BioLogic

Catalog

Electrochemistry intruments.

BioLogic

As one of the world's foremost designers and manufacturers of high-performance electrochemical measurement instruments, BioLogic has forged its place as a leader in its field.

A comprehensive product portfolio covers cutting-edge products and accessories across every possible area of electrochemistry including battery, fuel cell/electrolyzer and material testing.

And a culture of innovation, continuous improvement and a commitment to customer satisfaction helps BioLogic continue to develop high-performance products that meet the needs of industry and science.

The quality, reliability, and innovation that lies behind BioLogic's product portfolio help shape the future of innovative projects around the world.

Our close proximity with both academic and industrial users helps us understand our clients' needs and develop solutions that truly make a difference – through a marriage of cutting-edge, reliable, high-performance hardware and innovative, user-friendly software.

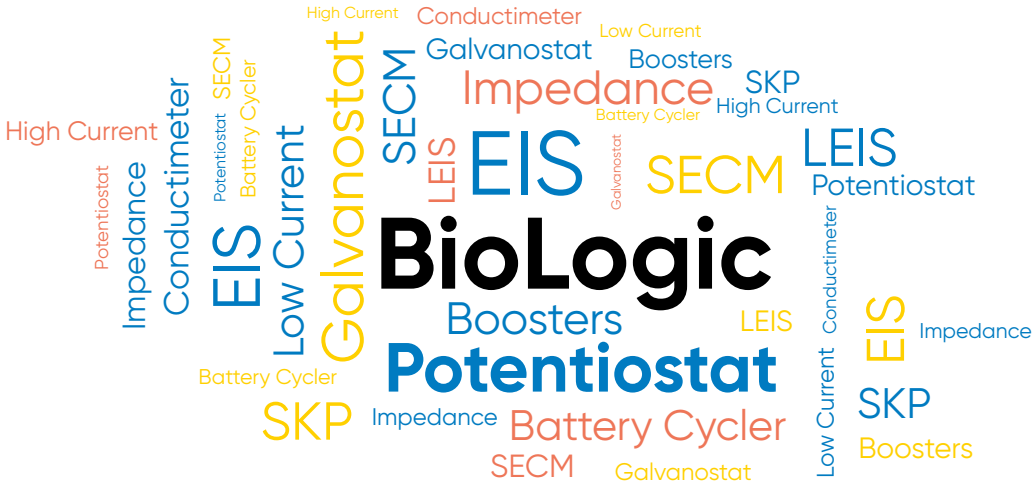
Our highly-qualified support engineers will first work closely with you to fully understand your project and your needs.

Only then will we start to develop a modular, user-friendly, high-performance measurement solution; one supported by a global technical support network.

So, wherever you are and whatever your field of electrochemistry, BioLogic can provide you with the measurement solution you need to take your research to the next level.

Shaping the future.
Together.

A unique and comprehensive range of products.



Modular systems

- Single to multichannel
- High current boosters up to 800 A
- Extended voltage range up to 60 V
- Low current options (down to aA)
- Multiple user systems
- ARG (Analogic Ramp Generator) to perform analog voltage ramp
- Scanning workstations with up to 9 different local techniques (dc-SECM, ac-SECM, LEIS, SKP, SVET, etc.)
- Fully featured impedance analyzer with temperature control

Controlled by a powerful suite of software

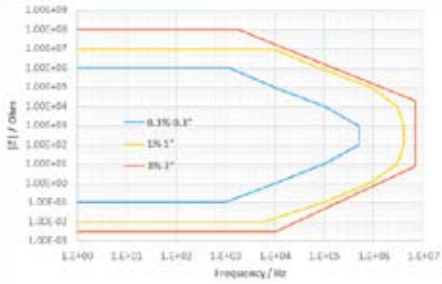
- Intuitive user interface
- Pre-set techniques for usual electrochemical applications
- Multi-technique experiment builder
- External devices control
- Multiple graph display
- Data analysis & fit
- Safety & experimental limits
- Software calibration

Electrochemical Impedance Spectroscopy

A leader in Electrochemical Impedance Spectroscopy (EIS) technologies, BioLogic strives to place EIS within every researcher's reach, by making it available on all of its instruments.

Integrated EIS makes the transition between AC and DC techniques smooth and flawless. Controlling techniques on AC sine waves can be superimposed on a DC potential or a DC current value. Additional techniques are also available that impose the sine wave on a varied potential (SPEIS, also known as Mott Schottky technique) or a current (SGEIS) values.

Finally, sequenceable EIS techniques can be applied to different defined conditions during the frequency sweep. Accuracy is given by the error observed on the phase of impedance module to magnitude. Most of our potentiostats come with a specification of 1%, 1° accuracy below 500 kHz. With the SP-300 potentiostat providing the highest performance reading 0.3%,0.3°.



*EIS contour plot of SP-300 with standard cable (1.75 m)**

Modeling

BioLogic software offers ZFit, a modeling tool for equivalent circuit fitting. 14 elements and two minimization algorithms (DownHill Simplex and Levenberg-Marquardt) are available to analyse impedance data.

*Contour plots were performed with the SP-300 standard 1.75 m cables because it's not always possible to perform measurements close to the instrument.

❑ Patented and unique transient state correction technique

- **Drift** correction

❑ Innovative and unique measurement Quality Indicators

- **THD**: Total Harmonic Distortion, quantifies the linearity of the response
- **NSD**: Non-Stationary Distortion, indicates the effect of time-variance and transient regime
- **NSR**: Noise-to-Signal Ratio, ensures the signal is large enough compared to the measurement noise


Reset
USB
S1
S2
S3

Potentiostats/Galvanostats.

Battery Test Stations & Cyclers.

Impedance Analyzer. 30

Scanning Probe Workstation. 32

Single

SP-200

Transportable potentiostat/galvanostat

The SP-200 is a **500 mA** research grade potentiostat/galvanostat for users who need to work their budget hard.
With the **80 fA** accuracy ultra-low current option, it is the ideal instrument for applications in electrochemistry, particularly corrosion.
The SP-200 offers a floating mode, analog filtering and a built-in calibration board.

Additionally, the SP-200 can be purchased with a standard DC potentiostat or an EIS capable one. There is also an Ultra Low Current (ULC) option. On-site experiments can be easily performed thanks to its portable design.

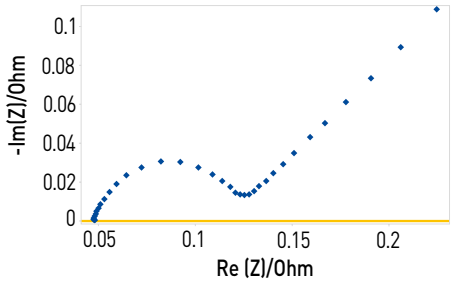
Applications

- General electrochemistry
- Sensors
- Corrosion
- Coatings
- Materials
- Batteries

SP-240

4 A of power crammed into a compact chassis

SP-240 is a **4 A** transportable potentiostat/galvanostat with EIS. Its integrated booster makes it the perfect instrument for any application in electrochemistry, especially energy device testing.



Options

- Ultra Low Current: Accuracy down to ± 100 fA on 1 pA range
- Built-in EIS analyzer: up to 7 MHz
- Analog Ramp Generator: 1 MV/s, acquisition 1 µs
- HCV-3048

SP-300

Fast, sensitive, stable and modular

The SP-300 is a **500 mA to 10 A** state-of-the-art research grade potentiostat/galvanostat with integrated EIS and remarkable specifications such as 7 MHz max EIS frequency, floating mode, analog filtering, built-in calibration board, and stability bandwidths.

The SP-300's modular chassis accepts an optional high current/high voltage option board.

Alternatively, the SP-300 can accept a second potentiostat board (either standard or EIS) and perform as a Bipotentiostat. It is also a multiple user system as each channel board can be used independently by two different researchers.

Options

- Ultra Low Current: Accuracy down to ± 100 fA on 1 pA range
- Built-in EIS analyzer: up to 7 MHz
- Internal boosters:
  ±1 A/±48 V, ±2 A/±30 V,
  ±4 A/[-3;14] V, ±10 A/[-1;6] V
- HCV-3048
- Bi-potentiostat
- Analog Ramp Generator: 1 MV/s, acquisition 1 µs

BP-300

The ultimate versatile bipot

The BP-300 is a **Bipotentiostat/Bigalvanostat** equipped with EIS capability and analog ramp generator. With the specific EC-Lab product control mode ie the CE to Ground mode, the BP- 300 can address any bipot measurement. This measurement is typically required for Rotating Ring Disk Electrode (**RRDE**) and InterDigitated Array (**IDA**) electrodes.

The BP-300 can also be used as a **multichannel** instrument with two measuring channels that can be controlled by one or several computer(s).

