 and VMP3.

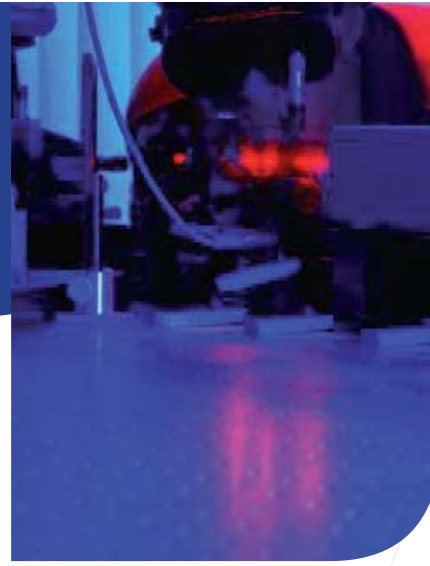
The **HCP-1005** is managed from a PC by an USB or an Ethernet connection. Using the Ethernet connection, the **HCP-1005** can be installed in a Local Area Network to follow the experiment from several computers.

The EC-Lab® software supplied with the potentiostat offers more than 50 techniques that can be sequenced or linked, but also a variety of analysis tools.

EIS capability is provided in standard with more than 5 dedicated techniques to control the cell in potentiostatic or galvanostatic mode. Specific multisine EIS techniques are developed to reduce the experiment duration. Among the different software tools, modelling EIS data with Levenberg-Marquardt and Simplex algorithms is interesting to study materials constituting the cells and for ageing follow up.

Our external electronic booster is plug-and-play. It can be connected and disconnected from the channel board and reconnected to another one without switching off the instrument.

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## GENERAL SPECIFICATIONS:

- Current ranges up to +/-100 A
- Voltage range: 0.6 - 5 V
- EIS capability from 10  $\mu$ Hz to 10 kHz and up to 1 MHz without booster
- EC-Lab® software with more than 50 techniques
- Disconnectable current booster to use the system as a research grade potentiostat / galvanostat
- Available as a 100 A / 5 V booster.  
Compatible with SP-150, VSP, VMP2 and VMP3.

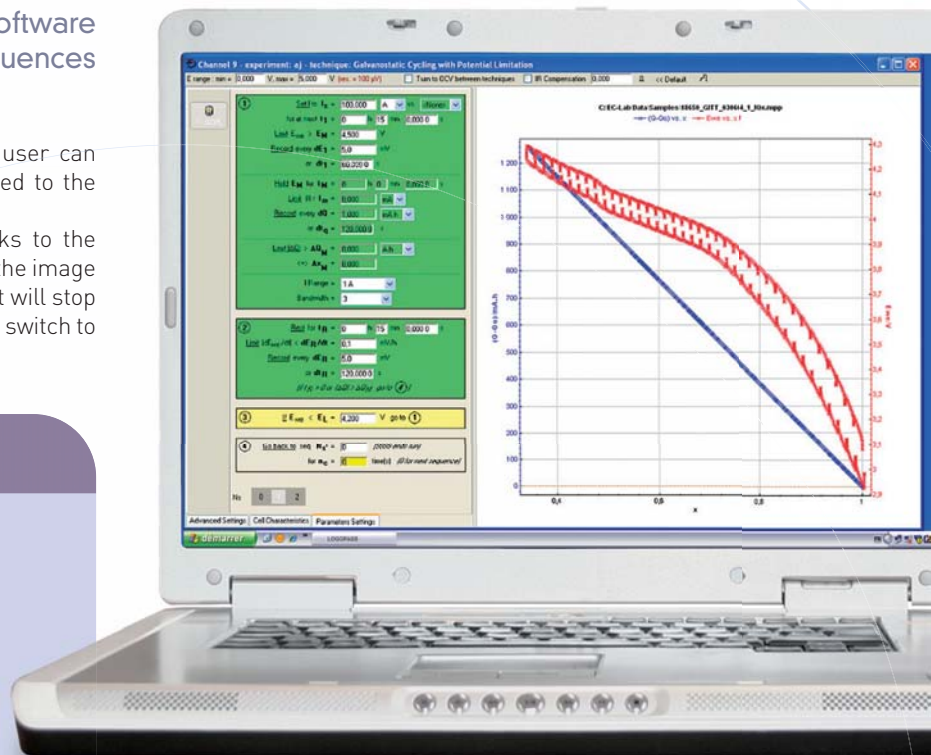


## EC-LAB<sup>®</sup>: COMPLETE SOFTWARE FOR A FULL CONTROL OF THE EXPERIMENT

Especially devoted to battery testing, EC-Lab<sup>®</sup> software offers more than 50 techniques with up to 100 sequences that can be linked.

With the special "Battery Cell Characteristics" window, the user can define the intercalation coefficient  $x$  and several values related to the battery material.

The cell temperature can be recorded in the data file thanks to the external device window. When configured the analog input 1 is the image of the temperature. It is used either as an experiment limit that will stop the experiment or as a conditional limit in special techniques to switch to the next technique.



