HIGH CURRENT POTENTIOSTAT/GALVANOSTAT/EIS

HCP-1005

High Current Potentiostat...
... specially focused on battery testing!

BioLogic

APPLICATIONS

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

HCP-1005

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/EIS 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 stack. The EIS capability integrated in the chassis is ideal for ageing tests.

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. EC-Lab® also allows the user to measure the counter electrode potential.

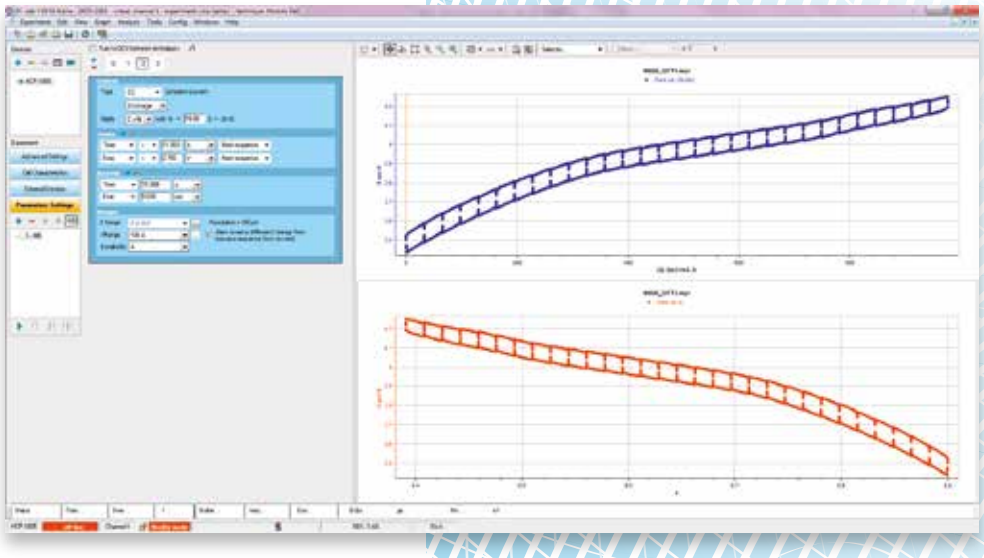
EIS capability is provided in standard with more than 5 dedicated techniques to control the cell in potentio or galvano mode. Specific multisine EIS techniques are developed to reduce the experiment duration. Among the different software tools, modelling EIS data with Levenberg-Marquardt and Simplex 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.

SPECIFICATIONS

- Current ranges +/-100 A
- Voltage range: 0.6 - 5 V
- EIS capability from 10 µHz 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
- Sampling rate: 200 µs
- Possibility to work with reference electrode (3 electrodes configuration)

EC-Lab® Software



EC-Lab®: complete software for a full control of the experiment

Especially devoted to battery testing, EC-Lab® 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 several parameters related to the battery material as the intercalation coefficient or the battery capacity.
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.

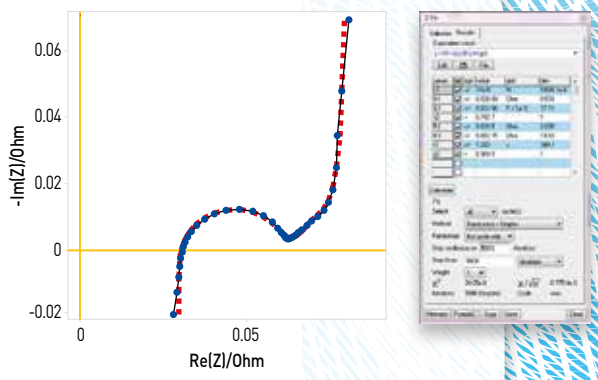
Techniques

Battery testing	Galvanostatic cycling (GCPL), Potentiodynamic cycling (PCGA), Constant Load Discharge (CLD), Constant Power (CP), Alternate Pulsed Galvano Cycling (APGC), ModuloBat*, Profile Import, Battery Capacity Determination (BCD), Coulombic Efficiency Determination (CED)
Impedance	Galvano/potentio EIS, Multisine mode, Staircase EIS (Mott-Schottky)
Ohmic drop	Manual IR, Current Interrupt, ZIR (EIS)
Voltammetric techniques	OCV, CV, CVA, CA, CP
Technique builder	Modular potentio/galvano, Loop, Wait, Trigger in/out

* 12 control modes, up to 100 sequences, 3 limits per sequence.

Analysis tools

The complete graphic package provided with EC-Lab® software includes analysis tools and advanced fitting tools. Coulombic Efficiency Determination technique and his analysis, CED, allow the user to determine and follow the evolution of the coulombic efficiency of a battery during a charge/discharge protocol.
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® 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).



Specifications

CHANNEL BOARD

Cell control

Connection	2, 3, 4 or 5 terminal leads (+ ground)
Compliance	+/-10 V range adjustable from ± 10 V to 0 – 20 V
Maximum current	± 400 mA continuous
Maximum potential resolution	300 µV on 20 V dynamic range programmable down to 5 µV on 200 mV range
Maximum current resolution	760 pA on the 10 µA range
Accuracy (DC)	< 0.1% FSR*
Rise time	< 2 µs (no load)
Acquisition time	200 µs

Current measurement

Ranges	± 10 µA to ± 400 mA (7 ranges)
Maximum resolution	760 pA
Acquisition speed	200,000 samples/s
Accuracy (DC)	< 0.1% FSR*

Potential measurement

Ranges	± 2.5 V, ± 5 V, ± 10 V , ± 10 V adjustable
Maximum resolution	0.0015% of the range, down to 75 µV
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 ± 2.5 V, ± 5 V, ± 10 V ranges
1 analog output	± 10 V
1 input trigger	TTL level
1 output trigger	TTL level

General

Dimensions, weight	495 x 465 x 260 mm (W x D x H), 23 kg
Power	200-240 V, 47-440 Hz

IMPEDANCE (EIS)

Impedance

Frequency range		10 µHz to 10 kHz
Amplitude	potentio	1 mVpp to 1 Vpp
	galvano	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 galvano mode (10/100 A) 20 mohms load (bw 3)	4 ms
Rise and fall time potentio mode (0.6/5 V) no load (bw 3)	1.7 ms

Measurement

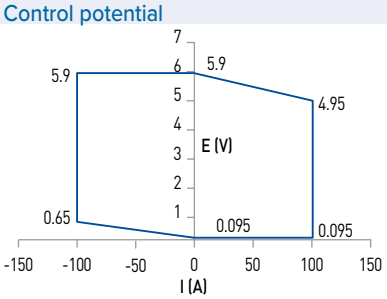
Current accuracy	0.5% FSR*
Potential noise (0-10 kHz)	0.15 mV rms
Current noise (0-10 kHz)	5 mA rms

Auxiliary inputs/outputs

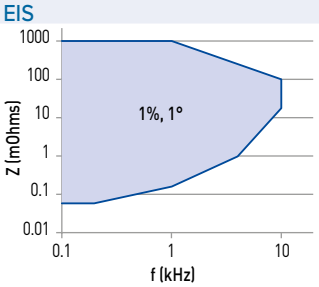
T° probe	PT-100 - 0 to 250 °C
1 open in	0-5 V TTL level
Overheat shutdown	70°C

CONTOUR MAPS

Control potential



EIS



* FSR: Full Scale Range
Specifications subject to change

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