Options

- Ultra Low Current: Accuracy down to ± 100 fA on 1 pA range
- Built-in EIS analyzer: up to 7 MHz
- Internal boosters:
  ±1 A/±48 V, ±2 A/±30 V,
  ±4 A/[-3;14] V, ±10 A/[-1;6] V
- HCV-3048

Applications

- General electrochemistry (RRDE measurements)
- Sensors
- Corrosion
- Electrolysis/anodizing
- Coatings
- Energy

Multi

VSP-300

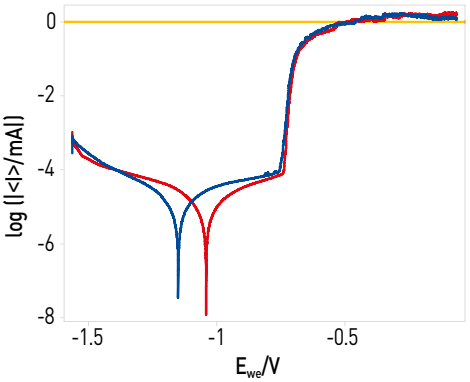
Small footprint multipotentiostat

The VSP-300 multichannel potentiostat/ galvanostat with integrated EIS is a versatile instrument offering **6 slots.**

Each channel board can accommodate an Ultra Low Current cable and can be associated with one or several booster kits. Up to 4 booster boards can be plugged in parallel in one VSP-300 chassis.

Applications

- Batteries/supercapacitors
- Fuel/photovoltaic cells
- General electrochemistry
- Corrosion
- Sensors
- Materials
- Energy storage



VMP-300

The ultimate multichannel potentiostat

The VMP-300 is the most modular chassis of the range, offering **16 slots** for potentiostat/ galvanostats with integrated EIS boards and/ or booster boards.

They can be combined according to user needs either to reach high currents, or to drive many measurements at the same time on all channels.

EIS measurements can be added as an option. The built-in EIS has a wide frequency range up to 7 MHz.

Low current sensitivity can be improved using the Ultra Low Current option.

All multichannel potentiostat are multiple user systems. Thanks to the Ethernet LAN connection capability, several computers can be connected to the unit at the same time.

Options

- Ultra Low Current: Accuracy down to ± 100 fA on 1 pA range.
- EIS measurement: up to 7 MHz
- Analog Ramp Generator: 1 MV/s, acquisition 1 µs
- Internal boosters:
  - ±1 A/±48 V
  - ±2 A/±30 V
  - ±4 A/[-3;14] V
  - ±10 A/[-1;6] V
- HCV-3048
- Additional potentiostat/galvanostat/EIS

HCV-3048

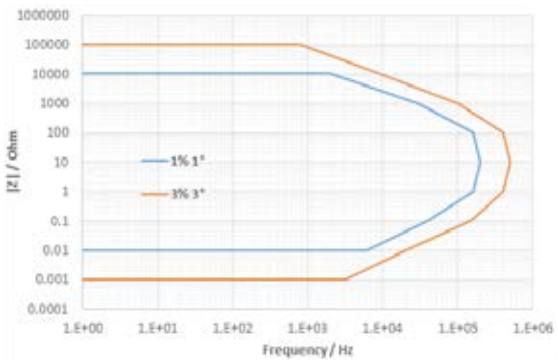
An unparalleled combination of power and speed

The HCV-3048 is designed for battery stack/pack characterizations. The continuous maximum current of **±30 A** for a single unit can be extended up to **±120 A** by connecting four units in parallel. The control voltage range is **0-48 V.**

Impedance spectroscopy (EIS) provides valuable information on energy storage and conversion products, helping to identify the kinetic properties of multiple processes within the device under test. The HCV-3048 brings unmatched insight to high power systems.

Features

- Max current ±30 A
- Voltage range 0-48 V
- EIS up to 500 kHz
- Stackable ±120 A



Internal boosters

High current and high voltage boosters

A range of internal boosters has been designed to increase the current and the voltage specifications of the **SP-300, VSP-300, VMP-300 and BP-300.** Four models are available (see below).

Depending on the instrument chassis, several similar boosters can be connected in parallel to expand the maximum current of the system, up to 150 A.

Configurations

- ±1 A/±48 V
- ±2 A/±30 V
- ±4 A/[-3;14] V
- ±10 A/[-1;6] V

Features

- Booster range included in the autoranging
- EIS capability up to 2 MHz
- Plug-in modules
- Plug-and-play
- 5-lead connection type
- Parallel boosters to increase max current

Single

SP-50

Affordable and easy-to-use

The SP-50 is a cost-effective, value oriented potentiostat/galvanostat designed to address applications in general electrochemistry.

Contained in a simple and compact chassis, the SP-50 is a fixed configuration unit with no options. It is an ideal instrument for teaching and education.

Applications

- Education/training
- General electrochemistry

SP-150

A research grade workstation

The SP-150 is a cost-effective, yet full specification, research-grade potentiostat/galvanostat. With its modular chassis, this instrument can be customized to address all applications in the area of classical electrochemistry.

The SP-150 potentiostat configuration can be modified at point of purchase to include an EIS-capable potentiostat board, and a low current option (1 nA full scale range).

It can also be connected to external high current boosters (2, 5, 10, 20, 80 and 100 A) or the FlexP series (see page 16).

Applications

- General electrochemistry
- Sensors
- Corrosion
- Energy sources
- Coatings

Options

- Low current: Accuracy down to ±2 pA on 1 nA range
- Built-in EIS analyzer: up to 1 MHz
- External current boosters: Up to 800 A
- RDE control kit

VSP

Affordable, research-grade multichannel potentiostat/galvanostat

The VSP is a research-grade potentiostat system in a **5-channel** modular chassis.
Options include EIS capability, low current, 4 A current booster and additional potentiostat channels.

The internal 4 A option takes two slots in the VSP chassis and requires a potentiostat board. External boosters from 2 A up to 100 A can be used with each channel in the VSP.

Applications

- Electroanalytical
- General electrochemistry
- Corrosion
- Sensors
- Energy sources
- Energy storage
- Batteries
- Coatings

VSP-3e

Tailor-made for energy applications

A research-grade multichannel potentiostat/galvanostat, the VSP-3e is purpose-built to meet the demands of energy research applications. With space allocated for up to eight channels, the instrument is flexible enough to meet the demands of researchers and R&D specialists alike. And with +/- 1A (expandable up to 800A with boosters), Ethernet LAN for improved multiple user/PC connectivity and built-in EIS, the instrument is especially suited to battery research applications.
Energy-specific functionality unique to BioLogic includes:

- Fast CCCV shift (constant current, constant voltage)
- Stack mode (follow individual elements in the pack)
- BCD (Battery capacity determination)
- Automatic plotting for Coloumbic efficiency

Options

- Low current: Accuracy down to ±2 pA on 1 nA range
- Built-in EIS analyzer: up to 1 MHz
- External current boosters: Up to 800 A
- Internal ±4 A booster kit for VSP only
- Additional potentiostat/galvanostat/EIS

VMP-3e

16-channel benchmark workstation

A research-grade multichannel potentiostat/galvanostat, the new VMP-3e's modular design, makes it perfect for wide-ranging applications. However, the ability to connect each potentiostat/galvanostat to an external high-current (up to 800 A) booster channel makes it especially suitable for battery research/testing.

A standard voltage range of ±10 V is extendable to -20 V to +20 V. And the standard current of ±1 A can be brought down to 20nA – via modules that can be easily added in-situ, by the user, enabling the instrument to grow with your needs.

For high-end EIS measurements, a 1 MHz specification is complemented by BioLogic Quality Indicators, a feature previously only available on BioLogic Premium instruments. Additional features include CE to GND mode, unique to BioLogic, which enables users to choose from independent channel or multi-electrode configurations and LAN connectivity to improve multi-user working.

Options

- Low current: Accuracy down to ±2 pA on 1 nA range
- Built-in EIS analyzer: up to 1 MHz
- External current boosters: Up to 800 A
- Internal ±4 A booster kit for VSP only
- SAM 50 for stack (50 V) measurement (up to 30 elements with three SAM-50)
- Additional potentiostat/galvanostat/EIS

Applications

- Electroanalytical
- General electrochemistry
- Corrosion
- Sensors
- Energy sources
- Energy storage
- Batteries
- Coatings

How to make reliable EIS measurements?

Three quality indicators are available in EC-Lab® to ensure the reliability of EIS measurements.

Total Harmonic Distortion (THD)

THD indicates if the amplitude of the current or potential modulation applied to the system is small enough to consider that the system behaves linearly. If it behaves non-linearly, the output signal will contain some harmonics. THD quantifies the non-linearity by evaluating the amplitudes of the N harmonics.
THD is expressed as a percentage. Generally, it is considered that a THD below 5 % is acceptable. In EC-Lab®, it is calculated on the potential and on the current and over 7 harmonics including the fundamental.

Linearity

$$THD_N = \frac{1}{|Y_f|}\sqrt{\sum_{k=2}^{N}|Y_k|^2}$$

Stationary

$$NSD_{\Delta f} = \frac{1}{|Y_f|}\sqrt{|Y_{f-\Delta f}|^2 + |Y_{f+\Delta f}|^2}$$

Non-Stationary Distortion (NSD)

We can distinguish two causes for the non-stationarity of a system: i) the response of the system has not reached its permanent regime; ii) the parameters defining the system are changing with time.
The response of a non-stationary system will contain, in addition to the fundamental frequency, some adjacent frequencies.
NSD is expressed in percentage and calculated on the potential and on the current.