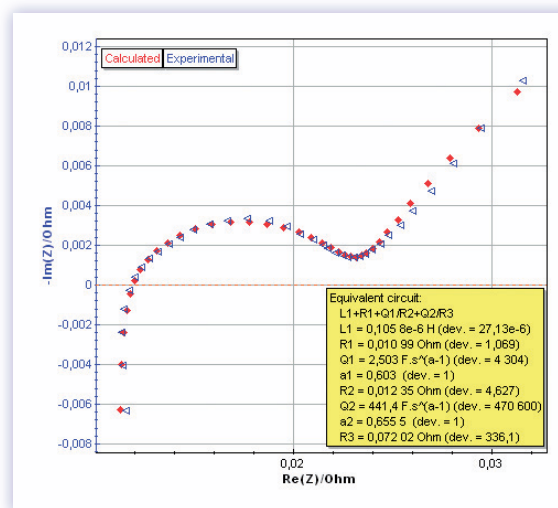
### TECHNIQUES

Voltammetric techniques	OCV, CV, CVA, CA, CP
Impedance	Galvano/potentiometric EIS, Staircase EIS (Mott-Schottky), Multisine mode
Technique builder	Modular potenti/galvano, Loop, Wait, Trigger in/out
Battery testing	Galvanostatic cycling (GCPL), Potentiodynamic cycling (PCGA), Constant Load Discharge, Constant Power, Alternate Pulsed Galvano Cycling
Ohmic drop	Manual IR, EIS determination

## ANALYSIS TOOLS

The complete graphic package provided with EC-Lab<sup>®</sup> software includes analysis tools and advanced fitting tools. A "Process data" function helps the user to calculate additional variables such as energy, charge or capacity during successive cycles.

The processed file is automatically stored on the hard disk. EC-Lab<sup>®</sup> software offers classical analysis tools (linear or circular fit) and also a powerful tool for EIS data fitting. It includes electrical equivalent circuits with basic electronic elements and uses two minimization algorithms (Simplex, Levenberg-Marquardt).



## CHANNEL BOARD

### Cell control

Connection	2, 3, 4 or 5 terminal leads (+ ground)
Compliance	+/- 10 V range adjustable from $\pm 10$ V to 0 - 20 V
Maximum current	$\pm 400$ mA continuous
Maximum potential resolution	300 $\mu$ V on 20 V dynamic range programmable down to 5 $\mu$ V on 200 mV range
Maximum current resolution	0.004% of the dynamic range programmable down to 0.760 pA on the 10 $\mu$ A range
Accuracy (DC)	< 0.1% FSR*
Rise time	< 2 $\mu$ s (no load)
Acquisition time	20 $\mu$ s

### Current measurement

Ranges	$\pm 10$ $\mu$ A to $\pm 400$ mA (7 ranges)
Maximum resolution	0.004% FSR*
Acquisition speed	200,000 samples/s
Accuracy (DC)	< 0.1% FSR*

### Potential measurement

Ranges	$\pm 2.5$ V, $\pm 5$ V, $\pm 10$ V, $\pm 10$ V adjustable
Maximum resolution	0.0015% of the range, down to 75 $\mu$ V
Acquisition speed	200,000 samples/s
Accuracy (DC)	< 0.1% FSR*

### Electrometer

Inputs	3 potential measurements
Impedance	> $10^{12}$ ohms in parallel with < 20 pF
Bias current	< 5 pA

### Auxiliary Inputs / Outputs

2 general purpose analog inputs	16 bits resolution with automatic $\pm 2.5$ V, $\pm 5$ V, $\pm 10$ V ranges
1 analog output	$\pm 10$ V
1 input trigger	TTL level
1 output trigger	TTL level

### General

Dimensions, weight	260 x 495 x 465 mm (H x W x D), 23 kg
Power	85-264 V, 47-440 Hz

## IMPEDANCE (EIS)

### Impedance

Frequency range	10 $\mu$ Hz to 10 kHz
Amplitude	1 mVpp to 1 Vpp
	0.1% to 50% of the current range
Accuracy	1%, 1°

## BOOSTER BOARD

### Cell control

Connection	2, 3, 4, 5 terminal leads
Compliance	6 V
Current range	-/+ 100 A
Potential range	0.6 - 5 V range adjustable
Rise and fall time	4 ms
Galvano mode (10/100 A)	
20 mohms load (bw 3)	
Rise and fall time	1.7 ms
Potential mode (0.6/5 V)	
No load (bw 3)	

### Measurement

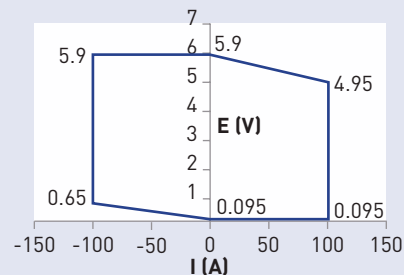
Current accuracy	0.5% FSR*
Potential noise (0-10 kHz)	0.15 mV rms
Current noise (0-10 kHz)	5 mA rms

### Auxiliary Inputs / Outputs

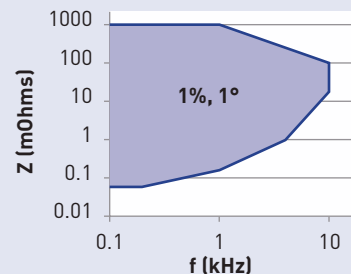
T° Probe	PT-100 - 0 to 250 °C
1 Open In	0-5 V TTL level
Overheat shutdown	70°C

## CONTOUR MAPS

### Compliance



### EIS



\* FSR: Full Scale Range  
Specifications subject to change

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