MPG-2xx

A series of battery testers with EIS capability

BioLogic Science Instruments

APPLICATIONS

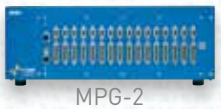
- Lithium-ion
- Lithium-polymer
- Lithium-air
- Nickel-metal hydride
- Supercapacitors

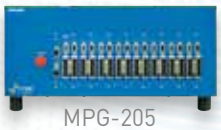
The **MPG-2xx series**

is a series of 5 battery testers designed for battery cycling and with EIS capability. Four new units come to extend the original MPG2 family.

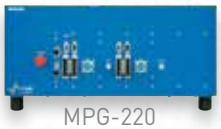
Introduced in 2010, the first **MPG-2** system offers 16 independent potentiostats/ galvanostats in one chassis.
To complete the range, more powerful systems have been developed: the **MPG-2xx series** is now proposed as a range of 5 units (in fixed configurations, each of them available with or without EIS capability):

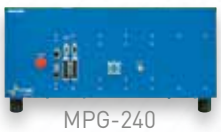
- MPG-2: 16 channels/100 mA each,
- MPG-205: 8 channels/5 A each,
- MPG-210: 4 channels/10 A each,
- MPG-220: 2 channels/20 A each,
- MPG-240: 1 channel/40 A.


MPG-2


MPG-205


MPG-210


MPG-220


MPG-240

The **MPG-2xx series** can be provided in a rack capable of supporting 5 units.
Only one computer is necessary to control all the units thanks to the Ethernet connection.
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 20 kHz to 10 µHz (accuracy: 1°,1%)
- Rack (5 units)
- Cables: short (25 cm), long (2.5 m)
- Temperature probe

EC-Lab®: 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.

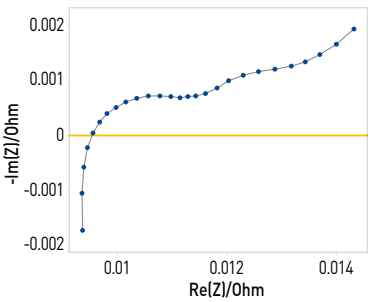
ModuloBat

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.

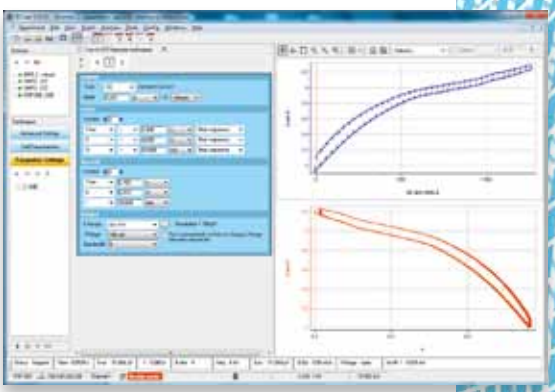
The processed file is automatically stored on the computer.



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

Specifications





General functions	MPG-2	MPG-205 (8 x 5 A)	MPG-210 (4 x 10 A)	MPG-220 (2 x 20 A)	MPG-240 (1 x 40 A)
Channel number	16	8	4	2	1
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	-2 V; 9 V @ 10 A	-2 V; 9 V @ 20 A	-2 V; 9 V @ 40 A
Maximum current	±100 mA continuous	±5 A continuous	±10 A continuous	±20 A continuous	±40 A continuous
Maximum potential	10 V @ 100 mA	9 V @ 5 A	9 V @ 10 A	9 V @ 20 A	9 V @ 40 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	0-5 V, 0-10 V	0-5 V, 0-10 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	±10 A, ±1 A, ±100 mA, ±10 mA, ±1 mA, ±100 µA, ±10 µA, autorange	±20 A, ±1 A, ±100 mA, ±10 mA, ±1 mA, ±100 µA, ±10 µA, autorange	±40 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 20 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	24 kg	24 kg	24 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

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