Noise to Signal Ratio (NSR)

In an ideal EIS measurement, all the signal energy is contained in the fundamental frequency, but because of various factors such as the accuracy and precision of the measuring device or external perturbations, there might be some energy in other frequencies than the fundamental one, the harmonics and the adjacent frequencies. In this document, this additional signal is called noise.
It represents all the signals not contained in:

- The fundamental frequency,
- The 7 harmonics used to calculate THD
- The signal at frequencies adjacent to the fundamental frequency used to calculate NSD.

Nose to signal Ratio

$$NSR_f = \frac{1}{|Y_f|}\sqrt{\sum_{k}|Y_{k\Delta f}|^2}$$

How do I use them?

Observation	Reason	Solution
High THD	Your system is not linear 	Decrease the perturbation amplitude of the input signal
High NSD	Your system is not yet stationary 	Increase the time of the rest period before the EIS measurement
High NSR	Your output signal is too small 	Increase the perturbation amplitude of the input signal

FlexP external booster

Power EIS with FlexP

EIS provides valuable information about working electrical devices. It helps identify the kinetic properties of multiple processes within the device under test.
Power EIS brings unmatched insight to very high-power units that have been out of reach until now. Driven by SP-150, VSP or VMP3 potentiostat/galvanostats, the FlexP brings unparalleled electrochemical knowledge and methodology to the high-power field.

Features

- Voltage up to 60 V
- Current up to 200 A
- Parallel ability (x4)
- 10 kHz - 1 mHz EIS capable
- Up to 2.4 kW continuous with water cooling
- Cell temperature measurement included

Configurations

- 60 V/50 A with the FlexP 0160/FlexP0060 to address battery pack characterization
- 12 V/200 A with the FlexP 0012 to address the electrolyzer and fuel cell/electrolyzer characterization

Internal & external Boosters

Deliver more power to your application

SP-150, VSP and VMP3 potentiostats can be interfaced to a separate current booster unit. These modular booster units can be filled with different booster boards (2, 5, 10, or 20 A). The standard booster chassis offers 8 available booster slots, each of them connected to a potentiostat board.

For higher current, 80 and 100 A booster units are available. They also exist as stand alone systems (HCP-803, HCP-1005 see page 17).

Configurations

- External:
  - ±2 A, ±5 A, ±10 A, ±20 A on ±10 V adjustable from −20 to +20 V
  - ±80 A on ±3 V
  - ±100 A on [0.6 - 5] V
- Internal kit (only for VSP):
  - ±4 A ±10 V adjustable from −20 to +20 V

HCP-803

High current potentiostat for supercapacitors and fuel cells

The HCP-803 is a High Current Potentiostat capable of handling **±80 A** with a voltage range of **±3 V**. It is primarily designed for applications in the fuel cell/electrolyzer and supercapacitor areas.

It is a combination of a research quality potentiostat and an 80 A booster built into the same chassis. The potentiostat has the same specifications as the VMP3 potentiostat boards (with EIS option) when not connected to the booster portion of the unit.

Applications

- Fuel cell/Electrolyzer
- Photovoltaic systems
- Supercapacitors
- Electroplating
- Battery

HCP-1005

More power for battery testing

The HCP-1005 is a compact High Current Potentiostat specially designed to study high capacity secondary batteries. With a voltage range of **0.6 to 5 V** and a current range of **±100 A**, this unit can be used to test Li-ion high current cells. The EIS capability integrated in the chassis is ideal for ageing tests.

The HCP-1005 structure is similar to the HCP-803. It is a combination of a research potentiostat and a 100 A booster built into the same chassis.

Applications

- Lithium-ion
- Nickel-Cadmium
- Nickel-Metal hydride
- Battery

Features

- Booster range included in the autoranging (for boosters up to 20 A)
- EIS capability
- Plug-in module or external chassis
- Plug-and-play
- 5-lead connection type

EC-Lab®

As powerful as it is user-friendly

Your hardware is only ever as good as your software.
With 20 years of constant development, EC-Lab, BioLogic's proprietary, patented software has become the benchmark in potentiostat control software.

Impedance spectroscopy
General electrochemistry
Electro-analytical
Corrosion
Battery
Super-capacitor
Fuel cell/Electrolyzer
Photovoltaic cell

Display mode

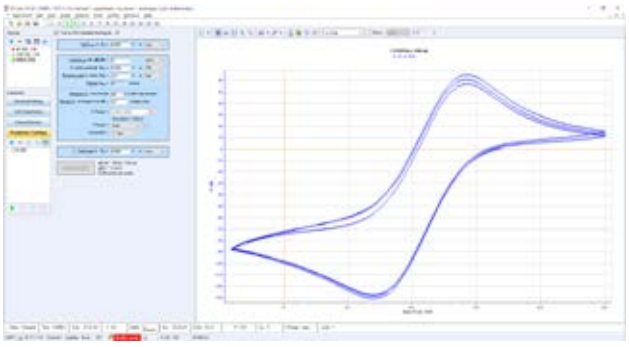
Most of the experimental parameters can be **modified "on the fly"** during the experiment, with the changes stored into the raw data file.
The software interface is **adjustable** to create the best possible working environment for the user.
EC-Lab®'s graphics package provided with the software includes a powerful 3D plot feature and a tool to create **unique graph templates.**
Using our advanced "Process" function, the user can create new variables for each axis. This enables mathematical functions to be performed on data plotted **on any axis** (x, y1 and y2).

EC-Lab® provided with...

- Single potentiostats/galvanostats:
  SP-50, SP-150, SP-200, SP-240, SP-300
- Bipot:
  BP-300, SP-300
- Multi potentiostats/galvanostats:
  VMP-300, VSP, VMP3, VSP-300, VSP-3e
- High current potentiostats/galvanostats:
  HCP-803, HCP-1005
- Battery test stations:
  MPG2, MPG-205

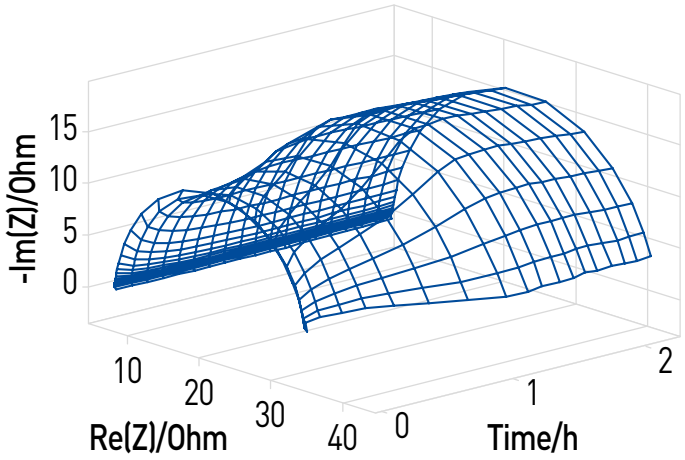
Experiment sequence builder

EC-Lab® software contains more than **80 techniques.**
These techniques can address applications in voltammetry, EIS, corrosion and energy source/storage development.
A **powerful technique builder** can execute a series of different modular techniques as well as wait and loop tasks to create complex experimental sequences.
Moreover, within each technique, the user can create **up to 100 linkable sequences** of that experiment with different parameters. An email can be sent to the user, if desired, to be informed when a certain step of the experiment has been reached. Battery cycling can be synchronized with a **temperature control unit.**



EIS measurements

EIS measurements can be made in both controlled potential and controlled current modes from 10 µHz to 7 MHz.
The patented **"drift correction"** algorithm and multiple stability parameters allow users to acquire high quality data from their EIS measurements.

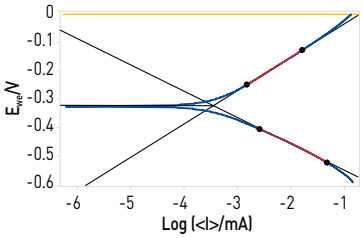


EC-Lab® Analysis package

An extended range of analyses

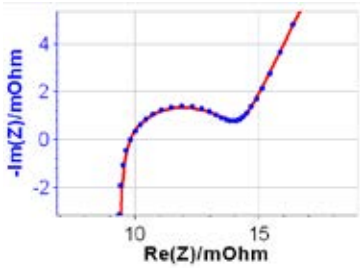
Display

Powerful electro-analytical analysis tools (such as peak find/height, convection wave, integral, Tafel fit, Rp determination) are available in EC-Lab®. These analyses incorporate classical fit routines (linear, polynomial, multi-exponential) and algorithms. All the analysis results are stored in a separate file.



Fitting

EC-Lab®'s EIS modeling package, ZFit, utilizes the equivalent circuit approach. There are over 150 standard circuits and two minimization algorithms available to help understand impedance plot information.
The user can define and build his own circuit model using a range of fourteen simple elements (R, C, L, Q, W, G, W_{δ}, W_{inf} M, G_{α}, G_{β}, L_{α}, M_{α}, M_{γ}). The last elements can be assimilated to transmission lines.
A batch processing feature allows the fitting of multiple cycles in an impedance experiment. Cable effects can be compensated by using cable compensation tool.



