BioLogic

RESEARCH GRADE BATTERY CYCLER

MPG-2xx.

A series of battery testers with EIS capability

The MPG-2xx series is a series of 2 battery testers designed for battery cycling and with EIS capability.
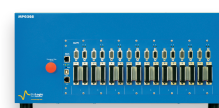
Introduced in 2010, the first MPG-2 system offers 16 independent potentiostats/galvanostats in one chassis.

To complete the range, more powerful systems have been developed: **the MPG-2xx series can be provided in a rack of supporting 2 different instruments : the MPG-2 and the MPG-205**:
- **MPG-2:** 16 channels/100 mA each,
- **MPG-205:** 8 channels/5 A each.
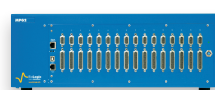
MPG-2

MPG-205

With this connection, the MPG-2xx units can be installed on a Local Area Network to allow multiple users to access the instruments and follow the battery cycling from anywhere.

The MPG-2xx series offers a temperature measurement and three optional connection modes to the battery (battery holder, short or long cables). Each channel has two analog inputs and one analog output to allow interfacing with external instruments.

The MPG-2xx series is supplied with EC-Lab® software, developed for battery and supercapacitor applications. Most of the techniques are designed specifically for batteries. Specific analysis tools are also available.

Specifications

- **Current ranging** from 10 µA up to max current with a resolution 0.004% of the range
- 0-9 V control voltage
- Resolution of 300 µV programmable down to 5 µV by adjusting the dynamic range (100 µV resolution on 5 V range)
- **Acquisition time:** 200 µs
- No limit in time and data recording

Options

- EIS from 10 µHz to 100 kHz
- Rack (5 units)
- Cables: short (25 cm), long (2.5 m)
- Temperature probe
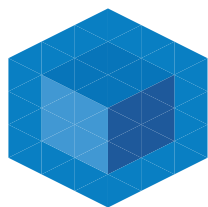
EC-Lab® Software
a monitoring software dedicated to battery testing

A new modular technique has been added to EC-Lab® software. This "ModuloBat" technique comes to complete the battery applications section.

Limits

In **EC-Lab®**, the user can define all the parameters related to the battery material such as capacity in a special "Battery Cell Characteristics" menu. For each technique many parameters can be defined as experiment limits (x value, charge/discharge capacity value, potential...). Some of these limits can be used as security parameters to stop the experiment and to avoid damaging the cell. They can also be used as conditional limits to switch to the next step (temperature, Q).

Each technique can be composed of several sequences (up to 100) and it is possible to link up to 20 different techniques. With this capability the user can create unique and flexible experiments.
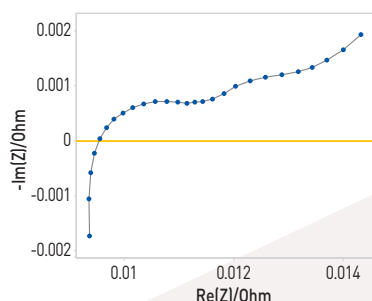
ModuloBat

The new **ModuloBat** technique can be composed of 100 sequences. For each of them, the control mode can be chosen by the user among 12 modes. In every sequence up to three limits can be selected with different action taken when reached, for example "go to the next sequence". Several recording conditions can be defined for an optimized amount of data points. Settings can also be defined as a function of the capacity rate.

Analysis

The graphic package provided with the **EC-Lab®** software includes advanced analysis and advanced fitting tools (Z Fit). Some process functions, such as "Process data", "Capacity & Energy per cycle" or "Constant Power Protocol Summary" help the user calculating additional variables during successive cycles, such as:

• energy,
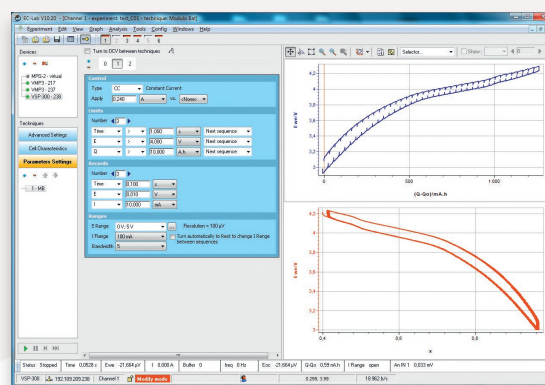• charge/discharge capacity,
• efficiency,
• dynamic resistance.

The processed file is automatically stored on the computer.