Simulation

Several tools are available to simulate CV curves, Tafel plots or EIS data. They can be used as training tools.
CV Sim allows the user to create data with different mechanisms such as single (E) or multi (up to EEEEE) electron transfer. Electron transfer reactions can also be mixed with chemical reactions to simulate an EC mechanism.

General electochemistry
- Peak Analysis...
- Wave Analysis...
- CV Fit...
- Levich...
- Koutecky-Levich...

Corrosion
- R_p Fit...
- Tafel Fit...
- Electrochemical Noise...
- Corr Sim...
- VASP Fit...
- CASP Fit...

EIS
- Z Fit...
- Z Sim...
- Mott-Schottky...
- Compensation...
- Kramers-Kronig...

Battery process
- Process data (capacity, efficiency, energy...)

Photovoltaic
- Photovoltaic analysis (fill factor, efficiency...)

Math
- Polynomial Fit...
- Multi-Exponential Fit...
- Line Fit...
- Subtract Files...
- Integral...
- Min Max...
- Filter...
- Fourier Transform...
- Linear Interpolation...

Detailed Specification

Channel Specifications

		Premium	Essential
EIS capability		10 µHz to 7 MHz	10 µHz to 1 MHz
Analog Ramp Generator		yes (1 MV/s), sampling rate 1 µs	n.a.
Floating option		yes	CE to Ground
Filters		analog/numeric	numeric
Acquisition time		12 µs (1 µs with ARG option)	20 µs
Electrodes connections		2, 3, 4, 5	2, 3, 4, 5
IR compensation		manual, EIS, current interrupt (software and hardware)	manual, EIS, current interrupt (software)
Current			
Maximum current		±500 mA	±400 mA ±800 mA for SP
Current ranges	with standard board	9: 10 nA to 1 A	6: 10 µA to 1 A
	with low current option	13: 1 pA to 1 A	9: 1nA to 100 mA (SP-50: n.a.)
Lowest accuracy	with standard board	±100 pA on 10 nA range	±20 nA on 10 µA range
	with low current option	±100 fA on 1 pA range	±2 pA on 1 nA range
Lowest resolution	with standard board	0.8 pA on 10 nA range	0.8 nA on 10 µA range
	with low current option	80 aA on 1 pA range	80 fA on 1 nA range
Current booster	internal	1 A, 2 A, 4 A, 10 A, 150 A	4 A for VSP only
	external	Premium External: HCV-3048 (30A/48V)	2, 5, 10, 20, 80, 100 A, FlexP0160, FlexP0060, FlexP0012
Input impedance		1 TΩ (//10 pF), ULC: 100 TΩ (//6 pF)	1 TΩ (//20 pF)
Voltage			
Compliance		±12 V	±10 V
Max applied potential		±10 V (±48 V with 1 A/48 V booster)	0-20 V ajustable
Resolution		1 µV on 60 mV	5 µV on 200 mV
Accuracy		< ±1 mV	< 5 mV on ±2.5 V
Range		±2.5 V, ±5 V, ±10 V, ±25 mV, ±250 mV	±2.5 V, ±5 V, ±10 V
Maximum scan rate		200 V/s (1 MV/s with ARG option)	200 V/s
Control amplifier			
Potentiostat bandwidth		8 MHz	1 MHz
Potentiostat rise/fall time		< 500 ns	< 2 µs
General			
I/O (analog/TTL)		3/2	3/2
Interfaces		Ethernet, USB 2.0	Ethernet, USB 2.0

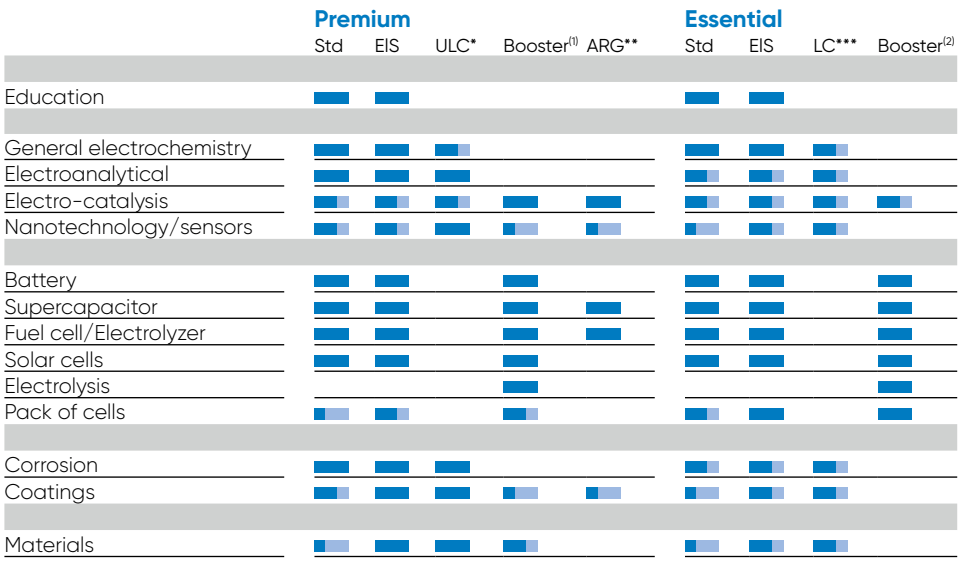
n.a.: not available

Chassis Specifications

Premium	SP-200	SP-240	SP-300	BP-300	VSP-300	VMP-300
Slots available	1	1	2	2	6	16
Dimension	167 x 410 x 225 mm	205 x 410 x 225 mm	205 x 410 x 225 mm	254 x 5147 x 337 mm	254 x 517 x 337 mm	534 x 565 x 315 mm
Weight	6 kg	7.5 kg	7.5 kg	20 kg	20 kg	30 kg
Power Requirement	350 W	350 W	350 W	650 W	650 W	1500 W

Essential	SP-50	SP-150	VSP	VSP-3e	VMP3
Slots available	1	1	5	8	16
Dimension	136 x 377 x 197 mm	136 x 377 x 197 mm	435 x 335 x 94 mm	405 x 225 x 320 mm	495 x 465 x 260 mm
Weight	4 kg	4.5 kg	8 kg	12 kg	20 kg
Power Requirement	110 W	110 W	300 W	1000 W	650 W

Applications



For each instrument, modules can be mixed together

suitable recommanded excellent

* ULC: Ultra Low Current ** ARG: Analog Ramp Generator ***LC: Low Current

(1): more details on page 11
(2): more details on pages 16 - 17

Premium boosters

Specifications

	±1 A/±48 V	±2 A/±30 V	±4 A/[-3;14] V	±10 A/[-1;6] V	±30 A/[0;48] V
Current					
Compliance	±1 A	±2 A	±4 A	±10 A	±30 A (±120 A with 4 units)
Accuracy	< 2 mA on 1 A range	< 4 mA on 2 A range	< 8 mA on 4 A range	< 60 mA on 10 A range	< 240 mA on 30 A range
Voltage					
Compliance	±49 V	±30 V	-3 V ; +14 V	-1 ; +6 V	0 ; +48 V
Control	±48 V	±30 V	-3 V ; +10 V	-1 ; +6 V	0 ; +48 V
Features					
EIS frequencies	2 MHz - 10 µHz	1 MHz - 10 µHz	1 MHz - 10 µHz	1 MHz - 10 µHz	500 kHz - 10 µHz
Bandwidth (-3 dB)	> 2 MHz	> 3 MHz	> 4 MHz	> 8 MHz	800 kHz
Slew rate (no load)	> 15 V/µs	50 V/µs	50 V/µs	50 V/µs	> 20 V/µs
Rise/fall time (no load)	< 250 ns	< 200 ns	< 200 ns	< 200 ns	< 3 µs
Floating mode	yes	yes	yes	yes	yes
Parallel ability	no (Yes with new version)	yes	yes	yes	yes up to 4
Connection	2, 3, 4, 5 leads	2, 3, 4, 5 leads	2, 3, 4, 5 leads	2, 3, 4, 5 leads	2, 3, 4 leads

Essential boosters

Specifications

	2/4/5 A	10/20 A	80 A/HCP-803	100 A/HCP-1005
Current				
Compliance	2 A: ±2 A, 4 A: ±4 A, 5 A: ±5 A	10 A: ±10 A, 20 A: ±20 A	±80 A	±100 A
Accuracy	2 A: < 4 mA on 2 A range, 4 A: < 8 mA on 4 A range, 5 A: < 10 mA on 5 A range	10 A: < 20 mA on 10 A range, 20 A: < 40 mA on 20 A range	< 160 mA on 80 A range,	< 200 mA on 100 A range
Voltage				
Compliance	adjustable ±10 V range	adjustable ±10 V range	±3 V	0.6 - 5 V
Control	±20 V	±20 V	±3/5 V	±3/5 V
Features				
EIS frequencies	2 A: up to 150 kHz, 4 A: up to 130 kHz, 5 A: up to 120 kHz	10 A: up to 80 kHz, 20 A: up to 80 kHz	up to 15 kHz,	up to 10 kHz
Bandwidth (-3dB)	1 MHz	1 MHz	1 MHz	1 MHz
Rise time and fall time (no load)	15 µs	25 to 60 µs	95 µs to 1.7 ms	95 µs to 1.7 ms
Parallel ability	no	no	no	no
Connection	2, 3, 4, 5 terminal leads	2, 3, 4, 5 terminal leads	2, 3, 4, 5 terminal leads	2, 3, 4, 5 terminal leads
General				
1 external input	security to open circuit (TTL level)	security to open circuit (TTL level)	security to open circuit (TTL level) Emergency push button	Security to open circuit (TTL level) Emergency push button

	FlexP 0160	FlexP 0060	FlexP 0012
Current			
Compliance	50 A up to 200 A (4 in parallel)		200 A up to 800 A (4 in parallel)
Accuracy	0.2% of value ±0.1% FSR		0.4% of value ±0.5% FSR
Voltage			
Compliance	±50 A: 2 - 58 V (water cooled)		±200 A -1;+10 V (water cooled)
Control	[1; 60] V	[0; 60] V	[-2,5;+11,5] V
Features			
EIS frequencies	10 kHz		10 kHz
Bandwidth (-3dB)	-		-
Rise time and fall time (no load)	< 10 µs		< 20 µs
Parallel ability	yes up to 4		yes up to 4
Connection	2, 3, 4 terminal leads		2, 3, 4 terminal leads
General			
1 external input	embeded (cell temperature and emergency)		embeded (cell temperature and emergency)

A full range of battery testers

Depending on your application, your requirements for battery/supercapacitor testing can be different (reference electrode required or not, sampling, maximum frequency for EIS, number of channels, etc). BioLogic offers a wide range of testing solutions to match your needs.

For advanced research measurements, BioLogic potentiostats/galvanostats are the right choice.

For classical battery cycling, BCS-800 series will offer you the best-in-class performance, research EIS measurements as an option and up to 128 channels in a single cabinet, making it the ideal solution for **high-throughput measurements.**

The MPG-200 series is an intermediary solution. It offers **research grade** battery testing and can be provided in a rack, with a maximum of 80 channels **to perform many tests simultaneously.** Each channel is an independent potentiostat/galvanostat.

How to choose your battery tester?

	VMP3/VMP-300	MPG-200 series	BCS-800 series
Application	**High-end research**	**Research development**	**High-throughput battery/ material screening**
Current ranges	1 pA - 150 A	10 µA - 5 A	10 µA - 120 A
Voltage range	±10 V	±10 V on MPG-2 -2;9 V on MPG-205	0;10 V
EIS frequency range	7 MHz - 10 µHz	20 kHz - 10 µHz	10 kHz - 10 mHz
Built-in EIS	Yes. On each channel	Yes. On each channel	Yes. On each module
Acquisition time	200 µs/1µs with ARG option	200 µs	2 ms
Electrode connection	2,3-electrode/4-points measurement with CE measurement	2-electrode/4-points measurement 3-electrode/5-points on MPG-2	2-electrode/4-points measurement
HPC measurement	Yes. Down to 6 ppm	Yes. Down to 6 ppm	Yes. Down to 6 ppm
Channels/module	16	16	8
Max Channels/cabinet	-	80	128

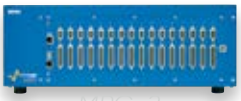
MPG-200 series

R&D grade battery test stations

The MPG-200 series is offered in two fixed configurations with or without EIS on every channel:
- MPG-2: 16 channels/100 mA each
- MPG-205: 8 channels/5 A each

The MPG-200 series can be provided in a rack capable of supporting up to 5 units.
Only one computer is necessary to control all units thanks to the solution's Ethernet capability. With this connection, the MPG-200 series can be installed on a Local Area Network to allow multiple users to access instruments and follow battery cycling from anywhere.

The MPG-200 series offers 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.



MPG-2

- 16 channels
- 100 mA
- 3 electrodes/5 points

MPG-205

- 8 channels
- 5 A
- 2 electrodes/4 points

Options

- EIS
- Rack (5 units)
- Short (25 cm) or long cables (2.5 m)
- Temperature probe
- Coin cell, cylindrical and pouch cell holders (see Accessories catalog)
- 5 A booster for MPG 2

Specifications

- Current ranging: 10 µA up to max current with a resolution 0.004% of the range
- 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

Software

Like BioLogic potentiostats/galvanostats, the MPG-200 series is supplied with **EC-Lab® software.** It provides techniques specifically designed for batteries and general electrochemistry applications, such as cyclic voltammetry. An extended range of analyses are also available (capacity, efficiency, energy, etc). Note that **EC-Lab®** allows the control of several VMP3 or MPG-200 instruments from one session.

BCS-800 series

Battery cycling test stations

Each BCS-800 module is made up of of 8 channels.
To ensure better accuracy in current control and measurement, **5 current ranges** are available depending on the model.

BCS-815 modules can be connected in parallel to increase the maximum current up to **120 A.**
With an 18-bit analog to digital converter for the voltage measurement, the resolution of the BCS-800 is an impressive **40 µV.**

EIS-capable modules provide EIS over a frequency range from **10 kHz to 10 mHz** for accurate and fast determination of internal battery resistance on every channel.

BCS-800 modules can be added to a single cabinet. Several sizes are offered (38U, 24U, 12U and 6U).

Specifications

- Optional high quality EIS: Full scan from 10 kHz to 10 mHz
- 18-bit A/D converter (40 µV resolution)
- HPC measurement down to 6 ppm
- Modularity from few µA to 120 A
- Voltage measurement from 0 V to 10 V
- Module mixing (BCS-805/810/815)
- 2 ms acquisition time
- Several cabinet sizes
- Plug and play module installation

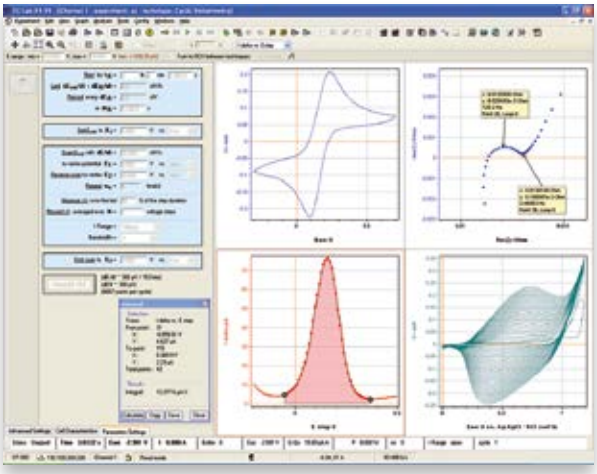
Options

Connection:
- Cell cable from 25 cm to 10 m
- CCH-1xx Coin cell holder
- BH-1i Cylindrical battery holder
- CCH-8 8 positions coin cell holder
- CC8 Current collector to set parallel mode (up to ±120 A)

Cabinet:
- Rolling cabinet (38U, 24U)
- Benchtop cabinet (12U, 6U)

BT-Lab® provided with...

BCS-805, BCS-810, BCS-815



BT-Lab®

An interface specifically designed for battery testing

BT-Lab® software offers great usability and flexibility for battery cycling. The powerful «ModuloBat» sequence builder offers **15 control modes for easy programming** of unique sequences, while the interface is informative and simple, simultaneously showing the experiment parameters and the corresponding graph of each selected channel.

Global view

All channels can be viewed **simultaneously** on an advanced global view. The status of each channel is displayed with different colors to give quick, informative, and visual indicators. The time, current, voltage and charge values can be all displayed simultaneously.

Comprehensive graphic and analysis package

BT-Lab® graphic package is embedded in the software and includes powerful tools to create **graph templates** and analyze data. This package offers a unique trace filtering option by channel. This results in a multigraph window capable of displaying **up to 128 graphs** within a single window. With the advanced graph properties, the user can add and customize new variables for each axis. Powerful analysis tools (dQ/dV, HPC, etc) are also available in **BT-Lab®**.

EIS capability

BT-Lab® software includes the capability for electrochemical impedance spectroscopy (EIS) measurement **on every channel** of EIS-capable modules, in a frequency range of 10 kHz to 10 mHz both in potensiostatic and galvanostatic modes. A **drift correction** option is available to correct the voltage drift of the battery during the EIS measurement.