Techniques

Batteries testing GITT, PITT, CLD, CPW, APGC, ModuloBat*, profile import, BCD
Voltammetric techniques OCV, CV, CVA, CA, CP
Supercapacitors CV, Cst Voltage, Cst Current, Current Scan
Technique builder modular potentio/galvano (MP/MG), SMP, SMG, loop, trigger in/out, wait
IR determination current interrupt, ZIR (EIS)

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

Graph tools

Calculation/analysis	process data, capacity & energy per cycle, summary per protocol & cycle, Z Fit
Graphic tools	integral, min/max determination, peak analysis, linear fit...
Graph representations	Q charge/Q discharge, time of charge/discharge
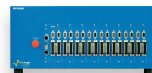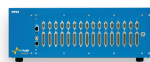
General functions	MPG-2	MPG-205 (8 x 5 A)
Channel number	16	8
Cell connection	2, 3, 4 or 5 terminal leads	2 or 4 terminal leads
Potentiostat/galvanostat		yes
IR compensation		yes
External input/outputs		yes
EIS		yes

Cell control		
Compliance	±10 V @ 100 mA	–2 V; 9 V @ 5 A
Maximum current	±100 mA continuous	±5 A continuous
Maximum potential	10 V @ 100 mA	9 V @ 5 A
Potential resolution		200 µV down to 5 µV
Current resolution		0.004% of FSR*/0.8 nA
Current accuracy		±0.1% of control ±0.01% of FSR*
Bandwidth/stability factor		62 kHz, 21 kHz, 3.2 kHz, 318 Hz, 32 Hz

Voltage measurement		
Ranges	±10 V, ±5 V, ±2.5 V	0-5 V, 0-10 V
Accuracy (DC)		±0,1% of control ±0.01% of FSR*
Resolution		0.004% of FSR*
Acquisition speed		200 µs
Noise (peak to peak 0-100 kHz)		600 µV

Current measurement		
Ranges	±100 mA, ±10 mA, ±1 mA, ±100 µA, ±10 µA, autorange	±5 A, ±1 A, ±100 mA, ±10 mA, ±1 mA, ±100 µA, ±10 µA, autorange
Accuracy (DC)		±0.1% of control ±0.01% of FSR*
Resolution	0.004% of FSR*	
Noise (peak to peak 0-100 kHz)	0.02% of FSR*	

EIS option		
Frequency range		10 µHz to 100 kHz
Amplitude		1 mVpp to 1 Vpp, 0.1% to 50% of the current range
Mode		Single Sine, Multi Sine, FFT analyis

Electrometer		
Input impedance[1]	100 GΩ || 25 pF typical	100 GΩ || 100 pF typical
Input bias current	< 10 pA	< 10 pA
Bandwidth (-3 dB)	8 MHz	3 MHz
Common mode rejection rate	> 85 dB	> 85 dB

Auxiliary inputs/outputs		
Emergency stop button	no	yes (global power off)
Monitor output	E and I monitors	I monitor
2 analog inputs [2]		automatic ±2.5 V, ±5 V, ±10 V ranges - 16 bits resolution
1 analog output [2]		±10 V range 16 bits resolution
2 digital inputs		TTL level trigger input
1 digital output		TTL level trigger ouput
Safety		1 digital security input (open in)

General		
Weight	17 kg	25 kg
Dimensions (H x W x D)	260 x 495 x 465 mm	254 x 494 x 454 mm
Power	350 W, 85-264 V, 47-440 Hz	860 W, 85-264 Vac, 47-440 Hz
Rack dimension (H x W x D)		5 units, 1850 x 600 x 710 mm
IP (protection level)		20
Temperature range		10 - 40°C

* FSR: Full Scale Range   (1): without cable   (2): the "PT-100" temperature probe uses one analog input and the analog output
Specifications are subject to change

Headquarters

BioLogic SAS

4, rue de Vaucanson
38 170 Seyssinet-Pariset
France
Phone: +33 476 98 68 31
Fax: +33 476 98 69 09

Subsidiary offices

BioLogic USA, LLC
USA
Phone: +1 865 769 3800

BioLogic Science Instruments GmbH
Germany
Phone: +49 551 38266900

BioLogic Science Instruments Ltd
United Kingdom
Phone: +44 333 012 4056

BioLogic Spain
Spain
Phone: +34 681 357 873

BioLogic Pvt Ltd
India
Phone: +91 022 46055588

BioLogic Singapore
Singapore
Phone: +65 92335838

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