ModuloBat

- **15 control modes**:
  - Constant Current/ Voltage/Power/ Resistance
  - Voltage/Current Scan
  - Galvano/Potentio EIS
  - DCIR
  - Galvano/Potentio ACIR
  - Current Interrupt
  - Rest/Loop
  - Urban Profile Import

- **Up to 100 sequences**
- **3 limits per sequence**
- **3 recording conditions per sequence**
- **Modify on the fly**

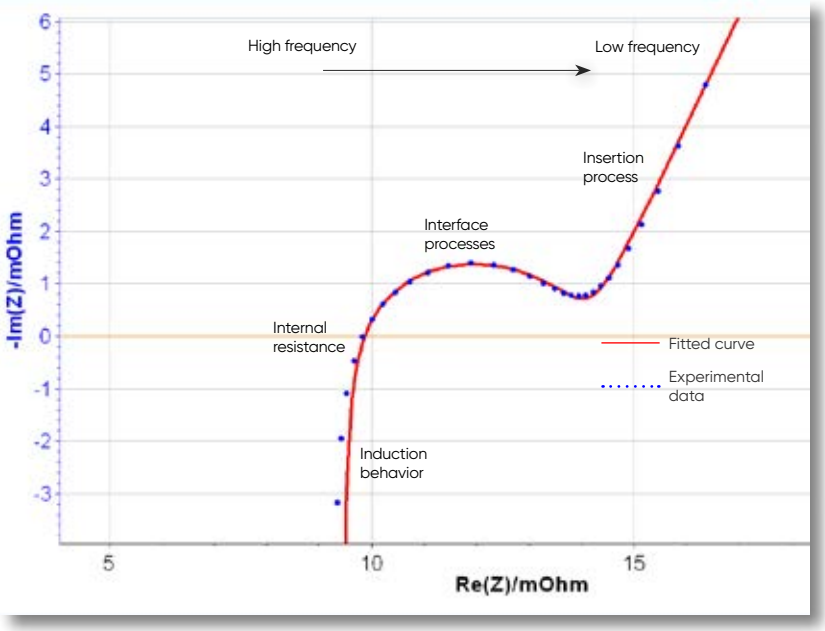
Why impedance measurement for battery testing?

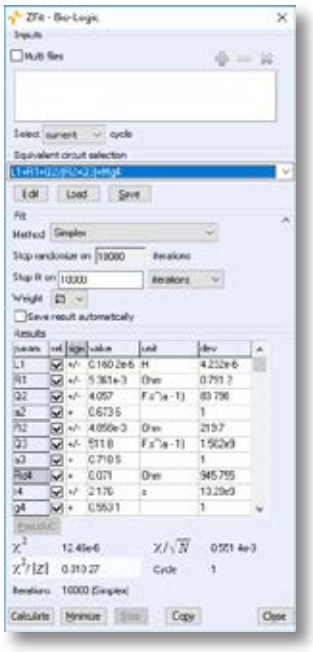
The BCS-800 series, with its fast bandwidth controllers, offers both **potentio** and **galvano**-control for EIS measurements in a **10 kHz to 10 mHz** frequency range, with user-specified number of data points and recorded frequency range. The user also controls the excitation amplitude. Impedance spectroscopy can be used as a standalone technique, but it can also be seamlessly incorporated into the ModuloBat technique to record the impedance spectrum of the battery, either in equilibrium or steady-state conditions. This means you not only can record a spectrum of the cell at a constant voltage, but also under a given galvanostatic load.

If there are sources of **uncompensated inductance** or capacitance in the cell, only a full impedance spectrum can be a reliable measure of internal resistance through an automated spectrum fitting procedure.

The low frequency range of the spectrum is an invaluable source of information concerning Li+ diffusion within the electrolyte (separator), as well as porosity within electrodes and inside the active material particles.

18-bit resolution allows the recording of small-amplitude EIS on top of substantial DC currents with very high levels of accuracy.





Specifications

	MPG-2	MPG-205
Channels/module	16	8
Cell connection	2, 3, 4 or 5 terminal leads	2 or 4 terminal leads
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*	
Voltage measurement		
Ranges	±10 V, ±5 V, ±2.5 V	0 - 5 V, 0 - 10 V
Accuracy	±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	
Curent 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	±0.1% of control ±0.01% of FSR*	
EIS option		
Frequency range	20 kHz to 10 µHz	
Amplitude	1 mVpp to 1 Vpp, 0.1% to 50% of the current range	
Mode	Single Sine, Multi Sine, FFT analyis	
General		
Dimensions (W x D x H)	260 x 495 x 465 mm	254 x 494 x 454 mm
Power requirements	350 W, 85-264 V, 47-440 Hz	860 W, 85-264 Vac, 47-440 Hz
Weight	17 kg	25 kg

*FSR: Full Scale Range

	BCS-805	BCS-810	BCS-815
Channels / module	8	8	8
Voltage			
Range	0 V to 10 V	0 V to 10 V	0 V to 9 V
Resolution control measurement	150 µV 40 µV (18 bit)	150 µV 40 µV (18 bit)	150 µV 40 µV (18 bit)
Accuracy	<±0.01% of value ±0.3 mV	<±0.01% of value ±0.3 mV	<±0.01% of value ±0.3 mV
Slew rate	150 kV/s	150 kV/s	3 kV/s
Current			
Max (continuous) per channel	±150 mA	±1.5 A	±15 A
Ranges	5: 100 mA down to 10 µA	5: 1 A down to 0.1 mA	5: 10 A down to 1 mA
Resolution control measurement	Down to 800 pA Down to 0.2 nA (18 bit)	Down to 8 nA Down to 2 nA (18 bit)	Down to 80 nA Down to 20 nA (18 bit)
Accuracy	< 0.05% of value ±0.015% of FSR	< 0.05% of value ±0.015% of FSR < 0.1% of value ±0.015% of FSR (1 A range)	< 0.05% of value ±0.015% of FSR < 0.1% of value ±0.015% of FSR (1 A range) < 0.3% of value ±0.04% of FSR (10 A range)
Parallel ability	No	No	Yes Up to ± 120 A with 8 channels
EIS			
Built-in	On each module	On each module	On each module
Range	10 kHz - 10 mHz	10 kHz - 10 mHz	10 kHz - 10 mHz
Measurement			
Thermocouple	n.a	K Type on each channel -25 °C +200 °C with accuracy of ±2 °C	K Type on each channel -25 °C +200 °C with accuracy of ±2 °C
Analog in	1 (18 bit) on each module	1 (18 bit) on each module	1 (18 bit) on each module
Analog out	1 (16 bit) on each module	1 (16 bit) on each module	1 (16 bit) on each module
Cell connection			
	4 terminal leads + Guard	4 terminal leads + Guard	4 terminal leads
General			
Height	1U	2U	4U
Weight	5 kg	10 kg	23 kg
Power consuption	60 W	220 W	1700 W

n.a.: not available

A wide range of comprehensive solutions.

From impedance analyzer to temperature control units and sample holders

Applications

- Ceramics
- Solid electrolytes
- Polymers
- Rubbers
- Dielectrics
- Composites
- Solar/photovoltaic cells
- Semiconductors
- Biological cells
- Liquids
- Electronic components

MTZ-35

35 MHz Impedance Analyzer

The **MTZ-35** is an impedance analyzer dedicated to electrical characterization over the frequency range of **10 µHz to 35 MHz.**

The **MTZ-35** can be coupled with the High Temperature Furnace **HTF-1100** and the Intermediate Temperature System **ITS** in order to investigate materials properties over a wide temperature range (**-40 °C to 1100 °C**).

Three kind of sample holders are offered: HTSH-1100 for high temperature use, in-plane and through-plane, CESH sample holders for intermediate temperature use (-40 °C to 150 °C) and HTCC for liquids/gels materials in the temperature range between -50 °C and 180 °C.

Specifications

Generator	
Frequency range	10 µHz to 35 MHz
Voltage range DC	100 µV to ±10 V
Voltage range AC	100 µV to 10 V
Measurement ranges	
Inductance	10 nH to 10 kH
Capacitance	1 pF to 1000 µF
Resistance	1 mΩ to 500 MΩ
Basic accuracy	0.1%

MT-Lab® Software

MT-Lab® is an intuitive software used to control the MTZ-35. It also controls several temperature control units:

- High temperature furnace (HTF-1100)
- Intermediate Temperature System (ITS)
- Temperature control systems using Eurotherm 22xx/35xx controllers

Open circuit/Short circuit Compensation

MT-Lab® software is provided with a compensation protocol for the compensation of residual impedance due to cell cables and test fixtures.

ITS

HTF-1100

HTSH-1100

Temperature Control Unit

	Operating Temp	Features
HTF-1100	RT to 1100 °C	Heating rate adjustable K-type thermocouple
In-plane ITS	-35 to 150 °C	Temperature accuracy: 0.3 °C PT1000 probes
Through-plane ITS	-35 to 150 °C	

CESH on its base

Sample Holders

		Operating Temp.	Features	Compatibility
HTSH-1100	Φ=25 mm Φ=12 mm Φ=03 mm	RT to 1100 °C	Quartz tube for control-led atmosphere Leak-tight up to 2 bar relative K-type thermocouple	HTF-1100 Tubular furnaces
CESH	In-plane Through-plane	-40 to 150 °C	Leak-tight up to 2 bar relative	ITS Other temperature units
HTCC	Platinized Non-platinized	-50 to 180°C	Cell factor: K= 1 ± 5% cm^{-1} Volume: 0.5 - 1.0 mL	ITS Other temperature units

Temperature control management

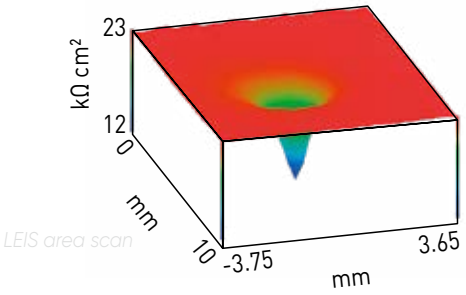
Five temperature control modes are available with **MT-Lab®**. The software offers a wide range of heating rates and two temperature stabilization modes (fast and precise) based on closed-loop temperature regulation. Temperature control is optimized. Setpoint temperatures are reachable and adjustable without overshoot.

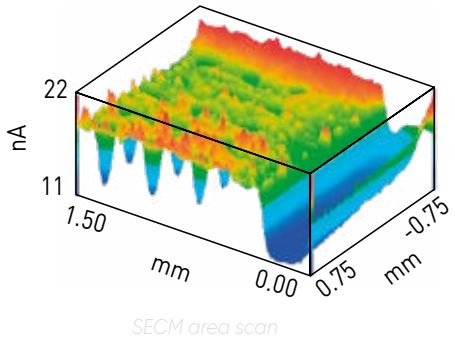
A complete graphics package

MT-Lab® is very easy-to-use software. The settings and graphs are displayable on one screen view. The software includes numerous graphic tools and advanced tools for equivalent circuit modeling (ZFit). Users can build their own circuit model using a range of 14 electrical elements (R, C, L, Q, L_a, W, W_a, W_{inf}, M, M_a, M_g, G, G_a, G_b).

Systems for localized electrochemistry measurement

The traditional potentiostat/galvanostat measures an average response of the electrode material and is often considered to be homogeneous. However, for more detailed studies, it is interesting to look beyond this homogeneity to study the spatial dependence of electrode properties.
Our localized electrochemistry platforms offer a range of modular and non-modular systems that can include up to 9 distinct localized measurement techniques.
The table below summarizes the techniques, the type of information that can be obtained, the smallest size features detectable and typical applications.



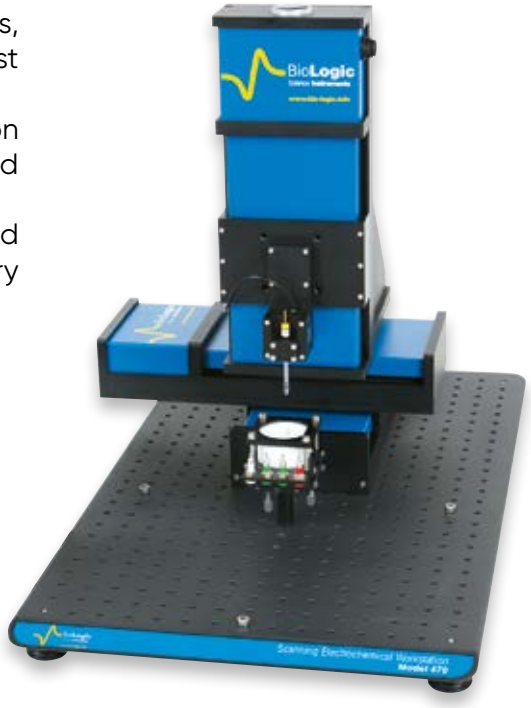


Scanning techniques		Information	Resolution	Applications
SECM	Scanning ElectroChemical Microscopy	reactivity, conductivity	probe size	bioelectrochemistry, corrosion, fuel cell/electrolyzer, batteries, catalysts, sensors
ac-SECM	alternating current Scanning ElectroChemical Microscopy	reactivity, conductivity, or localized EIS (no mediator required)	probe size	bioelectrochemistry, corrosion, fuel cell/electrolyzer, batteries, catalysts, sensors
ic-SECM	intermittent contact Scanning ElectroChemical Microscopy	topography and reactivity or conductivity or localized EIS.	probe size	bioelectrochemistry, corrosion, fuel cell/electrolyzer, batteries, catalysts, sensors
LEIS	Localised Electrochemical Impedance Spectroscopy	local impedance of the sample	hundreds of µm	corrosion, coatings, catalysts
SVP (SVET)	Scanning Vibrating Electrode Technique	electrochemical activity	tens of µm	corrosion, coatings, catalysts, bio electrochemistry
SDS (SDC)	Scanning Droplet System (Cell)	dc electrochemistry in a droplet of electrolyte	hundreds of µm	corrosion, coatings, catalysts, sensors
ac-SDS	alternating current Scanning Droplet System	impedance in a droplet of electrolyte	hundreds of µm	corrosion, coatings, catalysts, sensors
SKP	Scanning Kelvin Probe	work function difference / topography	probe size	corrosion, coatings, semi-conductors, catalysts, photovoltaics, sensors
OSP	Optical Surface Profiler	topography	100 nm (Z) 30 µm (X & Y)	any field, complementary to the above

M470

Ultra-high-resolution scanning stage with multiple modular techniques

The M470 is the 4th generation of scanning probe systems, which includes a high-resolution scanning stage and the most comprehensive range of modular scanning probe techniques.
The M470 achieves the perfect balance of scan speed, resolution and accuracy to deliver a new standard in spatially resolved electrochemical measurements.
The fast, precise, closed-loop positioning system is designed specifically for the demands of scanning probe electrochemistry with nanometer resolution.

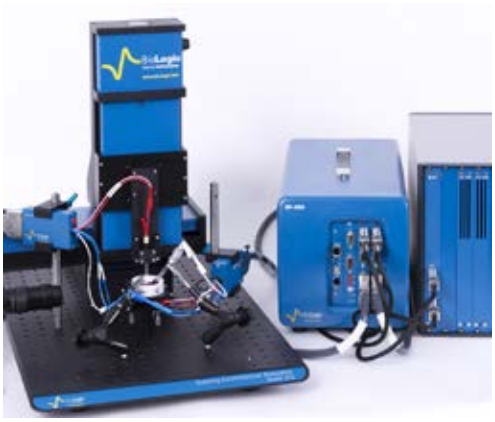


9 available techniques

SECM*	LEIS*	ac-SDS*
ac-SECM*	SVET*	SKP
ic-SECM*	SDS*	OSP

** Additional: Electrochemistry, Corrosion and EIS suites included.*

Options



The M470 is compatible with a large range of potentiostats/galvanostats:

- Single potentiostat: SP-200
- Multichannel potentiostat: SP-300, VSP-300 and VMP-300

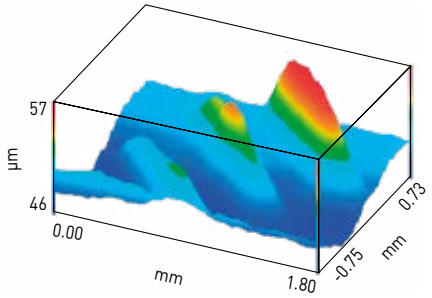
Any SP-/VSP-/VMP-configuration offers high dc current measurement sensitivity and increased EIS bandwidth. Owners of SP-/VSP-/VMP- have the option of purchasing the M470 system with a hardware interface to connect their existing potentiostat.

To facilitate mounting of the low current amplifiers local to the electrochemical cell, adjustable stands and brackets are provided which mount directly to the M470 base plate.

SECM150

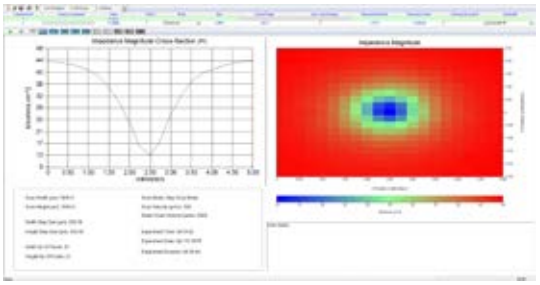
Compact & Powerful Scanning Electrochemical Microscope

The SECM150 is a new take on high performance and high value scanning probe microscopy. With piezo positioning and capacitive sensors on all axes, the SECM150 is a winning combination for newcomers and experienced users alike.
The system includes the electrochemical cell, standard sample, probes and all electrodes required to perform SECM. Installation and training is provided with a video course that covers unpacking through to advanced use of the SECM.



Scan-Lab® Software

All scanning probe microscopy systems come with **lifetime software updates** that allow the user to benefit from new features.
The user is able to select an experiment from within the technique to provide a powerful user interface, fully configurable with options to save and recall complex setups.
Data can be manipulated within the experiment and allows 2D and **3D heat map** presentations as well as advanced analysis features. All experiments can be combined in a cutting-edge sequencing engine that incorporates logic elements such as loops, delays, probe movement and more, to provide a powerful research tool now and for the future.
3DIsoPlot adds a further component to the line-up by providing fully rendered **3D data** display. 3DIsoPlot allows data to be rotated, angled, flipped, scaled, zoomed and more to provide beautifully rendered imagery over a huge range of scales suitable for large posters or projections.
The Microscopic Image Rapid Analysis (MIRA) package rounds off the line-up with 2D and 3D surface analysis features for experiments such as approach curves and area scan imagery. This truly powerful package is gaining popularity due to its strong analytical capabilities.



Probes

The foundation of a great measurement is a great probe, that's why we provide one of the most comprehensive range of probes, each individually characterized.

Technique	Materials	Options / sizes
SECM / ic-SECM	fused silica & platinum: Ø 4 mm	10, 15, 25 µm
SECM	borosilicate & platinum: Ø 2 mm	1, 2, 5, 10, 15 or 25 µm †
SVP	LDPE & platinum	> 5 µm
LEIS	LDPE & platinum	> 5 µm
SKP	brass & tungsten	150 or 500 µm
SDS	PTFE or MACOR	200 or 500 µm
OSP	Optical	Wavelength: 650 nm,

† Each pack includes a 2 mm to 4mm adaptor.

SECM SKP SKP

Tools

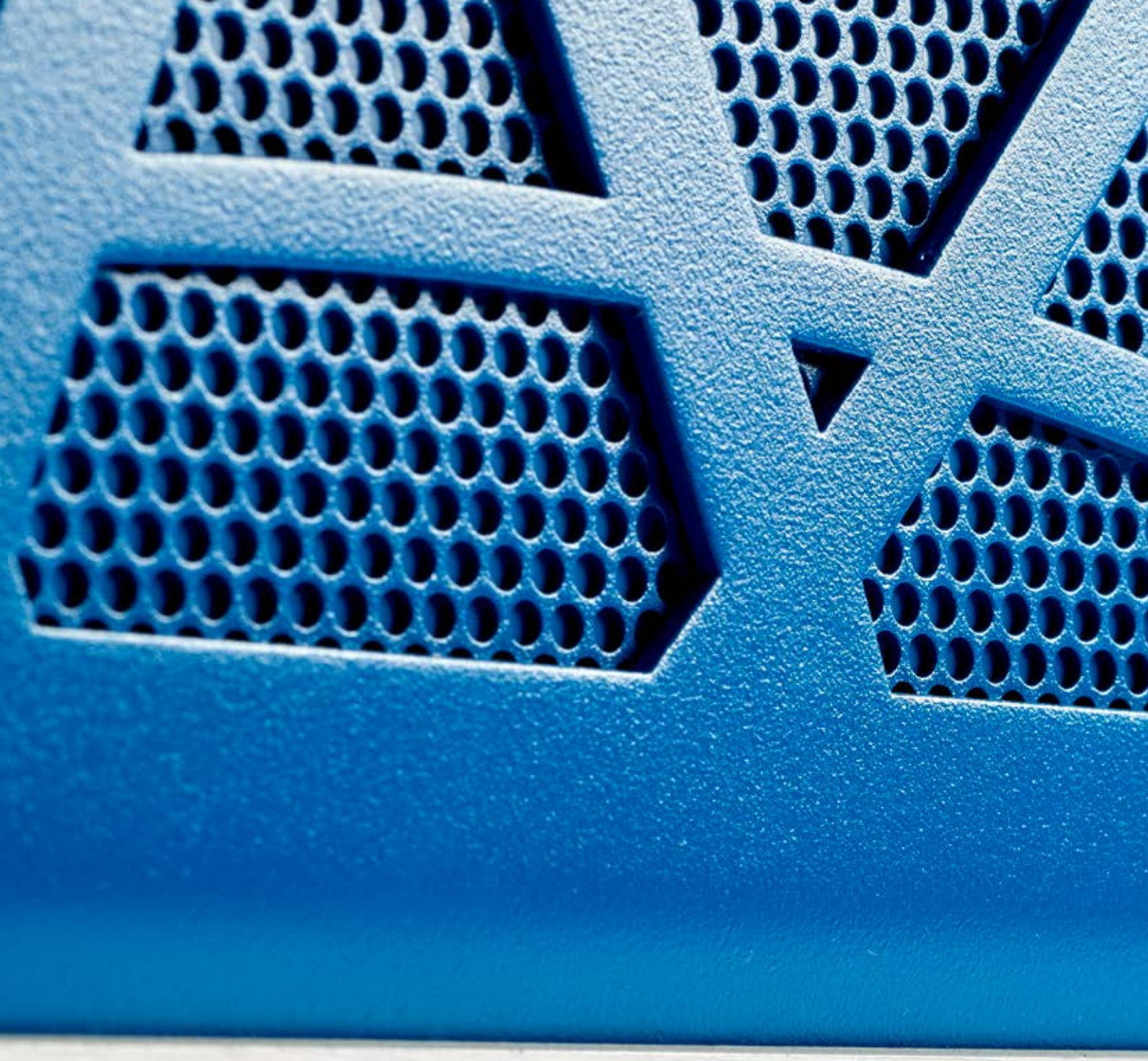
Tricell

A wide variety of optional accessories are also available, including various probe options, cell options (**environmental TriCell, µTriCell, shallow µTriCell, Foil Cell**) and long working distance optical video microscope (**VCAM3**). Additionally, the **USB-PIO** module allows the M470 to monitor digital signal levels and switch external hardware synchronized with experiments and movements.
Glove box cable sets are also available to place only the scan head inside a glove box, with the control unit remaining outside.

µTricell

Specification

	M470	SECM150
Number of techniques	9 techniques	1 technique
Modular upgradability	yes	no
Positioning resolution	20 nm	10 nm
Scanning range	110 mm	200 µm (X, Y) 100 µm (Z)
Max. scan speed	10 mm/s	200 µm/s
Piezo positioning	yes (ic-SECM)	yes
Potential range	±10 V	±2.048 V
Current ranges	1 A to 1 pA	1 mA to 100 pA
Analog to digital resolution	24-bit	16-bit
Impedance range (3300)	0.1 Hz to 1 MHz	no
Impedance range (VMP 300)	10 µH to 3 MHz	
VMP 300 family compatibility	yes	no
Recommended probe sizes	all	<= 5 µm
Dimension (mm)	500 x 400 x 675	180 x 225 x 355



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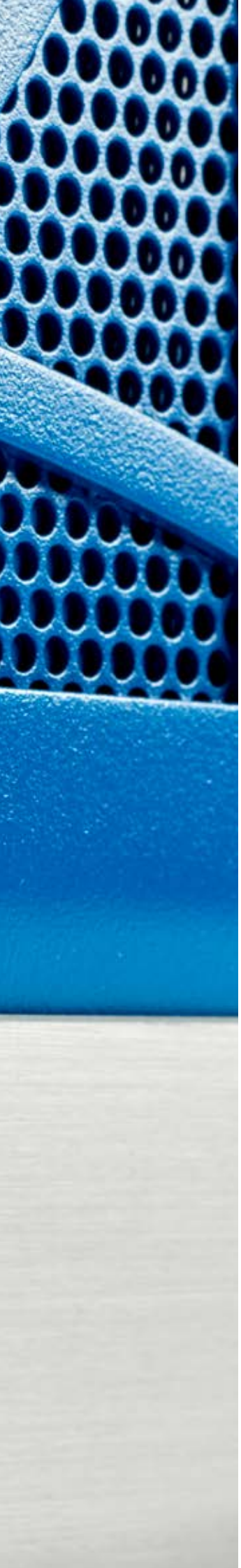

Find more information on

www.biologic.net

Application notes

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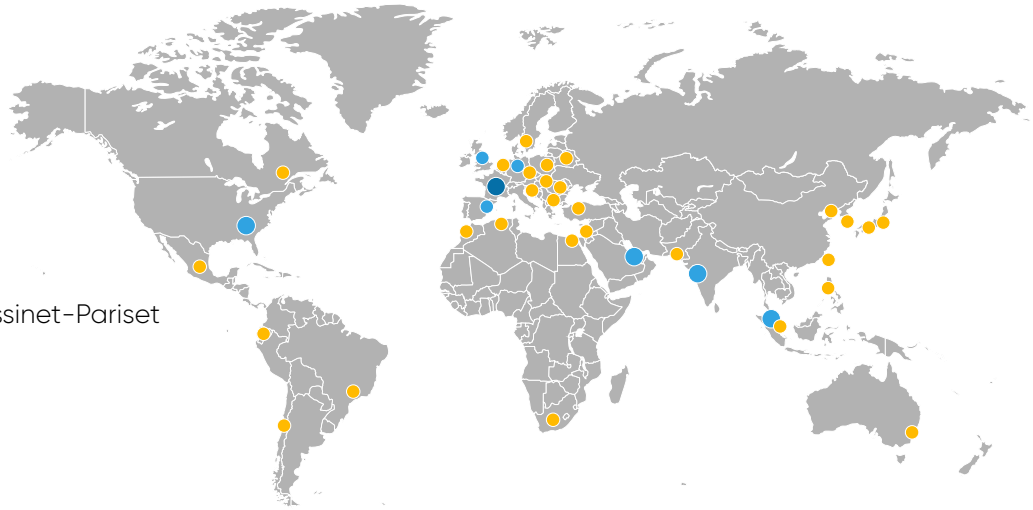

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